

## Abstracts for The European Society for Cardiovascular Surgery 54th International Congress, Athens, Greece, May 19-22, 2005

### SCIENTIFIC SESSION C1 CORONARY

#### C1.1

##### MINIMALLY INVASIVE RADIAL ARTERY HARVESTING FOR CORONARY ARTERY BYPASS

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**Objective:** In recent years, total arterial revascularisation has shown its superiority in long term patency of grafts. However, bilateral thoracic artery harvesting is not indicated in every patient, especially in the diabetic and obese patient. The radial artery seems to be a good alternative in these cases, but, local complications and the presence of an important scar on the forearm limits the use of this graft.

**Methods:** We reviewed retrospectively 85 patients operated in our institution from October 2002 to March 2005, with control of the scar, local complications, local infection, and presence of paresthesia. A stress test was made in every patient.

**Results:** 8 patients had a hematoma which disappeared after 2 weeks, one patient had a bleeding on the proximal stump which needed reoperation, one radial was not usable because of dissection, one patient presented paresthesia in the territory of the sensitive branch of the radial nerve. No patient presented peroperative ischemia, and no patient needed reoperation for bleeding. One patient presented post-operative ischemia because of pre-anastomotic stenosis of the radial artery.

**Conclusions:** We conclude that this technique is feasible, with a limited learning curve, shows good short term results, but long term patency must still be investigated.

#### C1.2

##### PRE-OPERATIVE ELECTIVE INSERTION OF INTRA-AORTIC BALLOON PUMP IN HIGH-RISK OFF-PUMP CORONARY ARTERY BYPASS GRAFTING REDUCES THE RISK OF ACUTE RENAL FAILURE

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**Objective:** The beneficial effects of intra-aortic balloon pump (IABP) in CABG with cardiopulmonary bypass have been reported. However, the benefits of insertion of IABP electively in high-risk off-pump coronary artery bypass grafting (OPCAB) have not been established.

**Methods:** 625 patients who underwent OPCAB form the study group. High-risk patients fulfilling two or more of the following: left main stem stenosis >70%, unstable angina and poor left ventricular function who had elective insertion of IABP pre-operatively by the open technique (group I;  $n = 20$ ) were compared with a similar high-risk group who did not (group II;  $n = 25$ ).

**Results:** There were no significant differences in risk factors between the two groups. Mean number of grafts were similar. Post-operatively, there were no significant differences in the need for inotropes, duration of ventilation, arrhythmias, cerebrovascular, gastro-intestinal and infective complications ( $P = NS$ ). There were no IABP-related complications. None of the patients in group I had a creatinine rise of >200  $\mu\text{mol/l}$ . By contrast, five patients (20%) in group II had acute renal failure (post-operative creatinine rise of >200  $\mu\text{mol/l}$  and oliguria;  $P < 0.05$ ) out of which three patients required hemofiltration. Five patients in group II who had a pre-operative serum creatinine of <120  $\mu\text{mol/l}$  developed a maximum post-operative serum creatinine of 120-170  $\mu\text{mol/l}$  whereas another five patients in the same group who had a pre-operative serum creatinine of 120-170  $\mu\text{mol/l}$

developed a maximum post-operative serum creatinine of >170  $\mu\text{mol/l}$ . Mean maximum serum creatinine reached post-operatively in the five group II patients with acute renal failure was  $258.4 \pm 42.5$   $\mu\text{mol/l}$  as compared to  $139.2 \pm 26.5$   $\mu\text{mol/l}$  pre-operatively ( $P < 0.05$ ). Four patients (16%) in group II required post-operative IABP. Although intensive care stay was longer in group I ( $27.6 \pm 15.3$  vs.  $18.6 \pm 9.1$  h;  $P < 0.05$ ), patients in group I were discharged earlier from hospital. There was no difference in mortality between the two groups ( $n = 1$  in each group).

**Conclusions:** In high-risk patients undergoing OPCAB, routine pre-operative insertion of IABP electively reduces the incidence of acute renal failure. In addition it avoids the need for emergency insertion post-operatively and may result in earlier discharge.

#### C1.3

##### POLAND'S EXPERIENCE IN 4799 WITH MINIMALLY INVASIVE CORONARY SURGICAL PROCEDURES—BASED UPON POLISH CARDIAC SURGEONS' CLUB-ANNUAL REPORT 2003

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**Objective:** Constant growth of cardiosurgical procedures in Poland is related to an increasing number of cardiosurgical wards as well as improvement of their performance (number of cases as follows: in 2001, 21190; 2002, 22927 and in 2003, 23682). This total growth is also noticed in coronary operations (consequently, as above: 11687, 13361 and 13752 in 2003). Development of operative techniques enabled surgeons to introduce more demanding, however safer, methods of coronary operations without use of extracorporeal circulation.

**Methods:** The percentage of minimally invasive (off-pump) operations is still growing—starting from (off-pump vs. all coronary operations) 1.6% (94/5765) in 1996 and reaching 35% (4799/13752) in 2003.

**Results:** The reason for this tendency despite higher demand of surgeon's technical skill is the safety of the patient. During all the analyzed period (1996-2003) the mortality (e.g. 3% (269/8953) in on-pump group vs. 2% (96/4799) in off-pump) and complications rate in the off-pump group was lower as compared to conventional coronary operations.

**Conclusions:** Increased amount of minimally invasive techniques is exceeding the 40-60% level of surgical procedures in some cardiosurgical centers (Gdansk, Warsaw, Zabrze) in Poland. This tendency seems to be beneficial both for patients (lower mortality and complications) and for the surgeons (constant improvement of operative technique).

#### C1.4

##### COMPLEX OFF-PUMP CORONARY ARTERY BYPASS SURGERY CAN BE SAFELY TAUGHT TO CARDIOTHORACIC TRAINEES

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**Objective:** Off-pump coronary artery bypass (OPCAB) is undoubtedly demanding technically as the surgeon is faced with a beating heart and not a bloodless field, which is in contrast with the conditions in on-pump surgery. The potential clinical advantages of OPCAB and the advances made in surgical technology have made this procedure an essential part of a

cardiothoracic training program. The aim of this study is to investigate the impact of teaching trainees complex OPCAB procedures (arterial grafting, "Y" grafts, sequential grafting and MIDCAB) on clinical outcomes.

**Methods:** All 323 OPCAB cases performed by one service over a 24-month period were analysed. The 125 (39%) operations performed by two trainees with previous exposure in on-pump surgery under supervision were compared with the 198 (61%) performed by an experienced consultant surgeon. Patient and disease characteristics, intra- and post-operative data, morbidity and mortality were analysed using uni- and multivariate analysis. Data were extracted from a prospective data base.

**Results:** The trainees performed 41% of the MIDCABs, 27% of the "Y" grafts (distal end) and 20% of the sequential grafts. The IMA was used in 96% of the cases, radial artery in 49% and bilateral IMAs in 11% equally distributed between trainees and consultant. The average number of grafts per case was 3.7 for the consultant and 3.3 for the trainees. Patients operated by the consultants were more likely to have unstable angina ( $P = 0.008$ ), poor left ventricular function (ejection fraction <30%) ( $P = 0.01$ ), or previous cardiac surgery ( $P = 0.027$ ). They were more likely to receive over 4 grafts ( $P = 0.01$ ). Operative mortality was 1.5% for the consultant and 0 for the trainees ( $P = 0.17$ ). Post operative morbidity, such as re-operation for bleeding (consultant 1% vs. trainee 0.8%), stroke (0.5% vs. 0.8%), haemofiltration (3.5% vs. 0.8%) were similar between the two patient groups. Hospital stay and ICU stay were also similar.

**Conclusions:** The results of this study suggest that trainees under supervision perform complex OPCAB safely with low rate of mortality and complications. These findings are in agreement with previous literature reports. Trainees should be allowed to operate on sufficient numbers of patients undergoing OPCAB after adequate exposure to on-CAB surgery according to their skills and abilities. Patients should be reassured that safety is not compromised by the presence of a trainee as a primary operator.

#### C1.5

##### CARDIAC TROPONIN I RELEASE FOLLOWING CORONARY ARTERY BYPASS SURGERY. EFFECTS ON OPERATIVE AND MID-TERM SURVIVAL

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**Objective:** Myocardial infarction (MI) associated with coronary artery bypass grafting (CABG) operations represents a serious and relatively frequent peri-operative complication. Markers of myocardial necrosis are usually found elevated in patients undergoing coronary bypass operation with cardiac arrest. Cardiac troponin I (cTnI) is the preferred marker to detect acute myocardial ischemia. Its ability to predict short and, particularly, mid-term outcome following coronary bypass operations is uncertain. The aim of the presented study is to assess the role of postoperative cTnI in predicting in-hospital and mid-term outcome in non-selected patients undergoing CABG and to suggest a critical use of cTnI to improve post-operative care of patients with elevated troponin release.

**Methods:** Between May 2000 and February 2003, 230 unselected patients undergoing surgical revascularization had cTnI measured preoperatively and 11 times postoperatively. Patients with unstable angina and recent MI (<7 days) were included in the study. Patients undergoing aortic dissection surgery and those undergoing heart valve procedures with associated CABG as well as patients transferred on emergency in the operative room following complicated percutaneous coronary intervention were excluded. A receiver operating characteristics (ROC) curve was constructed using cTnI postoperative peak values to assess prognostic specificity and sensitivity of the test. 13 ng/ml is the cut-off value used to assess the prognostic significance of peak cTnI postoperative release for short and mid-term outcome for mortality and hospitalization for cardiac causes. Mean and maximal follow-up were 22.6±10.7 and 48.3 months, completeness 90%.

**Results:** 146 patients (63.5%) had postoperative cTnI peak values <13 ng/ml (mean peak value 6.6±3.1 ng/ml), 84 patients (36.5%) had postoperative cTnI peak values >13 ng/ml (mean peak value 45.5±59.9 ng/ml). Patients with peak cTnI >13 ng/ml were older, had lower body mass index and had higher preoperative cTnI values. They required longer cross-clamp time and CPB time. Post-operative results are shown. Hospital death was significantly higher in cTnI >13 ng/ml group (9.5% vs. 0.7%,  $P = 0.0009$ ). Multivariate analysis showed that cTnI >13 ng/ml was the only independent predictor of hospital death (OR 10.33,  $P = 0.04$ ) and hospital death for cardiac causes. Two years follow-up demonstrate that cTnI postoperative release had no influence on mid-term mortality and hospitalization for cardiac causes.

**Conclusions:** The presented is the largest study reporting mid-term survival for CABG patients based on postoperative cTnI release. cTnI is a valuable marker for immediate myocardial damage following coronary bypass operations. cTnI postoperative release does not predict mid-term outcome.

#### C1.6

##### CORONARY BYPASS GRAFTING IN PATIENTS WITH CAROTID ARTERY DISEASE

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**Objective:** To present the management protocol of patients who undergo coronary bypass grafting (CABG) and have coexistent symptomatic or asymptomatic carotid artery disease (CAD).

**Methods:** According to our protocol, patients who undergo CABG and are >65 years old, or have left main coronary artery disease or have a history of carotid endarterectomy or present with asymptomatic carotid bruit or have a history of transient ischemic attack (TIA), routinely undergo carotid Triplex or angiography during their coronary angiogram. During the period Oct 2000 - Oct 2004 in a total of 636 patients who underwent CABG, 5 patients with symptomatic carotid bruit and internal carotid artery (ICA) stenosis >70%, underwent simultaneous percutaneous angioplasty or open endarterectomy (group A), 4 patients with asymptomatic >85% stenosis of ICA and occluded contralateral carotid, underwent carotid angioplasty before CABG at the same day of operation (group B) and 65 patients with asymptomatic >85% of one carotid underwent only CABG, maintaining a MAP during cardiopulmonary bypass >85 mmHg (group C).

**Results:** In all groups with the exception of one patient in group A, the postoperative course was uneventful. Patients in group C were instructed to undergo either angioplasty or carotid endarterectomy at a second stage.

**Conclusions:** The presence of carotid artery disease in patients who undergo CABG, symptomatic or not, continue to be a difficult and controversial entity both for the surgeon and the anesthesiologist. Our experience has shown that each case except the detailed medical history and preoperative study, should be managed accordingly, having the support of the cardiac anesthesiologist and the perfusionist.

#### C1.7

##### AN ORIGINAL CORONARY "TOTAL ARTERIAL ENDARTERECTOMY" TECHNIQUE. TECHNICAL ASPECTS AND IMMEDIATE AND LATE OUTCOME

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**Objective:** The progressive incidence of diffuse and extensive CAD has refocused attention on Coronary Endarterectomy (CE). We report a description of an original "total arterial" technique for CE and evaluate, retrospectively, the impact in the early and late outcome.

**Methods:** In case of extensive CAD, after a total length arterotomy and atheroma remotion (eventually extended to collateral branches), a reconstruction of coronary artery by an adequate IMA flap graft was performed. The dome of the new reconstructed coronary artery consisted of the IMA wall. The remaining part of the native endarterectomized artery forms a posterior gutter giving the origins of collateral branches. This technique was applied in 539 patients undergoing first-time CABG between June 1996 and July 2003. There were 427 men and 112 women; mean age was 59.5±12.3 years. 175 (32%) had a previous MI, and 42 (7%) were operated on an urgent/emergency basis. EF<30% was present in 126 (23%). 404 (75%) had a three-vessel disease. Mean EuroSCORE was 5.1±0.7; number of anastomoses/patient was 3.2±0.6. All patients underwent control coronarography prior to hospital discharge. Follow-up information was obtained from 514 patients (100% of the long-term survivors).

**Results:** The endarterectomized vessels were: LAD (58%); OMA (23%), RCA (10%) and multiple distributions (9%). The mean arterectomy length was 4.4±0.7 (range 2-12 cm) for LAD, 3±0.6 (2-5) for OMA and 3.2±0.7(2-6) for RCA. Mean CPB time was 54±12min; ACC = 48±7 min. There were 9 (1.7%)

perioperative deaths: 3 for MI and 6 LOS. The endarterectomised artery was not correlated with early mortality or complication. At postoperative angiography study, 15 endarterectomies were diffusely occluded (8 LAD, 6 OMB and 4 RCA;  $P = 0.56$ ). At the follow-up (mean =  $54 \pm 12.3$ , 2 to 68 months) survival was 95.4% (514): 481 (93.7%) were symptom free, and 33 (7.3%) were in CCS class II or III. In symptomatic patients, a control coronarography relieved a progression of coronary disease and/or vein graft but not alterations in the arterial endarterectomy. In a multiple logistic regression

analysis, prolonged ACC time and  $EF < 30\%$  were independent predictors of perioperative death and MI (OR = 2.6, CI = 1.87-3.9,  $P < 0.001$ ; OR = 1.2, CI = 1.05-1.39,  $P < 0.01$ , respectively)

Conclusions: This technique enhances the probability to achieve a complete revascularization in patients with an unfavourable anatomical substrate, is safe and effective and accomplished with acceptable operative risk and good long-term results similar to CABG without CE. CE itself is not an independent predictor for postoperative morbidity or mortality.

## SCIENTIFIC SESSION C2 MISCELLANEOUS

### C2.1

#### THE INFLUENCE OF ASCENDING AORTIC ATHEROSCLEROSIS ON LATE STROKES AFTER CABG

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**Objective:** Postoperative stroke is a severe complication immediately after CABG, and it significantly deteriorates the postoperative quality of life if it occurs in the long term. It was the aim of our study to determine factors associated with the occurrence of new strokes during long-term follow-up after CABG.

**Methods:** From 387 out of 500 CABG patients (aged 67 (33-84) years, 76% male), who underwent intraoperative epi-aortic ultrasound for assessment of ascending aortic wall thickness, a complete follow up regarding post-operative strokes was achieved. The median follow up time was 52 (9-74) months.

**Results:** In 26/387 (7%) patients a stroke occurred, and the cumulative freedom from stroke was 99%, 95%, and 89% after 1, 3, and 5 years, respectively.

A significantly lower freedom from stroke was present in patients with: an age of 70 years or more ( $P = 0.007$ ), preoperative unstable angina ( $P = 0.031$ ), chronic obstructive pulmonary disease ( $P = 0.009$ ), carotid artery disease ( $P < 0.001$ ), and preoperative history of neurologic events ( $P < 0.001$ ), and a maximum ascending aortic wall thickness of 4 mm or more ( $P = 0.010$ ).

**Conclusions:** Patients with ascending aortic atherosclerosis, older age ( $\geq 70$  years), preoperative unstable angina, chronic obstructive pulmonary disease, and carotid artery disease are at risk for late postoperative strokes after CABG.

### C2.2

#### RISK OF FATAL LOW CARDIAC OUTPUT CAN BE CALCULATED PRE-OPERATIVELY FOR ALL ADULT CARDIAC SURGICAL PATIENTS

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**Objective:** Low cardiac output syndrome is the most common seminal event leading to death following cardiac surgery. The aim of this study was to test a clinical risk assessment tool that allows clinicians to predict the risk of fatal low cardiac output (LCO) in the postoperative period for all adult cardiac surgical patients.

**Methods:** The study comprised of 1448 consecutive adult patients who underwent any cardiac surgery between April 2001 and March 2002. Preoperative patient characteristics were obtained from our cardiac surgical registry. A risk assessment tool that was initially developed by the Northern New England Cardiovascular Disease Study group (NNECVDSG) for patients undergoing coronary artery bypass surgery was used to predict the risk of fatal LCO in all these patients. The actual mode of death was decided by case note reviews carried out by two independent clinicians using specified criteria. Receiver operating characteristic (ROC) curve was calculated to assess the performance of the model in predicting fatal LCO.

**Results:** 48 (3.3%) in-hospital deaths occurred in the study, 27 of which were caused by LCO. 878 patients were classified as low-risk (score of 0 to 3), 422 were medium-risk (score 4 to 6), while 148 were high-risk (score 7 or more). The numbers of deaths caused by LCO were 2 (0.2%), 10 (2.4%), and 15 (10.1%) for low, medium, and high-risk groups, respectively ( $P < 0.001$ ). The ROC curve was 0.88, indicating an excellent ability of the model to predict fatal LCO.

**Conclusions:** The NNECVDSG model for predicting fatal LCO is a reliable and accurate tool for risk prediction. We found this model useful not only in patients undergoing coronary artery surgery, but in all adult patients undergoing cardiac surgery. Identification of patients with a high-risk of fatal LCO may allow for more aggressive monitoring and appropriate changes in therapy. The tool may also avoid invasive monitoring in low-risk patients.

### C2.3

#### THYMUS GLAND PRESERVATION DURING CARDIAC SURGERY REDUCES RE-EXPLORATION FOR HAEMORRHAGE

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**Objective:** A well described step of median sternotomy is the division of thymus gland and fatty tissue of the upper-anterior mediastinum. However this procedure carries a risk for postoperative bleeding and innominate vein injury. We describe an easily applied technique of mobilization of the above tissues instead of division.

**Methods:** From September 1993 to June 2004, 2850 consecutive patients underwent first time cardiac operation in our units with either standard median sternotomy or mini-sternotomy. We divide the patients in two cohorts, Group A (thymus division) 1150 patients (40%) and group B (thymus mobilization) 1700 patients (60%). The demographic and clinical characteristic was the same. In group B we mobilized with lectrocrauter the anterior-apical mediastinal content (thymus gland and mediastinal fat) from the pericardial sac and the mediastinal pleurae. The mobilized tissues were repositioned in their anatomic place at the end of the operation providing a natural cover of the ascending aorta.

**Results:** In group A we re-explored 67 patients for postoperative bleeding (5.83%). In 8 patients the cause of bleeding was related to the thymus surgical manipulations (in 4 patients innominate vein injury; 3 of them requiring pericardial patch closure) and in 4 patients due to thymic vessel injury. In group B 39 patients were reexplored for control of postoperative bleeding (3.39%). The number of re-explorations was significantly less ( $P < 0.000$ ) and the cause in any case was unrelated with thymus gland and adjacent tissues. No other complications related to this procedure were observed.

**Conclusions:** We believe that the above described technique is less traumatic for the mediastinal structures, less hemorrhagic and probably more protective in case of future redo sternotomy than the classic procedure of thymus division.

### C2.4

#### SPONTANEOUS RIGHT VENTRICULAR RUPTURE ASSOCIATED WITH MEDIASTITIS: ROLE OF PERICARDIAL CLOSURE AT INITIAL OPERATION

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**Objective:** Mediastinitis-related right ventricular (RV) rupture is a potentially life-threatening complication of cardiac surgery. Our experience with this complication is analyzed.

**Methods:** All the cases of mediastinitis recorded since the introduction of a prospective database for our cardiac surgery program were reviewed. Cases of mediastinitis were basically managed with sternal debridement, followed in a second stage, by chest reconstruction with pectoral flaps. All the patients with bleeding from the anterior surface of the heart during this interval were analyzed. Chi-square test was used for comparison with a  $P$  value  $< 0.05$  considered as significant.

**Results:** Among 560 consecutive patients who underwent heart surgery, mediastinitis occurred in 14 cases (2.5%). All 14 patients had coronary artery surgery, two of them combined with aortic valve replacement. Four patients developed active bleeding while waiting for their secondary chest closure. In the four cases, bleeding originated from the RV and occurred between 1 and 6 days after sternal debridement. One patient died on day 1 of exsanguinations because of intractable cough. The other three had limited bleeding which could be repaired at bedside with direct sutures and they were closed right away with pectoral flaps. One of them eventually died of multiple cerebral emboli. Notably, the four RV ruptures occurred among the 8 patients (4/8, 50%) who had their pericardium left open at the time of the initial cardiac operation, while no rupture occurred among the 6 patients who had their pericardium closed (0/6, 0%),  $P = 0.04$ .

**Conclusions:** In this series, RV rupture developed exclusively among patients who had their pericardium left open at initial cardiac operation. The RV tear likely resulted from the distraction of the sternal edges which was transmitted directly to the fragile RV wall. In order to prevent this severe complication, we recommend systematic closure of the pericardium at the primary operation whenever feasible. When the pericardium has been left open, we recommend that the RV should be widely freed from the sternal edges during the debridement and that the chest should be closed as soon as possible. Lastly, in case of RV rupture, emergency closure with pectoral flaps appears as a valid option.

## C2.5 TREATMENT OF POST-SURGICAL STERNAL INFECTIONS BY HYPERBARIC OXYGEN THERAPY

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**Objective:** A retrospective study was conducted to evaluate the eventual advantages of Hyperbaric oxygen therapy (HBO) in the management of sternal wound infection after cardiac surgery.

**Methods:** Between January 1, 1999 and December 31, 2004, 34 patients, who had undergone cardiac surgery at Centro Cardiologico Monzino, developed postoperative deep sternal wound infection (DSWI) according to the Center of Disease Control criteria. Two patients were excluded from our study group since they died from multiorgan failure early after surgery. Data were collected prospectively. Sternal wound infections were approached aggressively. In addition to traditional therapy, we proposed to all the patients HBO therapy. group 1 included all the patients able for HBO therapy that gave their consent ( $n = 14$ ) who were treated with HBO. Group 2 included patients that did not give written consent or were not able at the evaluation visit ( $n = 18$ ). group 1 was additionally treated by Hyperbaric oxygen therapy (at 2.5 atmospheric absolute, each session 72 min long). The 2 groups were studied retrospectively in order to evaluate eventual differences in outcomes.

**Results:** No significant differences were found between the 2 groups in preoperative, operative, perioperative parameters. The bacteriology was similar too and the dominant isolated microorganisms were *Staphylococcus aureus* and *Staphylococcus epidermidis* (80% in both groups). Time of infection recovery and time from diagnosis to closure of the wound were comparable ( $P = 0,357$  and  $P = 0,199$  respectively) between groups. No relapse of infection has been registered in the group treated by HBO therapy while in six cases (33,3%) of group 2 a relapse of infection was registered. The statistical analysis has shown a significant difference in infection relapse ( $P = 0,024$ ). In all cases, the microorganisms were the same as the first infection. The infection relapse has been treated as the first infection, through surgical approach, medications and intravenous antibiotic therapy. The total in-hospital stay was significantly higher in the group not treated by HBO therapy ( $73,55 \pm 24,47$  vs.  $52,56 \pm 9,10$ ;  $P = 0,026$ ). Moreover, days of intravenous antibiotics was significantly higher in the group not treated by HBO therapy ( $67,60 \pm 25,10$  vs.  $47,78 \pm 7,38$ ;  $P = 0,036$ ).

**Conclusions:** This retrospective study has pointed out a possible adjuvant role of HBO in treatment of the sternal wound infection after cardiac surgery.

## C2.6 NEUROLOGICAL COMPLICATIONS AFTER CARDIAC SURGERY: IS IT POSSIBLE TO REDUCE THEM?

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**Objective:** Cerebral injury after cardiac surgery is still a major cause of mortality and morbidity. In an aging patient population the incidence is likely to increase. Our purpose is to evaluate the usefulness of some measures aimed to avoid brain injury during cardiac surgery.

**Methods:** We analyzed 141 patients with high-risk of stroke (coronary artery disease and/or 70 years of age or older) who underwent cardiac surgery in our Institution during 2004. The average age was  $69.4 \pm 8.4$  years. Risk factors were previous neurological dysfunction (3.6%), extra cardiac arteriopathy (4.3%), diabetes mellitus (26.2%) and hypertension (62.4%). Preoperative treatment with aspirin was present in 63% of patients. We routinely performed carotid duplex ultrasound scanning in a preoperative basis. All patients underwent surgery under cardiopulmonary bypass with surface-coated circuits to minimize the cerebral and whole body inflammatory response to the bypass circuit, maintaining a perfusion pressure of at least the same age of the patient. 67% of them underwent coronary artery bypass grafting, and 95% of proximal anastomoses were performed on the aorta during a single period of aortic cross-clamping. We did not use epi-aortic ultrasound.

**Results:** The preoperative screening did not show any patient requiring carotid surgery previous to cardiac surgery. Following Roach's classification, there were no type I neurological complications, and 2 patients (1.2%) had type II outcomes (new seizures and encephalopathy). There were 5 (3.6%) in-hospital deaths, none of them due to neurological complications. The predicted mortality according to logistic EuroSCORE was 5.7%.

**Conclusions:** Even though the study was done on high-risk patients, the low incidence of neurological complications suggests that our protective strategies were effective. Although many factors remain unclear, our results suggest that neurological deficit could be due to low cerebral blood flow rather than to atherosclerotic emboli. As our measures are easy to perform, we strongly recommend putting them into practice. However, further experimental studies and, most importantly, prospective randomized clinical trials are warranted to prove new innovative concepts in clinical practice.

## C2.7 FIVE-YEAR FOLLOW-UP OF ASCENDING AORTOPLASTY

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**Objective:** Ascending aortoplasty is a feasible technique which presents various advantages as it is less radical than aorta replacement. This report evaluates the 5-year follow-up of patients who underwent ascending aortoplasty.

**Methods:** From January 1998 to November 2004, 68 patients underwent aortic valve replacement and reduction aortoplasty. The mean age was  $61.93 \pm 12.27$  years. 41 patients were male (60.3%). We performed a preoperative echocardiography and a computed tomographic scan of the chest to evaluate the diameter of the ascending aorta in all patients. It was measured at the level of bifurcation of the pulmonary artery. The mean preoperative aortic diameter was  $50.9 \pm 7.0$  mm (range 39-70). Aortic valve disease was present in all patients. Other associated cardiac procedures have been performed in 25% of our patients: coronary artery by-pass graft in 11 cases, mitral valve replacement in 3 cases and mitral valve repair (prosthetic annulus implantation) in an other 3 cases. Survival and time-related event analysis was performed with the Kaplan-Meier method. Follow up ranged between 1-69 months and was 100% complete.

**Results:** There has been no perioperative morbidity and one perioperative death (1.47%) for acute dissection of the aortic arch. Three patients died at follow-up, one from cerebral infarction, one from pulmonary cancer and one from prostate cancer. One patient had a transient cerebral ischemia at 16 months, with no actual neurological damages. Overall survival estimates at 36 and 66 months were  $90.32 \pm 5.72\%$  and  $85.80 \pm 6.99\%$ , respectively. The actuarial freedom from cardiac-related death at 36 and 66 months was  $98.53 \pm 1.46$  and  $93.60 \pm 5.00$ . Five patients underwent aortic redilatation, 3 of them underwent aortic reoperation. The actuarial freedom from redilatation at 36 and 66 months was  $97.22 \pm 2.74$  and  $76.25 \pm 9.82$ . The actuarial freedom from reoperation at 36 and 66 months was 100% and  $83.33 \pm 9.17$ . At the analysis of risk factors for redilatation, only preoperative diameter  $>55$  mm was defined a risk factor. Repeated-measures ANOVA were used to evaluate differences in diameters of the ascending aorta during follow-up, pointing out a significant decrease after surgery ( $50.9 \pm 7.0$  mm vs.  $36.4 \pm 5.2$  mm,  $P < 0.05$ ), without further changes (at 5 years,  $39.3 \pm 4.2$  mm,  $P > 0.05$ ).

**Conclusions:** Our experience demonstrates that ascending aortoplasty can be a feasible technique, when the preoperative diameter is lower than 55 mm. Five year follow-up points out low mortality and morbidity. A preoperative ascending aorta diameter greater than 55 mm is a risk factor of redilatation after surgery.

## C2.8 OPERATIVE RISK FACTORS AND LONG-TERM OUTCOME IN OCTOGENARIANS UNDERGOING CARDIAC SURGERY: IS THE RISK JUSTIFIED?

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**Objective:** With the progressive aging of the Italian population, cardiac operations are being performed more frequently in patients aged 80 years and older.

**Methods:** Between January 1997 and December 2003, 287 consecutive octogenarians (median age 81 years, age range 80 to 90 years) underwent cardiac surgery in our Department. We retrospectively analyzed patients' preoperative characteristics, postoperative complications, short and long

term outcome, and freedom from cardiac events (reoperation, cardiac-related re-hospitalization, and percutaneous cardiologic procedure).

Results: 159 patients (55.4%) were male; 269 (93.7%) patients had a EuroSCORE = 6, 84 (29.3%) a NYHA functional class III-IV, and 67 (23.3%) a left ventricular ejection fraction <50%. Operations included coronary artery bypass grafting in 58.5% cases, valve procedures in 19.9%, coronary artery bypass grafting plus valve procedures in 18.5%, and other procedures in 3.1%; in 78 (27.2%) patients the timing of intervention was urgent or emergent. The 30-day mortality rate was 9.1%. Multivariate predictors ( $P < 0.05$ ) of early death were a left ventricular ejection fraction <50%, a preoperative diagnosis of unstable angina, and an urgent or emergent surgical priority. Atrial fibrillation (35.2%), renal failure (9.8%), and type 2 neurological deficits (9.4%) were the postoperative complications occurring more frequently. Kaplan-Meier survival rates at 1-year, 3-year and 6-year were  $83.8 \pm 2.2\%$ ,  $73.1 \pm 3\%$ , and  $51.6 \pm 5.4\%$ , respectively; males and patients with a preoperative left ventricular ejection fraction <50% had a significantly lower survival than females and patients with a preoperative left ventricular ejection fraction = 50%. Clinical follow-up was complete in all the 203 survivors. Mean length of follow-up was  $59.6 \pm 2.5$  months (range 2.3-83.6 months). 184 (91%) patients were in a NYHA functional class I-II and 179 patients (88.2%) rated their present health as excellent or very good. Freedom from a new cardiac event at 3-year and 6-year was  $94.9 \pm 2.1\%$  and  $75.5 \pm 7\%$ , respectively.

Conclusions: Cardiac surgical procedures can be performed in octogenarians with reasonable operative risk and satisfactory long-term outcome. Elderly patients benefit from improved functional status and quality of life.

#### C2.9

##### APPLICATION SIMPLICITY AND EFFECTIVENESS OF INTRACELLULAR TYPE OF CARDIOPLEGIC SOLUTION IN PATIENTS WITH SEVERE LV DYSFUNCTION

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Objective: Increased age and increasing cardiac morbidity of patients (pts) in cardiac surgery challenge anaesthesiologists and cardiac surgeons. One of the main perioperative problems remains intraoperative myocardial protection that should be safe and simple for application. Therefore we retrospectively analysed effectiveness of the Bretschneider method in pts with severe LV dysfunction (EF < 30%).

Methods: In 69 pts (37 with CABG (A), 32 with valve replacement (VR) with/without concomitant CABG (B)) mean EF was 26.8% (range 40-10%). All pts were intraoperatively protected by HTK solution (Dr. Koehler Chemicals, Alsbach) during aortic x-clamping that lasted for 67 min in A and 82 min in B. No topical cooling of the hearts was done. In both groups cardioplegic perfusion time was 6.9 min during which 1,745 ml in A and 1,962 ml in B were delivered. In only 10 cases (14.5%) cardioplegic reperfusions were once necessary and in 2 cases (2.9%) a second reperfusion must be performed. Elective procedures were performed in 15 pts in A and in 14 pts in B. Urgent or emergent operations were necessary in 22 pts in A and in 18 pts in B. Old pts and redos were not excluded.

Results: Mortality rate (hospital 30 days) was 6.7% in A for elective cases and 0% in B. In the urgent/emergent subgroups it was 22.2%/25% in A and 7.1%/0% in B. In the survivor group 52% were on inotropic medication after 24 h postop. Circulatory assist (IABP) was necessary in 27.5% (most of them were non-survivors).

Conclusions: Low mortality rates in elective cases and in urgent/emergent VR/CABG procedures and a simple way of delivery of cardioplegia underline the effectiveness of histidine buffered HTK solution in severely diseased hearts.

## SCIENTIFIC SESSION Cmp3 CORONARY MINIPRESENTATION

### Cmp3.1

#### OFF PUMP MYOCARDIAL REVASCLARIZATION FOR CRITICAL LEFT MAIN STEM DISEASE. IS IT SAFE?

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**Objective:** Purpose of this study was to determine the safety of multivessel by pass grafting in patients with left main coronary artery disease greater than 50%, using current off pump heart surgical techniques.

**Methods:** Between July 2003 and December 2004, 34 patients with critical left main stem stenosis (LMS) underwent off pump coronary artery by pass (OPCAB) grafting and were compared to 55 patients with LMS disease who underwent conventional coronary artery by pass (CCAB) surgery. All patients had multivessel grafting performed through median sternotomy. The retrospective data analysis included demographic and preoperative risk factors, operative details and clinical outcome.

**Results:** The two groups were similar in terms of preoperative and intraoperative variables. Mortality was similar in both groups (OPCAB 0/34 patients vs. CCAB 1/55 patients). The patients revascularized using CPB were significantly more likely to require inotropic agents than the patients who were grafted off pump (CCAB 76% vs. OPCAB 33%,  $P<0.001$ ). There was also a significant reduction in the need for transfusion of blood or blood products in the off pump group (CCAB 75% vs. OPCAB 36.3%,  $P<0.001$ ). There was no difference in the length of stay between the two groups as calculated from the time of operation to the time of discharge. Postoperative complications were compared and although no significant differences were observed between the two groups, there was a trend toward less complication rate in the off pump group.

**Conclusions:** Off pump multivessel cardiopulmonary by pass grafting is a safe and effective technique for patients with critical left main coronary artery disease.

### Cmp3.2

#### OFF-PUMP VERSUS ON-PUMP CABG: MID-TERM ANGIOGRAPHIC AND CLINICAL RESULTS

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**Objective:** The aim of this study was to compare angiographic and clinical results of patients who underwent CABG using either off or on pump techniques. Patients were compared for patency of grafts, return of symptoms and reinterventions.

**Methods:** 100 patients were enrolled into two groups. In group A, 50 patients (42 male, 8 female) underwent off-pump CABG; in group B, 50 patients (40 male, 10 female) were operated using on-pump techniques. All patients were operated by a single surgeon in a single center. Groups were similar in demographics but patients in group A had higher Euroscore (group A:  $3.09\pm 2.03$ ;  $P<0.05$ ). Mean follow up for both groups was  $35.4\pm 11.5$  months.

**Results:** The mean number of anastomoses was  $2.18\pm 0.72$  in group A and  $3\pm 0.82$  in group B ( $P<0.05$ ). Patency rates for LIMA, RIMA, SVG were 86.6%, 83.3%, 76.3% in group A and 96.6%, 88.8%, 85.8% in group B respectively ( $P>0.05$ ). The return of angina and rate of reintervention for failing grafts or anastomoses were similar between two groups.

**Conclusions:** Mid-term angiographic and clinical results of off-pump CABG were comparable with the on-pump group, which suggests that off-pump CABG is a reliable method of revascularization.

### Cmp3.3

#### MINIMALLY INVASIVE SAPHENOUS VEIN HARVESTING GUIDED BY PREOPERATIVE ECHOTOMOGRAPHY. RESULTS OF A PROSPECTIVE RANDOMIZED STUDY

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**Objective:** As great saphenous vein grafts are extensively used for CABG, morbidity related to impaired leg wound healing may be detrimental for postoperative quality of life of patients with inherent social costs. Minimally invasive harvesting techniques with the aid of dedicated instruments have been reported to reduce such complications. We developed a minimally invasive harvest technique without need of specific devices but guided by preoperative echotomography of vein segments. Here we report the in-hospital results of such approach through a prospective, randomized study. Safety and reliability of minimally invasive harvest technique in comparison to traditional open harvest are evaluated.

**Methods:** 107 patients were prospectively randomized to receive either minimally invasive or conventional harvest. Preoperative Doppler echotomography was performed in order to identify vein segments suitable for CABG and surgically attainable. Multiple skin incisions (up to three per patient and up to 5 cm in length each one) parallel to vein axis were performed. We used descriptive statistics and multiple logistic regression analysis for factors associated to wound healing complications.

**Results:** Minimally invasive technique was free of adverse effects on graft function and associated to higher graft blood flow after anastomosis, probably due to reduced venospasm. Minimally invasive technique was more time-expensive, but resulted in dramatically reduced incidence of postoperative wound morbidity. This was particularly evident in patients with risk factors for wound complications (diabetes, extracardiac vasculopathy, acute renal failure [ $P<0.05$ ]).

**Conclusions:** Minimally invasive approach is safe and reliable for obtaining venous conduits for CABG. Accurate echotomography mapping of the leg veins is pivotal for the efficacy of the technique. Given its low costs and evident benefits, minimally invasive harvest should be tested for inclusion in the routine surgical practice.

### Cmp3.4

#### SURGICAL REVASCLARIZATION ON THE BEATING HEART IN PATIENTS WITH LOW EJECTION FRACTION

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**Objective:** The subset of patients most likely to benefit from off-pump coronary artery bypass grafting (OPCABG) remains a controversial issue, but the technique has been proposed to decrease postoperative mortality and morbidity. Coronary artery bypass grafting with cardiopulmonary bypass carries significant risk for patients with severe left ventricular (LV) dysfunction. The objective of this study was to compare off-pump to on-pump CABG in patients with EF lower than 30%.

**Methods:** Between June 2002 and March 2004, 60 high-risk patients were prospectively randomized to undergo off-pump or on-pump CABG. All recruited patients had left ventricular ejection fraction lower than 30%.

**Results:** Thirty patients averaging 59,6 years of age underwent 2,03 grafts off pump, and 30 patients averaging 59,2 years of age underwent 2,30 grafts on pump. There were significantly higher incidence of diabetes and hyperlipoproteinemia in the off-pump group. OPCAB patients exhibited significantly less release of TnI (average  $0,71 \mu\text{l}$ ) than on-pump patients ( $3,00 \mu\text{l}$ ). Inotropic requirements were less in the off pump group. Patients undergoing OPCABG received fewer units of blood, and had shorter postoperative length of stay in intensive care unit and in hospital. There were no significant differences in hospital mortality and complication rates.

**Conclusions:** The present study suggests that off-pump CABG in patients with poor LV function when compared with conventional CABG, achieved similar number of grafts per patient, similar in-hospital outcomes, shorter length of stay, reduced transfusion requirement, and less myocardial injury.

### Cmp3.5

#### COMPARISON OF THE EFFECT OF PRE-TREATMENT OF THE RADIAL AND THE INTERNAL THORACIC ARTERY WITH MIXED VASODILATOR BY USE OF THREE-DIMENSIONAL ANAGLYPH ELECTRON MICROSCOPIC EXAMINATION

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**Objective:** There is an increasing use of full arterial revascularisation in coronary artery bypass surgery, and the radial artery has become commonly the conduit of choice. However, the RA has a potential for spasm. We studied the cantitative effects of mixed vasodilator agents in the RA and the ITA diameter using a scanning electron microscope (SEM) with 3-D anaglyph technique.

**Methods:** Ring segments of the RA and the ITA taken from 30 cases undergoing coronary artery bypass grafting were studied. A total of 120 vessel segments, which were cut into 5 mm-long rings, were tested. The harvested 60 vessel rings, 30 RA and 30 ITA, were not pre-treated. The remaining 60 arterial segments, 30 RA and 30 ITA, were placed in a mixed solution including nitroglycerin (60 µmol/L), Verapamil (60 µmol/L), Papaverine (450 µmol/L), and 30 ml autologous blood with 5000 IU unfractionated heparin. All 60 arterial segments were incubated during 15-20 min in the solution. The specimens were fixed in 2.5% glutaraldehyde, washed in phosphate buffer (pH 7.4), post-fixed in 1% osmium tetroxide in phosphate buffer (pH 7.4), and dehydrated in increasing concentrations of alcohol. Then the samples were sputtered with a 150 Å thick layer of gold in a BIO-RAD sputter apparatus. The images were taken as stereopairs by JEOL SEM ASID.

**Results:** All grafts have been used as a coronary artery bypass conduit. There was no evidence of arterial spasm and no change of the patients' electrocardiographic analysis after the operations. The patients have not required inotropic support postoperatively. The diameter of the pre-treated RA and the ITA were measured between 1.9 mm and 2.8 mm (mean 2.08 mm), and 1.3 mm or 1.9 mm, respectively, preoperatively. Whereas, diameter of the arterial segments, which were incubated in the mixed solution, were measured between 3.5 mm and 5.8 mm (mean 4.40 mm) for the radial artery, and they were measured between 2.8 mm and 3.9 mm (mean 3.60 mm) for the ITA. These findings were statistically significant in both arterial grafts.

**Conclusions:** We conclude that the described mixed vasodilator solution with heparinised autologous blood seems to be very effective as a pre-treatment agent for the arterial conduits. The study findings showed that the nature of the more vasodilator characteristic of the RA and the ITA support the necessity of a more active synergetic pharmacologic intervention to relieve spasm and effective vasodilatation.

### Cmp3.6

#### TOTAL ARTERIAL MYOCARDIAL REVASCULARIZATION IN ELDERLY—EARLY AND MIDTERM RESULTS

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**Objective:** The aim of this study was to evaluate the early and mid-term results of total arterial myocardial revascularization (TAMR) in patients older than 60 years.

**Methods:** We studied prospectively 65 patients aged 60 years and older (mean 64.8±4.4, range 60-78 years) who underwent total arterial myocardial revascularization between January 2002 and June 2004. 41 (63.1%) had three-vessel coronary disease, 18 (27.7%) had two-vessel disease and 6 (9.2%) with left main disease. 22 patients had an old myocardial infarction (MI) and 11 unstable angina pectoris. Mean EF was 55%. All patients underwent TAMR. In total 167 distal anastomoses were constructed (2.6 per patient). Pedicled LITA and RITA, free RITA and radial artery were used as single or composite T- or Y- graft. Mean cross-clamp time was 32.3±7.1 min. There was one perioperative MI and one patient needed intra-aortic balloon pump. There was no operative mortality. There was one cerebrovascular accident. Mean extubation time was 4.3±1.2 h.

**Results:** Patients were followed-up in a mean period of 17.6±7.3 months (range 1-28 month). One patient died in this period (1.5%), one underwent PTCA (1.5%), two suffered angina pectoris (3.1%), there was no reoperation in this period. There was no occluded grafts in the early postoperative period (less than 30 days) patency 100%. Late (mean 16±2 month) LITA patency was 98.1% (one graft occluded), RITA patency was 93.4%, (one graft occluded) and RA patency was 93.2% (three grafts occluded).

**Conclusions:** In our study we concluded that using only arterial conduits in coronary bypass surgery in the elderly (patient aged over 60 years) is a safe procedure and demonstrated that total arterial revascularization in the elderly provides superior clinical results and improved patient outcome even in the short-term to midterm. Arterial conduit-related benefits were clearly evident with respect to higher patency rate, better outcome in terms of

angina recurrence, need of percutaneous transluminal coronary angioplasty or surgical reintervention and freedom from cardiac events.

### Cmp3.7

#### USE OF THE MODIFIED T-GRAFTS FOR HEART REVASCULARISATION

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**Objective:** The T-graft procedure achieves complete arterial revascularization in coronary three-vessel disease. In this technique, all bypass anastomoses are supplied by the left internal mammary artery (IMA). The radial artery (RA) provides the same clinical and angiographic results both as aorto-coronary and composite Y-graft with the left IMA. When the RA is used as Y-graft the procedure is more technically demanding and a greater number of distal coronary anastomoses is possible. RA grafts to targets with stenosis 70% appear to be at risk of failure. We present a new operative technique for multiple arterial revascularization using composite radial and internal thoracic arterial grafts. In this technique LIMA is harvested up to the half of its length and anastomosed end to the side of the RA, which supplies the anterior and lateral wall. The use of the RA as a supplying, bypass graft presents we believe several technical advantages.

**Methods:** Between April 2004 and February 2005, 22 patients had CABG with inverted graft. These patients were 5 women and 17 men with a mean age of 64 years (range 44-78). The indication for inverted graft was aortic calcification in 7 patients, and the need for total arterial revascularization in the rest of patients. All procedures were performed without cardiopulmonary bypass. In all patients the outflow from composite graft was estimated in ml/min prior to implantation.

**Results:** Overall, 56 distal anastomoses were made (average number per patient 2.9; range 2-4), of which 38 were with inverted grafts (average number 3.2; range 2-4) and nine were with a single attached ITA. All procedures were performed as OPCAB procedures. All patients are alive and well. There was no perioperative myocardial infarction or stroke. Angiography performed in the early postoperative period in 10 patients showed that all anastomoses were patent. Rest of patients had a 16 slice computed tomography which revealed patent grafts. All patients were asymptomatic and had negative results of stress test. Postoperative angiography and the stress test were performed during the second hospitalization.

**Conclusions:** Tadashi Tashiro described a technique of implanting RA to the RIMA which was implanted to the aorta in order to increase the range of revascularisation. We modified this approach attaching RA to the LIMA. The rationale was to obtain the bigger diameter of utilizing grafts, to increase the range of revascularisation of anterior wall. And finally to increase the capability of blood transmission.

### Cmp3.8

#### ARTERIAL GRAFTING FOR CORONARY ARTERY DISEASE. THE CYPRUS EXPERIENCE

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**Objective:** Multiple reports demonstrate that the use of arterial grafts for CABG ensure better short as well as long-term patency results. The aim of this study is to review and evaluate our 5-year results using these arterial grafts.

**Methods:** From January 2000 until December 2004, 110 patients underwent CABG at our clinic using a combination of left internal mammary artery (in all 110 patients), right internal mammary artery (in 10 of the patients), the left radial arteries (in all 110 patients) and the right radial artery (in 10 of the patients). The left internal mammary artery was used on the left anterior descending artery, the radial arteries were used on branches of the circumflex and right coronary artery, and the right internal mammary artery on branches of the right coronary artery as well as on branches of the circumflex artery as T or Y grafts.

**Results:** There were no hospital mortalities, not one incidence of perioperative myocardial infarction. In all, no arterial graft harvest related complications. The mean length of intensive care unit stay was ~ 50 h. (range 20-140 h). To date, all these patients are well in health and symptom free.

**Conclusions:** Our results using arterial grafts in coronary artery bypass surgery exhibit no increase in mortality, morbidity or other complications of the procedure. A much longer term follow-up is needed for more conclusive evidence.



**Cmp3.9****COMPARISON OF DIFFERENT STRATEGIES IN PATIENTS UNDERGOING CORONARY REVASCLARIZATION WITH OR WITHOUT SIMULTANEOUS CAROTID ENDARTERECTOMY. IS SIMULTANEOUS OPERATION NECESSARY?**

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**Objective:** Management and surgical strategy of patients with coexisting asymptomatic carotid lesion and symptomatic coronary artery disease is still controversial. However the widespread applications of off-pump coronary artery bypass and loco regional anesthesia in carotid endarterectomy in recent years have enabled different surgical strategies to be applied.

**Methods:** Seventy one patients with coexisting asymptomatic carotid lesion have undergone coronary revascularization operation during a 2-year period. All patients were asymptomatic with regards to carotid disease. Carotid artery stenosis was documented either by duplex scan or magnetic resonance imaging. group 1 patients had concomitant carotid endarterectomy and group 2 patients underwent carotid operation with beating heart technique without carotid intervention. The operation strategy was the surgeon's preference, no randomization was performed. Average age of patients was 60.4±2.1 years. Group 1 patients had statistically more severe carotid lesions and preoperative stroke rates. group 2 patients had more bilateral carotid artery lesions and higher rate of prior myocardial infarction ( $P<0,05$ ). Other preoperative variables were comparable in both groups.

**Results:** group 1 patients had more grafts ( $P<0,05$ ). Postoperative complications were comparable in both groups. However postoperative and hospital stay days were longer in group 1 ( $P<0,05$ ). Although postoperative neurological problems were more in group 1 it was not statistically significant.

**Conclusions:** In patients with coexisting asymptomatic carotid disease, off-pump coronary artery bypass strategy without intervening carotid lesion is associated with low postoperative morbidity. The results were comparable in patients with concomitant operation. The outcome was mainly determined by the inherent risks of cardiac procedure.

**Cmp3.10****CORONARY BYPASS GRAFTING IN PATIENTS WITH HEREDITARY HEMORRHAGIC DISORDERS**

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**Objective:** We present two patients with hereditary hemorrhagic disorders who underwent coronary bypass grafting (CABG) under cardiopulmonary bypass.

**Methods:** Patient A, a 59-year-old male with von Willenbrand and coronary artery disease underwent triple CABG and patient B, an 80-year-old male with hemorrhophilia type A (VIII factor deficiency) coronary and mitral valve disease underwent double CABG and MVR. The preparation of these two patients after a hematology consultation included (a) the preoperative IV bolus use of the appropriate factor (von Willenbrand or factor VIII) at a dose of 50 U/kg, (b) the 24 h infusion for 2 days (day of operation, pod #1) of these factors at a dose 100 U/kg, (c) the additional infusion of 30 U/kg for 10 days and (d) the final dose of 2000 U/24 h for the next 4 days. Both patients underwent normothermic cardiopulmonary bypass with crystalloid cardioplegic arrest.

**Results:** The postoperative thoracic drainage was persistent (>2000 ml for 9 days) despite the transfusion of additional FFP. The mechanical ventilatory support was 12 and 24 h, respectively, and their total hospital stay was 17 and 25 days, respectively, without any complications. The patients are well 9 months later.

**Conclusions:** These cases are presented because of their rarity and their particular management.

**Cmp3.11****THE ROLE OF ADENOSINE INFUSION PERIOPERATIVE IN MYOCARDIAL PRESERVATION IN CASES OF OFF-PUMP CORONARY ARTERY BYPASS**

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**Objective:** This double-blind, placebo-controlled study was designed to assess the myocardial protective effect of adenosine intravenous infusion

for chemical preconditioning of the myocardium during off-pump coronary artery bypass (OPCAB) surgery.

**Methods:** 30 adult male and female patients, requiring elective OPCAB surgery were enrolled in this study. Patients were randomized into two groups: group A (adenosine group,  $n = 15$  patients) received an infusion of adenosine at a rate of 70 µg/kg/min for 10 min starting 3 min before the first coronary graft. group C (control group,  $n = 15$ ) patients received an infusion of normal saline (placebo) using the same protocol. Measurements of cardiac enzyme profiles for CK-MB and Troponin T were withdrawn after induction of anesthesia (baseline), 6, 12, and 24 h post initial distal coronary occlusion. 12 lead electrocardiograms (ECGs) were recorded at the same timings, except for the baseline ECG which was recorded immediately preoperatively. Primary outcome measurements included cardiac index measured after induction of anesthesia (baseline), then 6, 12, and 24 h after the first coronary anastomosis. Heart rate, systemic and pulmonary arterial blood pressures, and central venous pressure were recorded as well. Secondary outcome measurements included the in-hospital mortality, length of ICU stay, vasoactive, antiarrhythmic, and other adjuvant drugs requirement for more than 15 min, and/or the need for intraaortic balloon pump insertion.

**Results:** Both groups showed significant increase of cardiac index 6, 12, and 24 h after the first coronary anastomosis compared to the baseline reading for each group. The increase in cardiac index at 6 h after the initial anastomosis was significantly higher in group A compared to group C. Adenosine-pretreated patients released significantly less troponin T, and showed lower CK-MB levels than the control group at 12 and 24 h after the first anastomosis ( $P<0,05$ ). The maximum CK-MB level (12 h after the first anastomosis) was lower in the adenosine group (21.4±6.8 vs. 31.4±13,6). One patient in the control group developed a postoperative myocardial infarction as opposed to none in the study group. Two patients in the control group developed postoperative atrial fibrillation requiring treatment as opposed to none in the study group ( $P<0,05$ ).

**Conclusion:** Adenosine may be an effective and safe drug for attenuation of ischemia-reperfusion injuries in patients undergoing OPCAB.

**Cmp3.12****UNUSUAL CASE OF LATE POSTOPERATIVE CEREBRO-CORONARY SUBCLAVIAN STEAL SYNDROME**

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**Objective:** Isolated occlusive lesions of the subclavian artery are usually asymptomatic, because of the rich arterial collateral supply of the head, neck and shoulder. Symptomatic subclavian artery lesions are associated with concomitant lesions of the contra lateral vertebral artery or of one or both carotid arteries in 35-85% of patients. Usually, these lesions may give rise to ischemia of either the upper extremity or the posterior cerebral circulation. The left subclavian artery is more often atherosclerotic than right, being involved in ~ 70% of symptomatic cases. Isolated occlusive lesions of the subclavian artery very rarely may give rise to stable or unstable angina pectoris in patients who were previously operated on. Here we present a case of cerebro-coronary subclavian steal.

**Methods:** We present retrospective analysis of clinical and laboratory data of a 56-year-old female patient with symptomatic LMCA and RCA stenosis, who underwent successful CABG surgery 9-years-ago and received 2 SVG (RCA, OM1) and 1 LITA (LAD). Routine preoperative diagnostic algorithm on her first admission included: echocardiography, catheterization with selective coronary angiography and Duplex Color Doppler screening of extra cranial blood vessels. Early and late postoperative course was uneventful. Eight years later, she came with dizziness, occasional syncope and unspecific chest pain on exertion. Holter ECG monitoring did not reveal any conductive disturbance and she was advised to continue with medicaments. Six months after, she developed severe vertigo and true angina pectoris.

**Results:** Duplex Color Doppler revealed retrograde vertebral-basilar flow. Catheterization revealed patent SVG grafts and flow reversal through patent LITA, along with sub-occlusive lesion of proximal left subclavian artery. Exercise ECG testing (flexion-extension of the left forearm) was positive. She underwent successful PTA of the left subclavian artery. Control angiography revealed minor residual stenosis and normalization of LITA flow. Control exercise ECG testing revealed absence of anterior wall ischemia. The rest of her clinical course was uneventful, without previously reported symptoms.

**Conclusions:** This case confirms the importance of meticulous evaluation of ITA flow, preoperatively. Selective subclavian and ITA angiography should

become a routine step in standard catheterization. Predominant vertebro-basilar ischemic symptoms (dizziness and syncope) made differential diagnosis difficult, suggesting possible conductive disturbances.

### Cmp3.13

#### CORONARY ARTERY BYPASS GRAFTING IN DIALYSIS DEPENDING PATIENTS

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**Objective:** The number of patients with dialysis depending end stage renal failure (ESRF) and coronary heart disease (CAD) has increased in recent years. CAD causes 40-50% of deaths in dialysis depending patients. Coronary artery bypass grafting (CABG) has become the standard treatment for CAD in this patient group, but is still considered as a risk procedure due to increased morbidity and mortality up to 12%. The aim of this study was to evaluate the clinical outcome of dialysis depending patients after isolated CABG compared to patients with normal renal function.

**Methods:** In a retrospective study we analyzed our clinical results of isolated CABG in 40 dialysis depending patients with ESRF (35 male and 5 female, mean age 65.0±8.4 years). Extracorporeal circulation with antegrade myocardial protection was used in all patients. The perioperative control group comprised 51 consecutive patients (41 male and 10 female, mean age: 67.0±7.3 years) with normal renal function.

**Results:** Demographic and preoperative data were comparable in both groups. Hospital mortality was 2.5% ( $n = 1$ ) in patients with ESRF and 0% in patients with normal renal function. Perfusion time in the dialysis group and in the control group were 69.0±22.6 vs. 68.2±12.4 min including a cross clamp time of 38.7±14.2 vs. 40.1±9.1 min. Morbidity was comparable in both groups. No perioperative myocardial infarction, no perioperative stroke or re-exploration for bleeding occurred. The mean number of grafts was 3.1±0.9 in the dialysis group and 2.9±0.8 in the control group. Chest drainages were comparable in both groups. In the follow-up of the dialysis group (34±23 months) 8 patients died (20%). Four of these patients died due to cardiac reasons.

**Conclusions:** CABG in patients with dialysis depending ESRF can be performed with good clinical results and morbidity comparable to patients with normal renal function. Extracorporeal circulation seems not to be an additional risk factor in the setting of short perfusion and cross-clamp time.

### Cmp3.14

#### ACTIVATION OF THE COAGULATION SYSTEM IN CORONARY ARTERY BYPASS SURGERY: COMPARISON BETWEEN ON PUMP AND OFF PUMP SURGERY

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**Objective:** Comparing peri-operative activation of the coagulation and fibrinolytic systems and platelet function in patients receiving CABG operation by means of on pump or off pump techniques.

**Methods:** 32 consecutive patients requiring elective CABG were enrolled in the study and assigned in a randomized fashion to: on pump group or off pump group. Heparin was given at the same dose (300 U/kg) and antifibrinolytic drugs were not administered. Activation of the coagulation system was evaluated by means of Prothrombin Fragment 1.2 (PF-1.2) and Tissue Factor (TF) measurements; fibrinolysis was evaluated measuring Tissue Plasminogen Activator (TPA), Plasminogen Activator Inhibitor-1 (PAI-1) and D-Dimer (D-D) formation. Platelets function was evaluated by means of the Platelet Function Analyzer (PFA-100®). Blood samples were collected at T0 (during induction of anesthesia), T1 (45 min after heparin administration), T2 (15 min after protamine administration), T3 (3 h after the end of the operation), T4 (postoperative day (POD) 1), T5 (POD4), and T6 (POD6). Results were corrected for haemodilution.

**Results:** No statically significant differences were found in pre, peri and post-operative clinical characteristics between the two groups, except for heparinization time (on pump group 159.6±40.4 min; off pump group 121.6±35.7;  $P < 0.05$ ) and hemoglobin value at POD6 (on pump group 9.3±2.34 g/dl; off pump group 10.9±1.35 g/dl;  $P < 0.05$ ). The coagulation system was activated during cardiopulmonary bypass (CPB) and highest levels of PF-1.2 were measured at T1, T2 and T3 ( $P < 0.05$  compared with off pump group); a trend towards increased levels of PF-1.2 was observed in both groups at T4,

T5 and T6. TF production was similar in the two groups and no statistically significant differences were found at any sample time. The fibrinolytic system was more activated in the on pump group as demonstrated by TPA levels at T1 ( $P < 0.05$ ), PAI-1 levels at T2 ( $P < 0.05$ ) and D-D levels at T2 and T3 ( $P < 0.05$ ). Not surprisingly, CPB induces platelet dysfunction; PFA-100 bleeding times were significantly elevated in on pump group at T1, T2 and T3 ( $P < 0.05$ ). PFA-100 bleeding postoperative times were not prolonged in both groups despite aspirin administration.

**Conclusions:** Off-pump patients produce less activation of the coagulation system and do not activate fibrinolysis during the operation; their platelet function is preserved during and after the operation. This may explain the reported reduced rate of postoperative bleeding associated with this technique. The absence of fibrinolysis together with functioning platelets and increased thrombin formation postoperatively suggest that off pump patients may experience a pro-thrombotic state.

### Cmp3.15

#### CORONARY ENDARTERECTOMY - EXPERIENCE WITH OVER 3500 PATIENTS

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**Objective:** Surgical treatment of diffuse and distal coronary disease is still controversial.

**Methods:** Out of the total number of 12844 patients who underwent myocardial revascularisation, 3553 (27.7%) had an additional endarterectomy (E) on one or several coronary vessels. Our technique is closed and manual E. We use extensive E, as the complementary procedure for direct myocardial revascularisation with bypass grafting. However, total E is E of the whole coronary artery, and this is the new effective possibility for direct myocardial revascularisation with patch reconstruction of coronary artery and without by-pass grafting (CABG). In 1988 we introduced Prostacyclin as a "bridge to heparinisation", based on the useful effect in prevention of early thrombosis in microcirculation during and after cardiopulmonary bypass and E.

**Results:** Postoperative mortality-30 days (PM) was 4.8% (170/3553). Early recoronarography has shown good patency of grafts. Long-term results showed the survival rate of 90±3% at 5 years and over 75% at 10 years. The majority of patients were free of angina and had an improved tolerance of effort.

**Conclusions:** Our results show an acceptable operative risk after coronary artery endarterectomy. Extensive or total E is the best procedure for revascularisation of the septum. Frequent and repeated application of angioplasty delays surgical revascularisation but later, in the stage of diffuse and distal coronary disease, E is unavoidable. In the future, we expect more frequent application and further development of technique of coronary artery endarterectomy.

### Cmp3.16

#### COMPARISON OF DIFFERENT RISK STRATIFICATION MODELS IN ISOLATED CABG SURGERY

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**Objective:** To compare risk stratification models derived in different settings and on different populations. To find out the optimal system for our institution.

**Methods:** Single centre study. Random samples of patients undergoing isolated CABG in years 2001-2002 ( $n = 928$ ) and 2004 ( $n = 415$ ) were reviewed. Logistic EuroSCORE and Northern New England scoring system were compared in terms of their predictive power in both periods. Additionally local modification of logistic EuroSCORE was derived by recalculating the regression coefficients in the first sample and then verified prospectively in the 2004 sample. Discriminative ability of all three systems was assessed by means of receiver operating characteristic (ROC) curve analysis.

**Results:** The area under ROC curve reached the following values in the samples 2001-2002 and 2004, respectively: Northern New England: 0.72 and 0.73; EuroSCORE: 0.74 and 0.70; Local modification: 0.82 and 0.74.

**Conclusions:** At the moment EuroSCORE does not remain the only option in cardiac surgery risk stratification. Its performance was surprisingly poor in the second sample. On the other hand Northern New England system despite its origin fitted quite well in both samples. Local modification of existing models for better fit seems to be a promising alternative. Further search for the perfect model is recommended.

**Cmp3.17****ENDOSCOPIC HARVESTING OF THE RADIAL ARTERY***Tugtekin S., Kapsalis A., Alexiou K., Knaut M., Matschke K.*

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**Objective:** The radial artery (RA) is a commonly employed conduit in arterial coronary revascularization. After successfully establishing endoscopic vein harvesting, we have recently introduced an endoscopic approach for RA harvesting. We present our clinical experience with this new approach.

**Methods:** Endoscopic harvesting of the radial artery was performed in 72 consecutive patients (pts) (13 women and 59 men, 65±8 years) receiving CABG surgery. In all pts confirmation of adequate ulnar collateral blood flow by Allen test and Doppler ultrasound were done preoperatively. Preparation was done with a basic endoscopic equipment set (Vasoview 5 EVH system). Two skin incisions up to 2 cm were used for endoscopic RA preparation under direct visualization using a minimal touch technique.

**Results:** All prepared RA were suitable as graft materials. The lengths of the conduits were between 16 and 22 cm. Preparation time for RA harvesting was 27±19 min. No perioperative myocardial ischemia was observed. There were no wound complications. Neurological symptoms were not observed. The cosmetic result was excellent in all patients.

**Conclusions:** Our experiences demonstrate that endoscopic RA harvesting is safe and suitable for RA harvesting. The cosmetic result is superior to conventional harvesting without limitation for adequate graft preparation. Therefore it has become the standard approach for RA preparation in our institution.

**Cmp3.18****CORONARY ARTERY BYPASS GRAFT SURGERY IN INDO-ASIAN POPULATION: IMPACT OF ETHNICITY ON OPERATIVE OUTCOMES***Elahi M.M., Chetty G., Matata B., Leverment J.*

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**Objective:** While the efficacy and safety of coronary artery bypass grafting (CABG) has been established as preferred choice for myocardial revascularization, few studies have examined the impact of ethnicity on its outcomes. We evaluated the effect of Indo-Asian (IA) ethnicity on cardiovascular risk factors, morbidity and mortality following CABG surgery.

**Methods:** 7226 Caucasian (CC) and 650 IA patients who underwent isolated first time CABG surgery at our centre from October 1999 through October 2004 were studied retrospectively. Patients were preoperatively risk stratified under the EuroSCORE risk assessment model into high, medium and low risk classes. The relationship between ethnicity (IA vs. CC) and 30-day mortality, 6-month mortality, and complications, adjusting for a wide array of demographic, cardiac, and noncardiac variables was then analysed in these different risk classes.

**Results:** After adjustment for baseline characteristics, IA and CC patients had similar 30-day (IA/CC odds ratio [OR] 1.07; 95% confidence interval [CI] 0.84 to 1.35; *P* = 0.59) and 6-month mortality risk (IA/CC OR 1.10; 95% CI 0.91 to 1.34; *P* = 0.31). However, IA patients were more likely to experience complications following surgery (OR 1.28; 95% CI 1.14 to 1.45; *P* < 0.01).

**Conclusions:** Ethnicity does not appear to be a strong risk factor for adverse outcomes following CABG surgery in the IA patients. However, future studies are needed to elucidate the specific reasons for higher complication rates in IA patients and to devise strategies to reduce complications following operations for these patients.

## SCIENTIFIC SESSION Crp4 RABAGO PRIZE

### Crp4.1

#### SYNERGY BETWEEN HUMAN SKELETAL MYOBLASTS AND ANGIOPOIETIN-1 FOR CARDIAC REPAIR

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**Objective:** To evaluate the effectiveness of angiotensin-1(Ang-1) expressing skeletal myoblast for cardiac repair.

**Methods:** Human skeletal myoblasts were transduced with adenoviral-vector carrying Ang-1 (Ad-Ang-1). The transduction efficiency of skeletal myoblasts were assessed by fluorescent immunostaining and RT-PCR. Human skeletal myoblasts were labeled with Lac-z reporter gene. Porcine heart model of myocardial infarction was created in 18 animals by coronary artery ligation and grouped as DMEM injected (group-1,  $n = 6$ ), Ad-null myoblast transplanted (group-2,  $n = 5$ ), and myoblast carrying Ang-1 (group-3,  $n = 7$ ). After 3 weeks, 5 ml DMEM with or without  $3 \times 10^8$  myoblasts was intramyocardially injected into the center and peri-infarction area. All animals were maintained in immunosuppression for 6 weeks using Cyclosporine-A (5 mg/kg). Animals were euthanized and the heart was explanted at 6 and 12 weeks.

**Results:** High transduction efficiency of Ad-Ang-1 with skeletal myoblasts (>95%) was revealed by fluorescent immunostaining. The transduced myoblasts expressed Ang-1 at least for 30 days as revealed by RT-PCR. Extensive survival of the Lac-z expression myoblasts were observed in and around the infarct at 6 and 12 weeks after cell transplantation. Average blood vessel density at low power field (x100) by dual-immunostaining for vWFactor-VIII and smooth muscle actin in group-3 increased from  $39.9 \pm 3.09$  ( $34.73 \pm 2.52$ ) at 6 weeks to  $45.14 \pm 1.75$  ( $41.36 \pm 1.53$ ) at 12 weeks compared with group-1 ( $16.0 \pm 0.91$   $P < 0.01$ ;  $7.88 \pm 0.52$   $P < 0.01$ ), group-2 ( $26.57 \pm 2.09$   $P < 0.01$ ;  $20.14 \pm 1.68$   $P < 0.01$ ) at 6 weeks and ( $13.25 \pm 1$   $P < 0.01$ ;  $6.87 \pm 0.64$   $P < 0.01$ ) of group-1 and ( $26.86 \pm 2.15$   $P < 0.01$ ;  $19.29 \pm 2.87$   $P < 0.01$ ) of group-2 at 12 weeks. Mature blood vessel index in group-3 was the highest at 6 weeks ( $85.26 \pm 2.86\%$ ) and 12 weeks ( $91.62\%$ ). Regional blood flow (ml/min/g) at 12 weeks significantly improved in group-3 ( $3.59 \pm 0.23$ ) compared with group-1 ( $0.98 \pm 0.04$   $P < 0.01$ ) and group-2 ( $1.38 \pm 0.12$   $P < 0.01$ ). Left ventricular ejection fraction and fractional shortening in group-3 were  $49.22 \pm 5.92\%$  and  $29.24 \pm 4.21\%$  that were significantly higher than those of control group-1 ( $36.84 \pm 3.02\%$   $P = 0.037$ ;  $20.46 \pm 1.83\%$   $P = 0.04$ ). However, no significant improvement was achieved by group-2 as compared with group-1.

**Conclusions:** Transplantation of Ang-1 carrying skeletal myoblasts into infarcted myocardium led to greater neovascularization with mature blood vessels, better regional blood flow and greater improvement in cardiac function compared with pure skeletal myoblasts transplantation.

### Crp4.2

#### THE IMPACT OF PERIPHERAL VASCULAR DISEASE ON LONG-TERM SURVIVAL FOLLOWING CORONARY ARTERY BYPASS GRAFTING

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**Objective:** Peripheral vascular disease (PVD) has been linked to increased rates of adverse outcomes following coronary artery bypass grafting (CABG). We sought to determine the impact of PVD on long-term survival after CABG.

**Methods:** We studied 3760 consecutive patients who underwent CABG between 1992 and 2002. Patients without PVD were compared with those who had PVD preoperatively. Long-term survival data (mean follow-up 5.2 years) were obtained from the National Death Index. groups were compared by Cox proportional hazard models and Kaplan-Meier survival plots. The propensity for PVD was determined by logistic regression analysis and each patient with PVD was then matched with 3 patients without PVD.

**Results:** There were 723 patients (19.2%) who had PVD preoperatively. Multivariate logistic regression analysis found that patients with PVD were

more likely to be female, were older and had higher EuroSCORE, lower ejection fraction and higher percentages of unstable angina, recent or transmural myocardial infarction, hemodynamic instability, hypertension, chronic obstructive pulmonary disease, diabetes mellitus, preoperative renal failure, calcified aorta, smoking and intravenous administration of nitroglycerine. Because of the significant differences in preoperative characteristics only 330 patients with PVD (45.6%) were matched with 990 patients without PVD using propensity scores identical to within 1%. After adjustment for all pre, intra and postoperative factors the adjusted hazard ratio of long-term mortality for patients with PVD was 1.36 (95% confidence interval 1.16-1.59;  $P < 0.001$ ) and if deaths during the first year were excluded the adjusted hazard ratio was 1.38 (95% confidence interval 1.14-1.69;  $P = 0.001$ ). Early outcome of matched groups is shown and Kaplan-Meier curves are shown. There were no differences in early mortality and in major complications except for deep sternal wound infections (2.4% in patients with PVD vs. 0.8% in patients without PVD,  $P = 0.036$ ). Freedom from all-cause mortality at 5 years after CABG was  $76.7 \pm 1.5\%$  in patients without PVD vs.  $70.7 \pm 2.7\%$  in patients with PVD ( $P = 0.0024$ ).

**Conclusions:** Patients with PVD showed similar early morbidity and mortality following CABG when compared with matched patients without PVD. However, patients with PVD had more deep sternal wound infections, while PVD is a continuing detrimental risk factor for long-term survival after CABG. The effect of PVD following CABG on patient survival extends far beyond the 30-day and in-hospital mortality time periods. These data suggest the need for a more frequent follow-up among patients with PVD and CABG.

### Crp4.3

#### EFFECTS OF ANTIOXIDANT AGENTS (COENZYME Q10, BETA GLUCAN AND N-ACETYLCYSTEINE) ON MYOCARDIAL ISCHEMIA REPERFUSION INJURY

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**Objective:** Endothelial cells, neutrophils, the complement system, cytokines and ROS such as superoxide anion hydroxyl peroxide and hypochlorous acid play a major role in ischemia reperfusion injury. The aim of this study was to evaluate and compare the effects of Coenzyme Q10, beta glucan and N-acetylcysteine on myocardial ischemia reperfusion injury.

**Methods:** The rabbits were enrolled into four groups (11 rabbits in each). Group 1 was the control group, group 2 was medicated with Coenzyme Q10 (5 mg/kg per day for 2 weeks), group 3 was medicated with beta glucan (250 mg/kg per day intraperitoneally for 7 days) and group 4 was medicated with N-acetylcysteine (50 mg/kg IV perfusion preoperatively). Under anesthesia, blood samples and a myocardial biopsy from left ventricle were taken and then the left coronary arteries of the rabbits were clamped for 15 min. After the ischemic period the clamp was taken and blood samples were taken. After 15 min of reperfusion blood samples and biopsy was repeated. Lipid peroxidation, oxygen radicals, nitric oxide derivatives were evaluated in blood.

**Results:** The markers of I/R were significantly higher in control group. Between the antioxidant groups, Coenzyme Q10 was found to be mostly effective on oxygen radicals, beta glucan on lipid peroxidation and N-acetylcysteine on nitric oxide derivatives and oxygen radicals. The myocardial functions were found to be better in antioxidant groups.

**Conclusions:** I/R injury is a morbid and mortal complication. Antioxidants may help to decrease the injury. We found that Coenzyme Q10, beta glucan and N-acetylcysteine significantly decreases I/R injury. Selective or combined medication of these in humans may be clinically helpful in I/R injury.

### Crp4.4

#### PLATELET ACTIVATION AFTER AORTIC PROSTHETIC VALVE SURGERY

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**Objective:** We aimed to compare platelet function using flow cytometry in patients undergoing aortic valve replacement with biological or mechanical prosthesis.

**Methods:** During 2004, 15 biological (group I) and 18 mechanical valve patients (group II) were studied. Polymorphonuclear and monocyte-platelet conjugates (PMN-Plt-Conj and Mono-Plt-Conj), platelet P-selectin expression

(P-sel) and platelet microparticles (PMPs) were measured prior to surgery (D-1), 8 days (D8) and 2 months (M2) after surgery.

Results: Mean age of groups I and II were, respectively, 76±2 and 64±2 years old ( $P<0.001$ ). At D8, Mono-Plt-Conj were increased in group I (21.0±6.7% vs. 9.4±1.3%) and in group II (21.8±3.6% vs. 11.6±1.9%,  $P<0.01$ ), as well as PMPs in group II (22.3±3.6% vs. 15.3±1.7%,  $P<0.05$ ) when compared to D-1. PMN-Plt-Conj were significantly higher in group II than in group I (respectively 14.2±2.2% vs. 7.8±1.9%,  $P<0.05$ ) at D8. At M2, all markers decreased in group II and were lower than their baseline levels (% positive cells for P-sel: 41.6±11.7 vs. 63.0±8.7,  $P = 0.02$ ). Mono-Plt-Conj were lower in group II compared to group I at this time point (9.0±3.2% vs. 16.5±1.2%,  $P<0.05$ , respectively). Neither at D8 nor at M2 P-sel was significantly different between both groups.

Conclusions: Biological and mechanical valves cause platelet activation that remains higher at 2 months in the biological group.

#### Crp4.5

##### ACUTE REGIONAL NEURONAL INJURY FOLLOWING HYPOTHERMIC CIRCULATORY ARREST IN A PORCINE MODEL

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Objective: Although deep hypothermic circulatory arrest (HCA) is routinely used to interrupt normal perfusion of the brain and prevent subsequent cerebral ischemic injury during cardiac surgery, it is associated with various forms of neurologic disturbances. Neurologic sequelae after prolonged HCA include motor, memory and cognitive deficits. The present study was designed to assess acute regional neuronal injury after HCA in a porcine model.

Methods: Six piglets underwent 75 min of HCA at 18°C. Four piglets served as normal controls. After gradual rewarming and 30 min of reperfusion, treatment animals were sacrificed and brains were perfusion-fixed and cryopreserved. Regional patterns of neuronal apoptosis after HCA was characterized by in situ DNA fragmentation using terminal deoxynucleotidyl-transferase-mediated biotin-dUTP nick end-labeling (TUNEL) histochemistry. Hematoxylin and eosin histology was used to characterize cell damage morphologically. Tunel-positive cells were scored on a scale of 0 to 5. Grade 0: no Tunel-positive cells; Grade 1: <10%; Grade 2: 10-25%, Grade 3: 25-50%, Grade 4: 50-75%; and Grade 5: >75%.

Results: Tunel-positive cells indicating DNA-fragmentation were scored in the precentral gyrus (motor neocortex), postcentral gyrus (sensory neocortex), hippocampus, cerebellum, thalamus and ventral medulla of HCA-treated animals and were significantly greater than in normal controls. Significantly higher concentrations of Tunel-positive cells were observed in the sensory and motor neocortex and hippocampus, compared to the cerebellum, thalamus and medulla, indicating a selective vulnerability of these brain subregions. Despite significant DNA fragmentation indicated by high-concentration Tunel-positive cells, no morphologic evidence of apoptosis or necrosis was observed in this acute model.

Conclusions: The data indicate that sensory and motor neocortex and hippocampal neurons are selectively vulnerable to neurologic injury after HCA as indicated by elevated levels of Tunel-positive cells in these brain regions. It is noteworthy that evidence of significant neuronal injury is observed in the acute state. The absence of morphological evidence of apoptosis or necrosis with high levels of Tunel-positive cells, strongly suggests activation of the apoptotic mechanisms at this early stage. These findings are compatible with data showing morphological evidence of apoptosis in these regions after prolonged treatment in a chronic animal model. The mechanisms underlying neuronal injury, and potential neuroprotective strategies remain to be defined.

#### Crp4.6

##### BNP - A GOOD PREDICTIVE VALUE FOR CARDIAC RESYNCHRONIZATION THERAPY AFTER CABG

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Objective: Brain natriuretic peptide (BNP) is a valuable marker in heart failure and its therapy, for example cardiac resynchronization therapy (CRT). So far, one finding which indicates for CRT is dyssynchrony of ventricular contraction obtained by echocardiography. The aim of this study was to

show that also BNP is a helpful marker to decide whether CRT is useful for patients after CABG.

Methods: Forty patients with a poor ejection fraction (<35%) underwent elective CABG. Twenty of them received permanent biventricular stimulation for 7 days after surgery. Before and on the first, third, seventh and tenth day after surgical treatment, the following parameters were established: left ventricular function obtained by transthoracic echocardiography, myocardium-specific enzymes (such as CK and CKMB), ECG.

Results: There was a very good correlation between the preoperative ejection fraction and BNP ( $r^2 = 0.98$ ,  $P<0.005$ ). Patients who had received CRT after CABG had BNP levels similar to preoperative data on postoperative day 7. This decrease of the BNP values in the CRT-group is in accord with an increased left ventricular function obtained by echocardiography. The control group, which had not received CRT, showed significantly higher BNP levels.

Conclusions: Therefore we conclude that BNP is a good marker to evaluate CRT in patients undergoing CABG. An extraordinary rise of the BNP level should lead to early therapeutical consequences like CRT. We see the following criteria for the implantation of a biventricular pacing device: poor ejection fraction (<35%), ischemic myocardial dilatation, dyssynchrony of ventricular contraction, postoperative benefit from non-permanent biventricular pacing and decrease of BNP-level during biventricular pacing until postoperative day 7.

#### Crp4.7

##### ACTIVATION OF COAGULATION AND FIBRINOLYSIS: IS THERE A DIFFERENCE BETWEEN ON-PUMP VERSUS OFF-PUMP CORONARY REVASCULARIZATION?

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Objective: There is concern that the preserved hemostasis after OPCAB surgery may result in a hypercoagulable status and may potentially endanger the patency of the anastomoses. The aim of this study was to compare the changes in selected hemostatic and fibrinolysis variables in patients undergoing OPCAB versus CABG techniques.

Methods: Thirty patients were prospectively studied. Platelet counts and plasma concentrations of antithrombin, fibrinogen, prothrombin factor 1 and 2 (F1+2), D-Dimer, factor V, VIIa, von Willebrand, PAI, TPA and Protein S were measured preoperatively (T0), 2 min after administration of heparin (T1), at the end (T2) and 24 h after the operation (T3) in patients scheduled to undergo OPCAB ( $n = 15$ ) or CABG ( $n = 15$ ). Hemostatic variables and platelets counts were adjusted for the changes in protide concentration.

Results: The two groups were similar for demographic and clinical characteristics at baseline. Platelet counts, hematocrit, factor II, V and VIIa decreased significantly at T2 and T3 and F1+2 increased significantly at T2 in both groups. However these variations were significantly more pronounced for the CABG groups. In both groups the fibrinogen, D-Dimer, von Willebrand and TPA values increased significantly at T3.

Conclusions: Coronary artery bypass grafting with or without CPB is responsible for activation of coagulation factors. However this activation is more pronounced in CABG group. In OPCAB group reduced coagulation activation and fibrinolysis activity indicates better preservation of hemostasis. In addition Protein S activity is significantly lower in CABG group. These may lead to a higher thrombotic risk in CABG patients.

#### Crp4.8

##### THROMBOPHILIC FACTORS: DO THEY HAVE A ROLE IN MODIFIED BLALOCK-TAUSSIG SHUNT THROMBOSIS?

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Objective: The modified Blalock-Taussig shunt is a palliative procedure for cyanotic congenital heart defects (CCHD). Although widely being performed, shunt thrombosis is one of the causes for early shunt failure and morbidity

as well as mortality. The purpose of this work was to evaluate thrombophilic factors for the assessment of modified Blalock-Taussig shunt patency in patients with CCHD.

**Methods:** Twenty-three consecutive patients with CCHD, who were planned to undergo the modified Blalock-Taussig shunt, were included in this study. Following parameters were collected previous to operation: activated protein C resistance, factor V Leiden mutation, factor II G20210A mutation, blood group, as well as demographic data. Patients were also evaluated for levels of factor VIII, factor IX, protein C, protein S, factor II, factor V, factor VII, factor X, factor XI, factor XII, antithrombin III activity, von Willebrand factor and homocystein preoperatively and 3, 6 and 9 months postoperatively.

**Results:** Mean age of patients was  $4.54 \pm 3.82$  months. The male/female ratio was 10/13. Five of these patients developed perioperative shunt thrombosis

(21.73%) (group I) and one died because of other reasons. Mean preoperative level of factor VIII was  $178.84 \pm 12.35$  in the non-thrombosis group (group II) and  $237.14 \pm 51.16$  in group I ( $P < 0.0005$ ). Levels of protein S was  $80.71 \pm 5.41$  in group II and  $50.56 \pm 28.79$  in group I ( $P = 0.0005$ ). Von Willebrand factor was also higher in group I ( $255.89 \pm 87.38$ ) than in group II ( $146.70 \pm 43.15$ ;  $P < 0.0005$ ). One of the patients in group I was blood group A and 4 of them were blood group O ( $P < 0.0001$ ). None of the thrombophilic factors showed significant differences.

**Conclusions:** Preoperative assessment of thrombophilic factors is important. Patients with risk factors for thrombosis should get anticoagulation to prevent shunt thrombosis. In our study high levels of factor VIII and high levels of von Willebrand factor are risk factors for early shunt thrombosis. Low level of protein S, which acts as a natural anticoagulant, is also a risk factor.

## SCIENTIFIC SESSION C5 MISCELLANEOUS

### C5.1

#### MULTI-MODALITY TREATMENT OF PRIMARY CARDIAC SARCOMAS

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**Objective:** Primary cardiac sarcomas are rare tumors that are usually fatal. Most reports have shown survival rates of less than 1 year. Extensive resection remains the primary mode of therapy with chemotherapy and radiation used as adjuncts. We review our experience with multi-modality treatment of primary cardiac sarcomas.

**Methods:** We performed a retrospective review of 24 consecutive patients treated for primary cardiac sarcoma at two tertiary referral centers.

**Results:** There were 12 female patients. Twenty-three patients underwent gross total cardiac resection and 1 patient palliative debulking only. Eight patients required autotransplantation due to tumor extent. Concomitant valve replacement or repair was performed in 6 patients. Five patients underwent resection of synchronous pulmonary metastases at the time of definitive cardiac surgery. Additional further treatment of extracardiac sites of metastatic disease included brain (2), liver (1) and lung (6). Pre-operative and/or post-operative chemotherapy was administered to 12 and 14 patients respectively. Three patients received post-operative radiation therapy. Of patients who survived surgery and underwent resection with curative intent ( $n = 21$ ), median survival was 24 months (mean 31, range 3-104 months). Ten patients are currently alive at 27 months.

**Conclusions:** Aggressive multi-modality treatment for primary cardiac sarcomas can result in long-term survival. Presence of metastatic disease should not necessarily preclude resection and should be treated whenever possible.

### C5.2

#### PRE-OPERATIVE INFLAMMATORY STATUS INFLUENCE SHORT AND MID-TERM OUTCOME AFTER CARDIAC SURGERY

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**Objective:** Several heart diseases often disclose an activated inflammatory status. C-reactive protein (CRP) and fibrinogen (FBG) seem to be the most significant inflammatory markers for the prediction of future cardiovascular events in healthy population as in patients with coronary disease. Highly activated inflammatory status before cardiac surgery is associated with higher post-operative mortality and morbidity but unknown remains the effect of pre-operative inflammatory status on mid-term outcome.

**Methods:** From May 2000 to June 2003, 1789 patients underwent cardiac surgery at our Institution. Preoperative plasma levels of CRP and FBG were available for 578 patients. Exclusion criteria for this study were emergency surgery, reoperations, use of deep hypothermia, presence of clinical signs of infection, history of tumours or autoimmune disease. 470 patients were suitable for this study. The median values of CRP (0.39 mg/dl) and FBG (366 mg/dl) divide the entire population in three groups: Low Inflammatory Status group (LIS) (CRP<0.39 mg/dl and FBG<366 mg/dl, 161 patients), Medium Inflammatory Status group (MIS) (CRP<0.39 mg/dl and FBG≥366 mg/dl or CRP≥0.39 mg/dl and FBG<366 mg/dl, 150 patients) and High Inflammatory Status group (HIS) (CRP≥0.39 mg/dl and FBG≥366 mg/dl, 159 patients). Follow-up was 94.8% complete (423/446). Maximum, minimum and mean follow-up were 48.6, 7.4 and 19.6±11 months.

**Results:** Preoperative characteristics were similar between the groups except for age, LVEF and hypertension. Operative mortality was not significantly different between the groups (LIS = 2.5%, MIS = 6%, HIS = 6.9%,  $P = 0.16$ ) while mortality for sepsis was significantly different (LIS = 0%, MIS = 1.3%, HIS = 3.7%,  $P = 0.03$ ). Incidence of infections was significantly higher in HIS group (LIS = 5.6%, MIS = 7.3%, HIS = 18.9%,  $P = 0.0002$ ). HIS group resulted independent risk factor for infections (RR = 3.1, CI = 1.2-7.9,  $P = 0.02$ ). During mid-term follow-up LIS group had better survival (91.9±3.1%) compared to MIS group (84.3±4.8,  $P = 0.13$ ) and to HIS group (85.7±3.0%,  $P = 0.01$ ). Cox regression revealed that HIS group (RR = 2.39, CI = 1.03-5.53,  $P$

= 0.05) and LVEF (RR = 0.96, CI = 0.92-0.99,  $P = 0.04$ ) were independent risk factors for mortality during follow-up.

**Conclusions:** Patients undergoing cardiac surgery with preoperative highly activated inflammatory status are exposed to higher risk of post-operative infections. During mid-term follow-up preoperative highly activated inflammatory status and LVEF were independent risk factors for mortality.

### C5.3

#### ECHINOCOCCOSIS OF THE HEART: CURRENT PROBLEMS AND SURGICAL PERSPECTIVES

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**Objective:** Heart echinococcosis is a rare but very dangerous disease. According to World Health Organization release (2001), the incidence of morbidity is increasing progressively.

**Methods:** A group of 426 patients with echinococcus cysts of different localization (lungs, liver) was treated in our clinic since 1997. Eleven patients had heart echinococcosis. Echinococcus cysts of the right heart were revealed in 4 patients, left ventricle cyst in 2, pericardium cysts in 2, and multifocal lesion of pericardium and heart cavities in 2, and atrial septum cyst in 1. Besides only 4 patients had isolated heart echinococcus, and another 7 had concomitant lesion of different organs (liver, lungs, spleen, kidneys, brain). Main clinical symptoms were heartaches and dyspnoe. Diagnosis was based on serological reactions (latex-test) PCR, etc., ECHO and spiral CT and/or MRT.

**Results:** Four patients had conservative therapy only and died of intracardiac cyst rupture in terms up to 11 months. Two patients underwent isolated cystectomy from pericardium. One patient had lung ectomy, then cystectomy from atrial septum under cardio-pulmonary bypass (CPB). Three patients primarily underwent cystectomy from the heart, then splenectomy and/or partial hepatic and renal resection. Another patient with multifocal echinococcus of the heart and brain was operated four times successfully. All patients received albendazol after surgery. Maximum follow-up period was 5 years.

**Conclusions:** Heart echinococcosis is a lethal disease, and the only solution is surgery. Using chemotherapy without echinococectomy in patients even with small cysts may cause cyst rupture and death. That's why a complex strategy is necessary: both diagnostic search with every organ investigated (due to high rate of combined lesion) and chemotherapy after surgery.

### C5.4

#### REENGINEERING TOWARDS AN OFF-PUMP CORONARY ARTERY BYPASS PROGRAM OVER A SHORT TIME PERIOD: FEASIBLE AND SAFE?

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**Objective:** Off-pump coronary artery bypass (OPCAB) allows myocardial revascularization without cardio-pulmonary bypass and without cardiac arrest. The advantages of this method are questioned because of the technical challenge it poses during the learning curve. The results of the reengineering of a classical coronary artery bypass grafting (CABG) program towards an OPCAB program with predefined treatment protocols are presented.

**Methods:** The data related to all the 333 coronary surgeries performed at our institution, during the 13 months following the introduction of the first OPCAB procedure of the reengineering program, were recorded prospectively. The patients were divided into 3 equal groups ( $n = 111$ ) according to the date of their surgery. The 1st, 2nd and 3rd group represented the initial, middle and last period of our experience respectively. For each group, the number of OPCAB procedures was recorded. For the OPCAB procedures, left main coronary artery disease, preoperative left ventricular ejection fraction (LVEF), number of bypass grafts per patient, left lateral wall revascularization, postoperative myocardial infarction (MI) and hospital mortality were analyzed. Comparisons between the 3 groups were performed with ANOVA test and chi-square test where appropriate. A  $P$  value <0.05 was considered significant.

**Results:** A total of 272/333 (82%) patients had OPCAB. This proportion increased significantly over time: 74/111 (67%) in the 1st group, 90/111 (81%) in the 2nd group and 108/111 (97%) in the 3rd group ( $P < 0.001$ ). In the OPCAB group, 88/272 (32%) had left main coronary artery disease, 90/272 (33%) had LVEF <45% and 26/272 (9.5%) had LVEF <30%. Mean number of

bypass grafts per patient was  $3.02 \pm 0.85$  and number of patients with left lateral wall revascularization was 221/272 (81%). Postoperative MI occurred in 5/272 (1.8%) patients, and mortality was 2.6% (7/272). The rate of these complications did not change significantly between the three groups.

Conclusions: An OPCAB program with predefined treatment protocols can be introduced over a short time period safely and with good results. Nowadays, this technique allows complete revascularization in most cases. Low LVEF and difficult coronary anatomy do not represent a limitation to the application of OPCAB.

#### C5.5

##### AORTIC ROOT REPLACEMENT WITH CUSTOM-MADE BIOLOGICAL VALVED CONDUITS: A GOOD OPTION FOR ELDERLY PATIENTS

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Objective: Combined disease of the aortic valve and the ascending aorta has been commonly treated with the Bentall procedure since its introduction in 1968. Because of the progressive ageing of the population, since the mid-1990s some surgeons started to propose the utilization of biological valved conduits, mainly custom-made. Here we present our experience with custom-made biological composite graft in 59 patients.

Methods: Since March 2002, 63 patients underwent combined replacement of aortic valve and ascending aorta with a custom-made biological valved conduit, constituted of a Dacron-coated vascular graft (straight or anatomically shaped) and a biological valve prosthesis (stented or stentless). Mean age was  $70.65 \pm 4.7$  years. They were 38 males (60.3%) and 25 females (39.7%). Seven patients (11.1%) were operated on emergency for type-A acute aortic dissection. Thirty-nine patients (61.9%) were in preoperative functional class III or IV. Stented bioprosthesis were utilized in 60 patients (95.2%), mainly STJ Epic prosthesis (45 of 60; 75%); stentless bioprosthesis in 3 patients (4.8%). A Gelweave Valsalva™ Vascutek prosthesis presenting pre-fashioned neo-sinuses, was used in 54 patients (85.7%) whereas a straight graft was used in 9 patients (15.2%). Associated procedures were performed in 35 patients (55.5%); the most frequent were arch replacement (10 patients); CABG (7 patients) and emiarch replacement (4 patients). Mean follow-up time was  $10.7 \pm 6.3$  months.

Results: In-hospital mortality was 9.5% (6 of 63 patients). Mortality at follow-up was 1.7% (1 of 57 patients). One patient (1.7%) required re-operation for partial detachment of the valved conduit due to prosthetic endocarditis. Echocardiographic evaluation during the follow-up period demonstrated favourable hemodynamics of the valve prosthesis, regardless of the valve type, with a statistically significant reduction in left ventricular diameters at 6 months.

Conclusions: Custom-made biological valved conduit is a good option for patients needing aortic root replacement who are 65 years-old or older or who present contraindication to anticoagulation therapy. The presence of neosinuses in the Gelweave Valsalva™ Vascutek graft makes easier the coronary ostia anastomosis. Moreover the pre-fashioned neosinuses facilitate the opening and the closure of the leaflets reducing the mechanical stress and prevent the contact of the leaflets to the vascular graft. For these reasons this vascular graft may contribute to prolonging the durability of the valve prosthesis. However longer follow-up is necessary.

#### C5.6

##### FREQUENCY OF RED CELL ALLOANTIBODIES AT A LARGE CARDIOSURGERY CENTER: A FOUR-YEAR RETROSPECTIVE STUDY

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Objective: The aim of this study was to determine the incidence of red blood cell (RBC) alloantibodies in patients undergoing cardiac surgery or cardiac procedure, during the pre-transfusion screening.

Methods: Blood samples of 16291 patients (12628 male and 3663 female) were evaluated. The mean age of the patients was 57 years. Pre-transfusion samples were examined for clinically significant alloantibodies, using antibody screening with gel test (Liss - enzyme). In case of a positive result, identification was performed (panel with autologous control). In addition, the serological testing included cold agglutinins' detection (tube test), as well as titration (tube test) and identification (gel test) in case of a positive

result. When the result was marginal (1/32) a new test was carried out after a 7-day period. In the presence of a positive autologous control or an autoantibody, samples were examined with Direct Antiglobulin Test (DAT). Results: Alloantibodies were detected in 580 patients with the incidence of 3.56%. Antibodies were registered more frequently in females (190/3663, 5.18%) than in males (390/12628, 3.09%). 183 patients (31.49%) developed single antibody with anti-Kell being the most frequent. The incidence and the specificity of the detected antibodies are summarized. In 23 patients (3.96%) multiple antibodies were detected, with most frequent the anti-D and anti-C combination. Thirty five patients (6.03%) were DAT positive. Autoantibodies were found in 10 patients (1.72%), all of which had specificity to Rhesus system. Cold agglutinins were positive in 53 patients (0.32%). No specificity could be assigned in 245 patients (42.24%), while in 110 patients (18.96%) non specific reactions in enzyme-treated RBCs, were observed. One patient developed delayed haemolytic reaction 15 days post-transfusion, due to anti-Jka. The antibody, however, was not detected in the pre-transfusion sample re-testing.

Conclusions: The frequency of the pre-transfusion detection of red blood cell alloantibodies in our Center was 3.56%. The most frequently identified were the anti-Kell and anti-Rh. The high rates of unidentifiable antibodies and non specific reactions in enzyme treated RBCs are probably attributed to the kind of medication that most of these patients receive, as well as to the degree of inflammatory process which usually accompanies such diseases. The high frequency of unidentifiable antibodies indicates that a larger and more complex erythrocyte panel would be useful for routine testing. The routine pre-transfusion screening for alloantibodies probably assures the prevention of DHTRs and provides sufficient time for blood selection.

#### C5.7

##### MINIMALLY INVASIVE SAPHENOUS VEIN HARVESTING PRESERVES ENDOTHELIAL CELL FUNCTION IN HUMAN SAPHENOUS VEIN GRAFTS

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Objective: The saphenous vein is the most commonly used conduit for coronary artery bypass surgery. During conventional surgery, considerable damage to the endothelium may occur during graft harvesting and this may play an important role in early and late saphenous vein graft (SVG) failure. Aim of this study was to compare the endothelial function of SVGs harvested by means of an endoscopic or conventional technique with respect to the leukocyte-endothelial cell adhesion molecule (LECAM) and inducible nitric oxide synthase (INOS-2) expression and cyclic guanylate monophosphate (cGMP) level.

Methods: Segments of 10 saphenous veins were harvested from 10 different patients undergoing CABG surgery either with the conventional (group A) or endoscopic (group B) techniques. Samples were taken from segments that were stripped of surrounding tissue but not distended. Human saphenous vein specimens were stored in heparinized blood for 1 h at room temperature. Specimens were analyzed by Western blotting to quantify intercellular adhesion molecule-1 (ICAM-1), vascular cell adhesion molecule-1 (VCAM-1), and inducible nitric oxide synthase-2 (INOS-2) expression, as well as tissue cGMP levels.

Results: Measured intensity of ICAM-1 bands (group A =  $2483 \pm 295$  vs. group B =  $1718 \pm 307$ ,  $P = 0.007$ ) and VCAM-1 bands (group A =  $1138 \pm 247$  vs. group B =  $703 \pm 162$ ,  $P = 0.013$ ) on Western blotting were significantly lower in endoscopically harvested vessels as compared with conventionally harvested vessels. In contrast, INOS-2 expression (Group A =  $531 \pm 215$  vs. Group B =  $296 \pm 86$ ,  $P = 0.034$ ) and tissue cGMP levels (Group A =  $2.02 \pm 0.53$  pmol/ml vs. group B =  $1.03 \pm 0.31$  pmol/ml,  $P < 0.001$ ) were higher in endoscopically harvested vessels as compared with conventionally harvested vessels.

Conclusions: Decreasing leukocyte-endothelial cell adhesion molecule expression and enhancing INOS-2 synthase expression and cGMP level is important to prevent vascular endothelial cell injury and atherosclerotic process in the vessels, and to improve saphenous vein graft patency after implantation. These findings suggest that minimally invasive harvesting technique, in addition to previous favorable reports on pain and wound complications, costs, low morbidity and earlier hospital discharge, provide better endothelial cell function and integrity in saphenous vein grafts when compared to the open technique.



## C5.8

**CORONARY ARTERY DISEASE SEVERES HUMAN MICROCIRCULATION: A CLINICAL INTRAVITAL MICROCIRCULATION STUDY**

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**Objective:** Due to technical limitations analysis of human microcirculation has been restricted to peripheral nailfold or conjunctival capillaroscopy. Using orthogonal polarization spectral (OPS) imaging non-invasive studies are possible at central positions. It was the aim of our study to describe changes in the sublingual microcirculation in patients with coronary artery disease under stress test conditions.

**Methods:** Microcirculatory parameters of 26 volunteers were analyzed and compared with 15 patients with coronary artery disease (CAD) with significant lower ejection fraction (control  $65 \pm 11\%$  vs. CAD  $44 \pm 7.5\%$ ,  $P < 0.04$ ; mean  $\pm$  SD). To challenge vessel reactivity a standardized orthostatic stress test was performed in three steps: baseline (BL) = 5 min horizontal resting, (I) = 5 min standing, (II) = 5 min horizontal resting again. Measurements of the sublingual microcirculation and arterial pressure and heart rate were performed at each time point.

**Results:** 1692 sublingual vessels in the CAD group and 1220 vessels in the control group were evaluated. During stress test functional capillary density increased in the CAD group ( $11.1 \pm 2.3$  mm/cm<sup>2</sup> to  $16.6 \pm 3.7$  mm/cm<sup>2</sup>,  $P < 0.05$ ) and was higher compared to control at TP I ( $12.1 \pm 3.1$  mm/cm<sup>2</sup>,  $P < 0.05$ ). In control vessel diameter, velocity and blood flow was unchanged, CAD patients exhibited a significant decrease (diameter from  $11.7 \pm 1.5$   $\mu$ m to  $9.5 \pm 1.4$   $\mu$ m, RBC velocity from  $524 \pm 74$   $\mu$ m/s to  $445 \pm 50$   $\mu$ m/s, flow from  $74 \pm 23.3$  pl/s to  $52 \pm 21$  pl/s,  $P < 0.05$ ).

**Conclusions:** Our experiment clearly demonstrated a significant microcirculatory dysfunction in patients with CAD and low ejection fraction. OPS imaging seems to be a reliable, non-invasive tool to diagnose disturbances of the human microcirculation.

## C5.9

**SMALL VESSEL CORONARY GRAFTING: WHERE IS THE LIMIT?**

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**Objective:** There is an old controversy regarding “complete revascularization” and “adequate revascularization”. Furthermore, there is no universally accepted definition for “complete revascularization”. Intraoperative flow measurement has yielded several parameters that could predict the long-term fate of a coronary graft in a quite accurate way, the most conclusive of which is the pulsatility index (PI). The objective of the study was to determine if small vessel grafting is adequate related to its flow performance.

**Methods:** A retrospective, observational study was conducted including 418 bypass grafts implanted consecutively in our institution, in which intraoperative flow measurements were obtained with a transit time flowmeter (Butterfly Flowmeter?, Medi-Stim A/S Oslo) and 1.5, 2 and 3 mm probes. Two groups were defined according to the coronary lumen diameter: group A, with a diameter lower than 1.5 mm ( $n = 69$ ) and group B, with a diameter equal or greater than 1.5 mm ( $n = 358$ ). Left main involvement, revascularized territory, degree of atherosclerotic disease, diabetes, LDL levels, conduit nature, and flow measures were extracted from our computer database and statistically analyzed.

**Results:** There were no significant differences as far as left main involvement, grafted territory, degree of atherosclerotic disease, diabetes, LDL levels and nature of the conduit.

**Conclusions:** The small vessel has very significant lower flow figures and an increased PI (greater than 5), which may relate to its poor long-term patency. Therefore, we recommend using an individual approach to small vessels when faced with a coronary disease patient.

## SCIENTIFIC SESSION C6 VALVES

### C6.1

#### CLINICAL OUTCOMES AND HEMODYNAMIC EVALUATION OF PATIENTS UNDERGOING CARPENTIER EDWARDS PERIMOUNT MAGNA AORTIC VALVE REPLACEMENT. EARLY REPORT

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**Objective:** PERIMOUNT Magna is a new bovine pericardial aortic valve with supra annular design and smaller sewing cuff with improved effective orifice area. It is treated with Thermafix technology to reduce calcification of the leaflets. We studied the clinical outcome and hemodynamic performance of patients who underwent aortic valve replacement (AVR) and AVR with combined procedures using the above bioprosthesis.

**Methods:** Data were prospectively collected for 106 consecutive patients between March 2003 and May 2004. Mean age at operation was 74 years. 88% (n = 93) were elective and 12% (n = 13) were done as urgent cases. The mean EuroScore score was 7. All were first time operation. Standard cardiopulmonary bypass with 2 stage venous (bicaval for mitral valve procedures) and ascending aortic cannulation was used with right superior pulmonary vent. Myocardial protection was achieved with intermittent ante-retrograde cold blood cardioplegia and terminal hot shot given after completion of procedure.

**Results:** Median bypass and cross-clamp time were 117.5 and 82.5 min respectively. Isolated AVR, AVR+CABG, AVR+MVR+CABG and AVR+other procedures comprised 49% (n = 52), 41.4% (n = 44), 3.8% (n = 4) and 5.8% (n = 6) cases respectively. Valve sizes used were 19 mm, 21 mm and 23 mm and comprised 17.8% (n = 19), 46.5% (n = 49), and 35.7% (n = 38) of cases respectively. In-hospital mortality was 2.8% (n = 3). 1.9% (n = 2) had CVA and 0.9% (n = 1) required permanent pacemaker insertion. There were no incidences of endocarditis, valve dysfunction, paraprosthetic leak, thromboembolism or valve thrombosis. Median blood loss was 450 ml (240 to 2490). The median ventilation time was 11 h (3 to 900). Postoperative CK-MB release was 19 U/l (0 to 300). The median length of stay in ITU and hospital were 1 and 10 days respectively. 35 patients were followed up at 6 weeks. Pre and 6 weeks postoperative mean aortic valve gradient was 59 mmHg (SD 22) and 14 mmHg (SD 10) respectively as measured by transthoracic echocardiography,  $P < 0.001$ .

**Conclusions:** The new Carpentier-Edwards PERIMOUNT Magna bioprosthetic aortic valve can be used safely with good clinical outcome and good reduction in aortic valve gradient. This is useful in patients with small aortic annulus requiring bioprosthetic AVR thus reducing the need for aortic annular enlargement procedures and avoids the problem of patient-prosthesis mismatch.

### C6.2

#### BILEAFLET VERSUS MONOLEAFLET AORTIC VALVE PROSTHESIS. COMPARISON BETWEEN THE CARBOMEDICS AND OMNICARBON MECHANICAL VALVE PROSTHESES. 10-YEARS FOLLOW-UP AND EXPERIENCE

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**Objective:** In search of a suitable mechanical aortic valve prosthesis for our patients we compared the long term outcome of the Carbomedics bileaflet and the Omnicarbon monoleaflet valves.

**Methods:** 227 randomized patients were operated on between 1994 and 1995 and were followed up until 2004. The mean age at the time of operation was  $60 \pm 9.5$  and  $61 \pm 9.0$  years, respectively. Six patients underwent a previous heart valve operation. 130 (57.3%) patients were in the Carbomedics group and 97 (42.7%) in the Omnicarbon group, respectively. In the total population 67 (29.5%) were female and 160 (70.5%) male. 132 (56.9%) patients were in NYHA Classes III and IV preoperatively. The mean left ventricular ejection fraction was  $62 \pm 15.6\%$  and  $62 \pm 14.6\%$ , respectively, 11.2% had a combined procedure.

**Results:** We had one perioperative death in this series (0.43%). The patients left our hospital after a median postoperative stay of 9 days. Follow-up was 99.6% complete. Mean follow-up time was  $7.11 \pm 2.5$  years. The mortality was in the group of Carbomedics (n = 18 patients) 13.84% and in the group of Omnicarbon (n = 20 patients) 20.62%. There were no valve thromboses. Thromboembolic events were 7.69% in the Carbomedics group and 1.0% in

the Omnicarbon group. Anticoagulant-related hemorrhage was 8.46% and 2.06%, respectively. Nonstructural valve dysfunction was 3.1% in either group. Reoperations were required in 7.69% and 7.21%, respectively. Quality of life and echocardiographic measurements did not differ significantly.

**Conclusions:** We conclude from the study that long time performance of the Carbomedics and Omnicarbon valves in the aortic position are comparable even though valve related complications tended to be fewer in the Omnicarbon group.

### C6.3

#### THE ROSS PROCEDURE IS THE PREFERRED AORTIC VALVE REPLACEMENT OPERATION FOR THE TEENAGED PATIENT—MIDTERM RESULTS FROM A SINGLE INSTITUTION

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**Objective:** Aortic valve replacement (AVR) in the teenage patient presents a significant challenge. The ideal AVR for these patients is safe, durable, provides optimal hemodynamics, requires no anticoagulation, and will grow. At our center the Ross procedure has provided excellent results for teenage patients and is the preferred AVR in this age group.

**Methods:** Since 1992 our center has performed 194 Ross procedures with 53 of these in teenagers (10-20 years of age). The primary indications for Ross procedure were aortic insufficiency 17%, aortic stenosis 42.5%, and combined insufficiency-stenosis 42.5%. Twenty-two patients (42.5%) had a bicuspid aortic valve. The median follow-up was 57 months (range 5-183).

**Results:** The mean age was  $14.2 \pm 2.7$  years with 72% males. The mean length of hospital stay was  $3.8 \pm 0.8$  days. Actuarial survival was 100% (30 days), 98% (6 months), 98% (1 year), and 98% (5 years). One patient died from arrhythmia secondary to pre-existing cardiomyopathy. Freedom from re-operation for failed pulmonary autograft was 100% (1 year), 100% (5 years), and 95% (10 years). Freedom from re-operation for failed pulmonary homograft was 100% (1 year), 100% (5 years), and 89% (10 years).

**Conclusions:** Pulmonary autograft in the aortic position demonstrates safety and durability and these patients go on to have an active lifestyle. For these reasons the Ross operation should be the preferred AVR operation for the teenager.

### C6.4

#### TWELVE YEARS MEDIAN FOLLOW UP OF BRAVO 400 STENTLESS AORTIC VALVE BIOPROSTHESIS

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**Objective:** The BRAVO Cardiovascular Model 400 Stentless is an entire porcine aortic root characterized by low pressure fixation, valve inflow portion reinforcement with zero pressure fixed equine pericardium and absence of synthetic materials. This report evaluates the 12-year median follow-up of patients who underwent aortic valve replacement with the BRAVO 400 Xenograft.

**Methods:** Between February 1992 and January 1994, 67 patients (37 male and 30 female, mean age  $67.9 \pm 7.2$  years, age range 22-83 years) underwent aortic valve replacement with Bravo 400 Xenograft at the Centro Cardiologico Monzino, University of Milan. Survival and time-related event analysis was performed with the Kaplan-Meier method. Median follow-up was 12 years.

**Results:** We did not observe perioperative and in-hospital mortality and morbidity. There were 20 late deaths at 12 years follow-up. Overall survival estimates at 6 and 12 years were  $89.02 \pm 3.92\%$  and  $67.64 \pm 5.99\%$ , respectively. There were 7 valve-related deaths. The actuarial freedom from valve-related death at 6 and 12 years was  $98.48 \pm 1.50\%$  and  $86.87 \pm 4.67\%$ , respectively. The actuarial freedom from cardiac-related death at 6 and 12 years was  $95.15 \pm 2.74\%$  and  $83.93 \pm 4.95\%$ , respectively. There were 11 non-cardiac deaths. The first cause of death in this sub-group was tumor. The actuarial freedom from non-cardiac death at 6 and 12 years was  $93.64 \pm 3.08\%$  and  $80.88 \pm 5.25\%$ , respectively. Twelve-year Kaplan-Meier survival of patients younger than 65 years at surgery was  $80.81 \pm 8.66\%$  vs.  $60.74 \pm 7.70\%$  for older patients ( $P = 0.0688$ , Log Rank Test). Freedom from valve-related death and from cardiac-related death was not significantly different between patients younger and older than 65 years at surgery ( $P = 0.8974$  and  $P = 0.6914$ , respectively, Log Rank Test). Freedom from non-cardiac deaths was significantly better in patients younger than 65 years at surgery ( $P = 0.0374$ , Log

Rank Test). The actuarial freedom from thromboembolism at 6 and 12 years,  $98.39 \pm 1.60\%$  and  $90.72 \pm 3.97\%$  was respectively. No hemorrhagic events were registered in follow-up. Prosthesis replacement was necessary in 6 patients for degeneration of the prosthesis. The actuarial freedom from reoperation at 6 and 12 years was  $98.41 \pm 1.57\%$  and  $88.26 \pm 4.53\%$ , respectively. The rest of our study group showed an echocardiographic control a good haemodynamic performance of the stentless prosthesis.

Conclusions: The Bravo 400 aortic prosthesis has provided good clinical and hemodynamic results up until 12 years of median follow-up.

#### C6.5

##### VALVULAR-PROSTHESIS MISMATCH: CLINICAL IMPACT

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Objective: Survival following aortic valve replacement has been related to the size of the indexed internal prosthesis orifice area (IOA). The main purpose of this study is to verify the relationship between IOA and clinical evolution following isolated aortic valve replacement.

Methods: From January 1999 to July 2004, 316 patients, whose aortic valve was replaced, were included (53% males, age: 69-77 years). Mean follow-up was 979,5 days. Follow-up included preoperative, intraoperative and postoperative data. Multivariable hazard domain analysis and time-related survival was performed in finely grouped strata of IOA. Four groups were established: A:  $<1 \text{ cm}^2/\text{m}^2$ , 15.5% patients; B:  $1-1.25 \text{ cm}^2/\text{m}^2$ , 32.5%; C:  $1.25-1.5 \text{ cm}^2/\text{m}^2$ , 27.4%; D:  $>1.5 \text{ cm}^2/\text{m}^2$ , 19.6% patients.

Results: No differences were found regarding in-hospital mortality or length-of-stay (mortality A: 12.2%; rest: 5.26%,  $P = 0.101$ ). However, follow-up and global mortality were significantly higher in A (follow-up mortality A: 17%, B-C-D mortality: 6%,  $P = 0.000$ ; global mortality A: 31%, rest of the groups: 12%,  $P = 0.024$ ). Patients in groups A and B showed more cardiac failure requiring hospital readmissions (A  $P = 0.000$ ; B  $P = 0.024$ ). There was a significant reduction in functional class in those groups with smaller IOA (A: 0,62; B-C-D: 1,24;  $P = 0.000$ ).

Conclusions: IOA does not seem to affect short term results but shows a significant influence on mid-term results concerning mortality, hospital readmissions and functional class reduction.

#### C6.6

##### AORTIC ROOT HOMOGRAFT IN THE SURGICAL TREATMENT OF AORTIC VALVE DISEASE WITH DILATED ASCENDING AORTA

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Objective: Patients with combined affection of the aortic valve and ascending aorta are commonly treated with prosthetic grafts. We review our experience in the treatment of these patients using aortic homograft.

Methods: An AH was implanted in 45 consecutive patients presenting aortic valve disease and dilated ascending aorta operated in two institutions between 1996 and 2004. Clinical and echocardiographic evolutions were assessed in the follow-up.

Results: 36 patients (80%) were male and mean age was 63.4 ( $\pm 10.7$ ) years. Aortic valve stenosis was present in 31 (68.9%), aortic insufficiency in 12 (26.7%), combined lesion in 1 patient (2.2%) and prosthetic degeneration in 1 (2.2%) patient. Mean preoperatively FEVI was 60.5% ( $SD = 11.6$ ). 11 patients (24.4%) were in CF>II at the time of surgery. AH was used as a complete root in almost all cases. A Dacron graft was used in 6 cases in order to restore continuity of the native aorta at different levels, other procedures associated were mitral valve surgery in 1 patient, CABG in 5 patients and cryoablation of atrial fibrillation in 1 patient. All patients survived surgery. ICU complications were low cardiac output state (2), atrial fibrillation (1), mediastinal bleeding (2), renal dysfunction (1), complete heart block (1). There was no hospital mortality. Mean follow-up was 16 months (0,1 month-63,9 months), with median follow-up of 8,5 months. Main events were classified as cardiac death, graft infection, and need of new surgery. Event free survival was 100% in all the periods of the follow-up. One patient died 39 months after surgery due to gastric carcinoma. There was a significant recovery of functional class after surgery ( $P < 0.001$ ). One month after surgery left ventricular systolic ( $P < 0.001$ ) and diastolic ( $P < 0.009$ ) had decreased significantly on echocardiography and this decrease persisted in

follow-up. The diameter of ascending aorta was normal in all patients ( $< 30 \text{ mm}$ ) except one.

Conclusions: The use of AH is a good alternative as a substitute of aortic root in patients with dilated ascending aorta. Homograft replacement has inherent advantages in terms of decreased incidence of thromboembolism, endocarditis and anticoagulation-related problems. Only 2 patients required inotropic support after cardiopulmonary bypass. This, and the rapid recovery of functional class and ventricular diameters after surgery may be a consequence of the good haemodynamic performance of the graft.

#### C6.7

##### A MULTICENTERED EUROPEAN STUDY ON THE SAFETY AND EFFECTIVENESS OF THE ON-X® PROSTHETIC HEART VALVE: 5-YEAR CLINICAL RESULTS

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Objective: This study was performed to determine the safety and effectiveness of the new prosthetic valve ON-X.

Methods: It was a European multicentered, longitudinal, non-randomized study of the performance of the valve including evaluations of echo hemodynamics, hemolysis, quality of life and adverse events. Isolated aortic (AVR) and mitral valve (MVR) replacement was studied in 184 AVR (average follow-up 5.0 years) and 117 MVR (average follow-up 4.4 years) patients.

Results: In AVR, hemodynamics are shown. Hemolysis was low with median postoperative LDH at 224 IU (250 upper normal). 91.6% of patients were in NYHA class I or II, at 1-year or more postoperatively. Adverse event rates in %/ptyr were: thromboembolism 0.88, thrombosis 0.11, bleeding events 0.77, and late mortality 1.97. In MVR, hemodynamics are also shown. Median postoperative LHD was 238. 84.6% of patients were in NYHA class I or II. Adverse event rates were: thromboembolism 1.76, thrombosis 0.20, bleeding events 1.96, and late mortality 2.55.

Conclusions: At the end of the 5-year study the ON-X valve has established a generally superior performance record in terms of hemodynamics with large effective orifice areas (EOA), hemolysis with in-range LDH and low adverse event rates, particularly in the aortic position.

#### C6.8

##### FACTORS AFFECTING MORTALITY FOLLOWING ISOLATED AORTIC VALVE REPLACEMENT. DOES SIZE MATTER ?

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Objective: The effect of patient-prosthesis size mismatch on mortality following aortic valve replacement (AVR) is controversial. A retrospective analysis of patients who underwent first time, isolated AVR was conducted to assess factors affecting mortality over a two and half year period.

Methods: Clinical case notes and patient administrative service (PAS) data of 211 patients (122 males, 89 females) with 105 mechanical and 106 bio-prosthetic aortic valves were reviewed. Variables included were age, gender, angina class, dyspnoea class, diabetes mellitus, valve size, effective orifice area (EOA), body surface area (BSA), indexed effective orifice area (IEOA = EOA/BSA), pre and post-operative urea and creatinine levels. Mean follow up was 40 months (26 to 56 months).

Results: The 30-day mortality was 3.3% (7/211 patients) and the overall mortality was 13.3% (28/211 patients). On univariate analysis, mortality was affected by age (70 vs. 64 years,  $P = 0.03$ ), EOA (1.9 vs. 2.2  $\text{cm}^2$ ,  $P = 0.02$ ), IEOA (1 vs. 1.2  $\text{cm}^2/\text{m}^2$ ,  $P = 0.04$ ), diabetes mellitus (29% vs. 12%,  $P = 0.04$ ) and post-operative urea (16 vs. 9.7  $\text{mmol/l}$ ,  $P = 0.01$ ). Logistic regression analysis showed that IEOA ( $P = 0.002$ , OR-0.25, 95% CI 0.1-0.59), diabetes mellitus ( $P = 0.002$ , OR-0.32, 95% CI 0.12-0.86) and post-operative urea ( $P = 0.002$ , OR-1.06, 95% CI 1.02-1.1) significantly affect mortality.

Conclusions: Indexed EOA, diabetes mellitus and post-operative urea levels are significant determinants of mortality in first-time, isolated, aortic valve replacement. As patient-prosthesis size mismatch is a modifiable factor,

stentless valves or aortic root augmentation procedures can be considered to improve patient survival.

#### C6.9

##### USEFULNESS OF MIDWALL INDICES OF SYSTOLIC FUNCTION TO PREDICT OUTCOME AFTER AORTIC VALVE REPLACEMENT FOR PURE AORTIC STENOSIS

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**Objective:** Ejection fraction (LVEF) and fractional shortening measured at endocardium (FSendo) are strongly influenced by myocardial loading, LV geometry and relative wall thickness (RWT). Thus, in the hypertrophied hearts, these might be normal or supranormal even in the presence of systolic dysfunction. This study was aimed to evaluate if load-independent midwall-indices may better predict outcome after aortic valve replacement (AVR) in patients with aortic stenosis (AS) and may help to recognize, among them, subjects who really benefit from surgery.

**Methods:** Midwall fractional shortening (FSmw), circumferential end-systolic stress (sc), ratios of observed to predicted FSmw (FSmw-r) and FSendo

(FSendo-r) and FSmw/sc relations were retrospectively analyzed in 498 consecutive AS patients (mean age  $64.3 \pm 11.2$ ; 62.4% male). sc was obtained by the Reichek formula. FSmw was calculated using a two-shell cylindrical model. Normal values were obtained from 1000 matched controls and FSmw = 0.1382, FSendo-r = 81% and FSmw-r = 79% resulted, indicative of myocardial dysfunction.

**Results:** Preoperatively, 162 patients (32.5%) had low FSmw and 154 (30.9%) showed a FSmw-r = 79%; in contrast, only 41 subjects (8.2%) had a subnormal FSendo ( $P < 0.001$ ) and 28 (5.6%) a FSendo-r = 81% ( $P < 0.001$ ). At logistic regression FSmw was a strong predictor of early death ( $P = 0.001$ ; OR 6.21 [95% CI] 2.22-10.30) and postoperative events ( $P = 0.003$ ; OR 4.25; 1.49-7.51). In addition FSmw was a multivariate predictor of late death at Cox regression analysis ( $\text{Exp}(\beta) = 1.87$ ; 95%; 1.61-5.13). Conversely, FSendo and FSendo/sc were not significant. In RWT-corrected model, with  $\text{RWT} > 0.60$ , FSmw was still an independent predictor of early death ( $P < 0.001$ ), postoperative events ( $P = 0.04$ ) and late death ( $P = 0.01$ ). Contrastingly, it was not significant when  $\text{RWT} < 0.60$ .

**Conclusions:** Midwall indices were strong predictors of adverse outcome after AVR for AS. FSmw = 0.13 and  $\text{RWT} > 0.60$  identifies subjects at markedly increased risk. In these patients, the surgical option should be carefully evaluated. Further larger studies are necessary to confirm our findings.

## SCIENTIFIC SESSION C7 CORONARY

### C7.1

#### NEW INSIGHTS IN THE CONDUIT USED FOR RIGHT CORONARY ARTERY REVASCLARIZATION

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**Objective:** There is an ongoing controversy about which is the ideal conduit for grafting the right coronary artery, with many surgeons discouraging the use of radial artery, whereas they strongly recommend the use of the saphenous grafts. The main goal of the study was to evaluate the intraoperative flow performance in both conduits.

**Methods:** A retrospective, observational study was conducted including 69 consecutive right coronary artery grafts implanted from May 2003 to January 2005 in our institution, in which intraoperative flow measurements were obtained with a transit time flowmeter (Butterfly Flowmeter?, Medi-Stim A/S Oslo) and 1.5, 2 and 3 mm probes. Two groups were defined depending on the nature of the conduit used: group A (25 grafts with radial artery) and group B (44 saphenous vein grafts). Data were obtained from a computer database and statistically analyzed. Coronary diameter, degree of atherosclerotic disease, diabetes, LDL levels, and flow measurements were obtained for every graft.

**Results:** Both groups were found to be comparable regarding the diameter and quality of the target vessel, and also the diabetes and LDL levels did not show any significant difference.

**Conclusions:** The study shows that there is a trend that does not reach statistical significance towards greater flow in the vein conduits, but we found a tendency to reach a higher PI in this conduit when compared to the radial artery. We firmly believe that this might be explained by the reduced number of cases of our study. According to our data, there is not enough evidence to recommend the use of vein conduits instead of arterial conduits.

### C7.2

#### EARLY AND LATE OUTCOME AFTER OPCAB WITH CORONARY ENDARTERECTOMY: A SINGLE CENTRE 10-YEAR EXPERIENCE

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**Objective:** We aimed to review the early and late results of OPCAB with coronary endarterectomy in patients undergoing surgical revascularisation at our institution.

**Methods:** Between 1995 and 2004, out of 680 OPCAB patients, 70 patients (10.29%) who underwent concomitant coronary endarterectomy were studied. The mean age was 63.6±9.29 years. Thirty-three patients (55%) were CCS class III or IV and twenty four (40%) patients were NYHA class III or IV. Eighteen patients (35%) had impaired LV function. The mean Euroscore of the patients was 5.9±1.8.

**Results:** Fifty-seven patients (81%) underwent RCA endarterectomy and 12 patients (17%) underwent LAD endarterectomy (8 LIMAS used as conduits). Four patients (5.7%) had two vessels endarterectomised. The mean number of grafts were 2.0±0.4. The 30-day mortality was 2.85% (n = 2). Three patients (4.3%) suffered from post-operative myocardial infarction and three patients (4.3%) required post-operative IABP insertion. The mean duration spent in ITU was 17.6±8.1 h. Patients were extubated after a mean of 10.38±4.9 h. The mean length of hospital stay was 6.1±2.0 days. Fourteen patients (20%) had post-operative atrial fibrillation and only one patient (1.42%) suffered from a transient stroke with complete recovery. There were no conversions to cardio-pulmonary bypass. A mean of 0.86±0.17 units of blood were transfused post-operatively. There was one reopening for bleeding and one patient went into renal failure requiring hemofiltration. The median follow-up was 4.91 years, 90% of patients were angina free and the actuarial survival at 10 years was 78.04±7.6%.

**Conclusions:** OPCAB with coronary endarterectomy is feasible to achieve complete revascularisation in patients with diffuse coronary artery disease.

### C7.3

#### PREDICTORS FOR OPTIMUM CONVERSION DURING ATTEMPTED OFF-PUMP CORONARY BYPASS GRAFTING

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**Objective:** In the era of aggressive off-pump coronary bypass surgery, the need to understand the outcome of and avoid calamitous intraoperative complications is growing increasingly strong. Yet, not many have discussed the consequences of emergency conversion to cardiopulmonary bypass during attempted off-pump surgery, and those who have addressed them have consistently emphasized the importance of the appropriate timing of conversion. Most decisions of when to convert, however, still depend on each surgeon's empirical perception—one question arises: is it always reliable? Given that most emergency conversions develop disastrous outcomes, the establishment of a guideline that provides clear criteria for a swift, optimum conversion seems mandatory. In this study, we sought to identify these criteria by determining predictive factors of conversion.

**Methods:** A retrospective study was performed reviewing 117 consecutive patients who underwent isolated, initial off-pump coronary artery bypass surgery between January 2000 and January 2005. Of these, 14 patients required cardiopulmonary bypass conversion. Perioperative clinical details of these patients were statistically analyzed and compared with those of the nonconverted patients. Multivariate logistic regression analysis was conducted to identify independent risk factors for conversion.

**Results:** The overall conversion rate was 12.0%. In-hospital mortality was 0% in the nonconverted patients compared with 20.1% in the converted patients. Major morbidity was also higher in the converted patients, although the values did not reach statistical significance (10.7% vs. 21.4%,  $P = 0.4$ ; nonconverted vs. converted patients, respectively). Variables that showed statistical significance were preoperative arrhythmia, history of atrial fibrillation, left main stenosis (>90%), right coronary stenosis (>90%), number of distal anastomosis, right coronary artery as the initial bypass target vessel, and vessels other than the left anterior descending as the initial bypass target. Of these variables, those that emerged as independent predictors of conversion were left main stenosis (>90%), proximal right coronary stenosis (>90%), and selection of bypass vessels excluding the left anterior descending as the initial target.

**Conclusions:** As off-pump indication expands, concern rises not only over the safety and quality of the procedure but also the rate of conversion. More attention should be paid on how to avoid disastrous outcomes of conversion and not the conversion itself. Our study indicated certain affinities among those requiring conversion, and these are the factors that may complement the determination of the criteria that can avoid detrimental consequences due to suboptimal conversions.

### C7.4

#### EVALUATION OF THE CLINICAL RESULTS OF OFF-PUMP CORONARY ARTERY BYPASS SURGERY IN PATIENTS WITH LEFT MAIN OR OSTEAL CORONARY LESIONS

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**Objective:** Coronary artery bypass graft (CABG) performed without cardiopulmonary bypass (CPB) is currently increasing in practice. Because of a concern about the ability to tolerate beating heart grafting, patients with left main coronary artery stenosis or ostial lesions have been excluded from off-pump bypass. We reviewed our experience with off-pump CABG for patients with left main coronary artery disease or ostial lesions.

**Methods:** Between January 2001 and April 2004 a total of 26 patients with left main coronary artery disease or ostial lesions underwent off-pump CABG by the same surgical team. Three patients had left ostial, one patient had both right and left ostial and 22 patients had left main coronary artery disease (= 50% stenosis). Preoperative, perioperative postoperative data (creatin phosphokinase-MB values, use of inotropes intraaortic balloon pump (IABP), mechanical ventilation times, intensive care unit stays, hospital stay) and 30 days follow-up data were analyzed.

**Results:** Urgent or emergent surgery was performed in 12 patients. Only one patient who was operated emergently, needed IABP and was in low cardiac output and had postinfarct angina prior to the operation. This patient was

discharged from the hospital at 9th postoperative day. Among the other 25 patients no morbidity was seen except two cases of atrial fibrillation. The mean hospital stay was 6 days. In the 30 days follow-up there were no rehospitalization, morbidity or mortality.

Conclusions: CABG using off-pump techniques are safe and effective in left main coronary artery disease and osteal lesions.

#### C7.5

##### IMAGING AND EVALUATION OF CORONARY ARTERY BYPASS GRAFT PATENCY BY MULTISLICE COMPUTED TOMOGRAPHY

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**Objective:** To evaluate the patency of coronary artery bypass grafts (CABG) and assess multislice CT (MSCT) abilities and limitations.

**Methods:** We studied retrospectively 25 patients (21 men, 4 women) over a 9-month period. All patients had undergone CABG surgery (3 months-7 years). Two patients were examined on an emergency basis for chest pain and their CABGs were evaluated simultaneously. The number of CABGs in each patient ranged from one to three. A total number of 62 grafts were evaluated. All scans were obtained by a 16-row detector scanner (MSCT), Toshiba Aquilion. MPRs, MIPs, and 3D images were performed on a Vitrea workstation. Heart rates ranged from 50-95 bpm. A non-ionic contrast medium, 120 ml, was injected through an 18g antecubital IV catheter by a single barrel injector. The flow rate was 3,5 ml/s, start-delay time was determined through a new automatic system, Sure Start. For each patient and each bypass graft, a single reconstruction was determined that displayed the highest resolution and less artefacts. Evaluation of the grafts was performed by dividing each graft into three segments and grading them on a scale.

**Results:** From the 62 grafts evaluated, 51 were classified as patent and 11 as not patent, 35 arterial grafts and 27 venous, respectively, were imaged. Of the 11 non-patent grafts, 10 were venous. In three cases of arterial grafts the distal anastomoses were not delineated. The evaluation of venous grafts was easier due to their larger diameter and lack of surrounding clips. One case of a carotid-subclavian shunt with a proximal anastomosis of the LIMA to the subclavian artery and distal to the LAD was reported. Two cases were confirmed by coronary angiography and two surgically.

**Conclusions:** MSCT is a fast and noninvasive imaging modality in evaluating CABG patency. It is gaining acceptance as an alternative method to coronary angiography. Sensitivity and specificity are determined by the available and fast growing technology and from a learning curve.

#### C7.6

##### RADIAL ARTERY FOR CORONARY ARTERY BYPASS GRAFTING—10 YEARS EXPERIENCE

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**Objective:** The aim of this study is to present our 8 years experience of routine use of the radial artery (RA) in coronary artery bypass grafting.

**Methods:** From 1995 till 2004 we used radial artery in 648 coronary grafting procedures. The results of the operations were studied using angiography, ECG monitoring, treadmill test. Patient characteristics were the following: angina class III (CSS) - 41,8%, IV - 29,4%, unstable angina - 17,3%, recent MI-4%, smoking - 74%, arterial hypertension - 57%, ejection fraction <40-31,2%, left main artery disease - 21,1%, 3 vessel injury - 71%.

**Results:** In short-term follow-up 32 (5%) patients died from non-cardiac reasons. In 20 autopsies from 22 cases RA grafts were patent. In 2 cases we found graft thrombosis. 6,5% of patients had postoperational myocardial infarction but only in 2 cases (0,3%) it was in RA graft area. During 30 cases of re sternotomy all grafts were patent. There were no significant hand complications. In 44 (6,8%) patients we found some skin hyperesthesia. In 92 (14,2%) patients treadmill test was done. Loading tolerance increased from 23,7 to 68,4 W. Mean angina class decreased from 3,3 to 1,0. Nobody had ECG ischemia in RA graft area. 21 patients had postoperative angiography. All grafts were patent. Long-term results of 8 years after operation were studied in 244 patients. During a mean term of observation of 4,3 years survival rate was 97.9%. 6.7% of patients had myocardial infarction. Recurrence of angina was in 8.3% patients. 5 (2.0%) patients had myocardial

infarction in RA graft area. Angiography was performed in 16 patients. In 13 (82%) patients RA graft was widely patent. In 3 cases we could not visualize the graft.

Conclusions: We consider that RA is a second conduit of choice after internal thoracic artery with good short-term and long-term results and we recommend it for further use in coronary operations.

#### C7.7

##### THE COMPARISON OF ULTRASONIC DISSECTION TO CLASSIC TECHNIQUE IN RADIAL ARTERY HARVESTING

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**Objective:** Radial artery is widely used in the last decade as a graft in coronary surgery. Currently, the harvesting techniques are different in many institutions. We aimed to evaluate the two (classic and ultrasonic dissection) techniques we performed in our clinic and to compare the results.

**Methods:** The patients receiving radial artery as a graft in bypass surgery from January 2000 were enrolled in the study. The patients were randomized and grouped into two according to the harvesting technique. The classical technique (Electrocauter-Hemoclips) was used in patients in group 1 and Harmonic Scalpel was used in group 2. The study was terminated when the patient number in each group reached 100. The mean age was 53.9±9.3, 53.5±8.4 (mean±SD), respectively. Allen test preoperatively and saturation probe check were performed during the operation valuation of hand vascularization. The pre- and post-operative parameters were recorded.

**Results:** The comparison of groups revealed significance in favor of ultrasonic dissection technique in parameters such as harvesting time, spasm and need for postoperative analgesia.

**Conclusions:** We think that ultrasonic scalpel causes less trauma, less spasm in radial artery during operation, and decreases the need for postoperative analgesia.

#### C7.8

##### MIDTERM RESULTS OF CORONARY ARTERY BYPASS GRAFTING IN PATIENTS WITH DIALYSIS DEPENDENT RENAL FAILURE

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**Objective:** To evaluate the short- and mid-term follow-up of patients with end stage renal failure after coronary artery bypass grafting (CABG).

**Methods:** We retrospectively reviewed 50 patients (40 male, 10 female, mean age 62.3±10.5 years, range: 33.8-81.75 years) with end stage renal disease who underwent CABG between 1992 and 2002. All patients had associated comorbid illnesses, 44 patients (88%) were in functional NYHA-class III or IV. 40 operations (80%) were elective whereas 10 operations (20%) were performed in an urgency or emergency setting. A mean of 3.3±1.06 bypasses/patient (range: 1-5) were performed; 25 patients (50%) became internal mammary arteries (BIMA), 19 patients (38%) received single internal mammary artery (LIMA: 18 or RIMA: 1) for grafting. Follow-up was complete in 92% (46/50), ranged 2-101 months (mean: 45.85 months) with a cumulative of 152.8 patient-years.

**Results:** The early (30-day) mortality rate was 12% (n: 6); 3 patients died due to myocardial infarction (MI), 2 due to multiple organ failure caused by pneumonia and one because of cardiac arrest following hemodialysis on the 14th pod. One patient (2%) required reoperation for mediastinal bleeding. None of the patients developed unstable sternum or wound healing complications. There were 13 late deaths (41.3%). One patient died due to MI, 8 due to non cardiac causes and 4 due to unknown causes. Severe cardiac events occurred in 2 patients. The survival rates were 78.3±6%, 55.5±8.5% and 40±11.6% at 1, 4 and 8.4 years, respectively. The survival rates of patients with a LIMA in comparison to those without a LIMA bypass graft were at 89 months 46.25% and 16.66% (P = 0.025), respectively. BIMA-patients showed at 7.4 years higher survival rates (61.7%) than patients with saphenous veins grafts (16.66%) (P = 0.236). The median time to death after discharge for the 13 patients (late deaths) was 35 months (range: 2-87 months). 10 patients (21.8%) underwent after CABG kidney transplantation.

92.5% of the hospital survivors (37 of 40 patients) showed postoperatively improved overall functional status; 22 patients (47.9%) were in functional NYHA class I and II.

Conclusions: CABG may be performed in dialysis patients with increased but acceptable morbidity and mortality with excellent symptomatic relief. The

use of arterial grafts especially both of the IMAs seems to provide higher graft-patency and mid-term survival rates without increased perioperative complication rates. However, limited long-term survival suggests that the relative costs and benefits of surgical revascularization need further examination of this patient population.

## SCIENTIFIC SESSION C8 CONGENITAL

### C8.1

#### LATE REOPERATION AFTER COMPLETE REPAIR OF TETRALOGY OF FALLOT

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**Objective:** Despite successful prior repair of Tetralogy of Fallot (TOF), long term follow up reveals significant residual or progressive lesions which lead to symptoms, impaired right ventricular function and thus need for reoperation. This study presents our experience in patients who required reoperation post complete TOF repair.

**Methods:** Twenty-five patients (age  $20 \pm 15.9$ , median 15 years) with previously complete repair of TOF (performed elsewhere in all cases), required reoperation for significant residual defects. Time since original repair was  $11.4 \pm 8.5$  (median 9) years. Fifteen patients (60%) were in NYHA class III, eight (32%) in class II and 2 (8%) were asymptomatic preoperatively. Residual defects for which intervention was necessary were: residual ventricular septum defect (VSD) in 11 pts, severe stenosis of right ventricular outflow tract (RVOT) in 5 pts, stenosis of right ventricle (RV) to pulmonary artery (PA) conduit in 2 pts and severe pulmonary valve insufficiency in 10 pts. Surgical repair included: VSD closure (11 pts), RVOT resection (5 pts), pulmonary valvotomy (1 pt), placement of new or replacement of dysfunctional RV to PA conduit in 14 cases (2 homografts, 12 Contegra™ type xenograft), ASD closure (6 pts) and tricuspid valvuloplasty (1 pt).

**Results:** There was no death in this series. Mean ITU stay was  $2.9 \pm 1.7$  (median 2) days and hospital stay  $8.3 \pm 1.9$  (median 7.5) days. There were no major post operative complications. At follow up of 24-62 months, all patients are well (NYHA class I-II), in sinus rhythm, free of any cardiac medication and of residual defects by echocardiography.

**Conclusions:** Late reoperation, which may be necessary after TOF repair, can be achieved with minimal morbidity. Follow up for these patients is demanding, as adverse effects may occur with deleterious results.

### C8.2

#### SURGERY FOR CONGENITAL HEART DISEASES COMPLICATED BY INFECTIVE ENDOCARDITIS

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**Objective:** The aim of the study was to analyze data of patients with congenital heart defects (CHD) and infective endocarditis (IE), in order to evaluate course of disease, complications and treatment.

**Methods:** The consecutive retrospective analysis of data of 28 patients with CHD (before surgery) and IE, treated at our surgery center since 1969 till 2004, was performed. Congenital aortic and mitral valve anomalies were excluded from study.

**Results:** The average age was  $19.8 \pm 13.1$  years. Most of our patients (92,8%) were of moderate risk group for IE according to ESC guidelines. Ventricular septal defect (VSD) (39,2%) and patent ductus arteriosus (28,6%) were the most common defects affected by IE. 26 (92,8%) patients underwent surgical treatment with mortality rate 3,8%. Seven of them were operated during the active phase of infection. Indications for urgent surgery were: mycotic pseudoaneurysm of aorta (3 cases); paravalvular abscess (1 case), heart failure due to acute severe aortic (1 case) or mitral (1 case) regurgitation and uncontrolled infection (1 case). One patient with pseudoaneurysm of aorta died in early postoperative period.

**Conclusions:** 1. Infective endocarditis was diagnosed more frequently in patients with VSD, particularly with perimembranous. 2. Surgical treatment of life-threatening complications during active IE was performed for 25% of patients with mortality rate 14,2%.

### C8.3

#### IMMEDIATE POSTOPERATIVE RESULTS AFTER COMPLETE CORRECTION OF TETRALOGY OF FALLOT—COMPARATIVE STUDY

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**Objective:** Evaluation of the operative and postoperative factors which influence the immediate operative and postoperative morbidity and mortality after complete correction of Tetralogy of Fallot in the period of 10 years.

**Methods:** In the period 1995-2005, 132 complete corrections of Tetralogy of Fallot were performed. Two groups of patients were compared, the first group operated between 1995-1999 (81 patients) and the second group operated on between 2000-2005 (51 patients). Using retrospective data and statistical analysis we have evaluated the significance of patient age, palliative procedures, surgical and perfusion techniques on the operative outcome.

**Results:** Complete correction in the first year of life was performed in 7/81 patients (8.6%) in the first group, and in 25/51 (49%) in the second group. Palliative procedures preceded the complete correction in 25% patients in group I, and in 12% patients in group II. Transannular patch was applied to 35% (group I) and 14% (group II) patients. The LV/RV ratio measured immediately after CPB showed no statistical significance between the two groups. There was a statistical significance between the length of the cross clamp time in the two groups (I,  $77 \pm 22.5$  min and II,  $49 \pm 17.7$  min). Restrictive physiology of the RV was present postoperatively in 20% patients (group I), and 12% patients (group II). Low cardiac output was present postoperatively in 39% patients (group I) and 14% patients (group II). The overall hospital mortality was 12.3% (group I) and 7.4% (group II). There was no difference in the length of the hospital stay in between the two groups

**Conclusions:** Younger age, different surgical approach to the right ventricular outflow tract, improved perfusion techniques and postoperative management of low cardiac output, have decreased the immediate postoperative complications and mortality after complete correction of Tetralogy of Fallot at our institution.

### C8.4

#### THE MANAGEMENT OF CHYLOTHORAX FOLLOWING CONGENITAL HEART SURGERY: A 7-YEAR EXPERIENCE

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**Objective:** Chylothorax after congenital heart surgery is a potentially challenging complication. The purpose of this study is to review our experience with the management of chylothorax following congenital heart surgery.

**Methods:** During a 7-year period between 9/1997-12/2004, 1171 pediatric patients underwent correction of congenital heart disease (CHD) in our institution. Of these, 10 patients (0.85%) (six females, four males), aged 5-42 (median 17) months old and body weight 6-18 (median 8.2) kg developed chylothorax postoperatively. The surgical procedures preceding the occurrence of lymph leak included Tetralogy of Fallot repair ( $n = 5$ ), ligation of patent ductus arteriosus ( $n = 1$ ), VSD ( $n = 1$ ), ASD with pulmonary stenosis ( $n = 1$ ), Fontan procedure ( $n = 1$ ), and coarctation of the aorta repair ( $n = 1$ ). In all patients, no sign of hemodynamic abnormalities were noted. Interestingly only one of the 35 patients (0,28%) who underwent a Fontan procedure during the same period developed chylothorax. All patients were initially treated conservatively with complete drainage of chyle collection and either total parenteral nutrition (TPN) or enteral low fat diet. Somatostatin was used adjunctively in five (50%) patients. Surgical intervention was reserved for persistent lymph leak, despite maximal therapy. When chylothorax resolved, medium chain triglyceride diet continued for 6 weeks.

**Results:** There was no death. Seven patients (70%) responded to conservative therapy. The median duration of lymph leak was 10 (range 8 to 36) days and the median lymph leak was 4.7 (range 2.5 to 5.7) ml/kg per day. In three patients with persistent drainage, thoracotomy with pleurodesis was necessary to achieve resolution. In two of these, an attempt of chemical pleurodesis with doxycycline preceded, yet was ineffective. The median duration of lymph leak in this subgroup was 24 (range 15 to 47) days with median output 5.3 (range 5.1 to 7.4) ml/kg per day.

**Conclusions:** Postoperative chylothorax is an infrequent complication of surgery for CHD and can occur even after median sternotomy in the absence of pathologically elevated venous pressure or Fontan circulation. Although hospitalization can be prolonged, conservative therapy is effective in most



cases, while surgical pleurodesis was successful in the medically refractory cases.

### C8.5

#### SURGICAL TREATMENT FOR MULTIPLE VENTRICULAR SEPTAL DEFECTS

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**Objective:** To evaluate results of total correction of multiple VSD.

**Methods:** From January 1990 to January 2004 a total of 137 consecutive patients underwent surgery for multiple VSD. Multiple VSD as isolated lesion have been founded in 79 pts (57,7%), associated with other cardiac malformations in 58 pts (42,3%). Mean age at operation was  $4.9 \pm 2.1$  years (27 days to 48 years), mean weight  $17,7 \pm 11,1$  kg (3,2 to 76 kg). Primary correction was performed in 92 pts (67,1%), total correction after palliation in 25 pts (18,2%). Previous procedures: PAB ( $n = 28$ ), repair of aortic coarctation ( $n = 10$ ), modified BT-shunt ( $n = 4$ ). Mean interval between PAB and total correction was  $22 \pm 4$  months (from 7 to 38 months). High pulmonary hypertension occurred in 63 pts, pulmonary stenosis in 29 pts, unaltered pulmonary flow in 45.

**Results:** Hospital mortality in the group of pts with PH was 14,3% ( $n = 9$ ), with PS 6,9% ( $n = 2$ ), with normal pulmonary flow 6,7% ( $n = 3$ ). Residual VSDs occurred in 18 pts from 103 discharged pts after total correction (17,5%). Follow-up was retraced in 88 pts (85,4%). Mean follow-up was  $3,8 \pm 1,1$  years (3 months to 13,5 years). No deaths occurred during follow-up. In 69 pts (78,4%) mid- or/and long-term results of operation were good (I-II NYHA, absence or non significant re-shunting), in 11 pts satisfactory (II-III NYHA, significant shunt), 4 pts (4,5%) underwent re-operation due to their residual VSDs, 4 pts due to other cardiac malformations to be corrected.

**Conclusions:** Pulmonary hypertension is the significant risk-factor in the surgery for multiple VSD. Residual VSD was the cause of re-operation in 4,5% pts during follow-up.

### C8.6

#### MID-TERM RESULTS OF THE SURGICAL TREATMENT OF AORTIC COARCTATION

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**Objective:** Surgical repair of coarctation of the aorta (CoA) remains the primary therapeutic modality. Our goal is to resect the stenotic area whenever possible as it is believed that residual coarctation tissue may be responsible for late re-stenosis and aneurysm formation when a prosthetic patch is used. This study summarizes our experience with surgical correction of CoA.

**Methods:** From 9/1997-2/2005, 88 patients (61 males and 27 females), aged 5 days to 41 (median 2) years and body weight ranging 2.4-104 (median 13) kg, underwent repair of CoA, accounting for the 6.3% of all patients undergoing surgical procedures for congenital heart disease at our unit during that time. Twenty patients had some degree of hypoplastic aortic arch, 3 aberrant left subclavian arteries and 5 recurrent stenosis after previous correction. Mean peak gradient across the stenosis was  $58 \pm 22$  mmHg. Seventeen patients had concomitant congenital cardiac lesions and in 5 CoA was part of a complex congenital cardiac entity. In 2 patients subclavian flap repair was performed and in 4 patients the stenosis was by-passed with an extra-anatomic tubular graft. The remaining 82 patients had resection of the stenosis and end-to-end anastomosis. In addition 2 of these patients required subclavian flap augmentation, 5 a reverse subclavian flap to repair the hypoplastic aortic arch, 7 the interposition of a synthetic tubular graft and 3 re-implantation of the left subclavian artery. In 5 cases cardiopulmonary by-pass support was necessary, while in 83 the procedures were accomplished via left thoracotomy with a temporary aortic clamping of  $28 \pm 11$  min. Concomitant procedures included the closure of a patent ductus arteriosus in 5 patients, pulmonary artery banding in 6 and a procedure for acquired heart disease in 3 patients.

**Results:** There was no operative death. Two patients developed post-operative chylothorax, one of them requiring re-operation, both of whom recovered completely. Median ICU and hospital stay were 3 and 8 days, respectively. Mean peak gradient was reduced to  $19 \pm 10$  mmHg. At follow up of 1 month to 7 years (mean  $44 \pm 23$  months) there was one late death due to concomitant complex congenital heart disease, while one patient required

balloon angioplasty for persistent high gradient at the isthmus. All other patients remain in excellent condition without evidence of re-stenosis and without significant change of the mean peak gradient ( $20 \pm 12$  mmHg).

**Conclusions:** Surgical correction of CoA is associated with low morbidity and mortality. Late mortality is related to the presence of severe concomitant congenital lesions.

### C8.7

#### COARCTATION REPAIR BEFORE ONE YEAR OF AGE, SURGICAL RESULTS AND RISK FACTORS. A 20 YEARS EXPERIENCE

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**Objective:** To report our results for surgical repair of aortic coarctation before one year of age and to study risk factor for mortality and recoarctation.

**Methods:** We reviewed the files of the 206 infants operated on between 1984 and 2004. We distinguished 3 groups of patients : I (isolated coarctation,  $n = 99$ ), II (associated ventricular septal defect,  $n = 63$ ), III (complex cardiopathy,  $n = 44$ ). In 51% of the cases, the aortic arch was hypoplastic. Uni- and multi-variate analysis of risk factors for mortality and recoarctation was done.

**Results:** An extended resection-anastomosis was done in all cases. An associated aortic arch reconstruction was done in 32 cases. Hospital mortality was 3,9% ( $n = 8$ ). Presence of a complex intracardiac anomaly was a significant risk factor for mortality ( $P = 0,023$ ). In univariate analysis, two stage repair of group III patients was a risk factor for mortality ( $P = 0,036$ ). Thirty patients (14,6%) presented a recoarctation (gradient  $> 20$  mmHg, follow-up  $40 \pm 44$  months). In multivariate analysis, only the importance of the immediate post-operative gradient was a risk factor for recoarctation.

**Conclusions:** Coarctation repair gives excellent results in infants under one year of age. Prognosis is linked to associated cardiopathy. Survival seems better if treatment is done in one stage in patients with associated cardiopathy. Recoarctation risk depends on the importance of the immediate post operative trans-isthmus gradient, justifying extensive repair of the aortic arch.

### C8.8

#### FEASIBILITY AND ACCURACY OF REAL-TIME THREE-DIMENSIONAL ECHOCARDIOGRAPHIC ASSESSMENT OF VENTRICULAR SEPTAL DEFECTS

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**Objective:** The aim of this study was to evaluate the feasibility and accuracy of real-time transthoracic 3D echocardiography (RT-3DE) in the determination of the position, size and shape of ventricular septal defects.

**Methods:** Between July and December 2004, 25 patients (age 2 month - 46 years) who were scheduled for surgical closure of a VSD, were enrolled in the study. The VSD localisation, shape and measurements of minimal and maximal diameter from 'en face' LV and 'en face' RV view were assessed from the 3D data set. These 3D data were compared with measurements and descriptions done by the surgeon, who was blinded for the 3D data, during the surgical procedure. RT-3DE was performed with Hewlett-Packard Sonos 7500 echo-system and off-line analysis with TomTec Echoview® software.

**Results:** Acquisition of RT-3DE datasets was feasible in 22 of the 25 (88%) patients. In 3 patients, the quality of the transthoracic 3D echo was too poor to allow 3D reconstruction. The time of 3D data acquisition was  $4 \pm 2$  min. Reconstruction time was  $23 \pm 16$  min. The localization and number of the VSD were determined correctly by RT-3DE in all 22 patients. There was a good correlation between RT-3DE and surgery for the maximal VSD diameter measurements from 'en face' RV view ( $r = 0.95$ ) and 'en face' LV view ( $r = 0.91$ ). A real-time 3D echocardiographic display of a typical perimembranous ventricular septal defect, viewed from left ventricular surface of the interventricular septum is shown. The minor and major diameter of the VSD when the VSD has the maximum area in the cardiac cycle is also shown: LV: left ventricle; LA: left atrium; AoV: aortic valve.

Conclusions: Real-time 3D echocardiography is feasible for quantitative assessment of VSDs and allows accurate determination of VSD size and location.

#### C8.9

##### CONGENITAL HEART SURGERY THROUGH A RIGHT POSTERIOR THORACOTOMY. AN ESTHETIC APPROACH

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Objective: The main sequel after correction of many congenital heart defects in infancy/childhood is the scar and its esthetic prejudice. Since 1995, an approach through a short right posterior thoracotomy has been used. After an initial period of restriction to Ostium II closure, we have been successfully using this technique to treat other defects (even in young adults) with superb esthetic results. This experience is here reported.

Methods: 145 patients (19 males, 126 females) were operated. We reviewed the files retrospectively. Mean age was 9,5 years (6 months-25 years). All patients but 2 (femoral artery) had standard ascending aorta cannulation. Caval cannulation, aortic cross clamping, cardioplegia and de-airing were routinely done. The diagnoses were: Ostium II (87); Ostium I/partial AV canal (10); sinus venosus/abnormal pulmonary venous return (13); ventricular septal defect (15); sub-aortic membrane (6); mitral reconstruction (5); miscellaneous (9). Three patients had a persistent left superior vena cava.

Results: There was no mortality. Morbidity was one reentry for bleeding and one redo (same approach) for residual shunt. Cross clamp time was 10% longer (23 to 57 min). Operating room total time was 15% longer. No additional complication appeared with follow up and the aesthetic result was excellent.

Conclusions: This approach is safe, reproducible and possible from infancy to adult age. A wide variety of simple defects can be successfully treated through a short posterior right thoracotomy, leaving absolutely no scar in the anterior/lateral chest wall. This is an advantage in young girls before breast formation, reducing the esthetic and psychological burden of surgery.

## SCIENTIFIC SESSION C9 AORTIC DISEASE

### C9.1

#### EVOLUTION OF NON-TRAUMATIC TYPE-A AND TYPE-B INTRAMURAL HEMATOMA OF THE AORTA

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**Objective:** Since its first description in the mid-1980s, both clinical interest and pertinent controversies related to the aortic intramural haematoma (IMH) are permanently present. IMH, which is a precursor of dissection, cannot be reliably distinguished from classic dissection on clinical grounds and is considered to represent about 10 to 20% of all cases of acute aortic syndromes. In spite of accumulating reports, many unresolved questions regarding this entity are still pending. Here we present our experiences in management and follow-up.

**Methods:** Retrospective analysis of 208 consecutive patients admitted with acute thoracic aortic syndrome between 1998 and 2004. Diagnosis of IMH was established in 11 (5.3%) patients; 8 (72.7%) female, 3 (27.3%) male; mean age 58.6 years (38-71). Sudden chest pain was present in all patients (100%). Other findings were: hypertension in 9 (81%); syncope in 1 (9%); arm pressure difference in 4 (36.3%) and paraplegia in 1 (9%) patient. Diagnostic algorithm included: TTE in all (100%), TEE in 7 (63.6%), contrast CT scan in 6 (54.5%), MRI in 1 (9%), while aortography was necessary in 6 (54.5%) patients. Type-A IMH was present in 4 (36.3%), of whom 1 had extension to mid-arch, while in remaining 3 entire aorta was involved. Type-B IMH was present in 7 (63.7%) patients; 4 with descending thoracic involvement, while in remaining 3 with thoracic-abdominal involvement.

**Results:** Surgical treatment was necessary in 4 (36.3%) patients with type-A, while all patients with type-B IMH underwent conservative therapy including anti-hypertensive medication. Indications for surgery were: aortic dissection early superimposed on IMH in 2; persistent pain with coronary malperfusion 1 and aneurismal dilatation of ascending aorta in 1 patient. There was no operative mortality in this group. After mean follow-up of 27 months (6-54) all patients are alive. Control CT scan showed regression of IMH in 3 (27.2%) patients. Reduction of aortic diameter was recorded in 6 (54.5%) while in 2 (18.1%) patients it remained the same.

**Conclusions:** On the basis of our experience, early operation is recommended for almost all patients with type-A IMH, and medical therapy for those with descending aortic involvement, unless complications occur.

### C9.2

#### DOES GENDER MATTER FOR THE OUTCOME OF SURGICALLY CORRECTED ACUTE AORTIC DISSECTION?

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**Objective:** To evaluate differences in surgical management and outcome between men and women undergoing operation for acute aortic dissections at a tertiary referral hospital.

**Methods:** Retrospective study of the entire population of patients surgically treated for acute aortic dissection at Onassis Cardiac Surgery Center between 2000 and 2004. Data on demographic and clinical characteristics, surgical management and survival were collected from hospital charts and computer.

**Results:** Of 142 patients enrolled in this study, 26 (18%) were women and 116 (82%) were men. No differences in age (women 60±16, men 57±14 years old) and the ratio of type A vs. type B dissection was found (81% type A dissection in women, 89% in men). There was no difference in the type of operation performed. Despite relatively shorter bypass and aortic cross clamp time in women, they tended to stay longer in ICU. Surgical mortality did not differ between men and women for both type A and type B dissections.

**Conclusions:** Although women were less frequently affected by acute aortic dissection, no gender-related differences were found in this analysis with regard to surgical management and postoperative survival.

### C9.3

#### ANTEGRADE CEREBRAL PERFUSION THROUGH THE RIGHT AXILLARY ARTERY FOR THE SURGICAL MANAGEMENT OF ACUTE AORTIC DISSECTION

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**Objective:** Evaluation and description of antegrade cerebral perfusion through the right axillary artery with hypothermic circulatory arrest for the surgical management of acute aortic dissection.

**Methods:** Between September 2000 and December 2004 in our institution twenty-one consecutive patients underwent right axillary artery cannulation for acute aortic dissection. Nineteen patients had type A aortic dissection and two patients had type B aortic dissection. Direct artery cannulation was performed in the first 2 cases and the last 19 patients were cannulated by interpositioning an 8-mm graft to a longitudinal arteriotomy. All the patients had hypothermic circulatory arrest and antegrade cerebral perfusion.

**Results:** Two patients died, one intraoperatively due to low cardiac output and one postoperatively due to multi-organ failure. Two patients suffered a temporally neurologic dysfunction. One patient suffered a mild right arm paresthesia with complete recovery. Axillary artery cannulation was successful in all patients with sufficient arterial flow and no intraoperative problems with perfusion.

**Conclusions:** Arterial perfusion through the axillary artery is simple and reproducible, provides sufficient antegrade aortic flow, with a low risk of cerebral ischemia, is more likely to perfuse the true lumen in case of dissection and is associated with a low incidence of atheroembolic complications with good neurologic results.

### C9.4

#### ACUTE TRAUMATIC AORTIC RUPTURES: WILL ENDOVASCULAR REPAIR TOLL FOR OPEN SURGERY'S DEATH?

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**Objective:** Appropriate management is essential for recovery from traumatic rupture of the aorta together with length of survival after accident and associated injuries. Because it was initially reserved to victims who could wait for the system delivery, aortic stent-grafting has often been presented as a less invasive technique with a potential for improving early outcome when compared to open surgery. We conducted this study to evaluate actual early results of both methods in a series of 30 acute traumatic ruptures of the aortic isthmus referred, managed and treated during the last decade by two European University Hospitals where vascular and cardiac surgery units work together as a tertiary trauma centre for aortic injuries.

**Methods:** During the study's period and once available in routine, aortic stent-grafting (Medtronic Talent®) was reserved for victims presenting one or more associated injury at risk for a life-threatening bleeding during anticoagulation required by open surgery. Open surgery consisted in direct suture or graft interposition by posterolateral left thoracotomy and was conducted under partial extracorporeal circulation with or without oxygenators. All cases were reviewed for: age, sex, date and mode of accident, associated injuries, injury severity score, date and details of operative procedure. Studied endpoints were: operative success, mortality, complications, and intensive and global length of stay.

**Results:** Two stented patients were operated conventionally during early course and remained in their intention-to-treat group. One patient treated by aortic stent-graft and two others treated by open surgery died post-operatively, injury severity scores were respectively: 57, 50 and 75. Main results, expressed with percentage or mean±SEM, are resumed (ASG: aortic stent-grafting; OS: open surgery; ISS: injury severity score; LOS: length of stay).

**Conclusions:** Comparably, both techniques present early outcomes mainly related to the injury severity score since associated injuries remain one important cause of death independently of the ruptured aorta itself. Not counting for hazardous outcome after aortic stent-grafting requiring close follow-up for eventual redo procedure, stented patients may also die in the early postinterventional course. Both techniques should be considered as complementary for appropriate management of traumatic aortic ruptures.

### C9.5 ENDOVASCULAR TREATMENT FOR DESCENDING THORACIC AORTIC DISEASES. AN INITIAL SINGLE CENTER EXPERIENCE

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**Objective:** The aim of this study is to present the initial experience of a single center on the treatment of descending thoracic aortic diseases with endovascular techniques and to evaluate the efficacy and middle-term results of these methods.

**Methods:** In a two-year period (2003-2004) 11 patients were treated with endovascular stent graft repair (EVAR) for aneurysms (8) false aneurysm (1), acute dissection and rupture 1), and traumatic rupture (1) of the descending thoracic aorta. The preoperative assessment was performed by CT scan and angiography when possible. All patients underwent the deployment of the endograft prosthesis under general anesthesia and with the same perioperative care protocol. The postoperative results, stent-graft related complications and hospital stay for each patient were recorded. After discharge, patients were followed-up with CT scans and clinical examination at 3, 6, 12 and 18 months and after that once per year. The mean follow-up time was 12.8 months (range 3-24 months).

**Results:** Optimal deployment with exclusion of the aneurysm sack, as well as closure of entry tear in dissection and seal of rupture was achieved in all patients. One type I endoleak was immediately and successfully managed with the insertion of an extra graft. No life threatening events or deaths were recorded during the procedures or the in-hospital period. None of the patients developed neurological deficits after the procedure, even though three of them had been treated for abdominal aortic aneurysms as well. The stent-graft related complications in the early postoperative period (30 days) were two type III endoleaks that spontaneously disappeared after two days and one month, respectively. The mean hospital stay after the procedures was 6 days (range 4-10 days). During the follow-up time no deaths were recorded.

**Conclusions:** Endovascular repair of descending thoracic aortic diseases seems to be a valid option with low mortality and complication rates and encouraging middle-term results.

### C9.6 PACEMAKER IMPLANTATION AFTER REPLACEMENT OF THE ASCENDING AORTA AND AORTIC VALVE WITH A COMPOSITE GRAFT USING A STENTLESS BIOPROSTHESIS IN A MODIFIED BENTALL PROCEDURE. A RETROSPECTIVE ANALYSIS

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**Objective:** This study was performed to determine the incidence of the necessity of a permanent pacemaker implantation after a modified Bentall procedure.

**Methods:** Between 1998 and 2004, 114 modified Bentall procedures using a stentless bioprosthesis were performed in our Institution. 37 (32,5%) of the patients were female and 77 (67,5%) were male. 7 (6,1%) patients underwent a previous aortic valve replacement. The aortic pathology was in 39 (34,2%) patients an aortic stenosis, in 23 (20,2%) a combined aortic stenosis with insufficiency and in 43 (37,7%) an isolated aortic insufficiency. 3 (2,6%) patients have had a paravalvular leak after aortic valve replacement and one (0,9%) a prosthetic endocarditis. 3 (2,6%) patients have had an acute aortic dissection and 2 (1,8%) a chronic aortic dissection. None of the patients underwent a preoperative pacemaker implantation.

**Results:** Two (1,75%) patients developed postoperative a second degree and 10 (8,77%) a third degree atrioventricular block. 4 (3,51%) patients have had a Sick-Sinus-Syndrome and 3 (2,63%) developed a persistent bradyarrhythmia absoluta. 19 patients underwent a permanent pacemaker implantation. In 14 (12,3%) patients a dual chamber system (DDD) and in 5 (4,4%) a single chamber system (VVI) were implanted. The pacemaker implantations were performed 39,16±81,02 days after the Bentall procedure (ranging from 5 to 318 days). The median interval between the Bentall procedure and the pacemaker implantation was 12 days.

**Conclusions:** Regarding the early and late incidence of the necessity of a permanent pacemaker implantation after a modified Bentall procedure, we found out that there is a high but acceptable risk.

### C9.7 MID TERM RESULTS OF ENDOVASCULAR REPAIR OF BLUNT TRAUMATIC AORTIC RUPTURES

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**Objective:** Endovascular treatment of traumatic ruptures of the aorta has been proposed as an alternative of classical surgical procedures. Mid- and long-term results after endovascular treatment remain unknown. The aim of this work was to report mid-term results of endovascular treatment of traumatic ruptures of the isthmus aorta.

**Methods:** Between January 1996 and October 2004, endovascular treatment of blunt traumatic aortic ruptures was performed in 40 patients (mean age 40±17 years). Stent-grafts were either Talent Medtronic (n = 32) or Gore Excluder (n = 6) or Boston (n = 1) or Stentor (n = 1). Mean Injury Severity Score of patients with acute or sub-acute ruptures was 41.7±12.1. Patients were treated at an average of 2.3±2.6 months after the injury in the acute and sub-acute group (n = 35) and 25±13.84 years in the chronic group (n = 5). Follow up was 94.7% complete and averaged 28.1 months (range 1 to 75 months).

**Results:** Stent-graft deployment was successful in all cases without need for surgical conversion. No patient died during the procedure. Except one iliac rupture treated during the same procedure, there was no major complication during the procedure. No neurological complication occurred. The aortic lesion was excluded in all. Three patients presented initial endoleak (1 type I, 2 type IV). All of them were successfully treated before discharge. The ostium of the left sub-clavian artery was covered in 6 patients, none of them was symptomatic and we did not perform any revascularisation of the left subclavian artery. No followed patient died during the follow-up. No patient needed any endovascular or surgical re-intervention. The observed complications were an occlusion of the left superior bronchus (treated with a Dumont prosthesis during 3 months), 2 brachial pseudo-aneurysms (which were operated on), an asymptomatic thrombosis of the left brachial artery and a thrombus at the distal part of the stent-graft (treated with anticoagulation).

**Conclusions:** In our series, the short and mid term morbidity rates associated with endovascular treatment of blunt aortic ruptures of the aorta seem to be lower as those reported in the literature after classical surgical procedures.

### C9.8 IS THE TREATMENT OF ACUTE TYPE A AORTIC DISSECTION IN PATIENTS >70 YEARS OF AGE JUSTIFIABLE?

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**Objective:** This study was undertaken to analyze the risk of mortality and neurological complications after treatment of acute type A aortic dissections using hypothermic circulatory arrest (HCA) in patients >70 years of age.

**Methods:** Between 1/1996 and 12/2002 twenty-four patients >70 years at time of surgery were examined. Median age was 75 years (71-82), 15 were male. 22% presented with hemodynamic instability, aortic rupture was found in 7%. 11 had previous neurological events such as strokes or TIAs. Ten patients had HCA alone, 3 a combination with retrograde cerebral perfusion (RCP) and in 11 selective antegrade cerebral perfusion (SACP) was used as an adjunctive. **Results:** The overall survival rate was 71% (17/24). Temporary neurological dysfunction (TND) was found in 3 (12.5%), permanent neurological dysfunction (PND) in 9 (37%), leading to death in 3. Comparison of mortality rates between pts treated with HCA alone and those with HCA+SACP showed a marked tendency towards better outcome in the HCA+SACP group (P = 0.067). TND as well as PND were also markedly reduced in the HCA+SACP group (P<0.05).

**Conclusions:** Surgery for acute type A aortic dissection in the elderly can be performed with an acceptable mortality. On the other hand, this operation is associated with a high rate of neurological complications. Despite the small number of patients in the present study it seems that SACP may reduce the incidence of neurological events.

## SCIENTIFIC SESSION C10 VALVE REPAIR

### C10.1

#### EARLY AND MIDTERM RESULTS OF DIFFERENT TYPES OF SURGICAL VENTRICULAR RESTORATION PROCEDURES (LINEAR CLOSURE, MODIFIED LINEAR CLOSURE AND ENDOVENTRICULAR CIRCULAR PATCH PLASTY) APPLIED IN ISCHAEMIC LV

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**Objective:** The goals of surgical ventricular restoration (SVR) procedures are the excision or exclusion of left ventricular (LV) scar, the modification of the LV shape and volume together with the revascularization of the ischemic remote myocardium. These goals can be achieved by performing the type of SVR procedure that matches to the operating findings (extent of scar in different LV walls). We perform linear closure (LC) in cases without involvement of the septum, endoventricular circular patch plasty (EVCPP) in cases with scar in the majority of the apical walls and modified linear closure (MLC) with septoplasty (patch or plication) in cases of extensive involvement of the septal and anterior walls and normal posterior and lateral walls. We compare the early and midterm results of this strategy in ischemic cardiomyopathy patients.

**Methods:** Between May 2000 and December 2004, 30 patients underwent SVR procedures. 9 pts (30%) were submitted to LC, 4 pts (13.3%) submitted to MLC (two with patch-plasty and two with septal plication) and 17 pts (56.7%) to EVCPP. There were 27 (90%) men and 3 (10%) women, age  $62.9 \pm 10.79$  years. All pts had simultaneous coronary revascularization  $2.3 \pm 0.7$  for the LC group,  $2 \pm 0.8$  for the MLC group and  $2 \pm 0.7$  for the EVCPP group. In 3 pts of EVCPP group mitral valve repair was performed. Mean preoperative LVEF was  $30 \pm 4.33$  for the LC group,  $27.5 \pm 8.66$  for the MLC group and  $28.23 \pm 7.05$  for the EVCPP group. 33% of the pts were in preoperative NYHA class IV. Preoperative examinations consisted of echocardiography, ventriculography, and recently magnetic resonance imaging studies. Mean postoperative follow-up was mean 23.13 months (2 to 59).

**Results:** In hospital mortality was 11%, 0% and 11.76%, for the LC, MLC and EVCPP groups, respectively. Inotropic support, intra-aortic balloon pumping, prolonged ventilation, and hospital stay of the three groups are similar. LVEF in the third post-operative month was significantly improved to  $44.11 \pm 13.40$ ,  $P = 0.006$ ,  $42.5 \pm 11.9$ ,  $P = 0.005$ ,  $43 \pm 10.48$ ,  $P = 0.000$  respectively for the different groups and maintained during the follow-up period. None of the survived patients have postoperative NYHA class IV. (Results are expressed as mean  $\pm$  SD, statistical analysis is prepared by pair *t* test).

**Conclusions:** SVR procedures combined with revascularization achieve similar perioperative morbidity and mortality, and good early and mid results. Adapting the type of restoration procedure to each ischaemic cardiomyopathy patient seems to play an important role.

### C10.2

#### LEFT VENTRICULAR RECONSTRUCTION M. MENICANTI IN ISCHEMIC HEART FAILURE PATIENTS. 1-YEAR FOLLOW UP RESULTS

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**Objective:** In patients with coronary disease and poor LV function, ventricular reconstruction (VR) combined with revascularization is a surgical option. Criteria for patient selection and optimal surgical technique are still debated. This study reports results achieved with VR modo Menicanti (TR3ISVR) in 58 patients who had akinesia or dyskinesia of the anterior wall.

**Methods:** A prospective review of 58 pts (45 male) undergoing TR3ISVR ventriculoplasty from March 2003-December 2004 was performed. Reconstruction from the ECC was accomplished using special devices - mannequin. The mannequin acts as a template for creating an elliptical ventricle with a known volume. Preop 11 patients (19%) were with VT, mean symptom of CHF class were 2,55 and angina was present in 46 patients (79%). Mean Euroscore was 6.6. Operative procedure included CABG in 50 patients (86%), VSD closure in 2 (3.4%) and mitral valve procedure 14 (24%).

**Results:** Hospital mortality was 3 (5,2%). Perioperative support included IABP 16 (27,5%) and inotropes in all. Among survivors, symptom class improved in all but 5 (8,6%), mean improvement  $1.2 \pm 0.6$  functional class per patient. Survival (Kaplan-Meier) at 1 year was 91.4%. Average decrease in EDVI was 32 ml (33,6%), in ESVI was 25 ml (41%). Increase in EF postop was 8,3 (29%). At 1 year following TR3ISVR ventriculoplasty, no patient demonstrated significant redilation of ventricular volume or decrease in left ventricular ejection fraction.

**Conclusions:** LV reconstruction modo Menicanti can be performed with low operative mortality and provides good control of symptoms. This approach should be considered in all patients with coronary disease, poor LV function and akinesia or dyskinesia of the anterior wall. TR3ISVR provides durable improvement in both left ventricular volumes and function.

### C10.3

#### MITRAL VALVE SURGERY AFTER PERCUTANEOUS BALLOON VALVULOTOMY

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**Objective:** Analyze the early results of mitral valve surgery after percutaneous balloon valvulotomy and the types of failure of the procedure.

**Methods:** Between 1985 and 2003, 458 patients underwent percutaneous mitral balloon valvulotomy for a predominant mitral valve stenosis. Seventy-one of them required an open-heart operation due to complications of the procedure. The mean age was  $56.2 \pm 11.6$  years (range: 31-78 years), 56 were women (78.9%) and 15 men (21.1%). The echocardiographic score of the mitral valve was less than 8 in 34 patients (47.9%), between 8 and 12 in 35 patients (49.2%) and over 12 in 2 patients (2.8%). The interval between balloon valvuloplasty and surgery was less than 24 h in 11 patients (15.5%), between 1 and 30 days in 19 patients (27.8%) and over 30 days in 41 patients (57.7%). Indication of the surgical intervention was cardiac tamponade due to cardiac cavities injury in 7 patients (9.9%), unsuccessfully percutaneous mitral dilatation in 23 (32.4%), iatrogenic mitral insufficiency in 20 (28.2%) and progression of the rheumatic mitral valve disease in 21 patients (29.6%). **Results:** The percutaneous mitral valvuloplasty produced injuries in the anterior leaflet of the mitral valve in 5 patients (7.0%), in the posterior in 7 (9.9%), paracommissural tears in 4 (5.6%), commissural tears in 2 (2.8%), ring injuries in 6 (8.4%), chordae tendineae ruptures in 8 (11.3%) and rupture of the auriculoventricular sulcus in 1 (1.4%). The mitral valve operation was a prosthetic valve replacement in 60 patients (84.5%) and a valve repair in 11 (15.5%). Associated surgery was repair of cardiac perforations (atrial or ventricular) in 6 cases (8.5%), closure of iatrogenic atrial septal defect in 8 (11.3%), tricuspid valve annuloplasty in 21 (29.6%), aortic valve replacement in 7 (9.9%) and coronary artery bypass graft in 3 (4.2%). The hospitable mortality was 6 patients (8.5%) and the average postoperative stay was  $13 \pm 10$  days.

**Conclusions:** The unsuccessful percutaneous mitral valvuloplasty is a different nosological entity with some specific features. The surgical treatment has a less satisfactory result with minor possibility of conservative treatment.

### C10.4

#### PORT-ACCESS MITRAL VALVE REPAIR WITH PROSTHETIC RING

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**Objective:** Port-Access mitral valve repair constitutes an alternative to standard sternotomy. Reduced trauma, low morbidity and fast recovery are the goals of this technique. Different plasty techniques can be employed, the use of a prosthetic ring constitutes a common strategy. Flexible mitral rings are available for everyday use, with the promise of more "physiological" behavior of the mitral annulus, after valvuloplasty. We reviewed short and mid-term results after 120 patients, moreover spiral computed-tomography (CT) scan was used to investigate the in-vivo performance of flexible rings after implantation.

**Methods:** From October 1999 to December 2004, a group of 120 patients (mean age: 55.9) underwent Port-Access mitral valve repair. Severe (4+) MR was seen in 86 patients (71.6%). In 52 patients a rigid ring was employed, in 68 flexible ring was used. In 13 patients (10.8%) chronic or persistent AF was treated with cryoablation or microwave. 10 patients (5 before hospital

discharge and 5 different pts at 1 year follow-up), underwent 16-slices spiral CT scan after mitral valvuloplasty with flexible mitral rings.

Results: Hospital mortality observed was 0.8%. Mean cross-clamp time was 64.8±13.6 min. Two patients had intraoperative conversion to sternotomy. Mean hospital stay was 5.4±5.8 days. One patient suffered neurological damage at discharge, two had transient episodes. Follow-up showed trivial or no mitral regurgitation in 107 cases (89.1%), 13 cases (10.8%) of mild to moderate MR were seen. Four patients (3.3%) underwent MV replacement during the follow-up period, two of them for endocarditis. The group of patients who underwent CT scan of the flexible rings showed that the rings flexed at the point corresponding at the commissure between anterior and posterior mitral valve leaflet, but only in the recent operated pts. For the 1 year control, it was not possible to identify any sign of flexibility of the rings.

Conclusions: Port-Access mitral valve repair constitutes an alternative technique to standard sternotomy, with good mid-term results. Early discharge, and reduced trauma, constitute a marked advantage. The flexibility of mitral rings couldn't be shown in long term controls.

#### C10.5

##### MITRAL VALVE REPAIR WITH THE JOSTRA FLEXIBLE AND ADJUSTABLE ANNULOPLASTY RING: SHORT TERM EXPERIENCE

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Objective: The Jostra annuloplasty ring is a new flexible and in diameter adjustable ring, similar to the previous Puig-Masana-Shilley ring. It may be used for complex corrections of mitral valve dysfunctions. The study aim was to evaluate clinical and functional results during the first years in patients receiving this annuloplasty.

Methods: Between November 2000 and December 2004, 72 patients (mean age 59 years; range 32-77 years) underwent mitral valve repair that included implant of the Jostra annuloplasty ring, 38 (52.8%) were women and 34 (47.2%) men. Mitral regurgitation was the predominant lesion, with all patients exhibiting grade of insufficiency III/IV. Valve disease etiology was degenerative in 38 (52.8%), rheumatic in 30 (41.7%), ischemic in 2 (2.8%), endocarditis in one (1.4%) and congenit in one (1.4%). In all patients Jostra annuloplasty was performed and combined with leaflet resection in 36 (50%), leaflet plication in 19 (26.4%), chordae enlargement in 4 (5.6%), artificial chordae in 9 (12.5%) and open commissurotomy in 4 (5.6%).

Results: There was one hospital death (1.4%). One-year actual survival was 98.6%, free from thromboembolism was 70 (98.6%), from endocarditis 100%, and reoperation free was 69 (97.2%). Echocardiographic evaluations performed at 3 months after repair showed MR to be grade I in 92% of patients and grade II in 6%. Mitral valve area was 3.1±1.9 cm<sup>2</sup>, within normal limits, in 95% of patients. Left ventricular end-diastolic diameter decreased post-operatively, from 61±1.3 to 54±1.8 which may reflect successful correction of MR after mitral valve repair.

Conclusions: These early results show that the Jostra annuloplasty system is safe and effective when used with other techniques for repair of MR, and preserves mitral annular flexibility and function at short term follow-up.

#### C10.6

##### NEOCORDA REPLACEMENT IN DEGENERATIVE MITRAL VALVE DISEASE WITHOUT USING PROSTHETIC RING

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Objective: Mitral valve repair techniques are now widely applied in patients with myxomatous mitral valve diseases due to superiority to replacement. However whereas posterior leaflet valvuloplasty techniques are being performed extensively in many centers, reconstructive procedures of anterior mitral valve is still challenging and considered in some centers as an indication of valve replacement. Recently chord replacement with PTFE has been popular and is being performed extensively. Herein we report our early experiences with PTFE chord replacement without using a prosthetic material for annular reinforcement.

Methods: During the last 3 years, 48 patients with myxomatous mitral valve disease were operated in our hospital. In 14 of them mitral repairs were performed with PTFE suture. Posterior annular reinforcement was achieved by multiple sutures with pledges. Mean age of patients was 57±12 years and

6 of them were male. Concomitant operations were coronary revascularization in 2 cases and aortic valve replacement with tricuspid Devega procedure in another patient. Generally one to four PTFE sutures sufficed. Three or 5 pledged sutures with figure of 8 techniques are placed at the posterior annulus and the sutures are tightened without knotting. Two polypropylene sutures are placed appositioning the kissing edges of anterior and posterior leaflets as if Alfieri stitch without knotting. The indwelling line is inserted into the left ventricle across the mitral valve again and saline is injected with a considerable pressure. As the leaflets domed out, each suture has been tied up while appropriate height of leaflet is being estimated. Thereafter posteriorly placed sutures were tied up.

Results: No hospital mortality was present. In one patient who had anterior valve triangular resection, mitral insufficiency occurred in the postoperative period and valve replacement was performed. Control echocardiography displaced none or less than 1 (+) mitral regurgitation in patients.

Conclusions: We believe that neochordae replacement with PTFE is a promising technique for degenerative disease states. Our early result of reconstruction of anterior leaflet prolapses is satisfactory and not troublesome. The technical challenge in achieving correct height can be overcome by appositioning the kissing edges of anterior and posterior leaflets as in the Alfieri method.

#### C10.7

##### MITRAL VALVE REPAIR USING TEFLON FELT STRIP: MIDTERM RESULTS

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Objective: Recently many alternatives for annuloplasty ring were developed and their results are known to be acceptable. This retrospective study was undertaken to assess the efficiency of mitral valve repair (MVR) with posterior annuloplasty performed with Teflon felt strip and to compare the results with commercial rings.

Methods: From January 1996 through December 2002, 35 patients underwent MVR for mitral regurgitation. Eighteen patients (51.4%) underwent an annuloplasty with a prosthetic ring (group 1) and 17 patients with a Teflon felt strip (group 2). Associated congenital heart disease and dilated cardiomyopathy were considered exclusion criteria.

Results: In group 1, nine patients received a Carpentier-Edwards ring and 9 received a Duran ring. In group 2, all patients underwent posterior annuloplasty with Teflon felt strip. Demographic and preoperative echocardiographic data were similar in two groups except left ventricular end systolic dimension (group 1: 46.0, group 2: 38.9 mm;  $P = 0.030$ ). No mortality was recorded. Intraoperative data showed a significant short bypass time ( $P = 0.029$ ) and in follow up echocardiographic data there were no significant findings between both groups. There were nonsignificant recurrence of mitral regurgitation. During follow up period three patients of group 1 were reoperated.

Conclusions: Mitral valve repair with Teflon felt strip annuloplasty has a similar effect to prosthetic ring in reducing mitral regurgitation.

#### C10.8

##### REVERSE LEFT VENTRICULAR REMODELLING AFTER RESTRICTIVE MITRAL ANNULOPLASTY IN PATIENTS WITH ISCHEMIC VALVE REGURGITATION

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Objective: Restrictive mitral annuloplasty has been widely used for repair in ischemic mitral regurgitation (IMR). This study was aimed to explore if such a technique translates in to a significant postoperative left ventricular (LV) remodelling.

Methods: We reviewed 90 patients (mean age 58±10 years, 64.4% male) who survived undersized mitral annuloplasty (UMA) between 2002 and 2004. The entire population had associated coronary graft surgery (mean graft 2.7±0.6, artery graft score 61.50). Associated mitral procedures were: para-commissural "edge-to-edge" ( $n = 13$ ) and secondary cordae resection ( $n = 9$ ). Ventriculoplasty was associated in 7 patients. Mean follow-up was 21±10 months.

Conclusions: Excellent results of combined UMA and coronary artery bypass were obtained. Residual mitral regurgitation was absent/minimal at follow-up, associated with significant LV remodelling.

## C10.9

**RECONSTRUCTION OF MITRAL AND TRICUSPID VALVES IN PATIENTS WITH PRIMARY DILATED CARDIOMYOPATHY**

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**Objective:** Mitral and tricuspid regurgitation are unavoidable complications of the end-stage primary dilated cardiomyopathy (PDCM), significantly contributing to cardiac failure and predicting early lethal outcome.

**Methods:** From July 1991 to December 2004, 149 patients (119 males and 30 females) underwent reductive annuloplasty of double (mitral and tricuspid) orifices (RADO) for end-stage PDCM. The mean ejection fraction was  $25.4 \pm 6.5\%$ . The average time of duration of illness was 24.5 months and the average number of preoperative decompensations was 2.9 (range 1-18) per patient. Thirty-five patients were dependent on inotropic agent stimulation (intravenous administration) at the time of operation. In order to evaluate

the viability of myocytes the perioperative immunohistological analyses were done in 56 pts: apoptosis (Ap), volume density of interstitial tissue (VVi), myofibrillar volume fraction (Mvf), Bcl-2 marker expression (Bcl-2).

**Results:** The immediate postoperative results obtained by the analysis of the hemodynamic and morphological parameters (Swan-Ganz catheter and transesophageal echocardiography) indicated a significant improvement. The postoperative mortality-30 day was 2.7% (4/149). The cumulative survival at 3 years was  $51.4 \pm 4.4\%$  and fell to  $30.6 \pm 4.8\%$  at 7 years. Survival was significantly higher in patient with lower Ap, VVi and higher Mvf and Bcl-2.

**Conclusions:** RADO correct remodeling of the fibrous skeleton of the heart changes the spherical geometry of the left ventricle, improves hemodynamic action of both ventricles and slows down the progression of heart failure. We recommend this procedure as a new surgical alternative or a bridge to heart transplantation in the early stage of PDCM. The preoperative immunohistological analyses might be useful in predicting the prognosis and the optimal surgical treatment.

## SCIENTIFIC SESSION C11 ARRHYTHMIAS

### C11.1

#### TOTALLY ENDOSCOPIC MINIMALLY INVASIVE SURGICAL TREATMENT OF ATRIAL FIBRILLATION

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**Objective:** Surgical treatment of atrial fibrillation (AF) is widely established in association with concomitant valvular or coronary surgery. The introduction of new energy sources, innovative minimally invasive techniques and devices may nowadays expand the surgical treatment to patients with lone AF.

**Methods:** Via bilateral or monolateral thoracoscopic approaches the pericardial cavity was entered and pulmonary veins dissected; a continuous linear epicardial isolation of the pulmonary veins (box lesion) was carried out using a microwave unidirectional endoscopic device. Study population included 13 patients (mean age = 65 years; range: 47-74 years) with lone AF refractory to medical treatment (mean number of pre-operative electric cardioversions x patient = 1.9; range: 0-5). AF was paroxysmal in 76.9% and permanent in 23.1%.

**Results:** Pulmonary veins isolation was successfully performed in 12 pts: in 9 of them the procedure was totally endoscopic while in 3 pts a ministernotomy was necessary to complete the ablation due to the presence of pericardial adhesions. In 1 pt with a previous history of myocardial infarction the procedure was withdrawn since a significant hemodynamic instability with electrocardiographic changes occurred during the initial thoracoscopic manoeuvres. Mean ablation time was 15±2 min, while the overall procedural time was 1.5±0.7 h. All patients receiving ablation were extubated in the OR and were transferred directly to the ward, without any ICU stay. There were no peri/postoperative complications and all patients had a full functional recovery within 24 h. At a mean follow-up of 275 days (range: 15-420) all patients are alive: 9 pts (75%) are in stable sinus rhythm, 2 pts (16.6%) experienced recurrent bouts of atrial fibrillation while an electrical cardioversion is pending for the remaining patient.

**Conclusions:** In conclusion, total endoscopic epicardial pulmonary veins isolation proved to be a feasible and promising technique for the treatment of AF. Endoscopic microwave ablation allowed a prompt patient recovery and was associated with a high rate of success at short-term.

### C11.2

#### THE ACUTE EFFECTS OF RESYNCHRONISATION THERAPY ON MITRAL COAPTATION POINT DISPLACEMENT IN PATIENTS WITH HEART FAILURE

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**Objective:** Cardiac resynchronisation therapy (CRT) is an established treatment in selected patients with heart failure. The displacement of the mitral leaflet coaptation point (CPMA) towards the LV apex correlates with the degree of left ventricular (LV) dysfunction. We evaluated the acute effects of biventricular pacing in the mitral apparatus and LV function in heart failure patients.

**Methods:** We studied 17 pts, 16 men, 1 woman aged 56±25 years in NYHA class III or IV and left ventricular ejection fraction (LVEF) 22±4%. All pts received cardiac resynchronisation therapy. An echocardiogram was performed within 1 week after implantation during biventricular pacing (CRT on) and without pacing (CRT off). The CPMA, i.e., distance between coaptation point of mitral leaflets and mitral annulus, was measured from the apical 4-chamber view in midsystole and was evaluated with CRT on and CRT off. Echocardiographic indices such as LV end diastolic diameter (LVEDD), end systolic diameter (LVESD), ejection fraction (LVEF) and mitral annulus diameter (MAD) were also measured at CRT off and at CRT on. Furthermore the systolic and diastolic velocities at the level of mitral annulus in the anterior (AntSw, AntEa), and lateral (LatSw, LatEa) wall, as measured by tissue Doppler, and the degree of intraventricular desynchronization were also evaluated at CRT off and CRT on.

**Results:** CPMA decreased from 11.3±2 mm at CRT off to 9.1±1.8 after CRT on ( $P<0.001$ ) and MAD decreased from 38.9±3.9 mm at CRT off to 37.5±3.7 mm at CRT on ( $P<0.002$ ). LVEF improved from 24.5±5.7% at CRT off to 29.5±5.1%

at CRT on ( $P<0.001$ ). We also found that the velocities in tissue Doppler at the level of mitral annulus improved, in AntSw ( $P<0.001$ ), in LatSw ( $P<0.001$ ), in AntEa ( $P<0.003$ ) and LatEa ( $P<0.01$ ). Furthermore there was an improvement in LV synchronization from 0.05±0.1 at CRT off to 0.02±0.05 s at CRT on ( $P<0.004$ ). CPMA was related to MAD ( $r = 0.52$   $P<0.05$  and  $r = 0.59$   $P<0.05$  at CRT off and CRT on respectively). Moreover the CPMA improvement was related to the degree of baseline LV dilatation (LVDS  $r = 0.68$ , LVDD  $r = 0.65$ , both  $P<0.05$ ), inversely related to the baseline LVEF ( $r = -0.55$ ,  $P<0.05$ ) and related to the time difference of the basal segments of the anterior and lateral wall at CRT on ( $r = 0.68$ ,  $P<0.01$ ).

**Conclusions:** In patients with severe LV systolic dysfunction and LV dilatation biventricular pacing led to an improvement in CPMA, which was strongly related to the improvement in resynchronisation. This finding underlines the acute effect of resynchronisation therapy in the mitral apparatus in heart failure patients.

### C11.3

#### EARLY RESULTS OF MODIFIED MAZE PROCEDURE FOR TREATMENT OF CHRONIC ATRIAL FIBRILLATION IN PATIENTS UNDERGOING MITRAL VALVE REPAIR OR REPLACEMENT

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**Objective:** Atrial fibrillation in patients with mitral valve disease is associated with functional and prognostic worsening and with an increased risk of thromboembolism. Restoration of sinus rhythm at the time of surgical correction of valve disease may be desirable in particular for patients undergoing valve repair or replacement with biological valve to avoid the risks of anticoagulant treatment. Moreover the recovery of mechanical atrial function may improve functional status. The study was aimed to assess the effectiveness of radiofrequency treatment of atrial fibrillation and to evaluate factors influencing the restoration of sinus rhythm.

**Methods:** In the Division of Cardiac Surgery of Florence from January 1 2002 to December 31 2004, 132 patients (74 females and 58 males, mean age 68 years, average duration of atrial fibrillation 42 months) undergoing mitral valve surgery, 58 mitral valve repair, 74 mitral valve replacement were treated with modified left Maze procedure using a Medtronic Cardioblate instrument. The technique consisted in surgical and radiofrequency encircling of right pulmonary veins, radiofrequency encircling of left pulmonary veins with a linear lesion connecting two groups of pulmonary veins and by a linear lesion connecting left pulmonary veins and mitral annulus, excision of left atrial appendage (LAA) and linear lesion connecting LAA with left pulmonary veins.

**Results:** One patient died in the perioperative period of cerebral haemorrhage, the other 131 were discharged from hospital. At discharge 94 patients were in sinus rhythm while atrial fibrillation persisted in the other 38. Among the 20 clinical and echocardiographic variables tested, only NYHA class and the value of pulmonary artery pressure before intervention were associated with persistence of atrial fibrillation at hospital discharge, while no differences in the two groups were found regarding duration of atrial fibrillation, left or right atrial dimension or LV function, etiology of MV disease or type of intervention performed.

**Conclusions:** Radiofrequency treatment turned out to be effective on restoration of sinus rhythm in cardiac surgery patients. Further larger studies are needed to confirm our findings.

### C11.4

#### TRANSMURALITY OF LESIONS MAY NOT BE ESSENTIAL IN EPICARDIAL PULMONARY VEIN ISOLATION FOR ATRIAL FIBRILLATION

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**Objective:** Surgical pulmonary vein isolation has established itself as an effective treatment modality for patients with concomitant atrial fibrillation (AF). However, several uncertainties persist concerning the appropriate energy source, approach and the need for transmural lesions. In this study, we present an in-depth histological investigation of epicardial ablation lesions in 3 patients.



**Methods:** Within a large clinical series of adjective epicardial beating-heart microwave isolation of the pulmonary veins with intra-operative measurement of electrical block, 3 non-ablation related deaths allowed detailed histological investigation of the lesions. Two out of three patients had been in stable sinus rhythm prior to death, one patient did show several short paroxysms of AF post-operatively. Stained sections from the box lesion encircling the pulmonary veins were microscopically examined for tissue damage, lesion depth, width, transmural, as well as for signs of ongoing repair.

**Results:** Three out of 13 samples showed transmural lesions. In three sections no histological damage was observed and in the remaining samples transmural ranged from 48% to 82% (mean  $64 \pm 13\%$ ). Lesion depths varied between 1.2 and 5.7 mm (mean  $2.6 \pm 1.3$  mm). The lesion depth did not differ significantly between patients and was not related to the thickness of the epicardial or myocardial layers. Interestingly, several sections showed clear necrosis of nerve branches located in the epicardial tissue.

**Conclusions:** Even in this validated approach of epicardial beating heart ablation with satisfactory clinical results, transmural cannot be assumed. This indicates that complete histological isolation of the pulmonary veins may not be necessary for the treatment of AF. The working mechanism of epicardial pulmonary vein isolation may also involve modification of AF substrate, for instance by epicardial nerve denervation.

#### C11.5

##### **SURGICAL TREATMENT OF ATRIAL FIBRILLATION WITH RADIOFREQUENCY USING ENDOCARDIAL OR EPICARDIAL APPROACH: INTERMEDIATE RESULTS AND PREDICTIVE FACTORS OF SUCCESS**

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**Objective:** This prospective study was designed to evaluate the intermediate results of treatment of atrial fibrillation (AF) with radiofrequency using endocardial or epicardial approach during cardiac surgery at Dijon university hospital.

**Methods:** From December 1999 to October 2004, 81 patients (49 M, 32 F; mean age  $71 \pm 8.6$  years) presenting a chronic atrial fibrillation (AF) (3 to 360 months) were treated by radiofrequency (Thermaline, Boston Scientific): endocardial approach during mitral surgery (57%) or epicardial approach (43%) during aortic valve surgery or coronary artery bypass grafting.

**Results:** There was no complication due to this procedure and in-hospital mortality was 5%. Late follow-up showed that 65% of our patients were in sinus rhythm, 71% for endocardial approach and 51% for epicardial approach (mean follow-up 15 months ranged between 3 months and 4 years). Seven cardiac conversion and 5 DDD Pace Maker for atrioventricular bloc were necessary in 12 of our patients. A multivariate statistical study showed 3 predictive independent factors for success: 2 preoperative factors, the left atrial diameter less than 60 mm and the duration of AF less than 12 months, and 1 postoperative factor, the sinus rhythm at discharge from hospital.

**Conclusions:** Surgical treatment of AF by radiofrequency using endocardial or epicardial approach has good midterm results. Two preoperative factors, the left atrial diameter less than 60 mm and the duration of AF less than 12 months, suggest that earlier surgical intervention would further increase efficacy.

#### C11.6

##### **SURGICAL TREATMENT OF PAROXYSMAL ATRIAL FIBRILLATION WITH ENDOCARDIAL AND EPICARDIAL APPROACH—IS THERE DIFFERENT EFFICACY?**

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**Objective:** Left atrial ablation lines differ during the endocardial and epicardial paroxysmal atrial fibrillation (PAF) ablation. Epicardial technique includes pulmonary vein isolation (PVI) and endocardial approach allows additional substrate modification. Regarding etiology of paroxysmal PAF we prospectively collected data to assess if PVI with or without substrate modification gives different short and mid-term results.

**Methods:** Between October 2002 and November 2004, 50 patients (12 males and 30 females) with PAF were submitted to different combination of cardiac surgical procedure and concomitant surgical treatment of PAF with either endocardial radiofrequency ablation or endocardial cryoablation (group I: age  $56.5 \pm 11.1$  years,  $n = 21$ ) or epicardial bipolar radiofrequency ablation or epicardial cryoablation (group II: age  $66.8 \pm 11.6$  years,  $n = 21$ ). Prospective follow-up was collected during hospitalization, 3 and 6 months after discharge including 24-h Holter ECG and echocardiography.

**Results:** Preoperative diameter of left atrium (LA) was  $50.6 (\pm 3)$  and  $40.4 (\pm 4)$  mm in groups I and II, respectively,  $P < 0.05$ . In both groups during hospitalization cardioversion was performed equally in 13 (61,9%) patients ( $P = NS$ ). At 3 month-long follow-up, stable sinus rhythm (SR) was observed in 14 (77,7%) patients in group I and in 13 (76,4%) patients in group II, ( $P = NS$ ). At 6 month-long follow-up, SR was in 15 (88,2%) and 12 (75%) in groups I and II, respectively ( $P = NS$ ).

**Conclusions:** All techniques of surgical treatment of PAF are efficient. There is no significant difference in short and mid-term results between endocardial and epicardial approach, despite different preoperative LA diameters. In accordance with PAF etiology, accessory substrate modification does not influence on ablation efficacy.

#### C11.7

##### **INTRAVENOUS MAGNESIUM FOR PREVENTING POST-CORONARY ARTERY BYPASS GRAFTING ATRIAL FIBRILLATION: A META-ANALYSIS**

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**Objective:** To determine the effectiveness of prophylactic perioperative intravenous magnesium in reducing the incidence of post-CABG AF.

**Methods:** Computer assisted searches of COCHRANE, MEDLINE, EMBASE and HERDIN using the following search words “atrial fibrillation” and “magnesium” and “coronary artery bypass grafting” or “CABG”. All randomized controlled trials with patients for CABG under cardiopulmonary bypass who were given prophylactic perioperative intravenous magnesium vs. placebo were included. Assessment of quality of studies was done. Relative risks and 95% confidence intervals were calculated for each study. Summary measures were obtained using fixed and random effects. Stratified analysis was performed.

**Results:** Twelve trials with 1367 patients were included. The incidence of AF was reduced in the Mg group compared to the control (RR = 0.72 [95% CI: 0.54, 0.96]) However, test for heterogeneity was significant. Incidence of AF was further reduced if Mg was given up to the 4th (RR = 0.21 [95% CI: 0.09, 0.45]) or 5th post-CABG day (RR = 0.26 [95% CI: 0.11, 0.61]). Incidence was also reduced if total Mg given was 9 g (RR = 0.17 [95% CI: 0.08, 0.37]).

**Conclusions:** Prophylactic perioperative intravenous magnesium reduced the incidence of post-CABG AF. The significant heterogeneity was probably due to the dose and duration of Mg administration.

#### C11.8

##### **EVALUATION OF ATRIAL CONTRACTILITY AFTER SURGICAL ATRIAL FIBRILLATION ABLATION**

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**Objective:** Resumption of sinus rhythm (SR) has been the main goal of atrial fibrillation (AF) surgery for many years. Recently the presence of atrial contraction has gained much attention too. In fact it may allow withdrawal of specific anticoagulant therapy and guarantee a higher quality of life. Standard echocardiography does not allow evaluation of the posterior left atrial wall and parameters of atrial contractility used so far are all indirect. Multislice spiral computed tomography (MSCT) with iodinated contrast medium allows direct vision of the atrial chambers either in systole and diastole along the three main axes.

**Methods:** Among a consecutive series of 95 pts operated for AF, with cryoablation of the left atrial endocardial posterior wall, 82% of the 86 surviving pts are in SR at 5 years of follow-up. All SR pts living in Northern Italy were contacted to undergo a MSCT to evaluate the presence and degree of atrial contraction. Among the 21 pts who accepted, 8 and 13 pts were respectively operated with the open or close technique with respect to a completely isolated area between the four pulmonary veins. 13 control pts, either in AF after cryoablation or in SR non-ablated, were evaluated too. Antero-posterior, supero-inferior, latero-medial diameters and left superior-right inferior

pulmonary veins distance and atrial volume were evaluated either in systole and diastole.

Results: The only significant difference between the two surgical techniques adopted concerned the latero-medial diameter, while SR control pts showed relevant better atrial emptying.

Conclusions: MSCT has proved great advantages over echocardiography for atrial contractility evaluation. The left atrial posterior wall doesn't usually participate in the atrial contraction. Closed techniques have shown overall better results.

#### C11.9

##### **BIPOLAR RADIOFREQUENCY ABLATION OF ATRIAL FIBRILLATION WITH MITRAL VALVE SURGERY**

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Objective: Atrial fibrillation affects 30 to 50% of patients undergoing mitral valve surgery. We report our initial clinical experience with bipolar radio-

frequency for intraoperative ablation of atrial fibrillation concomitant with mitral valve surgery.

Methods: From October 2003 to January 2005 a bipolar radiofrequency clamp Atricure was used to facilitate atrial fibrillation ablation in 42 patients. Preoperative atrial fibrillation was paroxysmal in 5% and permanent in 95% patients. All patients underwent bilateral pulmonary vein isolation performed with bipolar radiofrequency clamp and excision or exclusion of the left atrial appendage. All patients had also connecting lesions between the right and left pulmonary veins.

Results: All patients left the operating theatre with sinus rhythm or with ventricular pacing for an underlying nodal rhythm. Perioperative atrial fibrillation was common, affecting 71% of patients. By discharge 61% of patients were in sinus rhythm. By 3 months postoperatively 69% of patients were on sinus rhythm. There were no device-related complications. Mean time required for ablation was 12±5 min (range 7-18 min).

Conclusions: Bipolar radiofrequency ablation of atrial fibrillation in patients undergoing mitral valve surgery is a safe, easy to perform and fast method. Additional experience and close patient follow-up are necessary to determine the late success rate and the optimal lesion pattern.

## SCIENTIFIC SESSION C12 CORONARY

### C12.1

#### DIGITALIZED EVALUATION OF CORONARY BYPASS PATENCY—A NEW TOOL IN CORONARY ARTERY SURGERY

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**Objective:** Coronary angiography still presents the standard for evaluation of graft patency but is related to certain risks. Intraoperative use is limited and application is demanding. We present a convenient, noninvasive, intraoperative direct method based on fluorescence laser angiography (DLA) with further digitalized evaluation of coronary bypass patency.

**Methods:** In 11 patients receiving elective CABG surgery intraoperative DLA was performed for evaluation of graft patency. For digital evaluation and calculation of myocardial perfusion index, special software was used. In three patients an additional postoperative coronary angiography was performed to compare the indocyanine green (ICG) based angiography.

**Results:** Myocardial perfusion index and additional flow-measurement were feasible. 37 anastomoses (g/p 3.4) were performed. Graft patency, run-off were evaluated in 11 arterial and 26 venous grafts with the ICG method. There were no ICG-related or imaging device-related complications.

**Conclusions:** This modified method is convenient, safe, and provides good-quality images of coronary grafts with easy quantification of coronary flow. Further studies are needed to evaluate this new intraoperative graft validation tool for CABG surgery, especially for OPCAB surgery.

### C12.2

#### DEGREE OF OBESITY AND POSTOPERATIVE OUTCOME FOLLOWING ISOLATED CABG

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**Objective:** The number of obese patients undergoing CABG is increasing as results of the worldwide increasing incidence of obesity in the general population. Several studies reported no significant differences in postoperative outcome following CABG in obese patients. Most of these studies, however, were not focused on the degree of obesity but just on the definition of obesity (BMI >30). Objective of this study was to investigate the incidence of obese patients in our region and to evaluate the effects on postoperative outcome according to the degree of obesity.

**Methods:** Data from 3275 patients undergoing isolated CABG over the past 7 years were prospectively collected. According to the value of BMI patients were divided in two groups: obese (BMI >30) and not obese (BMI <30). Among the obese patients four subgroups were created according to the degree of obesity (very mild obesity = BMI from 30 to 31, mild obesity = BMI from 31 to 35; moderate = BMI from 35 to 40; severe = BMI >40). Postoperative outcome in terms of mortality and morbidity were evaluated and compared considering the presence and the degree of obesity.

**Results:** The mean BMI of our total population was 28.4±4.2 with a median of 28 and a maximum value of 52. 937 patients (28.6%) were obese (group O) and 2338 patients (71.4%) were non obese (group NO). According to the above definitions the degree of obesity was: very mild in 252 pts (27%), mild in 622 pts (65%); moderate in 56 pts (5.8%) and severe in 21 pts (2.2%). Statistical analysis did not show any significant differences in terms of postoperative outcome between group O and NO. However, when considering a separate analysis between group NO and the different subgroups of the group O significant differences in terms of prolonged postoperative ventilation time/ICU stay and postoperative infections were found.

**Conclusions:** The effect of obesity in the postoperative outcome following CABG could be underestimated if we just consider the general definition of obesity as BMI >30. Our experience revealed how, in specific regions, the degree of the obesity and not only the incidence of obesity is increased, with important effects on the characteristics of patients undergoing CABG. Although obesity does not increase the risk of mortality, moderate and severe obesity (BMI >35) are significant risk factors for prolonged postoperative ICU stay and postoperative infections requiring prolonged antibiotic treatment.

### C12.3

#### CAROTID ENDARTERECTOMY COMBINED WITH CORONARY BYPASS GRAFTING

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**Objective:** The management of patients with concomitant carotid and coronary artery diseases remains controversial. Proponents of combined carotid endarterectomy and coronary artery bypass grafting procedures (CEA/CABG) cite low stroke (0-5.8%) and mortality rates (0-8.9%). On the other hand, several investigators have reported stroke and mortality rates up to 25% and 13%, respectively, and advocate staged procedures. The purpose of this report was to review the early stroke and mortality rates in our series of CEA/CABG to determine whether these results justify the continuation of our current policy of combining the carotid endarterectomy with coronary bypass grafting.

**Methods:** Retrospective chart review of 166 consecutive CEA/CABG, which were performed in our institution since 1994. There were 145 males, mean age 75 years and 21 females, mean age of 65 years. Carotid indications included 49 (30%) symptomatic pts with recent stroke or transient ischemic attack and 118 (70%) asymptomatic pts. Sixty nine (42%) pts had bilateral stenosis and 15 (8%) pts had contralateral occlusion. Thirty-four (20%) pts had left main disease and 143 (85%) pts had 2-3 vessel disease. Seven (5%) pts underwent redo operations and 4 (2%) pts underwent emergent operations. Sixty-one (36%) pts had significant proximal aortic atherosclerosis. Mean total pump time was 114 min and mean total cross-clamp time was 86 min. Mean number of bypasses was 2,8.

**Results:** There were 3 (1,8%) nonfatal strokes, 1 ipsilateral and 2 contralateral and 5 (3%) deaths. One death was due to irreversible low cardiac output, 2 deaths were secondary to sepsis and 2 deaths were due to multiple organ system failure.

**Conclusions:** These data suggest that CEA/CABG procedures can be performed with low stroke and death rates. Based on these results we will continue our current policy of recommending CEA/CABG to patients with significant concurrent carotid and coronary artery diseases.

### C12.4

#### ANGIOGRAPHIC RESULTS IN MINIMALLY INVASIVE CORONARY ARTERY BYPASS GRAFTING (MIDCAB/EACAB)

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**Objective:** Progress in interventional cardiology creates the need to achieve better operative results with less postoperative trauma. Despite promising results of drug eluting stents, the left internal thoracic artery to LAD grafting still has best late results. Minimally invasive coronary artery grafting enables connection of the specificity of LITA to LAD graft with low operative injury. Particularly videoscopic LITA harvesting involves decrease of operative access and postoperative pain. The aim of the study was to evaluate results in MIDCAB and EACAB operations and early angiographic results in the first consecutive 100 patients in this cohort.

**Methods:** From 1999 to 2004 the MIDCAB/EACAB operations were performed on 113 patients. The MIDCAB technique was used for 42 patients. From 2001 we used only videoscopic LITA harvesting during EACAB procedure (71 patients). A selective coronary angiography of the LITA-LAD bypass was performed during the first postoperative period (0-3 days). All anastomoses were classified as described by FitzGibbon scale.

**Results:** One patient died (0.8%) in hospital. Although there were no perioperative myocardial infarctions related with LITA to LAD grafting, in 3 patients postoperative myocardial ischemia was observed. There were no neurological injury or other serious postoperative complications. Postoperative early coronary angiogram could be obtained in 97/100 patients. The early patency rate was 96.8%. Grade B stenosis was observed in 10 patients. In 3 patients anastomosis was erroneously performed on the diagonal branch. Two patients needed reoperation through sternotomy despite graft occlusion. Although in 7 patients during angiography PCI was performed, only 2 of them presented clinically myocardial ischemia.

**Conclusions:** Minimally invasive coronary artery bypass grafting is a safe method with few complications and a low mortality risk and also the early angiographic patency rate is acceptable.

### C12.5 EFFECTIVENESS OF DRUG-ELUTING STENT IN THE TREATMENT OF PATIENTS WITH PREVIOUS CORONARY ARTERY BYPASS GRAFT SURGERY

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**Objective:** Percutaneous coronary intervention (PCI) in patients (pts) with a history of previous coronary artery bypass grafting (CABG) is associated with an increased rate of subsequent adverse events. Encouraging results with the use of the drug-eluting stent (DES) have been recently presented in pts with coronary artery disease (CAD). In this prospective single center non-randomized study we assess the short- and long-term results of DES in pts with prior history of CABG.

**Methods:** Between December 1st 2002 and November 30th 2004, 29 consecutive pts (male 100%) that had been treated with DES were compared with 37 consecutive pts (male 97%) treated with bare metal stent (BS). The in-hospital results and clinical outcome during follow-up (13.83±6.8 months, range 2-25) were obtained.

**Results:** Compared with BS, pts treated with DES were older (71±9 vs. 65±9 years,  $P = 0.03$ ) and had a higher incidence of diabetes mellitus (55% vs. 27%,  $P = 0.025$ ). Clinical presentation of CAD, risk factor profile, history of myocardial infarction (MI), ejection fraction <40%, and stenosis location and characteristics were not different between DES and BS pts. PCI was performed to dilate 28 saphenous vein grafts (SVG), and 3 arterial conduits using sirolimus (90%) or paclitaxel (10%) DES; in the BS group PCI was performed in 37 SVG and 2 arterial conduits. In addition 9 native vessels were dilated in the DES and 10 in the BS group. The stent length was 19.03±4.3 mm in the DES compared to 16.99±3.0 mm in the BS ( $P = 0.03$ ). There were no differences in the number of SVG treated or number of stents implanted/pt or graft in the two groups. Use of IIb/IIIa inhibitor and distal embolization protection device were 14% and 14% in the DES and 32% and 19% in the BS pts ( $P = ns$ ). The clinical success rate (angiographic success without death, Q-wave MI, emergency CABG) was 97% in the DES and 100% in the BS ( $P = ns$ ). In the BS group there was one (3%) sub-acute thrombosis and 2 (5%) non-Q-wave MIs (defined as increases of CK-MB >3 times normal) and in the DES group one (3%) Q-wave MI (in all cases PCI performed without distal embolization protection devices). Clinical follow-up was obtained in all pts in both groups. There were no differences in death (3% vs. 0%,  $P = ns$ ), MI (3% vs. 5%,  $P = ns$ ) or any revascularization (14% vs. 11%,  $P = ns$ ) in the DES and BS group of pts and the event free survival was 79.3% and 86.49%, respectively ( $P = ns$ ).

**Conclusions:** The implantation of DES in pts with SVG lesions is associated with similar in-hospital and long-term results compared to those treated with BS. Increased utilization of distal embolization protection devices might reduce the peri-procedural rate of MI.

### C12.6 SEQUENTIAL USE OF INTERNAL THORACIC ARTERY IN MYOCARDIAL REVASCULARIZATION: RESULTS OF 1025 PATIENTS

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**Objective:** The aim of this study is give an answer to the following questions.

- Can sequential use of internal thoracic artery (ITA) properly meet nutritional demands of the ischemic myocardium in early postoperative period?
- Does the risk of the operation increase?
- What is the long-term results of the operation?

**Methods:** 1025 patients operated with sequential use of ITA technique between January 1986 - March 2005. 861 (84%) patients were male; 164 (16%) patients were female. Age of patients were between 29 and 81 (mean age: 55.44). Follow-up ranges between 1 and 20 years (mean 52±24). Follow-up completed for 815 patients (79.51%). Coronary angiography was done in 135 patients (13.2%). Mean time for coronary angiography was 59 months. Control exercise tests were done in 450 patients (43.1%).

**Results:** Total 4530 distal anastomoses have been done (mean 4.35), 3010 of which were arterial (mean 2.9), 2495 of which were sequential (mean 2.5). 14 hospital mortalities and 18 perioperative myocardial infarctions were seen. 36 patients died during follow-up (10 cardiac related). Patency of sequential ITA anastomoses: 96.80%. Two patients underwent reoperation (occluded D-LAD anastomoses at postop. 2 years, occluded combined ITA anastomoses at 6th years). 13 patients underwent PTCA. Rate of reinterven-

tion: 1.73%. Other patients with angina were receiving medical therapy at the completion of the study.

**Conclusions:** Sequential use of ITA grafts was not associated with the increased perioperative mortality and morbidity. Reintervention rate has been extremely low in this series (1.73% at the mean 65 months). Mid-and long-term patency rates of sequential ITA anastomoses is excellent and is identical to that of single ITA grafting. Sequential use of ITA has the potential to improve the long-term results of CABG surgery.

### C12.7 EMERGENT CABG IN PATIENTS WITH HIGH-RISK UNSTABLE ANGINA

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**Objective:** Although a higher mortality has been observed in the emergent surgery in acute phase of myocardial infarction, there is not a clear option in patients with high-risk unstable angina. Our objective is to evaluate if emergent CABG is the most recommended option in patients who suffer ongoing ischemia and high-risk unstable angina despite intensive medical therapy.

**Methods:** We analyzed a group of 163 patients who underwent consecutive CABG in our Institution. Thirteen patients (8%) were operated on an emergency basis because of high-risk unstable angina, with 5 cases of post-infarction angina. Preoperative treatment included endovenous nitrates in all patients and intraaortic balloon pump in nine of them. We have analyzed retrospectively observed mortality and risk factors of these patients, with a quality control based in the EuroSCORE.

**Results:** The general operative mortality was 38.5% (5 patients) vs. 2% in the control group ( $P < 0.001$ ) with good calibration ( $P = 0.6$ ) and an excellent ability of discrimination ( $C = 0.86$ ) according to EuroSCORE. The multivariate analysis did not show any independent risk factor.

**Conclusions:** Taking into account the results of this study, we consider that emergent coronary surgery is not a good choice in patients suffering high-risk unstable angina who are under intensive medical therapy. Surgery can be postponed and mortality can be reduced in this kind of patient through haemodynamic stabilization based on pharmacological treatment and intraaortic balloon pump support.

### C12.8 REDO CORONARY ARTERY BYPASS GRAFTING WITH AND WITHOUT CARDIOPULMONARY BYPASS

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**Objective:** Redo coronary artery bypass grafting (CABG) is still associated with increased morbidity and mortality compared to primary operation. Myocardial protection is one of the key issues in redo on pump CABG and is still a matter of debate. Off pump redo CABG seems to be an attractive alternative as morbidity associated with the use of cardiopulmonary bypass (CPB) is avoided. The aim of this retrospective study was to compare the outcome with on pump redo CABG with the off pump approach in redo CABG.

**Methods:** From 01/98-05/2004 redo CABG was performed in 195 patients (pts): 162 male (83.1%) and 33 female (16.9%) pts, age 66±9 years. In 160 pts, CPB with isolated antegrade myocardial protection was used for redo CABG. Two different cardioplegic solutions were applied: Brettschneider solution ( $n = 128$ ; 65.6%) and blood cardioplegic solution ( $n = 32$ ; 16.4%). Off pump redo CABG was performed in 35 pts (30 male (85.7%) and 5 female (14.3%), age 67±8 years). Demographic, pre-, intra- and postoperative data and a follow-up of all pts were recorded.

**Results:** Perioperative overall mortality rate was 3.6% ( $n = 7$ ) and comparable in both groups (on pump 3.8% vs. off pump 2.9%), as well as perioperative myocardial infarction, IABP implantation rate and secondary morbidity. Complete revascularization was possible in 139 pts (71.3%) after on pump CABG and in 17 pts (48.6%) of the off pump group. The average number of grafts was significantly higher in the on pump group (2.4±0.8 vs. 1.4±0.6,  $P < 0.05$ ). Perfusion time was 69±14 min including a cross clamp-time of 38±12 min. No conversion to CPB was necessary in the off pump group. During the complete follow-up further 13 pts (8%) of the on pump group died, with 5 pts (3.1%) dying due to cardiac reasons. In the off pump group 2 pts (5.7%) died in the follow-up, both due to non-cardiac related reasons.

Conclusions: On pump redo CABG and off pump redo CABG can be safely performed with low mortality and morbidity. Off pump redo CABG might be limited due to incomplete revascularization.

#### C12.9

##### SHORT- AND LONG-TERM RESULTS AFTER DRUG-ELUTING STENTING IN DIABETIC PATIENTS

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**Objective:** Encouraging results with the use of drug-eluting stents (DES) have been recently presented in patients (pts) with coronary artery disease (CAD). In this prospective single center registry, we present our experience with the use of DES in everyday clinical practice of interventional cardiology in diabetic (DM) pts undergoing percutaneous coronary intervention (PCI).

**Methods:** Between June 1st 2002 and June 30th 2004, 294 consecutive pts (male 81%, mean age 65±9 years) had been treated with DES. Pts were classified in 3 groups according to DM status: (1) DM treated with diet (112 pts, DMD); (2) DM treated with oral agents (137 pts, DMO); (3) DM treated with insulin (45 pts, DMI). The in-hospital results and clinical outcome during follow-up (11.93±3.6 months, range 5-27) were obtained.

**Results:** Clinical presentation of CAD was stable angina in 36%, unstable angina in 35%, silent ischemia in 27%, and acute myocardial infarction in 3%

of pts. Ejection fraction <40% was present in 12%, total occlusion in 12%, and 70% had multi-vessel disease. The reference vessel size was 2.90±0.24 mm, the minimal lumen diameter 0.35±0.24 mm and the lesion length 17.25±6.7 mm. PCI was performed to dilate 341 vessels with 423 lesions using sirolimus (88%), paclitaxel (9%) or both types (3%) of DES. A single stent was implanted in 63% of pts and the stent length was 19.15±6.7 mm. The clinical success rate [angiographic success without death, Q-wave myocardial infarction (MI), emergency bypass surgery (CABG)] was 99.7%. Non-Q-wave MI (defined as increases of CK-MB >3 times normal) was higher in DMI pts compared with the other two groups (13.3% vs. 4.5% vs. 5.8%,  $P = ns$ ). There was no death, acute or sub-acute thrombosis, or CABG before hospital discharge. Clinical follow-up has been completed in 290/294 (99%) pts; death occurred in 2.4%, CABG in 0.7%, target lesion revascularization (TLR) in 3.4%, any revascularization in 7.8% and any event in 11.9%. There were no differences in the incidence of death, MI and non-TLR between the three groups; DMI pts had higher rate of CABG (4.7% vs. 0%, vs. 0%,  $P = 0.003$ ) and TLR (9.3% vs. 3.6%, vs. 1.5%,  $P = 0.045$ ) compared with the other two groups. When these DM pts were compared with 360 consecutive non-DM pts treated with DES with a follow-up period of 11.43±3.5 months there were no differences in the incidence of death (2.4% vs. 1.4%), MI (0% vs. 0.6%), CABG (0.7% vs. 0.3%), TLR (3.4% vs. 2.2%) and non-TLR PCI (4.8% vs. 4.7%).

**Conclusions:** The implantation of DES in pts with DM is associated with excellent in-hospital and long-term results comparable to those in non-DM pts. However in pts treated with insulin there is an increased risk for new revascularization at long-term follow-up.

## SCIENTIFIC SESSION C13 EXPERIMENTAL

### C13.1

#### PRESERVED ENDOTHELIAL CELL INTEGRITY AND NITRIC OXIDE SYNTHESIS FOLLOWING ENDOSCOPIC HARVESTING TECHNIQUE OF SAPHENOUS VEIN GRAFTS

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**Objective:** Endoscopic harvesting of the saphenous vein is increasingly used during cardiac surgery to improve patient comfort and reduce wound complications associated with traditional open techniques. Preservation of endothelial integrity and endothelial NO synthesis in harvested saphenous vein grafts is important in improving early and long term graft patency rate after implantation. We sought to investigate whether the harvesting technique (either conventional or endoscopic) may affect endothelial integrity and nitric oxide syntheses in saphenous veins grafts (SVGs).

**Methods:** Segments of 10 saphenous veins were harvested from 10 different patients undergoing CABG surgery with the endoscopic (Gorup A) or conventional (group B) techniques. Human saphenous vein specimens were stored in heparinized blood for 1 h at room temperature. Saphenous vein specimens were analyzed by Greiss method and nitric oxide formation (nitrate-NO<sub>3</sub>- and nitrite-NO<sub>2</sub>-) in vein grafts harvested by endoscopic and conventional techniques. To determine the degree of neutrophil induced saphenous vein endothelial injury, myeloperoxidase (MPO) activity, a marker of neutrophil infiltration into the saphenous vein graft endothelium, was also measured in each group.

**Results:** Nitric oxide formation, nitrate plus nitrite, (group A = 36.77±4.72 µM vs. group B = 21.49±1.95 µM, *P*<0.001) was higher in endoscopically harvested SVGs as compared with conventionally harvested SVGs. In contrast, saphenous tissutal MPO activity (group A = 6.63±0.92 nm/min vs. group B = 9.89±1.09 nm/min, *P*<0.001) was significantly lower in endoscopically harvested saphenous vein grafts as compared with conventionally harvested grafts.

**Conclusions:** These results demonstrate that neutrophil infiltration into the vascular endothelium and neutrophil induced endothelial injury is reduced in the endoscopically harvested saphenous grafts. Furthermore, these results demonstrate that endothelial nitric oxide formation, which plays a significant role in leukocyte-endothelial cell interaction, vascular hemostasis and consequently also in the progression of atherosclerosis, is better preserved with the endoscopic harvesting technique. These findings also suggest that minimally invasive harvesting techniques can be used without major detrimental effects on vascular endothelial function and integrity in human saphenous vein grafts.

### C13.2

#### FLOW-DEPENDENT SAFETY AND ADEQUACY OF ANTEGRADE SELECTIVE CEREBRAL PERFUSION DURING DEEP HYPOTHERMIC CIRCULATORY ARREST: AN INTRAVITAL FLUORESCENCE MICROSCOPY STUDY IN PIGS

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**Objective:** The principal disadvantage of antegrade selective cerebral perfusion (ASCP) is that the safe and adequate flow to achieve optimal cerebral capillary blood flow (CCBF) remains poorly defined. We aimed to define the margin of safety and efficacy achieved with various perfusion conditions.

**Methods:** Ten pigs were exposed to 40 min cooling on cardiopulmonary bypass (CPB), 60 min of ASCP during deep hypothermic circulatory arrest (DHCA) at 18°C at ASCP flow rate of 10 ml/kg/min (group 1, *n* = 5) or 30 ml/kg/min (group 2, *n* = 5) and 40 min rewarming followed by 30 min normothermic bypass. ASCP perfusion pressures of 50-60 mmHg were employed. Intravital microscopy of the pial vessels was assessed every 10 min. Histopathology was obtained at the completion of each experiment.

**Results:** In group 1 there was minimal flow at arteriolar level which did not reach the capillary level. Thus, the functional capillary density (FCD) in group 1 was significantly reduced compared to group 2 (*P*<0.01). group 2 showed adequate flow at capillary level. Both groups showed a time-dependent capillary leakage increase during rewarming. The higher NADH accumulation in group 1 during ASCP reflected the significantly better tissue oxygenation in group 2 during ASCP (*P*<0.05). Histopathological analysis of hippocampal vessels showed matched response with intravital microscopic analysis of superficial cerebrocortical vessels.

**Conclusions:** Adequate ASCP flow to achieve good CCBF and tissue oxygenation ranges between 25 and 30 ml/kg/min. Nevertheless, prolonged bypass induces flow-dependent perivascular edema formation.

### C13.3

#### IN VITRO TOXICITY TESTING OF ETHYL 2-CYANOACRYLATE, A TISSUE ADHESIVE USED IN CARDIOVASCULAR SURGERY, USING L929 CELLS

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**Objective:** The aim of this study was to evaluate the cytotoxicity of cyanoacrylate polymers (ethyl 2-cyanoacrylate) by an elution test system. In such systems, the material is extracted with a cell culture medium, which is subsequently added onto cultured cells.

**Methods:** L929 mouse fibroblast cell line was used in this study. The effects of extract dilutions on cellular functions were evaluated by two experiments: a) for attachment, the cells were suspended and seeded in medium containing extract, following a short incubation, number of attached cells were quantified. b) For proliferation, cells were seeded and allowed to attach in normal medium. Subsequently, medium containing extract was added and long-term effects on cell proliferation were measured. In both experiments, the cytotoxicity was quantified using neutral red uptake assay, a method well established for use in the evaluation of cell-biomaterial interactions.

**Results:** These results indicate that, in the test system utilized, a tenfold dilution of the extract results in a 10% decrease in cell attachment and 18% decrease in proliferation, whereas the constitution of equal and greater than 50% of the added volume by the extract resulted in inhibition of cell attachment or cell growth.

**Conclusions:** In this study, the observed effects of extracts follow a similar trend on cell attachment and proliferation, with adverse effects becoming significant at equal and greater than 50% extract concentrations. Our findings regarding the in vitro cytotoxicity of ethyl 2-cyanoacrylate are in parallel with the published reports.

### C13.4

#### DELAYED RECOVERY OF REGIONAL MYOCARDIAL PERFUSION AND FUNCTION AFTER SUCCESSFUL REVASCULARIZATION BY CABG TO TOTALLY CHRONIC OCCLUDED CANINE MYOCARDIUM

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**Objective:** This study was designed to evaluate the correlation and time discrepancy between restoration of epicardial coronary blood flow and improvements of regional myocardial perfusion and function to chronically ischemic myocardium after coronary artery bypass grafting surgery (CABG). **Methods:** Ameroid occluders were implanted on the proximal left anterior descending coronary artery (LAD) for 4 weeks to create myocardial ischemia in five dogs. Direct revascularization (CABG) was performed during second re-open chest surgeries and animals with survival for additional three weeks. Left ventricle (LV) pressure, mean LAD flow distal to the CABG, regional myocardial perfusion (RMP) and regional myocardial function were monitored under anesthesia with chest open in three conditions: 4 weeks after Ameroid occluder, 30 min and 3 weeks after CABG. RMP was measured with color microspheres under adenosine vasodilatory stress and expressed as percent of normal. The regional LV systolic function was assessed by regional stroke work divided by end-diastolic segment length (pressure-segment length area/end-diastolic segment length, PSLA/EDSL).

**Results:** Although CABG applied to the chronically ischemic canine myocardium normalizes epicardial coronary blood flow instantly, it does not acutely

restore regional myocardial perfusion and function; however, after 3 weeks they were all recovered chronically.

**Conclusions:** This suggests that long-term effects of vascular under-perfusion may have led to a regression of the normal vascular connections between the conduit vessels and the microvasculature which limits its ability to normally distribute flow when epicardial flow is abruptly restored. However, revascularization of the chronically ischemic vascular bed by CABG eventually reestablishes microvascular connections and restores cardiac performance.

### C13.5

#### EARLY INFRARENAL ISCHEMIC PRECONDITIONING PREVENTS SPINAL CORD INJURY DUE TO DESCENDING THORACIC AORTIC OCCLUSION

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**Objective:** It has been shown that ischemic preconditioning (IPC) reduces spinal cord injury caused by descending thoracic aortic occlusion (DTAO) in pigs. In this study we investigated whether early infrarenal ischemic preconditioning (eIR-IPC) can also reduce spinal cord injury due to DTAO.

**Methods:** Thirty pigs (30-35 kg) were used and were randomly divided into five groups according to the performed procedure. group 1 ( $n = 6$ ) underwent sham operation, group 2 ( $n = 6$ ) underwent infrarenal aortic occlusion for 35 min, group 3 ( $n = 6$ ) underwent 35 min DTAO, group 4 ( $n = 6$ ) underwent 35 min eIR-IPC and 80 min later DTAO for 35 min and group 5 ( $n = 6$ ) underwent 20 min eIR-IPC and 80 min later DTAO for 35 min. The lower thoracic and lumbar spinal cord sections were harvested at the seventh day of reperfusion for histological study with hematoxylin and eosin stain. Neurologic evaluation was performed by an independent observer according to the Tarlov's scale every 24 h until the sacrifice time. The neurologic outcomes and histological results were analyzed.

**Results:** All animals in group 3 developed neurological deficits and none was able to stand and walk normally during the 7 days reperfusion period (Tarlov score <3,  $P = 0.001$ ). Animals in eIR-IPC groups (group 4 and 5) had complete neurologic recovery during reperfusion period (Tarlov score 4 and 3.83,  $P = 0.001$  and 0.002, respectively) and better histological scores.

**Conclusions:** eIR-IPC seems to be a highly protective method against spinal cord injury caused by DTAO, as confirmed by Tarlov scores and histopathology in this experimental porcine model.

### C13.6

#### MAGNESIUM SULFATE REDUCES ISCHEMIA REPERFUSION INDUCED SPINAL CORD INJURY BY MODULATING LEUKOCYTE-ENDOTHELIAL CELL ADHESION MOLECULE EXPRESSION AND NITRIC OXIDE SYNTHESIS: AN EXPERIMENTAL STUDY IN RABBITS

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**Objective:** Spinal cord (SC) injury still represents a major complication associated with the surgical treatment of the thoraco-abdominal aortic disease. We investigated the potential benefits of systemic infusion of magnesium sulfate ( $Mg_2SO_4$ ) administration on SC injury by measuring the leukocyte-endothelial adhesion molecules (LECAM), inducible nitric oxide synthase (iNOS-2) and cyclic guanylate monophosphate (cGMP) levels in a rabbit model of SC ischemia/reperfusion injury.

**Methods:** Sixteen New Zealand white rabbits were divided into 2 groups, 8 animals each. Fifteen min before inducing SC ischemia, the animals in group A (study group) were given 50 mg/kg of intravenous  $Mg_2SO_4$ , while the animals in group B (control group) received the intravenous saline alone. A 30 min period of SC ischemia was obtained by clamping the abdominal aorta just below the left renal artery and above the aortic bifurcation. Hemodynamics were continuously monitored and recorded. Neurological functions were graded according to the Tarlov's score (TS) at 8, 16 and 24 h after surgery. Animals were killed one day post-operatively and SC specimens were obtained for analysis. Histopathological changes were

evaluated. Intercellular adhesion molecule-1 (ICAM-1), vascular cell adhesion molecule-1 (VCAM-1) and iNOS-2 expression were measured by means of Western blotting and cGMP levels were measured by ELISA from the SC specimens.

**Results:** Hemodynamics was similar between the groups. Neurological impairment was significantly lower in the group A (TS at 24-h was  $4.37 \pm 1.18$  in group A and  $0.50 \pm 0.92$  in group B,  $P < 0.001$ ). ICAM-1 ( $1464 \pm 627$  vs.  $2521 \pm 655$ ,  $P = 0.003$ ) and VCAM-1 ( $694 \pm 178$  vs.  $1574 \pm 289$ ,  $P < 0.001$ ) expression were significantly lower in group A. In contrast, iNOS-2 expression ( $2208 \pm 676$  vs.  $899 \pm 216$ ,  $P < 0.001$ ) and cGMP levels ( $4.14 \pm 1.03$  pmol/ml vs.  $2.08 \pm 0.53$  pmol/ml,  $P = 0.002$ ) were increased in group A. Histological examination of SCs from group A animals revealed that the integrity of the SC was relatively preserved, whereas SCs from group B had evidence of acute severe neuronal injury.

**Conclusions:** These data establish that  $Mg_2SO_4$  reduces upregulation of LECAM and increases iNOS-2 expression and cGMP level in the ischemic SC tissue, thus offering a protective effect. This is confirmed with the clinical improvement provided in the animals, in an ischemia/reperfusion SC injury model. This experimental report evidences the potential protective effects of  $Mg_2SO_4$  on the ischemic SC of the rabbit through an attenuation of the inflammatory milieu. Although further studies are required for its validation, the use of  $Mg_2SO_4$  may provide a new therapeutic option to improve organ function in the setting of an SC.

### C13.7

#### ASSESSMENT OF CARDIAC FUNCTION AND CELL TRACKING AFTER BONE MARROW CELL TRANSPLANTATION IN PIGS WITH MYOCARDIAL INFARCTION

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**Objective:** Bone marrow derived cells may support cardiac regeneration as putative therapy for myocardial infarction (MI). In most clinical studies simultaneous revascularization is performed, hampering conclusions on the specific effect of cell therapy. Therefore, we investigated the impact of mononuclear bone marrow cell (MNC) injection on cardiac function in pigs with MI but no revascularization.

**Methods:** MI was induced in 16 male domestic pigs (2 months, 28-32 kg) by catheter guided coil occlusion of the LAD. 2 weeks later, MNC (ficoll gradient) were injected into the infarcted area (border zone, 6 animals, 12 injections, 200  $\mu$ l each,  $4 \times 10^7$  MNC). 4 animals were medium injected for control. Laevocardiography was performed before MI, 2 weeks after MI (before cell injection), and 2 weeks after cell injection. In 2 animals cells were labeled with In-111, and cells were tracked scintigraphically at 0, 0.5 2 and 24 h after injection. 4 animals were used for histological analysis (2, 4 and 8 weeks after cell injection, cells labeled with Hoechst dye and colloidal gold).

**Results:** As expected, LVEF was decreased 2 weeks after MI vs. baseline in both groups (cell therapy: RAO  $56.4 \pm 5.2$  vs.  $64.0 \pm 2.1\%$ ,  $P = 0.18$ ; LAO  $46.4 \pm 3.8$  vs.  $57.0 \pm 3.0\%$ ,  $P = 0.04$ ; medium injection: RAO  $57.0 \pm 5.4$  vs.  $74.2 \pm 3.4\%$ ,  $P = 0.11$ ; LAO  $56.5 \pm 2.1\%$  vs.  $69.0 \pm 3.7\%$ ,  $P = 0.07$ ). After cell therapy, there was a trend towards increased LVEF (RAO  $61.2 \pm 5.5\%$ ,  $P = 0.34$ ; LAO  $55.8 \pm 2.7\%$ ,  $P = 0.08$ ), which was not observed in medium injected animals (RAO  $56.7 \pm 7.2$ ,  $P = 1.0$ ; LAO  $49.8 \pm 4.7\%$ ,  $P = 0.14$ ). Regional LV function as assessed by gravity wall motion analysis remained unaffected by cell therapy. In scintigraphy, at 0.5 h after injection 84-87% of the cells were detected in the heart, 4-6% in the lungs and 3-5% in the liver. At 2 h the numbers were 85%, 4% and 6%, at 24 h they were 76-77%, 5-6% and 11-14%, and at 48 h 77%, 7% and 11%. In histology, grafted cells were readily identified, some were longitudinal in shape and adjacent to cardiomyocytes. However, most cells were monocyte- or macrophage-like in morphology. They stained positive for p-connexin and CD45, but not for alpha-actinin.

**Conclusions:** In conclusion, there is evidence for high grafting efficacy and persistence of MNC after needle injection into myocardial infarction. Global LV function shows a trend for improvement by cell therapy, but no effect on regional wall motion was seen. In histology, the labeled cells were readily

identified for up to 8 weeks. However, no evidence for myocardial differentiation was found.

#### C13.8

##### NOVEL, INJECTABLE BIOARTIFICIAL TISSUE FACILITATES TARGETED, LESS INVASIVE, LARGE-SCALE TISSUE RESTORATION ON THE BEATING HEART FOLLOWING MYOCARDIAL INJURY

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**Objective:** Implantation of bioartificial patches distorts myocardial geometry, and functional improvement of the recipient heart is usually attributed to reactive angiogenesis around the graft. With the here presented liquid bioartificial tissue compound we achieve targeted large-scale support of the infarcted left ventricular wall and improve heart function.

**Methods:** A liquid compound consisting of growth factor-free Matrigel and 106 GFP+ (green fluorescent protein) mouse (129sv) embryonic stem cells (ESC) was generated and injected into the area of ischemia following ligation of the left anterior descending artery (LAD) in BALB/c mice (group I). LAD-ligated mice (Group II) and mice with Matrigel (Group III) or ESC treatment alone (Group IV) formed the control Groups ( $n = 5$  in all groups). The hearts were harvested for histology 2 weeks later following echocardiographical assessment with a 15 MHz probe.

**Results:** The liquid, injectable tissue solidified at body temperature, and retained geometry of the infarcted lateral wall. Immunofluorescence stains revealed voluminous GFP grafts. The quality of restoration (Graft/Infarct area ratio) was  $45.5 \pm 10.8\%$  in group I and  $29.1 \pm 6.7\%$  in group IV ( $P = 0.034$ ). ESC expressed connexin 43 at intercellular contact sites. The mice treated with the compound had a superior heart function compared to the controls ( $P < 0.0001$ , ANOVA/Bonferroni, group I:  $27.1 \pm 5.4$ , group II:  $11.9 \pm 2.4$ , group III:  $16.2 \pm 2.8$ , group IV:  $19.1 \pm 2.7$ ).

**Conclusions:** Injectable bioartificial tissue restores the hearts' geometry and function in a targeted and non-distorting fashion. This new method paves the way for novel, interventional approaches to myocardial repair, using both stem cells and matrices.

#### C13.9

##### HEART VALVE TISSUE ENGINEERING: ASSESSMENT OF DETERGENT ELIMINATION AND SUSCEPTIBILITY OF RESULTING MATRIX TO RESEEDING WITH HUMAN ENDOTHELIAL CELLS

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**Objective:** Several detergents were proposed cardiac valve decellularization in tissue engineering. The resulting scaffolds are thought to be toxic for ulterior cell seeding. We evaluated efficacy of detergent elimination and susceptibility of obtained matrix to recellularization with human endothelial cells.

**Methods:** Porcine pulmonary valve conduits were decellularized 24 h using 1% Na-deoxycholate (ND)—group A ( $n = 5$ ) and 1% sodium-dodecyl-sulphate (SDS)—group B ( $n = 5$ ). Ten washing cycles (WC) in phosphate-buffered solutions during 5 days were used to remove cellular and detergent remnants. Afterwards, scaffolds were reseeded with HEC. Treated conduits were investigated (HE-; DAPI-; Pentachrom-stainings, EM and DNA-Assay) to prove decellularization and reseeding quality. Washing solution (WS) samples after each WC were collected to investigate their influence on human endothelial cells (HEC) culture (cytotoxicity and metabolic activity assays). Detergent concentration in WS was determined using solid phase extraction and high performance liquid chromatography (HPLC).

**Results:** Both methods showed efficient cusp, wall and myocardial cuff decellularization with satisfactory maintenance of extracellular matrix architectonic. After 8 WC, detergents were not detected in WS in both groups. WS after 4 (group A) and 6 (group B) WC did not influence the metabolic activity and growth of HEC culture. In both groups, the absence of matrix toxicity after 8 WC was demonstrated by efficient adhesion and growing capacity of HEC after reseeding on decellularized scaffolds.

**Conclusions:** Detergent decellularization results in non-toxic scaffolds. Concentration of detergent in WS directly correlates with scaffold toxicity and can be efficiently assessed for each detergent using solid phase extraction and HPLC.



## SCIENTIFIC SESSION C14 HEART FAILURE

### C14.1

#### CARDIOMYOCYTE-ENRICHED HUMAN EMBRYONIC STEM CELLS ENGRAFT IN ISCHEMIC MYOCARDIUM AND SUPPORT MYOCARDIAL RESTORATION

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**Objective:** The potential of human embryonic stem cells (hESC) to survive in vivo and improve cardiac function is not known. In this study we tested the potential of a cardiomyocyte-enriched population of hESCs to restore ischemic myocardium in mice.

**Methods:** Green fluorescent protein (GFP) -labeled cardiomyocyte-enriched hESC (250,000) were injected into the area of injury following ligation of the left anterior descending artery (LAD) of group I: BALB/c, group II: immunosuppressed BALB/c (cyclosporin), group III: SCID-beige mice, and group IV: mice with LAD-ligation only (BALB/c). Engrafted cells were identified by GFP stain and staining for a-sarcomeric actin, connexin 43 using confocal microscopy. Their origin was confirmed by human antinuclear antigen staining. The in vivo persistence of hESC was assessed by bioluminescence imaging. Heart function was evaluated by echocardiography (15 MHz), 4 weeks postoperatively.

**Results:** Bioluminescence revealed viable intramyocardial donor grafts. Confocal microscopy showed myotubular formations and expression of connexin 43 in the GFP+ grafts. Morphometric analysis of the GFP stains showed only a small surviving portion of the cells by 4 weeks (<10%). Cardiac function as shown by fractional shortening was significantly higher in the hESC-treated groups at 4 weeks post cell transfer (group I: 23.3±2.2, group II: 29.6±3.7%, group III: 29.2±3.6%, group IV: 16.4±2.6%). There was no tumor formation 4 weeks post cell transfer.

**Conclusions:** Enriched populations of human embryonic stem cells have the potential to survive within injured myocardium of mice without causing tumors and improve cardiac function.

### C14.2

#### IDENTIFICATION OF A NOVEL SUBPOPULATION OF ADULT BONE-MARROW DERIVED STEM CELLS FOR MYOCARDIAL REGENERATION

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**Objective:** Severe limitations exist in the treatment of post-infarction congestive heart failure. Autologous bone-marrow derived stem cells have the potential to regenerate tissues damaged by ischaemia, including heart and connective tissues. Thus cellular transplantation is currently being investigated. In the majority of conducted preclinical and clinical studies crude cell populations are being used. Little is known about the molecular identity of these cells and minimal information is available in regards of potent subpopulations expressing cardiac, endothelial or smooth muscle cell genes.

**Methods:** Extensive laboratory work has led to the identification of a multipotent subpopulation of adult bone-marrow derived stem cells. This is extracted from the CD34+ fraction of bone marrow aspirate or peripheral mobilised blood. We have carried out gene profiling of these cells with the use of nested RT-PCR. Molecular markers for cardiomyocyte and endothelial cell potential have been looked for. In addition we have searched for primitive stem cell gene markers.

**Results:** With the use of nested RT-PCR we have been able to identify at different time points the expression of cardiac transcription factors GATA-4 and Nkx2.5 as well as cardiac troponin I. Multiple endothelial markers have also been found including von Willebrand factor, VE-cadherin and intracellular adhesion molecule-2. More interestingly expression of CXCR4 (receptor of SDF-1) implicated in the homing to injured myocardium was seen. Molecular expression of connexin 43 was also documented. Finally primitive stem cell markers such as oct4, rex1 and nanog were expressed.

**Conclusions:** Co expression of cardiomyocyte and endothelial differentiation markers along with markers of stem cell plasticity is at least promising. The potential for homing to injured areas as well as forming intercalated discs makes these cells even more favourable. Further research to identify the particular culture conditions that may influence the localisation and differentiation of these cells once introduced in areas of myocardial injury is being

carried out. Factors being examined include time in culture, medium composition and exposure to various peptide growth factors. We are also investigating possible ways to expand cells without altering their molecular profile. This will allow for acquisition of the cell numbers required for clinical use.

### C14.3

#### SOLE THERAPY WITH CD 133+ STEM CELLS FOR ISCHEMIC HEART DISEASE

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**Objective:** To restore tissue viability in ischemic myocardium not amenable to coronary bypass grafting, transplantation of bone marrow derived stem cell (BMC) has been used in combination with conventional revascularisation in clinical setting. Here, we report on application of AC 133+ stem cells as sole therapy in 5 patients.

**Methods:** A new method for intraoperative isolation of AC 133+ stem cells during a limited period of time was developed. Autologous AC 133+ (7-10 x 10<sup>6</sup> cells; purity 90-99%) stem cells were injected in predefined region within hibernating myocardium, which was not amenable to CABG in all patients. Up to 300 ml bone marrow was harvested from the iliac crest and processed.

**Results:** Improvement of cardiac function, as assessed by cardiac MRI, could be documented 3 months postoperatively (mean pre- and postoperative LVEF 18,3% and 29%). A dose-dependent improvement of the ejection fraction could be demonstrated.

**Conclusions:** This technique can be an alternative to medical management in patients with end stage coronary heart disease, who are ineligible for conventional revascularization.

### C14.4

#### SURGICAL TREATMENT OF ISCHEMIC MITRAL VALVE INSUFFICIENCY

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**Objective:** Midterm clinical and echocardiographic results after mitral valve (MV) surgery for chronic ischemic mitral regurgitation (MR) were investigated to evaluate validity of criteria for surgical treatment and applying of our newly created suture annuloplasty.

**Methods:** From 2000-2005, 192 pts with ischemic MR underwent MV surgery (190 repairs and 2 replacements). Mitral ring (>3,5 cm,) and regurgitate jet (>2) were key factors that allowed surgical treatment. 87 pts underwent combined surgery: CABG, LV aneurysmectomy and MV surgery. Newly created suture annuloplasty reconstructed the posterior part of mitral annuli using double continuous suture, with knotting after every parallel bite. Pts had been controlled by transthoracic and transoesophageal echo pre/postoperatively.

**Results:** 51 pts (26.5%) had transventricular mitral valve annuloplasty combined with CABG and LV aneurysmectomy; 33 (17.1%) had transatrial mitral annuloplasty. 34 (17.7%) combined with tricuspid annuloplasty. 60 (30.2%) had transatrial mitral valve annuloplasty (24 pts DeVega annuloplasty, 4 complex reconstruction and 32 pts new kind of suture annuloplasty). 6 pts got flexible ring, 2 had been re-operated (ring dehiscence). 2 pts got mitral valve replacement. Intraoperative TEE showed decreasing of average valve systolic gradient 25±5.7 mmHg/7±0.9 mmHg, with decreasing of EDV volume for additional 40 ccm (reducing of subvalvular space), with increasing of EF: 20±5.2%/35±4.3%. Follow-up results showed that: NYHA class at 6 weeks was improved (mean: 2.4±0.5) in pts with the new kind of suture annuloplasty and transventricular mitral valve annuloplasty, without development of significant MR. 5 pts with DeVega annuloplasty developed MR>+3, and 2 had been reoperated. 19 pts died. Actuarial survival was 89.5%, follow-up period 1-48 months.

**Conclusions:** Correction of chronic ischemic MR through classic way of reconstruction or new kind of suture annuloplasty provides good mid-term survival rate with more than 89% of survivors in NYHA class I/II. Pts with our new created suture annuloplasty had better clinical outcome, without regression of MR.

### C14.5

#### CLINICAL COMPARISON BETWEEN HEARTMATE VE AUTO-MODE AND HEARTMATE XVE OPTI-FILL AND THE EFFECT OF STROKE VOLUME ON BLOODCHAMBER AND INFLOW VALVE PEAK PRESSURES

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**Objective:** The aim of the Heartmate XVE auto mode with Opti-Fill is to reduce the incidence of high blood chamber and inflow valve peak pressure pulses and to reduce mechanical stress at interior parts of the pump. This study aimed to determine whether there is a significant difference, in the clinical situation, between the Heartmate VE auto mode, with an average filling of 76 ml, and the Heartmate XVE auto mode Opti-Fill with an average filling of 79 ml; the latter with another algorithm to control pump rate.

**Methods:** The relationship between stroke volume and peak pressure pulses was investigated using a Circulatory Mock Loop, controlling stroke volumes at afterloads ranging from 50-130 mmHg. Blood chamber peak pressure was measured in the centre at the upperside of the blood chamber and inflow valve peak pressure in the elbow of the inflow conduit. The distribution of stroke volumes was registered in 2 VE and 6 XVE patients during rest and activities of daily living (ADL).

**Results:** At high stroke volumes, 79-83 ml, blood chamber peak pressure and inflow valve peak pressure never exceeded 400 mmHg. Blood chamber peak pressure and inflow valve peak pressure started to increase when stroke volume was reduced to 78 ml. Maximum peak pressures occurred at a stroke volume of 50 ml: 788 mmHg for blood chamber peak pressure and 416 mmHg for inflow valve peak pressure. The pressures depended on the resistance and compliance of the Heartmate device and Circulatory Mock Loop. For clinical comparison, percentages of stroke volume >78 ml were determined.

**Conclusions:** Use of the Opti-Fill software shows a significant increase in percentage stroke volume >78 ml. The Opti-Fill software makes an important contribution reducing the incidence of high peak pressure pulses and might diminish inflow valve damage and mechanical stress at interior parts of the pump in the clinical setting.

#### C14.6

##### HEART RETRANSPLANTATION: IS IT A GOOD SOLUTION?

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**Objective:** Heart transplantation is sometimes the only solution that can be offered to patients with irreversible heart dysfunction. Unfortunately, nowadays there are less donors than needed. Therefore, a proper selection of patients should be done in order to make good use of donors. Last data have reported a one year survival of 76% after transplantation in our country. However, data considering retransplantation are not well known and there is a conflict about the convenience of using hearts in these patients. We report the outcomes and survival of patients receiving a heart retransplantation in our institution.

**Methods:** All patients receiving a heart retransplantation in our hospital between 1992 and 2004 were selected ( $n = 25$ ). Baseline clinical characteristic, hospital outcomes and five years survival using a Kaplan-Meier curve, were analysed.

**Results:** Mean age was 55.4±6.9 years with a male/female ratio of 5/1. Reasons for entry into the heart transplantation waiting list were: 1) primary graft dysfunction ( $n = 11$ ), 2) graft vascular disease ( $n = 14$ ). A total of 12 patients had national priority for heart transplantation (4 because of intraaortic balloon pump and 8 because of ventricle assist device). Morbidity after surgery was infectious ( $n = 12$ ) and neurological ( $n = 5$ ). One year survival was 67%. After analysing survival considering the reason for receiving retransplantation, a better survival in those patients with primary graft dysfunction than in those patients with graft vascular disease could be seen ( $P = 0.16$ ).

**Conclusions:** Nowadays in our country, patients receiving a heart transplantation have one year survival close to those patients receiving their first heart transplantation (67% vs. 76%). Survival seems to be better in those patients with primary graft dysfunction than in those patients with graft vascular disease ( $P = 0.16$ ).

#### C14.7

##### THORACIC ORGAN TRANSPLANTATION IN KOREA

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**Objective:** Four years have passed since the legislation of the brain death law in Korea. The purpose of this report is to briefly introduce the current status of thoracic organ transplantation in Korea after establishment of a nationalized organ donation system in Korea.

**Methods:** A retrospective analysis of the data of KONOS (Korean Network for Organ Sharing) was performed during the past 4 years. A total of 241 heart, 6 heart-lung, and 12 lung transplants were reviewed.

**Results:** For heart transplantation, the recipient's mean age was 39 years (range 8 to 50 years). Male patients comprised 79% of cases. The mean donor age was 12 years younger than the recipient (mean 27.3±9.2 years, range 10-67). The primary indication was dilated cardiomyopathy (75%) followed by ischemic cardiomyopathy (11%), valvular cardiomyopathy (6%), and miscellaneous causes (8%). The mean graft ischemic time was 130±49 min (61 - 280). The actuarial survival rate was 85% for the first-year and 70% for the five-years.

**Conclusions:** After the government-controlled organization (KONOS) was established, the number of thoracic organ transplants has decreased. However, an active donor action program is under way with the renewal of regulations and incentives to the donor.

#### C14.8

##### MAIN COMPLICATIONS FOR THE PATIENTS WITH MECHANICAL SUPPORT CIRCULATORY SYSTEMS: BERLIN HEART EXCOR AND INCOR

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**Objective:** Heart diseases are an epidemic or even perhaps a pandemic silent and cunning killer in the world. Globally, with high blood pressure, atherosclerosis, coronary artery stroke, congestive heart failure, it is expected that the number of heart diseases will increase. The World Health Organization estimates that it comprises one third of all deaths worldwide in the early 21st century (2003). Heart transplant (HTx) is a gold standard treatment for these patients. However its application is extremely limited due to the storage of donor organs. Mechanical circulatory support systems (MCSS) could benefit such patients. Ventricle assist devices (VAD) in Vilnius University Heart Surgery Center were started in 1999.

**Methods:** 18 patients (pts) were connected to MCSS. All patients were with low cardiac output index less than 1,8 l/min/m<sup>2</sup>, despite maximum pharmacology support and intraaortic balloon counterpulsation. BERLIN HEART EXCOR (BHEX) pulsate flow (15 pts) and BERLIN HEART INCOR (BHIN) axial flow (3 pts). Operative technique: BHEX inflow cannulae from left and right atrium were connected with artificial left and right ventricles when biventricular MCSS was used. The outflow cannulae from artificial left and right ventricles were connected end to back to ascending aorta and pulmonary artery using Ethibond 4/0 and Prolene 4/0 sutures. BHIN inflow cannula with axial pump was connected from left ventricle of native heart and outflow cannula was connected with ascending aorta.

**Results:** Mean duration on MCSS: BHEX from 1 to 1098 days, BHIN from 150 to 560 days. For 10 pts BHEX were as a bridge to HTx. HTx were performed on five of them. For 8 pts MCSS were connected: in postcardiotomic, post-transplant surgery - 6 pts, as a bridge to recovery - 2 pts. Complications: 1) vital necessity with lethal outcomes because of brain thromboembolisation (2 pt), massive brain hemorrhage (1 pt), incomplete blood outflow from left atrium (1 pt). 2) Without lethal outcomes thrombosis of artificial ventricle (3 pts), defect (rupture) of artificial ventricle membrane (1 pt), local infection in the site of cannulae (1 pt), bacteriemia (1 pt).

**Conclusions:** Connection of the MCSS BHEX and BHIN is a successful bridge to HTx in many patients with heart failure in whom standard therapy had failed. The blood coagulation therapy and infection control are the most important points in the patient's treatment after MCSS connection.

#### C14.9

##### VENTRICULAR ASSIST DEVICE AS A BRIDGE TO TRANSPLANTATION: 15-YEARS EXPERIENCE

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**Objective:** Cardiac transplantation may be the only option in patients with severe ventricular dysfunction in whom medical treatment is insufficient. In critically ill patients ventricular assist devices may support the patient until heart transplantation. In the present study we report our experience in the last 16 years.

**Methods:** Every patient receiving heart transplantation after a ventricular assist device between August 1988 and December 2004 was included. Baseline clinical characteristics, postoperative morbidity and mortality data were analysed. Also we analysed 5 years survival using Kaplan-Meier survival tests.

**Results:** Mean age was  $51,8 \pm 8,5$  years. Male/female ratio was 13/9. Reasons for heart transplantation were: postcardiotomy ventricular dysfunction in 8 patients (36,4%), myocardial infarction in 5 patients (22,7%), primary graft dysfunction in 8 patients (36,4%) and dilated cardiomyopathy in 1 patient (4,5%). Ventricular assist devices were placed in left side in 12 patients

(54,5%), in right side in 1 patient (4,6%) and biventricular in 9 patients (40,9%). Different types of ventricular assist devices were used: "Abiomed 5000" in 13 patients, "Biomed Comunidad de Madrid" in 9 cases and "BioMedicus" in 1 case. Mean waiting time to transplantation was 5 days (median 4; IQR: 4.5). Main hospital complications were: neurological ( $n = 7$ ), infectious ( $n = 12$ ), renal ( $n = 3$ ), severe hemorrhagic ( $n = 3$ ) and respiratory ( $n = 2$ ). Mortality before discharge was 40,9% (primary graft dysfunction;  $n = 3$ , stroke;  $n = 3$ , multiple organ dysfunction;  $n = 2$ , septic shock;  $n = 1$ ). Kaplan-Meier analysis showed 1 year survival of 54% and 5 year survival of 31%. 1 year survival after discharge was 92.3%.

**Conclusions:** Medical treatment offers poor results in critically ill patients in cardiogenic shock. In our experience the use of a ventricular assist device as a bridge to transplantation can be a good alternative. Hospital survival is 60% and in this group 1 year survival is 92.3%.

## SCIENTIFIC SESSION C15 CORONARY

### C15.1

#### MIDTERM RESULTS OF SURGICAL ANGIOPLASTY OF THE LEFT MAIN CORONARY ARTERY

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**Objective:** Surgical angioplasty of ostial stenosis of the left main coronary artery (LMCA) seems to be a logical procedure in the absence of additional obstructions of the left main stem. Despite several publications on early surgical results, little information is available about long-term outcome of patients treated by this type of operation. We wished to evaluate the mid- and long-term outcome of patients treated by surgical angioplasty with vein for isolated ostial stenosis of the left main coronary artery at our institution.

**Methods:** Between 04/95 and 07/04, 18 patients (9 males, 9 females) with a mean age of 59±8 years (range: 46-74 years) underwent vein patch angioplasty of the left coronary ostium. All experienced major depression of cardiac function during intubation of the left main ostium and in most cases the ostial lesion could be demonstrated angiographically. The left main stem was approached by dividing the pulmonary artery in 10 patients and directly by retracting the pulmonary artery in 8 patients. A manubrium sparing partial sternotomy was sufficient for optimal exposure. The operation, which normally is less time-consuming than standard coronary revascularisation, was prolonged in four patients with concomitant procedures: 3 aortic valve replacements (AVR) and 1 coronary artery bypass grafting.

**Results:** The operation was uneventful in all patients and there were no in-hospital deaths. In the late course, two patients died from unrelated causes 3,5 and 4 years following surgery. At the time of follow-up mean period of 4,7±3,4 years, (range: 0,3 to 9,4 years), all patients were in excellent clinical condition. Follow-up MRI-scans in these patients revealed no restenosis and a result which had been described as very satisfactory by cardiologists. **Conclusions:** Vein patch angioplasty seems to be an adequate surgical procedure for treatment of isolated LMCA ostial stenosis with both no additional operative risk and good long-term results. Patients with angiographic findings of long-distance main stem disease should be excluded from this type of operation.

### C15.2

#### OPCAB OR CONVENTIONAL CABG? DECISION BY USING XENON CT SCANNING

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**Objective:** We consider OPCAB should be used only for the pt must avoid extra-corporeal circulation (ECC) as its longterm result isn't clear and it sometimes needs incomplete revascularization. Therefore, we produced a strategy to detect true cerebral ischemia by using Xenon CT scanning with Acetazolamide tolerance test to avoid overestimation.

**Methods:** Between January 1989 and March 2004, 1045 patients underwent simple CABG in our institute. OPCAB was started in January 1995 and our strategy using tolerance Xenon CT scanning started in 1998. The patient with cerebral blood flow (CBF) activated by Acetazolamide less than 5 ml/100 g/min and cerebral blood flow at rest less than 40 ml/min were judged as contraindicated for using ECC. The patients with CBF activated by Acetazolamide more than 5 ml/100 g/min and CBF at rest more than 40 ml/min underwent conventional CABG (c-CABG) with who ECC. The patients didn't satisfy both criteria were judged as a group of relative contraindication for using ECC. Using ECC or not was considered accounting for other complications and the general status of the patient.

**Results:** 134 patients underwent OPCAB operation. Permanent stroke didn't occur both in c-CABG group and OPCAB group after starting this strategy (between January 1998-March 2004). After starting this strategy, total mortality rate was decreased to 2.18% (10 cases of 458 operations) from 4.09% (24 cases of 587 operations) between January 1989 - December 1997.

**Conclusions:** OPCAB is a justified and safe technique for the patients who are ineligible for c-CABG especially in patients at high risk for stroke. Xenon-CT

with Acetazolamide tolerance test was useful to detect the true cerebral ischemia.

### C15.3

#### SURGICAL TREATMENT OF YOUNG PATIENTS WITH CORONARY ARTERY DISEASE

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**Objective:** During recent years the number of patients in younger ages who underwent surgery due to coronary artery disease (CAD) has sharply increased. In our investigation the analysis of surgical treatment results and long-term follow-up data in patients of less than 40 years old was performed.

**Methods:** Between 1988 and 2003, 155 patients in the age less than 40 underwent coronary artery surgery. Left ventricle aneurysms were revealed in 27.7% of cases. According to radioisotope research of a metabolism of a myocardium (SPECT), young patients had, as a rule, inadequate myocardium perfusion due to scar myocardium changes, that distributed up to interventricle wall in all cases. There were performed revascularization procedures using arterial and venous grafts. Both left- and right IMA and radial artery were used in 28 patients. Those who had left ventricle aneurysm underwent aneurysm resection and CABG. Most of aneurysm resection cases were Dor procedures.

**Results:** Hospital mortality was 5.2%; long-term results were similar in the group older than 40 years. Survival rate in patients without ischemic events was the worst after using venous grafts and one IMA; the most encouraging results were achieved in patients with multiple autoarterial bypass grafting. There were not any cases of mediastinitis after using both left- and right-IMA.

**Conclusions:** Left ventricle aneurysm resection by Dor technique in young patients is more preferable. Multiple autoarterial bypass grafting is an effective and safe method of myocardium revascularization in the young. Correction of numerous risk factors in CAD patients younger than 40 is necessary for achievement of the best long-term results of CABG.

### C15.4

#### CORONARY-CORONARY BYPASS OPERATION: TECHNIQUE OF CORONARY REVASULARIZATION WITH A SEGMENT OF DISTAL INTERNAL THORACIC ARTERY

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**Objective:** The internal thoracic artery (ITA) is unquestionably the best conduit for coronary artery bypass grafting (CABG). The current trend is to use ITA as much as possible in CABG operations. Some of the coronary bypass operation, complete arterial revascularization can be difficult with bilateral ITA. This can be achieved distal segment of ITA to the right coronary artery in selected cases. We described the indications and results of coronary-coronary bypass using a free segment of distal ITA. Coronary-coronary bypass grafting (CCBG) allows complex myocardial revascularization with an expanded use of ITA. Proximal and distal anastomoses (single or more) can be achieved either between two segments of the same coronary artery or between two different coronary arteries. Early angiographic and clinical results were excellent.

**Methods:** Between August 2000 and December 2004, 43 patients of 1500 patients underwent myocardial revascularization operated with this technique. 33 patients (77%) were male and 10 patients (23%) were female. Age of the patients was between 40 and 71 (average 57.2).

**Results:** Total 172 distal anastomoses have been done (mean 4.35), 160 of which were arterial (mean 4,02). There were no hospital mortality and perioperative myocardial infarction. Follow-up ranges between 1 and 46 months (mean 9.5). There were no anginal symptoms in patients in controls. Coronary angiography was done in 24 patients (55.8%). Mean time for coronary angiography was 16,5 weeks (7 days to 2 years). Patency rate was 100%.

**Conclusions:** CCBG is an alternative technique, with sequential anastomosis and Y or T grafts, allowing extensive myocardial revascularization with both ITAs in selected patients. To decrease the sternal and respiratory morbidity in patients such as: obese, insulin dependent elderly diabetic, COPD and fragile sternum, single ITA (LITA) can be used for two different vessels (LAD and RCA). Considering that atherosclerosis is an on-going disease, in patients

with mild stenosis of RCA, CCBG with the short segment of the ITA can also be used.

#### C15.5 PERIOPERATIVE CORONARY ARTERY BYPASS GRAFT EVALUATION BY PARAMETER IDENTIFICATION

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**Objective:** In the present study we measured resistance to coronary artery grafts and graft compliance using parameter identification by delta operator to create patient-specific mathematical models for quick intra-operative evaluation of coronary artery bypass grafts and the prevention of postoperative graft failure. The study also aimed to develop a method capable of predicting changes in graft blood flow by entering simulated data on changes in blood pressure and heart rate into the mathematical model.

**Methods:** For perioperative evaluation of graft resistance and compliance, we measured arterial pressure and coronary artery bypass blood flow and took ECG during surgery, immediately after bypass anastomosis. The bypass blood flow was measured with an ultrasound blood flow meter (Transonic Systems), and the data recorded using a data logger (Keyence). The sampling frequency was set at 200 Hz. The subjects for this study were 50 patients who underwent coronary artery bypass surgery. In total, 104 grafts were evaluated. Angiography conducted soon after surgery revealed graft failure in 4 cases of stenosis and 4 cases of obstruction. These failed grafts were compared with 96 grafts showing good patency on angiograms. Because this method uses a delta operator, robust, highly accurate identification, which was difficult in the past, is possible. Applying parameter identification to the data obtained with this method allows calculation of graft resistance and compliance.

**Results:** The 8 grafts where failure was observed in angiograms taken soon after surgery had a mean graft blood flow of 7.3 ml/min, graft resistance of 16.9, and compliance of 0.007. These three parameters were respectively 28.4 ml/min, 5.1 and 0.17 for 96 grafts remaining adequately patent, graft flow and resistance differed significantly between the failed graft group and the patent graft group ( $P < 0.05$ ).

**Conclusions:** This method was shown to allow perioperative detection of graft stenosis and spasm occurring perioperatively because it allows perioperative measurement of resistance and compliance, which was difficult in the past. This method is thus expected to provide a useful means of preventing postoperative graft failure by allowing appropriate measures to be taken perioperatively. Furthermore, this method will also be useful in postoperative patient management since its patient-specific mathematical models allow prediction of bypass graft reserves by entering simulated changes in arterial pressure and heart rate into the model.

#### C15.6 THE EFFECT OF DRUG-ELUTING STENTS AND STATIN ON THE SERUM LEVELS OF INFLAMMATORY MARKERS IN PATIENTS UNDERGOING PERCUTANEOUS CORONARY INTERVENTION

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**Objective:** In recent years it has become apparent that inflammatory and immune mechanisms are involved in the pathophysiology of atheromatous plaque disruption. We evaluated the serial changes of serum levels of inflammatory and cardiac injury markers in coronary artery disease (CAD) patients (pts) undergoing percutaneous coronary intervention (PCI).

**Methods:** Serum levels of high-sensitivity C-reactive protein (hs-CRP), metalloproteinase 9 (MMP-9), tissue inhibitor of metalloproteinases 1 (TIMP-1), neopterin (NEO), creatine kinase (CK), CK-MB and troponin-I (Tn-I) were measured in 118 consecutive CAD pts (male 101, mean age  $62 \pm 10$  years) undergoing PCI procedure. Diabetes mellitus was present in 23%, and hypercholesterolemia in 87% (69% of them were receiving statin treatment) of pts. Blood samples were taken pre-, 24-h post-PCI and 13.8  $\pm$  3.5 months later (follow-up). Serum levels of NEO, MMP-9 and TIMP-1 were assessed using commercially available immunoassays (IBL, Hamburg, Germany and R&D Systems, Minneapolis, USA).

**Results:** PCI was attempted in 140 vessels to treat 185 lesions, using sirolimus-eluting (SES,  $n = 78$ ) or bare metal (BS,  $n = 42$ ) stents. There were no differences in demographic, risk factors profile, clinical symptoms for CAD, or angiographic characteristic of stenosis in pts treated with SES or BS. In pts receiving statin treatment the pre-PCI serum levels of hs-CRP ( $3.99 \pm 5.98$  mg/l vs.  $5.13 \pm 6.58$  mg/l,  $P = 0.02$ ) and NEO ( $10.94 \pm 10.0$  nmol/l vs.  $12.26 \pm 5.7$  nmol/l,  $P = 0.03$ ) were lower compared to pts without treatment. Pre- and post-PCI CK, CK-MB, and Tn-I measurements showed no differences in pts treated with SES compared to BS. Serum levels of hs-CRP, MMP-9, and TIMP-1 increased 24-h post-PCI both in pts treated with SES and BS ( $P < 0.001$ ); these changes were not affected by statin treatment. However 24-h post-PCI MMP-9 levels were lower in pts treated with SES ( $P < 0.01$ ). During follow-up (99% of pts were on statin treatment) a significant decrease was observed in hs-CRP, MMP-9, TIMP-1 and NEO serum levels ( $P < 0.001$ , analysis for repeated measurements); however these changes were not different between SES and BS pts.

**Conclusions:** Statin therapy pre-PCI is associated with a significant reduction in specific inflammatory markers of CAD, suggesting the interrelationship between inflammation and statin use. There were no differences in serum levels of inflammatory markers, except for MMP-9, 24-h post-PCI, and at long-term clinical follow-up in pts treated with SES or BS. The greater increase in MMP-9 observed with BS might be due to greater tissue damage post-PCI.

#### C15.7 PREOPERATIVE ASSESSMENT OF FOREARM ARTERY CIRCULATION AND EFFECTS OF RADIAL ARTERY HARVEST ON THE FOREARM BLOOD FLOW

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**Objective:** The aim of this study was to evaluate the forearm artery circulation preoperatively to identify arterial dominance into the hand and postoperatively to describe the effects of radial artery (RA) harvest on the forearm blood flow in the harvested forearm.

**Methods:** A total of 52 patients (the mean  $\pm$  SD age;  $53.29 \pm 8.4$  years) scheduled for elective CABG and who had the RA as one of the conduits were included in this study. Patients were evaluated preoperatively and one year after RA harvest by color flow Doppler ultrasonography for forearm artery circulation and followed-up postoperatively for two years for any long-term complications in the nondominant harvested forearm.

**Results:** The mean time between the preoperative and postoperative evaluations was  $13.3 \pm 1$  months (range 11-15 months). In the preoperative evaluations, the mean cross-sectional area of the RA and the ulnar artery (UA) were  $4.8 \pm 1.15$  mm<sup>2</sup> and  $5.3 \pm 0.8$  mm<sup>2</sup>, respectively ( $P = 0.03$ ). In the postoperative evaluations of the UA, the mean cross-sectional area was 5.3 mm<sup>2</sup> preoperatively and increased to 5.8 mm<sup>2</sup> postoperatively ( $P = 0.005$ ). The mean peak systolic velocity in the UA significantly increased preoperatively to postoperatively, from 58.9 cm/s to 73.9 cm/s ( $P < 0.001$ ). The mean blood flow was 60.4 ml/min preoperatively and increased to 105 ml/min postoperatively ( $P = 0.03$ ). The postoperative mean blood flow in the UA (105 ml/min) was lower than the overall preoperative mean blood flow in the sum of the RA and the UA (120.6 ml/min) (105 ml/min vs. 120.6 ml/min,  $P > 0.05$ ). After two years follow-up, the patients were not complaining of any ischemic symptoms except minimal paresthesia at the fingertips in 2 patients.

**Conclusions:** There are many studies with conflicting results about the dominant artery of the forearm. The results of this study showed that in the perfusion to the hand, UA is dominant. Postoperatively, the mean blood flow in the UA and therefore cross-sectional area increased to compensate the harvested RA. In our study, there was no ischemic complication of the hand after RA harvest. The overall decrease in the blood flow to the hand after RA harvest seems to remain adequate to meet the physiologic demands of the hand without causing hand ischemia or any clinical symptoms. We conclude that with a correct preoperative assessment of the adequacy of the ulnar collateral circulation, blood flow to the hand will not be compromised by RA harvest and can be performed safely in selected patients.

#### C15.8 REVASCULARIZATION OF WHOLE MYOCARDIUM WITH IN SITU BILATERAL INTERNAL THORACIC ARTERY

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**Objective:** The internal thoracic artery (ITA) has been established as the preferred conduit for coronary artery bypass grafting. In order to achieve total arterial revascularization with in situ ITA for patients having three vessel disease we created a new technique. The RITA was routed anterior to the aorta to graft the left anterior descending (LAD), and LITA was used to graft starting from distal right coronary artery (RCA) to the circumflex branches.

**Methods:** Between September 2001 and March 2005 we have operated 58 patients with this method. 50 patients (86.2%) were male and 8 patients (13.8%) were female. Ages of the patients were between 35 and 78 (average 56.7 years). Operative technique: after sternotomy LITA and RITA were harvested with pedicle. Following systemic heparinization, both ITAs were transected as distal as possible, and diluted papaverine was injected intralumenary. Cardiopulmonary bypass was initiated with aortic and two staged right atrial cannula; intermittent isothermic, antegrade and retrograde blood cardioplegia was used. In order to prevent compression of LITA pericardium dissected as "reverse T" shape. After the bypasses completed surgicell with diluted papaverine was used topically (with these techniques we didn't detect any ITA spasm for the last 5 years). The mean period of follow up was 11.2 months (ranges between 1 and 42 months). Coronary angiography was done in 23 patients (39.6%). Mean time for coronary angiography was 8.1 months.

**Results:** Total 247 anastomoses have been done (4.10 anastomoses/patient) 195 of which were sequential (3.25 anastomoses/patient). There were no preoperative or postoperative mortality, all the patients were in NYHA Class 1. Patency rate was 100%.

**Conclusions:** In situ use of bilateral ITA in three vessel disease is safe, and successful in selected patients. Short and mid-term results are favourable.

#### C15.9

##### FIRST CLINICAL EXPERIENCE WITH A NEW BIFURCATION STENT SYSTEM, THE NILE

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**Objective:** Bifurcation coronary lesions (BL) remain an interventional therapeutic challenge, even in the drug eluting stent era. We present the first clinical experience of a new bifurcation stent system called the "Nile"<sup>®</sup>.

**Methods:** The system consists of a single stent and 2 separate monorail balloons (6F compatible). The stent is mounted on the main vessel (MV) balloon. The second balloon is positioned behind the first with a long nose cone extending to middle of the stent, exiting for few mm through its struts. Two wires are advanced to the BL and pre-dilatation of the main vessel is performed. The stent system is advanced to the lesion over both wires through the 2 balloons as one unit. Markers allow precise stent placement in the MV, securing the entry of the tip of the nose cone of the second balloon into the side branch (SB). The stent is deployed, then the SB balloon is advanced to the side branch for a kissing balloon inflation.

**Results:** The "Nile"<sup>®</sup> system was applied in 31 cases with BL, involving LAD-DIAG in 24, LCX-OM in 5, RCA-PDA in 1 and LM-LAD/LCX in 1. The system was successfully deployed in 29 cases. In 3 cases SB occlusion followed the initial stent deployment. This was immediately resolved by advancing and inflating the SB balloon without any complication. In 2 cases the SB balloon of the system could not be advanced through the deployed stent and it was exchanged for smaller balloons successfully. In only one case stenting of the SB was required. Markers of myocardial damage did not increase significantly.

**Conclusions:** The "Nile"<sup>®</sup> is an effective and safe bifurcation stent system. It constitutes a true improvement in the treatment of BL. It is highly effective in deploying an MV stent, while maintaining the access, thus eliminating the chance of losing the SB and facilitating its stenting if necessary.

## SCIENTIFIC SESSION C16 VALVES

### C16.1

#### BEATING HEART VALVE SURGERY AS POSSIBLE ALTERNATIVE FOR PATIENTS WITH POOR LEFT VENTRICULAR FUNCTION

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**Objective:** Reperfusion injury during cardiopulmonary bypass is known to pose a damaging effect of extracorporeal circulation. The myocardial ischaemia induced by cardioplegic arrest cannot be completely eliminated, myocardial edema intrinsic to the diastolic state of the heart causes reduced cardiac function. The increased preoperative risk profile of patients requiring valve surgery to date has led to different surgical techniques for performing valve surgery on the beating heart. Severely compromised left ventricular function, long-term haemodialysis or endocarditis are a few of the reasons for choosing these operative options. Studies in vitro and in vivo have demonstrated the efficacy of beating heart valve surgery using retrograde perfusion over the coronary sinus, and we chose to investigate our clinical experience with beating heart valve surgery using antegrade perfusion of warm oxygenated blood.

**Methods:** Between 06/1999 and 02/2005, 13 patients underwent valvular operations on the beating heart with use of cardiopulmonary bypass and antegrade perfusion with warm oxygenated blood. Preoperative history included mitral insufficiency, previous congenital cardiac surgery with tricuspid valve replacement, aortic stenosis and/or insufficiency and chronic atrial fibrillation. Blood perfusion was achieved by selective cannulation of the coronary ostia, perfusion through venous grafts after distal anastomosis off pump or by other antegrade techniques. Statistic analysis of our clinical data was performed.

**Results:** Altogether 13 patients received beating heart valvular operations, these being isolated aortic valve replacements ( $n = 3$ ), mitral valve reconstructions ( $n = 3$ ) combined with concomitant coronary surgery ( $n = 2$ ), tricuspid valve replacement as reoperative interventions ( $n = 3$ ), and combined valve operations ( $n = 1$  AVR+MVR,  $n = 1$  AVR+MVR+TVR). Preoperative left ventricular function was reduced with a mean EF of  $38.7 \pm 15.3\%$ , all patients being preoperatively in an NYHA class III-IV. The mean time of cardiopulmonary bypass was  $124.4 \pm 66.7$  min, one patient required mechanical circulatory assistance (intraaortic balloon pulsation) and high inotrope medication post bypass. Perioperative drainage loss was  $2495 \pm 5381$  ml, excluding the patient with circulatory assistance  $949.1 \pm 562.2$  ml. Mean ICU stay was  $6.2 \pm 8.7$  days, overall hospital stay being  $11.9 \pm 7.9$  days. 2 patients died within 30 days, however one patient under nonoperative complications. Postoperative ischaemic parameters were not significantly increased, postoperative clinical and echocardiographic follow-up demonstrated good results. Previous endocarditis and preoperative surgical intervention were significant predictors of postoperative mortality.

**Conclusions:** Our results demonstrate encouraging results concerning beating heart valvular surgery with good outcome and low postoperative complications. Further clinical studies with larger patient collectives are needed to evaluate the benefit of antegrade perfusion with valve operations without cardioplegic arrest.

### C16.2

#### LONG-TERM RESULTS OF TRICUSPID VALVE ANNULOPLASTY

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**Objective:** We analyse the clinical and echocardiographic long-term results of tricuspid valve annuloplasty operations in our material.

**Methods:** We have retrospectively reviewed the case notes of all patients operated in our institution for tricuspid regurgitation between 1985 and 2001. We have identified 102 cases in which the modified De Vega annuloplasty was performed. In all patients the procedure was performed together with mitral or double valve replacement. The echocardiographic examination assessed the tricuspid valve regurgitation severity, right ventricular inflow velocity, the dimensions of the heart chambers, fractional shortening of tricuspid annulus, spectral Doppler analysis of transpulmonic blood flow,

right ventricular systolic pressure (taken from transtricuspid gradient and inferior vena cava diameter and mobility during respiration) and the function of valve prostheses and left ventricular contractility.

**Results:** Hospital mortality was 14.7% (15 patients). The survival rates were 68% at 5 years, 50% at 10 years and 33% at 15 years. We have examined 48 patients in the mean time after operation of 65 months (up to 194 months). The mean NYHA class which was 3.07 before the operation has decreased to 1.9. In 88% we have found a competent tricuspid valve. In patients who had hemodynamically significant tricuspid regurgitation the right ventricle was enlarged, the tricuspid annulus diameter was bigger, the right ventricular pressure was higher and there were signs of pulmonary hypertension and right ventricle volume overload. We have not noted any correlation between the tricuspid valve annulus function (annulus shortening fraction) with the degree of regurgitation. The tricuspid valve regurgitation was more severe in patients with atrial fibrillation. In majority of patients the right ventricular inflow velocity was elevated.

**Conclusions:** The function of the tricuspid annulus after annuloplasty had no influence over severity of regurgitation. The elevated right ventricular inflow velocity which was frequently observed was probably due to right ventricular diastolic dysfunction, and not to constricted tricuspid annulus. Atrial fibrillation has a strong negative effect on both tricuspid competence and survival.

### C16.3

#### QUALITY OF LIFE AND ECHOCARDIOGRAPHIC DATA AFTER AORTIC VALVE REPLACEMENT WITH THE SJM REGENT VALVE: IS THERE A CORRELATION?

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**Objective:** The SJM Regent® valve was introduced into clinical use in 1995 with an improved design resulting in significantly larger effective orifice areas (EOAs). The aim of this study was (1) to evaluate the quality of life (QoL) scores, assessed with SF-36, after aortic valve replacement (AVR) with the SJM Regent® valve; (2) to study the association of QoL with NYHA score and echocardiographic data; (3) to compare these QoL scores with QoL scores of other populations.

**Methods:** We investigated a total of 75 patients at 12 to 21 months follow-up after AVR. We determined parameters of the QoL questionnaire SF-36 and echocardiographic data: left and right ventricular systolic and diastolic function, EOA and transvalvular peak gradients at rest. Outcome was assessed by NYHA classification and functional status.

**Results:** Five (6.7%) late deaths were observed within the surveillance period. At time of follow-up all patients had improved by at least one NYHA class. The majority of survivors reported good functional status and QoL scores. The mean (SD) SF-36 scores for responders were:  $75 \pm 24$  for physical function,  $65 \pm 38$  for role-physical,  $87 \pm 21$  for bodily pain,  $68 \pm 23$  for general health,  $52 \pm 24$  for vitality,  $93 \pm 15$  for social functioning,  $69 \pm 44$  for role-emotional,  $65 \pm 20$  for mental health. There was no correlation between QoL total scores and echocardiographic parameters. Compared to age adapted normal German population the scores for SJM Regent® valve patients were worse in role-physical, vitality, role-emotional and mental health, identical in physical function and significantly improved in bodily pain, general health, social function and changes in health.

**Conclusions:** Patients after AVR with the SJM Regent® valve judge their QoL for physical function better than the normal population but are more concerned about their further health. There are no echocardiographic predictors for physical status after AVR with the SJM Regent® valve.

### C16.4

#### TRICUSPID VALVE REPLACEMENT: WHICH IS BETTER, MECHANICAL OR BIOPROSTHESIS?

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**Objective:** Tricuspid valve replacement is less common than mitral and aortic valves used in clinical practice, but the choice between mechanical valves and bioprostheses remains controversial.

**Methods:** Between 1991 and 2003, 158 patients underwent tricuspid valve replacement and were followed at the Bakulev center for cardiovascular

surgery. Patients underwent replacement with bioprostheses ( $n = 102$ ) and mechanical valves ( $n = 56$ ).

Results: Patients with bioprosthetic tricuspid replacements averaged  $48 \pm 13.2$  years of age compared with  $40.5 \pm 12.1$  years in those with tricuspid mechanical valve replacements ( $P = 0.2$ ). Isolated tricuspid valve replacement was performed in 41 patients (25,9%), in the mechanical valve group compared with 32 patients (20,2%) ( $P = 0,01$ ), in the bioprosthetic replacement group. Most patients were in New York Heart Association functional class III or IV. Infective endocarditis was detected in 35 patients; all were replaced by bioprosthesis. Hospital mortality was 5,37% (7 patients). One-, 5-, and 10-year survival rates were 98,2%, 89,9%, and 80,2%, respectively. 5 patients were reoperated because of structural valve deterioration. 7 patients were operated because of mechanical valve dysfunction.

Conclusions: No superiority could be identified for biological or mechanical prostheses in the tricuspid position for either survival or reoperation. Mechanical valves were significantly more prone to thromboembolism, whereas bioprostheses suffered structural valve deterioration. Patient survival after tricuspid valve replacement is suboptimal but related to the clinical condition at operation.

#### C16.5

##### NARROW AORTIC ROOT AND SMALL DIAMETER PROSTHESES: WHO CAN PREDICT FUNCTIONAL RESULT?

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Objective: During the last 10 years there were performed a lot of investigations dedicated to small diameter prostheses in aortic position. Nevertheless, you cannot predict whether the small diameter valve substitute will be hemodynamically "small" for the patient with narrow aortic root. In some cases small prostheses (18-19 mm) can create more favourable results than "normal" ones.

Methods: We analyzed the results of surgical treatment of 73 (from 417) patients with aortic valve disease (38 male, 35 female, mean age  $46.8 \pm 9.5$  years old, all in NYHA class III-IV). Body square area (BSA) varied from 1.5 to  $2.1 \text{ m}^2$  (mean  $1.82 \pm 0.19$ ). The etiology of valve lesions were: rheumatic fever in 41 patients (secondary infectious endocarditis (IE) - 7), bicuspid aortic valve in 21 (IE-11), primary IE 4, atherosclerosis 3, cusp degeneration 2. According to preoperative echo all patients had narrow aortic root irrespectively of etiology. Peak gradient (PG) was in the presence of: aortic valve stenosis  $87 \pm 20$  mmHg, combined valve lesion  $26 \pm 5$  mmHg, insufficiency with primary IE  $35 \pm 8$  mmHg.

Results: All patients underwent aortic valve replacement (AVR) with prostheses 23 mm or less. We used only mechanical prostheses. The enlarging aorta technique was used in 2 patients. Hospital mortality was 3 (4%) patients. PG, mean gradient (MG) and indexed effective orifice area were measured by transthoracic and transesophageal echo postoperatively. The gradients on aortic valves in patients with aortic stenosis, combined lesion and insufficiency with primary IE after surgical procedure were different even if diameters of prostheses implanted were identical. In group of patients with aortic valve stenosis "before/after ratio" was not less than 2.5, in some cases coming up to 7.0. Long-term follow-up included 56 patients; there was prosthesis dysfunction in 1 patient due to inadequate anticoagulation therapy 1 year after surgery. Gradient meanings during the follow-up period haven't been changed.

Conclusions: In our opinion, you cannot predict confidently the functional results of AVR with small valve substitute. Identical sizes and models may create different gradients but carry a favourable prognosis in terms of post-operative survival. Moreover, we can use modern models of small prostheses in case when we need predictable early result—when severity of patient's illness requires shortening of cross-clamping time, reduction of operative trauma, etc.

#### C16.6

##### LEFT VENTRICLE REGRESSION AFTER VALVE REPLACEMENT IN YOUNG MALE POPULATION WITH ISOLATED AORTIC STENOSIS AND REGURGITATION: 5 YEARS' FOLLOW-UP

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Objective: The aim of the study was to evaluate and compare the regression in left ventricle in means of left ventricular function and geometric parameters during 5 years' follow-up after aortic valve replacement in patients with isolated aortic valvular stenosis or regurgitation in young male population.

Methods: Eighty patients with aortic valve replacement were enrolled in the study. All of the patients were male. 40 of the patients received mechanical valve due to isolated aortic regurgitation and in the other 40 the pathology was isolated aortic valve stenosis. The mean ages of patients were  $23.2 \pm 1.3$  and  $22.6 \pm 1.5$  (mean $\pm$ SD) in aortic stenosis and regurgitation, respectively. The valve areas in stenosis and regurgitation were  $0.66 \pm 0.9$  and  $3.79 \pm 0.42$  (mean $\pm$ SD), respectively. The peak gradient was  $88.9 \pm 19.7$  and  $23.1 \pm 25.6$  (mean $\pm$ SD), respectively. During the 5 years' follow-up trans thoracic echocardiography was performed at the sixth month and second year and the fifth year of the post operative period the diastolic values of interventricular septum thickness, left ventricular end diastolic diameter, left ventricular diastolic posterior wall thickness, left ventricular mass and mass index and ejection fraction parameters were recorded.

Results: A significant regression in ventricular hypertrophy was seen in both groups. The regression was more significant in the aortic stenotic group; the improvement in left ventricular end diastolic diameter, left ventricular diastolic posterior wall thickness, left ventricular mass, mass index and ejection fraction values were more significant in the stenotic group.

Conclusions: The regression in left ventricle after valve replacement occurs in both valvular pathologies. We evaluated that the regression was more significant in valvular aortic stenosis. Thus, the improvement in left ventricular functions was found better.

#### C16.7

##### RISK FACTORS FOR EARLY AND LATE MORTALITY AFTER COMBINED VALVE REPLACEMENT AND CORONARY ARTERY SURGERY. RESULTS OF AN ANALYSIS IN 271 PATIENTS

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Objective: Aim of the study was to identify risk factors for early and late mortality after combined valve surgery with a mechanical prosthesis and coronary artery bypass grafting (VR-CABG).

Methods: In the period 01/1994-10/2000, 294 patients underwent combined valve and CABG surgery at our department. 271 (92.2%) of those patients were available for clinical evaluation.

Results: There were 182 men (67.2%) and 89 women (32.8%) (mean age: 66.6 years, range: 35.4-86.7 years). 216 patients (79.7%) underwent aortic valve replacement (AVR) and coronary artery bypass grafting (AVR-CABG), 45 patients (16.6%) had mitral valve replacement and CABG (MVR-CABG) and 10 patients (3.7%) underwent double valve replacement and CABG (DVR-CABG). Cumulative duration of follow up is 1007 patient-years (py) with a maximum of 7.6 years. 94.1% ( $n = 255$ ) of the patients were preoperatively in NYHA functional class III and IV. Overall hospital mortality (30 days) rate was 6.5% ( $n = 19$ ). With regard to the type of operation early mortality rate was for AVR-CABG, MVR-CABG and DVR-CABG 6.5%, 8.9% and 10% respectively ( $\chi^2:0.47$ ,  $P: 0.789$ ). Hospital mortality was significant higher in females (13.5%,  $\chi^2:8.51$ ,  $P: 0.0035$ ) and in patients older than 70 years. (11.1%,  $\chi^2:4.02$ ,  $P: 0.045$ ). 29 VR-CABG-patients (11.5%) died during the follow up, which resulted in a cumulative survival rate at 7.6 years of 78.6%. Cumulative survival rates at 7.6 years were for AVR-CABG, MVR-CABG and for DVR-CABG 84.5%, 80.6% and 86.6% respectively ( $P: 0.143$ ). Males and patients older than 70 years showed at 7.6 years significant higher survival rates: male vs. female: 89.1% vs. 73.1% (Logrank test  $P: 0.006$ ) and <70 years vs. >70 years: 89.15% vs. 74.6% (Logrank test  $P: 0.00237$ ). NYHA III patients showed at 7.6 years a cumulative survival rate of 86.5% whereas NYHA IV patients revealed 74.7% (Logrank test  $P: 0.14$ ). Multivariable logistic analysis identified female gender ( $P: 0.027$ ) and high age at operation (>70 years) ( $P: 0.006$ ) as independent late mortality risk factors. At follow up 80% of survivors were in NYHA class I or II.

Conclusions: Hospital mortality (30 days) was nearly 2.5-fold higher in female, older than 70 years and in preop. NYHA class III or IV patients. Advanced age at operation (>70 years) and female gender were identified as independent late mortality risk factors for combined VR and CABG surgery.



**C16.8****ST. JUDE-BIOPOR PORCINE PROSTHESIS, A NEW DESIGN TISSUE VALVE FOR AN EXTENDED DURABILITY IN MITRAL POSITION: THE PATHOLOGIST POINT OF VIEW**

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**Objective:** Calcification is the main cause of structural valve deterioration, however other causes of failure have been reckoned. Dehiscence of a commissure from the stent has been reported only in few models of porcine-tissue-valve so far. Aim of this study was to analyze the rate of this peculiar complication in several I-II generation-porcine models.

**Methods:** Among more than 580 tissue-valves explanted and analyzed at the Cardiovascular Pathology Institute of the University of Padua, 17 have been replaced due to commissural dehiscence. All these occurrences were in mitral position with the exception of a single aortic (CE-S). There were 9 HcK S (9/455), 1 HcK II (1/31), 1 CE-S and 2 CE-SAV (3/35), 1 Liotta (1/42), and 3 Xenotech (3/6), after a mean time of function of 157±50, 156, 103±40, 143, 130±8 months, respectively.

**Results:** The dehiscence was the sole cause of incompetence in 6 cases, and in 9 cases there was no evidence of calcification. Up to now 14 Biopor tissue valves have been replaced at our Institute, 8 in aortic position and 6 in mitral position. At 8-years a single valve was replaced because of dystrophic calcification (aortic), and commissural dehiscence was never observed.

**Conclusions:** Commissural dehiscence is a rare cause of failure. The technology of the Biopor, which uses 3 separate leaflets of similar size and protects their suture to the Dacron stent with a strip of pericardium may guarantee a higher SVD-freedom. Therefore this valve may be proposed for use in younger pts, expecting a freedom from reoperation longer than that observed with other second generation bioprostheses.

**C16.9****THE ON-X PROSTHETIC HEART VALVE: RESULTS OF EUROPEAN TRIAL**

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**Objective:** Multicenter clinical trial was conducted to evaluate the performance of the ON-X bileaflet heart valve prosthesis (Medical Carbon Research Institute, Austin, Tx).

**Methods:** A total of 152 patients underwent implantation, 91 for aortic valve replacement (AVR) and 80 for mitral valve replacement (MVR) and 21 double valve replacement (DVR), at 9 centres from July 2000 to December 2002. The study followed the guidelines of the AATS/STS. Mean follow up was 12 months.

**Results:** Freedom from adverse events in the study were as follows: thromboembolism, 98.9% for aortic valve replacement (AVR) patients, 100% for mitral valve replacement (MVR) and 95.2% for double valve replacement (DVR); thrombosis, 100% for AVR, MVR and DVR; bleeding events, 98.9% for AVR and 100% for MVR and DVR. The postoperative median lactate dehydro-

genase level was within the normal range for AVR, MVR and DVR patients. The mean INR level was 2.6 for AVR, 2.8 for MVR and for DVR at 1 year follow-up. At 1 year, AVR echocardiographic results for the 19 to 25 valves, respectively, ranged from 1.3 to 2.8 cm<sup>2</sup> for the effective orifice area and 9.2 to 3.2 mmHg for mean gradient (mean pressure gradient 8.9 mmHg, peak pressure gradient 16.0 mmHg), and MVR effective orifice area by pressure half-time was 2.62 cm<sup>2</sup> and mean gradient was 4.8 mmHg.

**Conclusions:** The results of the European trial show that the ON-X heart valve has an excellent haemodynamic profile. Moreover, the results indicated a very low rate of valve related complication in particular with a low rate of thromboembolism with low degree of anticoagulation.

**C16.10****MORTALITY AND MORBIDITY ANALYSIS AFTER AORTIC VALVE REPLACEMENT IN 387 PATIENTS WITH THE SORIN BICARBON™ BILEAFLET VALVE: A 9-YEAR EXPERIENCE**

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**Objective:** Aim of the study was to determine the early and midterm clinical performance of the Sorin Bicarbon™ bileaflet prosthesis after aortic valve replacement (AVR).

**Methods:** Between January 1993 and October 2000, 541 patients underwent AVR with the Sorin Bicarbon prosthesis. 387 patients aged 16.5-85.8 years (mean 61.5 years), 285 males and 102 females were available for clinical evaluation. 103 patients were lost to follow up which was complete in 88.5% (387/438). 86.5% of the patients were preoperatively in New York Heart Association (NYHA) functional class III or IV. Cumulative duration of follow up is 1574 patient-years (py) with a maximum of 9 years.

**Results:** Overall hospital mortality (30 days) rate was 3.5% (n: 19). In 12 cases the valve lesion was stenosis, in 4 cases regurgitation and in 3 cases combined lesion. 10 patients died because of low cardiac output syndrome, 6 because of multiple organ failure and 3 due to stroke. Valve-related early deaths could not be detected. There were 33 late deaths (6.1%). Overall late mortality and cumulative survival rate at 9 years was 2.1%/py and 80.7% respectively. Late outcome at 9 years with regard to valve lesion, gender, age at operation and preoperative functional NYHA class was as follows: stenosis vs. regurgitation: 79.5% vs. 88.2% ( $\chi^2$ :0.38, P: 0.53); male vs. female: 82.1% vs. 76% ( $\chi^2$ :0.26, P: 0.61); age>70 years: 55.9% ( $\chi^2$ :11.2, P: 0.01) and preop. NYHA class IV:57% ( $\chi^2$ :2.34, P:0.031). 83% of survivors were at follow up in NYHA class I or II. Valve related complications were thromboembolism at 1.6%/py (n: 25), anticoagulant-related (major) hemorrhage at 1.2%/py (n: 19), bacterial endocarditis at 0.25%/py (n: 4), reoperation at 1.01%/py (n: 16), paravalvular leak at 0.9%/py (n: 14) and valve thrombosis at 0.06% (n: 1). No structural dysfunction of the prosthesis has been reported. Actuarial freedom of complications at 9 years was as follows: thromboembolism 89.7%, major hemorrhage 94.7% prosthetic valve endocarditis 98.5%, reoperation 94.3%, paravalvular leak 94.5% and valve thrombosis 99.4%.

**Conclusions:** Sorin Bicarbon prosthesis provides excellent clinical results and long-term survival with very low complication rates comparable with those of other bileaflet prostheses currently in use. High preoperative NYHA class (IV) and increasing age at operation (>70 years) were identified as significant predictors of late mortality. Anticoagulant-related complication rates, such as bleeding and thromboembolism, are very low.

## SCIENTIFIC SESSION C17 MISCELLANEOUS

### C17.1

#### AORTIC VALVE INSUFFICIENCY: LOSS OF VALVE NERVOUS ELEMENTS

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**Objective:** The aortic valve is a complex structure made up of cells with different properties and closely related to nerve endings whose exact function at the valvular level is yet to be defined. Main aim of this study is to correlate morphologic changes (loss of nerve fibers, presence of inflammatory cells, fiber degeneration) and aortic valve disease (insufficiency).

**Methods:** 14 aortic valves were obtained from patients who underwent surgical intervention of aortic valve replacement for insufficiency and 2 aortic valve leaflets from aortic cryopreserved valves not fit for clinical surgical implant. Pathologic human aortic valves after a formalin fixation (maximum 48 h) were embedded in paraffin with standard treatment. 4 micron thick slides were immunostained for actin, neurofilaments, PGP 9.5, GFAP, synaptophysin, S100, vimentin and CD117. Different antibodies microwave settings for antigen retrieval were used. Binding was revealed by 3',3'-diaminobenzidine and counterstained with haematoxylin and eosin. Two frozen cases of normal valves in DMSO and embedded in OCT were evaluated with same immunostains both with immunohistochemistry and immunofluorescence; negative control obtained with primary antibodies omission.

**Results:** First results show a discrete immunoreactivity for neuronal markers (S100, GFAP, PGP9.5, neurofilaments) in normal frozen valve, less intense and with a different distribution in pathologic valves, especially in terminal arborizations. No significant inflammation or endothelial damage was present; morphologic alterations were similar in all leaflets from same valve. Actin was positive in few cells, synaptophysin and CD117 constantly negative.

**Conclusions:** No recent studies on human aortic valve innervation are present in the scientific literature. Our first data concerning aortic valve leaflets innervation suggest that in the aortic valve insufficiency alterations in the nervous fibers are visible and often the main damage. Further studies are requested to better understand if and how the loss of innervation is related to aortic disease and possible differences between coronary and non-coronary leaflets and to understand how peripheral nervous system damage is caused or consequence of valvular damage.

### C17.2

#### USE OF WARM BLOOD CARDIOPLEGIA FOR CORONARY ARTERY BYPASS GRAFTING IN PATIENTS OLDER THAN 75 YEARS OF AGE

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**Objective:** From Jun 2003 to Dec 2004 128 cardiac patients >75 years of age were operated in our institution. 62 of them underwent CABG with administration of warm blood cardioplegia. We evaluated early results of surgical revascularization of coronary arteries in the population of patients >75 years of age, operated with use of normothermic cardiopulmonary bypass and warm blood cardioplegia. We also compared early outcome in patients with normal, impaired and severely impaired left ventricular systolic performance.

**Methods:** 62 CABG patients, mean age 76,5 ( $\pm 2,2$ ) years, 44 men, 18 women were divided into 3 groups—group 1: 34 patients with preoperative LVEF >50%, group 2: 13 patients with LVEF 36 - 49%, group 3: 15 patients with LVEF <35%. We analysed EUROSCORE, total number of coronary grafts, number of arterial grafts, cardiopulmonary bypass time (CPB), aortic cross-clamping time (AXC), inotropic support, incidence of perioperative myocardial infarction or stroke, early survival, time of postoperative mechanical ventilation, length of stay in the postoperative ICU and overall hospitalization time.

**Conclusions:** Use of normothermic cardiopulmonary bypass and warm blood cardioplegia seems to be a safe way of myocardial protection in elderly. The number of perioperative adverse sequelae was significantly higher in patients with impaired preoperative LVEF.

### C17.3

#### 42 AORTIC ARCH REPLACEMENTS UNDER DEEP HYPOTHERMIC CIRCULATORY ARREST AND CEREBRAL PERFUSION

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**Objective:** The aim of our study is to present our experience from aortic arch replacement under deep hypothermic circulatory arrest and cerebral perfusion.

**Methods:** Between years 1997-2005 we performed 42 aortic arch replacements, 31 (73,8%) were male and 11 (26,1%) were females. The mean age of the patients was 64,8 years (range 42-78). All of the patients were smokers or ex-smokers. 34 patients (80,9%) were hypertensive and 10 (23,8%) had a history of diabetes mellitus. 6 patients (14,2%) had a previous stroke and 9 (21,4%) had peripheral ischemic disease. 32 patients (76%) were operated in an emergency basis due to acute dissection of the aorta. In one case we operated on a posttraumatic ruptured aortic arch. We use retrograde cerebral perfusion in 29 patients (69%) and antegrade in 13 (31%). Hypothermic circulatory arrest time was 52 $\pm$ 13 min. Concomitant operations we performed were replacement of the ascending aorta in 34 patients (80,9%), elephant trunk in 2 (4,7%), aortocoronary bypass in 13 (31%), a Bentall operation in 12 (28%), a Cabrol operation in 6 (14%) and descending aorta replacement in 7 (12%) patients.

**Results:** 30 day or in hospital mortality were 8 patients (19%). The main complication was temporary neurologic dysfunction that was noted in 34 patients (80,9%) whereas permanent was noted in 4 patients (9,5%). Acute myocardial ischemia was apparent in 4 patients (9,5%), acute renal failure in 6 (14,2%) and hoarseness in 1 patient (2,3%). 7 patients (12%) had major complications from abdominal ischemia.

**Conclusions:** Aortic arch replacement presents today a surgical challenge for the cardiac surgeon. It is currently accompanied with unacceptable high morbidity and mortality. Deep hypothermic circulatory arrest, optimisation of cerebral perfusion along with myocardial and other vital organ protection are promising techniques in the management of aortic arch diseases.

### C17.4

#### DIFFERENCE IN CEREBRAL DAMAGE MARKERS RELEASE AND NEUROCOGNITIVE OUTCOME AFTER CONVENTIONAL CABG AND OPCAB

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**Objective:** S-100 $\beta$  and NSE proteins have been suggested as markers of brain damage following cardiac surgery. The aim of this study was to examine whether their serum concentrations are different in OPCABG vs. on-pump surgery and relate it to neurological outcome particularly to post-operative neurocognitive dysfunction.

**Methods:** Between 2002-2004, 42 patients undergoing first time CABG were enrolled prospectively. Exclusion criteria were: LVEF<35%, age>70 years, previous MI, associated valvular or cerebrovascular disease, abnormal preoperative carotid vessels, renal dysfunction, coagulopathy. They were divided randomly in group I (n = 24 patients) undergoing on-pump CABG and group II (n = 18 patients) undergoing OPCAB. There was no autotransfusion of shed blood and cardiotomy suction. The transcranial Doppler was performed during operation in all patients. Neurocognitive tests were performed pre-and post-operatively.

**Results:** There was no difference according to the numbers of grafts per patients (P = ns). The total surgical time of the procedure was significantly higher in I versus II (P<0.021). The mean ICU and hospital stay were significantly higher in group I than II (P = 0.005 and P = 0.036, respectively). There were no significant differences in preoperative S-100 $\beta$  and NSE serum concentrations between groups. The postoperative S-100 $\beta$  and NSE levels were increased in both groups, but in II were 0.5 $\pm$ 0.11 ( $\mu$ g/l) and 8.6 $\pm$ 4.2 ( $\mu$ g/l) respectively, significantly lower than in I (P<0.001). Linear regression analysis revealed a significant correlation between CPB duration and S-100 $\beta$  and NSE peak levels (P<0.0021r = 0.36 and P<0.0001r = 0.81 respectively).

There was no evidence of a relationship between these markers and High-Intensity Transient Signals (HITS) in both groups; instead we found a strong correlation between cerebral marker level and performance in neurocognitive tests.

Conclusions: The release of NSE and S-100 $\beta$  protein and decrease perioperative cognitive function are increased in patients undergoing on-pump CABG. The main mechanism of brain damage seems to be the blood-barrier impairment and cerebral cell injury due to inflammatory response caused by CPB.

#### C17.5

##### EVALUATION OF QUALITY IN BLOOD COMPONENTS PRODUCED BY APHERESIS PROCEDURE

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Objective: Latest generation cell separators allow the collection of leucoreduced platelet concentrates and FFP units simultaneously during a single plateletpheresis procedure. The aim of this study was to evaluate the quality of platelets and plasma components obtained from single donors by automated apheresis.

Methods: 135 single-needle plateletpheresis were harvested by means of two automated intermittent-flow separators (MCS3p and MCSplus, Haemonetics). The instruments were programmed to collect an additional plasma unit in every session. The mean harvesting time was 71.2 min. The donors were 113 males and 22 females, mean age 33 years. The mean platelet yield was  $3.2 \times 10^{11}$ /unit. We investigated: a. the in vitro platelet aggregation response, in samples of all final platelet concentrates, after stimulation with ADP, collagen, ristocetin and arachidonic acid (Aggregometer PAP-4C, BioData). b. The recommended from the Council of Europe quality criteria, in 48 FFP units: final volume, residual cells (RBC, WBC and PLT) before freezing (-30°C) and Clotting Factor VIII levels during the first and the last month of storage (Cell Counter Coulter LH 750, Coagulation Analyzer BCT Dade Behring). c. Fibrinogen levels and Clotting Factors V, VII, XI, XII activity, in 20 FFP units, during the first month of storage (Coagulation Analyzer BCT Dade Behring). Results: a. The response of platelets to aggregation inducing stimuli is shown. b. The properties of the FFP units, as well as the percentage that meets the requested quality criteria (Confidence Interval: CI) are summarized. c. The activity of all investigated coagulation factors ranged from 88.04% to 96.05% (mean values), which was within normal limits (70-120%). The mean fibrinogen levels were  $2.82 \pm 0.8$  mg/ml (normal range 1.8-3.5 mg/ml). Totally, about 90% of the tested FFP units had coagulation factor activity within the normal values, while above 95% of the units had normal fibrinogen levels.

Conclusions: From the components collected with modern cell separators, platelets display sufficient in vitro aggregability, while plasma units fulfil the quality requirements and maintain satisfactory levels of coagulation factors and fibrinogen. These components can be safely used for transfusion, as an alternative to whole-blood-derived platelets and plasma, in order to support patients in cardiosurgical settings.

#### C17.6

##### MICROCIRCULATION AFTER EXTRACORPOREAL CIRCULATION: MODULATION BY DIFFERENT COLLOID SOLUTIONS

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Objective: Extracorporeal circulation (ECC) may induce clinical complications caused by activation of cellular and humoral factors followed by an impaired microcirculation. To prevent this systemic inflammatory reaction, different colloids were used as priming solution for the ECC system.

Methods: Intravital fluorescence microscopy was used on the hamster skinfold chamber model. ECC for 30 min was introduced and the ECC-tube system was flushed with different solutions: Ringer solution (control), Dextran60 (group I), HES 10% (group II) and hypersaline dextran solution (7.5% NaCl/+6% Dextran60). Macro- and microcirculatory parameters were assessed at timepoints BL (before ECC), 30 min, 4 h and 24 h after ECC and analyzed offline at a later timepoint.

Results: ECC for 30 min resulted in an increase in rolling and adherent leukocytes in postcapillary venules in the control group (Roller:  $2.7 \pm 2\%$  to  $33 \pm 17\%$  4 h after ECC, mean  $\pm$  SD,  $P < 0.05$ , Sticker:  $20 \pm 16$  cells/mm $^2$  to  $129 \pm 108$  cells/

mm $^2$  4 h after ECC,  $P < 0.05$ ;  $n = 7$ ). Use of Dextran prevented L/E cell interaction (Roller:  $10.2 \pm 5.5\%$ ; Sticker:  $53 \pm 37$  cells/mm $^2$  at 4 h), whereas HES only showed an attenuating effect on adherent white cells ( $87 \pm 66$  cells/mm $^2$  at 4 h). Hypersaline Dextran solution was not effective when compared to control group. Hemodynamics showed no significant changes during the observation period in all groups.

Conclusions: Dextran60 showed an inhibitory effect on L/E cell interaction in comparison to the other colloids. The stronger protective effect of Dextran is more likely due to its pharmacologic properties than to the colloidal effect. Therefore Dextran60 is an interesting priming solution for ECC in regard to inhibition of SIRS.

#### C17.7

##### EFFECT OF APROTININ ON OXIDATIVE STRESS AFTER CARDIOPULMONARY BYPASS

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Objective: We tested if aprotinin has any protective effects on oxidative stress which is seen after cardiopulmonary bypass (CPB).

Methods: Thirty patients who underwent elective coronary artery bypass graft surgery were included in the study. High dose of aprotinin (induction and continuous infusion) was given during surgery to the study group (group I;  $n = 15$ ), while no aprotinin treatment was applied to the control group (group II;  $n = 15$ ). Demographic, pre-, peri- and postoperative parameters of the patients were recorded and compared. Plasma lipid hydroperoxides, total thiol, protein thiol, nonprotein thiol (as markers of extracellular oxidative stress) and erythrocyte reduced glutathione (as a marker of intracellular oxidative stress) levels were analyzed by colorimetric methods before induction, and 6 and 24 h of initiation of CPB. Amount of changes according to the basal values were calculated and compared in both groups.

Results: Demographic, pre- and postoperative parameters were similar, except higher values in iron binding capacity ( $290.0 \pm 49.9$  mg/dl vs.  $223.1 \pm 56.8$  mg/dl;  $P < 0.05$ ) and hemoglobin ( $14.2 \pm 1.4$  g/dl vs.  $12.8 \pm 1.4$  g/dl;  $P < 0.05$ ) values in Group I. The patients in Group I required less mechanical ventilation time ( $7.9 \pm 2.5$  h vs.  $11.1 \pm 2.5$  h;  $P < 0.01$ ) and less blood and blood products usage with significantly less postoperative bleeding. Basal values for oxidative stress markers were similar in both groups, except higher non-protein thiol values ( $1.13 \pm 0.32$   $\mu$ mol/l vs.  $1.80 \pm 0.41$   $\mu$ mol/l;  $P < 0.05$ ) in Group II. But amounts of increase in time were similar in both groups. Lipid hydroperoxides levels decreased compared to the basal values in both ischemia (6th h) and reperfusion (24th h) phases ( $-0.66 \pm 1.67$   $\mu$ mol/l and  $-0.60 \pm 1.72$   $\mu$ mol/l, respectively) in Group I, while increased ( $+0.20 \pm 0.77$   $\mu$ mol/l and  $+0.46 \pm 0.63$   $\mu$ mol/l, respectively) in Group II ( $P < 0.05$  and  $P < 0.05$ , respectively). Erythrocyte glutathione levels decreased in time in both groups, but amount of decrease was higher in 24th h in Group II ( $-19.40 \pm 18.04$  mg/dl vs.  $-7.54 \pm 8.91$  mg/dl;  $P < 0.05$ ). Although statistically not significant, protein thiol, non protein thiol and total thiol levels trended to decrease more in time in the control group compared to the study group.

Conclusions: Decreased lipid hydroperoxide levels after ischemic and reperfusion phases suggest that aprotinin improves oxidative burden after CPB. However, decrease on erythrocyte reduced glutathione levels in reperfusion phase is intriguing. Although mechanism is not clear, aprotinin might induce intracellular glutathione consumption or inhibit reduction of oxidized glutathione. Therefore, in order to clarify antioxidant mechanisms of aprotinin, studies that analyze intracellular and extracellular redox balance are required.

#### C17.8

##### RESULTS WITH REOPERATION IN THE INTENSIVE CARE UNIT AFTER CARDIAC SURGERY

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Objective: The majority of our early cardiac reoperations are done in the intensive care unit (ICU). Our objective was to collate our results, compare them with results in the literature, and evaluate the ICU environment for cardiac re-operation.

Methods: The study includes 79 patients who were re-operated on in the ICU after undergoing cardiac surgery. These patients represent 5.3% of all

cardiac surgery patients ( $n = 1482$ ) between 1997 to 2004 and 97.5% of reoperations ( $n = 81$ ). Mean age was  $66 \pm 8$  years. The original operative procedures were CABG in 29 cases, valve replacements in 33, CABG plus valve in 11, and others 8. The reasons for re-operation were bleeding or cardiac tamponade (49 patients, 62%), delayed sternal closure (2 patients, 2.5%) and cardiac arrest or low cardiac output (28 patients, 35%). Many of the patients requiring re-operation had antecedents of renal insufficiency, low ejection fraction and chronic obstructive pulmonary disease (COPD). The same aseptic procedures were used as in the operating theatre except that patients were in their beds, there was no high-pressure air conditioning and there was not the same degree of isolation. ICU medical staff were responsible for anaesthetics and hemodynamic control. After re-operation, patients received conventional antibiotic therapy (Cefazolin or Vancomycin) for 72 h.

Results: Mortality was higher for re-operation than for straightforward initial operation. Mortality after reoperation for cardiac arrest was more than twice as high as after reoperation for bleeding and delayed closure ( $P < 0.001$ ). The rate of sternal wound infection was higher after reoperation than after a straightforward initial operation (2.5% vs. 0.3%) ( $P < 0.001$ ). None of the patients developed prosthetic valve endocarditis. Incidence of myocardium infarcts, incidence of multisystem organ failure, need for inotropic support, need for mechanical ventilation, days in the ICU, and days with open chest were all significantly higher in patients reoperated on for reasons of cardiac arrest ( $P < 0.001$ ).

Conclusions: The rates of infection we observed in the ICU are similar to those in the few reports published for reoperation in the ICU and within the range accepted for early reoperations in the operating theatre. The advantages of the ICU relative to the operating theatre for cardiac surgery reoperations are many: it is not necessary to move unstable patients, it is not necessary to prepare and occupy an operating room, the demands on human resources (such as anaesthetists and nurses) are reduced, the response time is faster, the cost is reduced.

#### C17.9

##### EARLY HEMODYNAMIC, MORPHOLOGIC AND BIOCHEMICAL MODIFICATIONS IN OVERLOADED WINE LEFT VENTRICLE

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Objective: Sarcoplasmic reticulum (SR)  $\text{Ca}^{2+}$ -ATPase (SERCA2a) plays a pivotal role in myocyte function and its expression level decreases in hypertrophy and heart failure. Few reports exist conducted on large mammals and focused on  $\text{Ca}^{2+}$  handling modifications in early phases of pressure overload. Methods: To investigate on the role of SR, SERCA2a  $\text{Ca}^{2+}$  transport and acylphosphatase in the early overloaded myocardium and to correlate these changes to hemodynamic modifications, we subjected 54 farm pigs to acute pressure overload. Pigs were compared at 0.5, 3, 6, 12, 24, 48, 72, 96 and 168 h to sham-operated controls ( $n = 18$ ).

Results: All indices of left ventricular function reduced significantly with a peak at 6 h. At 168 h values returned to baseline. At each observational time both SR  $\text{Ca}^{2+}$ -ATPase activity and  $\text{Ca}^{2+}$  uptake, as well as acylphosphatase activity enhanced significantly with a maximum increase at 6 h; in addition a positive and significant correlation was found between these parameters. These changes reflected a higher expression of these proteins, while phospholamban did not show significant changes in its concentration nor in its phosphorylation status. Nuclear proto-oncogene c-fos expression raised at 6 h. A strong inverse correlation was found between  $\text{Ca}^{2+}$ -ATPase activity,  $\text{Ca}^{2+}$ -ATPase expression,  $\text{Ca}^{2+}$  uptake and acylphosphatase vs. indices of systolic function.

Conclusions: These data suggest that a transient reduction in LV function occurs in the early phase of pressure overload and this biochemically translates in enhanced SR function, higher  $\text{Ca}^{2+}$ -ATPase and  $\text{Ca}^{2+}$  uptake activities. Acylphosphatase seems to play an important role in these modifications through a SERCA 2a regulation. Nonetheless further studies need to confirm our findings.

## SCIENTIFIC SESSION C18 MISCELLANEOUS

### C18.1

#### FIRST EXPERIENCE WITH CLOSED CIRCUIT/CENTRIFUGAL PUMP EXTRACORPOREAL CIRCULATION

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**Objective:** Closed circuit extracorporeal circulation comprising a centrifugal pump has recently been introduced to reduce inflammation and coagulation disturbances. The purpose of this initial study was to evaluate safety, efficacy, and clinical benefits of such a system.

**Methods:** 20 patients underwent isolated routine coronary artery revascularisation. 10 patients underwent conventional extracorporeal circulation (ECC) with open, passive venous return into a reservoir and roller pump as the main circulatory device. 10 patients were operated upon using a commercially available closed circuit/centrifugal pump system with coated surfaces (IDEAL/SYNERGY, Stöckert, Munich, Germany). Both groups did not differ regarding age, body mass index, left ventricular function, number of bypasses, and concomitant diseases. Free hemoglobin (fHb), plasmin-anti-plasmin complex (PAPc), platelet function (EXTEC), and interleukin 6 (IL-6) were measured preoperatively, intraoperatively (after sternotomy, during X-Clamp, during reperfusion, post ECC or IDEAL), and postoperatively. Fluid balance, drainage loss, and hospitalisation were assessed and compared.

**Results:** Technical problems such as inadvertent venous air suction were not observed. While PAPc and EXTEC did not differ significantly the IDEAL group demonstrated significantly less fHb during bypass as well as less increase in IL-6 after bypass and postoperatively. In IDEAL fluid balance was significantly lower than in ECC (IDEAL: 680±322 ml; ECC: 1371±510 ml) whereas drainage loss and hospitalisation did not differ statistically. All patients demonstrated an uneventful postoperative course.

**Conclusions:** Extracorporeal circulation with a closed circuit/centrifugal pump system can be routinely employed and appears to be safe. Intraoperative and early postoperative reduction of red blood cell trauma and inflammation are of potential value. As this initial series is too small to derive a clear clinical benefit, studies on a larger scale are required. However, the first successful evolutionary steps towards truly minimally invasive extracorporeal circulation have been taken.

### C18.2

#### EFFECT OF EPTIFIBATIDE ADMINISTRATION IN PATIENTS WITH ACUTE CORONARY SYNDROME WITH NON-ST SEGMENT ELEVATION REQUIRING CABG

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**Objective:** Aggressive complex anti-aggregative treatment with aspirin, fractionated heparin and platelet GP IIb/IIIa inhibitors is an important strategy involved in PCI procedure preserving myocardial microcirculation during mechanical reperfusion for myocardial ischaemia. Comparable or even higher potential benefit could be observed in patients undergoing CABG for acute coronary syndrome without ST elevation (NSTEMACS) where the period of ischaemia and subsequent reperfusion is relatively longer. However patients exposed to eptifibatide in the setting of urgent or emergency CABG may be at risk of increased bleeding. The aim of the study was to evaluate the efficacy and safety of eptifibatide administration in the high risk group of patients with NSTEMACS, requiring CABG.

**Methods:** In our study 45 patients with NSTEMACS qualified for surgical revascularization were prospectively randomized into two groups. 23 patients in the study group apart from routinely administered enoxaparin and aspirin received additionally eptifibatide (180 µg/kg bolus plus 2 µg/kg/min infusion) 24 h prior to surgery. The control group consisted of 22 patients who received only enoxaparin and aspirin before surgery. The CABG was performed in all patients 4 h after discontinuation of eptifibatide infusion. The primary end point were MACE defined as: cardiac related death, myocardial infarction, stroke and recurrence of angina pectoris symptoms in 30 days following surgery. The assessment of eptifibatide administration safety was based on the occurrence of bleeding complications. Secondary end point was the perioperative profile of TnI (2 h before CABG, 1, 6, 12, 24, 48 h after surgery).

**Results:** The safety of eptifibatide administration in patients with NSTEMACS was proved by comparable MACE rate (8.7% vs. 13.5%,  $P = ns$ ) and lower bleeding complications in comparison with controls. There was no mortality in 30-days observation in both groups. There was no difference between both groups regarding perioperative MI (8.7% vs. 9%,  $P = ns$ ) and stroke incidence (0% vs. 4.5%,  $P = ns$ ). The most interesting were major bleeding rate in control group compared to study group (950 ml vs. 430 ml,  $P < 0,05$ ). There was a significantly lower TnI peak level (5,5 ng/ml vs. 2,1 ng/ml,  $P < 0,05$ ) in eptifibatide group. Additionally, platelet counts after surgery were higher in the patients who received eptifibatide.

**Conclusions:** Administration of eptifibatide immediately before coronary artery bypass grafting is safe and does not increase postoperative bleeding. Lower TnI peak release in study group may reflect less frequent microemboli and microinfarcts in the postoperative period.

### C18.3

#### THE ROLE OF EUROSCORE IN PREDICTING THE COSTS AND COMPLICATIONS OF CARDIAC SURGERY

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**Objective:** To determine the correlation between EuroSCORE and the costs of cardiac surgery, the patients, intensive care length of stay and incidence of selected postoperative complications were studied.

**Methods:** Data from all 1054 patients undergoing cardiac surgery in our institution in 2004 were prospectively collected. The mean age of the patients was 60.1±9.8. There were 757 males (72%). 842 (80%) had isolated coronary operation, 96 (9,1%) combined procedures, 94 (8,9%) valvular operations, 22 (2%) other procedures. The mean EuroSCORE and EuroSCORE Logistic for all patients was 3.3±2.6 and 4.4±6.5. The statistical analysis of the data was performed in order to establish the predictive ability of the scoring systems.

**Results:** The hospital mortality was 3.9%. Costs were significantly correlated with EuroSCORE ( $P = 0,0000001$ ,  $r = 0,3$ ). The costs increase by 4,3% for each EuroSCORE logistic point (and by 10,6% for each standard Es level). Similar correlation was noted for postoperative intensive care length of stay. We have also noted that certain complications like low output syndrome, kidney or respiratory failure were correlated with EuroSCORE.

**Conclusions:** EuroSCORE can be used not only to predict the mortality but also the cost of treatment, length of stay in the intensive care and certain complications like: low output syndrome, kidney or respiratory failure.

### C18.4

#### CLINICAL BENEFIT OF PROPHYLACTIC USE OF ROBICSEK'S STERNAL REINFORCEMENT IN HIGH RISK PATIENTS

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**Objective:** Sternal dehiscence is considered to be a very important complication in cardiac surgery because of the risk of mediastinitis, the pain and the mechanical ventilatory disturbances that generates in operated patients. Our objective was to evaluate prospectively the potential clinical benefits of routine prophylactic use of Robicsek's sternal reinforcement in high risk of dehiscence patients undergoing major cardiac surgery.

**Methods:** Among 383 consecutive patients operated on consecutively in our institution, a high risk of sternal dehiscence group was defined, including 141 patients that met at least one of the following criteria: obesity with body mass index (BMI) superior to 30, chronic obstructive pulmonary disease (COPD), sternal osteoporosis and use of double internal mammary artery. This high risk group represented 36,8% of all cases, 51,1% were male and 48,9% female (vs. 58,3% and 41,7% respectively in the whole group); mean age was 66,8±9,9 years-old and BMI was 33,6±18,3. A Robicsek's sternal bilateral prophylactic reinforcement was employed in every high risk patient, immediately after opening the sternum. The sternum was approximated using two or three simple-wire sutures in the manubrium, 3-4 double-wire swaged to a blunt needle peristernal sutures and one simple-wire in the xifosternal junction; all the transversal sutures were implemented laterally to the reinforcement longitudinal lines in both hemisternal sides.

Results: No sterile dehiscence occurred in the Robicsek's group. Only one case (0,7%) with COPD from the reinforced group presented sternal dehiscence due to osteomyelitis, with good response to surgical debridement associated to intravenous antibiotherapy. No complications associated to reinforcement technique were found. Ten cases (7,1%) of superficial wound infection without sternal involvement were detected and all of them had a good response to antibiotherapy and surgical treatment.

Conclusions: 1) In our experience, the routine use of Robicsek's sternal reinforcement in high-risk patients decreases the incidence of dehiscence. 2) Performing the sternal reinforcement before using the retractor could be protective against transverse fractures. 3) We firmly recommend the prophylactic sternal reinforcement in patients with BMI>30, sternal severe osteoporosis or double mammary artery use.

#### C18.5

##### PILOT STUDY OF ATHEROSCLEROSIS AND NON-ATHEROSCLEROTIC LESIONS IN 100 CONSECUTIVE LEFT INTERNAL THORACIC ARTERIES—IMPLICATIONS FOR CORONARY ARTERY BYPASS SURGERY

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Objective: The left internal thoracic artery (LITA) grafting to the left anterior descending artery (LAD) has been demonstrated to be the most important determinant of survival and of minimizing late cardiac events in patients undergoing coronary artery bypass grafting (CABG) surgery. Atherosclerosis and other non-atherosclerotic lesions of the LITAs are thought to be rare causes for their discard in CABG surgery. This pilot study intends to determine the incidence of atherosclerotic and non-atherosclerotic lesions, leading to discard of LITAs, in CABG surgery patients.

Methods: Unobstructed free flow in 100 consecutive LITAs, was examined. Each LITA with free flow = 40 ml/min was pharmacologically treated with combined vasodilator solution and re-tested after 10 min. Discarded LITAs and distal 3 cm segments of LITAs with acceptable flow, but macroscopically evident vascular wall changes, were histologically examined.

Results: Harvesting injury was evident in 2 of 100 grafts (1 definitive). In the remaining 98 (100%), included in pilot study, initially low free flow was present in 37 (37.7%) LITA grafts. Pharmacological treatment improved flow in 29 (29.6%), while 8 (8.2%) LIMAs were discarded. Overall incidence of LITA atherosclerotic and non-atherosclerotic lesions was 14.3% (14) and 2% (2) respectively, leading to LITA discard rate of 8.2% (8). Advanced atherosclerosis (type 4 and 5) was verified in 5.1% while low-grade (type 1-3) lesions were evident in 9.1% (9) of LITAs.

Conclusions: High overall incidence (14.3%) of atherosclerotic lesions, producing unacceptably high LITA discard rate (5.1%), suggests very poor primary and secondary prevention of the atherosclerosis in our patients. In addition, the incidence of non-atherosclerotic lesions (2%) urges for much wider preoperative scope in estimation of LITA suitability. Further study should identify the most relevant risk factors, leading to advanced disease of the most valuable CABG graft.

#### C18.6

##### CORONARY BYPASS GRAFTING IN PATIENTS RECEIVING ASPIRIN AND CLOPIDOGREL

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Objective: To present the management protocol of patients who receive aspirin (ASA) and clopidogrel 2-3 days prior to coronary bypass grafting (CABG).

Methods: During the period Oct 2000 - Oct 2004, out of 636 patients who underwent CABG, 224 patients (35.2%) continued to receive ASA and clopidogrel up to 2-3 days prior to CABG because of the urgency of the procedure. To these patients 2 g of tranexamic acid IV, 1 g in 5 min before the induction

of anesthesia and 1 g during cardiopulmonary bypass (CPB) (86 patients - 38.4%) or aprotinin 1.000.000 U before the induction of anesthesia and prior to heparin administration and another 1.000.000 U during CPB (138 patients - 61.6%) were given. The choice of tranexamic acid or aprotinin was based on (a) the age of the patient, (b) the presence of left main coronary artery disease (LMCA) and (c) the renal function. In general, aprotinin administration was avoided in patients with LMCA, in renal dysfunction (creat > 1.4 mg) and younger patients with the expectation of a reoperation.

Results: With the administration of these drugs, there was no reoperation for bleeding whereas there were 5 reops (0.8%) for surgical bleeding. These results are better than our previous experience before 2000, when postoperative bleeding was high (2.5%) and secondary to ASE/Clopidogrel use and no Trasylol or Tranexamic administration prior to CABG.

Conclusions: The aggressive administration of tranexamic acid or aprotinin in patients who undergo CABG and receive ASA and clopidogrel 2-3 days prior to CABG is safe and effective for the control of pharmaceutical postoperative bleeding.

#### C18.7

##### INCREASED MORTALITY IN SEVERELY HYPOPHOSPHATEMIC PATIENTS AFTER OPEN HEART SURGERY

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Objective: Postoperative hypophosphatemia is a multifactorial event and it has been associated with high mortality rates (>30%) in patients admitted to general ICUs. Hypophosphatemia may anticipate adverse outcome, either because it reflects an early and stronger acute-phase response with shift of phosphate from extra- to intravascular space or because it impairs high-energy substrate availability for host defense and other vital cell functions. To determine the impact of severe hypophosphatemia (<1.5 mg/dl) in mortality of patients referred to a Tertiary Cardiac Surgery Center for open heart surgery.

Methods: Retrospective noninterventional study. Hospital database was used to identify patients, who admitted to Surgical ICU after open heart surgery and developed severe hypophosphatemia for the period of July 1993 to May 2002.

Results: A total of 906 measurements with serum phosphate level = 1.5 mg/dl were identified in 824 operated patients. As shown, the worse the hypophosphatemia the higher the postoperative mortality. \* denotes  $P < 0.002$  vs. entire population.

Conclusions: Our data indicate that phosphate levels <0.4 mg/dl after open heart surgery is associated with 5-fold increase in mortality rates. Further studies will be required to evaluate if aggressive correction of hypophosphatemia would improve outcome.

#### C18.8

##### ABDOMINAL COMPLICATIONS ASSOCIATED WITH CARDIAC SURGERY

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Objective: Gastrointestinal complications after cardiac surgery are associated with a high mortality rate. Because of the absence of early specific clinical signs, diagnosis is often delayed. This retrospective study seeks to determine predictive risk factors for subsequent GI complications after cardio-surgical procedures.

Methods: In our department from 1.01.2001 to 31.12.2003, 4606 patients underwent cardiac operation, 74 patients were identified with acute GI complication. We divided them in two groups: A with and B without GI complications. Demographic, pre-, intra- and postoperative variables were collected from their case notes.

Results: In group A were performed: coronary revascularisation in 47, valves and valves with grafts in 19, AAA in 4 and OHT in 4 patients. 20 patients were treated surgically with success in 5 patients and 54 were treated conservatively with mortality rate 66,7%. Mesenteric ischemia and necrosis were found in the majority of them. Comparing control group to group with GI complications by univariate analyses significant associations were: age, euroscore, reoperation, postoperative acute ischemia or PMI, perioperative cardiac arrest, acute renal failure and low cardiac output. Neither CPB

time and aortic cross clamp time, sex, diabetes and operation without CPB achieved significance.

Conclusions: GI complications although of low incidence, carry a very high mortality and because of the absence of early specific clinical signs it requires a high degree of awareness. GI complications appear to be significantly associated with: age, Euroscore count, reoperation, perioperative ischemia, low cardiac output and acute renal failure.

#### C18.9

##### **SURVIVAL IN EMERGENCY AND PROPHYLACTICALLY OPERATED PATIENTS WITH MARFAN SYNDROME**

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Objective: Marfan syndrome (MFS) is an autosomal dominant heritable connective tissue disorder. Affected patients (pts) are at risk of aortic dissection. The diagnosis is primarily based on well-defined clinical criteria (Ghent

Nosology). Early diagnosis may be helpful to start prophylactic treatment. The aim was to evaluate survival in emergency and prophylactically operated pts with MFS.

Methods: Between 1987 and 2003, 96 pts were diagnosed as having MFS, with end points: death, aortic root dissection (AD), and prophylactic aortic root replacement. For prophylactic surgery the inclusion criteria were: (1) aortic root diameter = 55 mm, (2) positive family history of aortic dissection and aortic root diameter = 50 mm, and (3) aortic root growth = 2 mm/year. Forty pts underwent aortic root replacement in MFS in our clinic and were divided into two groups: group A: prophylactic repair ( $n = 15$  pts), group B: AD surgery ( $n = 25$  pts). Outcomes following emergency surgery ( $n = 14$  pts, all of the group B) and prophylactic aortic root replacement were compared.

Results: There was no significant difference between prophylactically and in emergency operated patients in age ( $30 \pm 16$  years vs.  $37 \pm 10$  years), gender (male 87% vs. 50%), family history (66% vs. 47%), left ventricular diameter and in follow-up time ( $49 \pm 26$  vs.  $47 \pm 35$  months), respectively. We found significance between the two groups.

Conclusions: Improvement in prognosis of Marfan syndrome might be achieved by early detection of the syndrome and by early prophylactic treatment.

## CARDIAC POSTERS

### 1. AORTOCORONARY BYPASS GRAFTING WITHOUT CARDIOPLEGIC ARREST IN PATIENTS WITH RECENT MYOCARDIAL INFARCTION

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**Objective:** Global myocardial ischemia despite improvements in cardioplegic techniques can be deleterious for the recently injured myocardium. We evaluated the early and midterm outcomes of CABG without cardioplegic arrest, off or on pump, in patients with recent ( $\leq 1$  month) MI.

**Methods:** The records of all consecutive patients with recent transmural MI who underwent isolated CABG in a 1-year period were reviewed ( $n = 47$ , 26% female). Mean age was  $66.2 \pm 7.6$  years, mean LVEF  $40.5 \pm 7.5\%$ . Time intervals between MI and CABG were less than 6 h (3 patients, 6.4%), 6 h to 7 days (7 patients, 15%), 1 to 4 weeks (37 patients, 78.7%). The patients operated within 6 h had evolving MI after coronary angiography or angioplasty. All other patients had postinfarction angina, refractory to medical treatment. Additionally 17% had life-threatening anatomy and 13% had postinfarction complications. All patients were operated by the same surgeon, 70% off-pump, 30% on pump-supported, empty, beating heart. The decision was made preoperatively or early intraoperatively, with no conversion. The mean number of grafts was  $2.8 \pm 0.8$ . Although the mean LVEF was lower, circumflex grafting, and the mean number of grafts were higher in the on-pump group, the only statistically significant variable was the mean EuroSCORE, which was higher in the on-pump group ( $7.1 \pm 2.8$  vs.  $5.5 \pm 2$ ,  $P = 0.02$ ).

**Results:** Early mortality was 4.2%, (salvation operation in one patient, inferior wall infarct expansion in another patient with LVEF of 30%, both operated on-pump). Cardiogenic morbidity was 4.2% (successfully treated VT, in two patients operated off-pump). Mean hospital stay was  $9.4 \pm 7.3$  days. Mid term follow up (mean: 7.9 months) showed that all but one early survivor remained alive (97.7%).

**Conclusions:** We did not attempt comparison between the on and off pump group because it would be an unmatched comparison. 30% of our patients could not tolerate OPCABG (cardiogenic shock, pulmonary edema, haemodynamic instability). Our speculation that pump support may be required in high-risk patients (especially with cardiac-related risk factors) was documented in this subgroup of patients, since we showed a higher mean EuroSCORE in those that required pump support. Pump supported empty beating heart (or other biventricular or univentricular support) can be an acceptable trade-off, since global ischemia of the recently infarcted myocardium is avoided. Myocardial revascularization on beating heart, off or on-pump, is reasonably safe and effective in patients with recent MI.

### 2. CYCLOSPORINE INDUCED NEUROPATHY AFTER HEART TRANSPLANTATION IS REVERSIBLE BY CONVERSION TO RAPAMYCIN

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**Objective:** Use of immunosuppressants after heart transplantation is accompanied by known side-effects, especially in the case of cyclosporine. Literature reports of nephrotoxicity, hypertension, an increase in the incidence of deep venous thrombosis, a variety of neurological complications like hyperglycemia, dyslipidemia, hepatotoxicity, gingival hyperplasia and hypertrichosis. Information about neurologic complications is scarce.

**Methods:** We describe the case of a 58 year-old patient who underwent orthotopic heart transplantation for ischemic cardiomyopathy. Transplantation procedure was straightforward. Postoperative heart function was excellent. **Results:** Three weeks after onset of immunosuppression using triple therapy with cyclosporine, mucomofetilphenolate (MMF) and prednisone the patient developed tremor and repeated general seizures. CCT showed a mainly right sided frontal leukoencephalopathy, leading to the diagnosis of a neuropathic encephalopathy after exclusion of other possibilities. Immunosuppression was switched to sirolimus instead of cyclosporine. No major adverse side effects of sirolimus were noted, especially no wound healing problems. Neurologic symptoms disappeared and CCT-findings faded in the next 3 months, when only small residues could be detected. 2 years after transplantation the patient is in a very good physical shape without any neurologic deficiencies.

**Conclusions:** Side effects like neurological complications and morphological changes under CSA therapy, as evidenced by CCT, can be reversed by conversion to rapamycin.

### 3. CARDIAC PACING FOLLOWING OPEN HEART SURGERY

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**Objective:** To study the incidence of permanent pacing (PP) and to determine perioperative predictors of PP requirement following open heart surgery.

**Methods:** Retrospective data collected on 3387 consecutive postoperative patients, during a 2-year period concerning the need for PP. Implantation of PP was done after 6th postoperative day ( $5.84 \pm 2.8$ ) with these indications: sick sinus syndrome (SSS), atrial fibrillation with low ventricular response (AFib), atrioventricular block (AVB) and combined AVB/SSS.

**Results:** In 64 patients (Group P) (1.89%), 40 men (62.5%) and 24 women (37.5%), a PP was inserted postoperatively. The following required PP: 11 patients (17.2%) undergoing CABG, 6 patients (9.4%) multiple valve replacement (VR), 44 patients (68.7%) aortic valve replacement (AVR)± other and 3 patients (4.7%) mitral valve replacement (MVR). 25 patients with PP were pacemaker dependent (39%). 17 VVIR (26.6%) and 47 DDDR pacemakers were implanted (73.4%). Comparing Group P to those patients not requiring PP (Group NP), in Group P: mean age was not statistically different ( $65.9 \pm 12.4$  vs.  $64.73 \pm 9.04$ ,  $P = NS$ ), the proportion of female patients was higher, incidence of preoperative rhythm abnormalities was higher (54.68% vs. 23.61%,  $P < 0.005$ ), NYHA III-IV was more frequent (46.9% vs. 36.6%,  $P = 0.116$ ), cardiopulmonary bypass time (CPB) was longer ( $132.2 \pm 47.3$  min vs.  $89.5 \pm 19.5$  min) ( $P < 0.0005$ ), incidence of aortic valve surgery was higher (68.8% vs. 24.6%,  $P < 0.0005$ ), 20 patients (31.23%) suffered from SSS, 7 patients (10.3%) from AFib with slow ventricular response, 34 patients from AVB (53.2%) and 3 patients (4.68%) from combined AVB/SSS. There was no mortality in P Group. PP after heart surgery had a significant impact on resource utilization with prolonged mechanical ventilation ( $17.7 \pm 8.3$  h), longer intensive care unit stay ( $4.3 \pm 4.0$  days) and postoperative hospital stay ( $12.9 \pm 4.7$  days).

**Conclusions:** The incidence of PP after open heart surgery is 1.89%. Aortic valve surgery, CPB time, preoperative rhythm disturbances (absence of sinus node, intraventricular conduction abnormalities) and the female sex all constitute perioperative predictors of PP requirement. PP after open heart surgery does not aggravate the patients, outcome.

### 4. SAFETY AND EFFICACY OF THE NOVEL CALCIUM SENSITIZER LEVOSIMENDAN AFTER OPEN HEART SURGERY: OUR EXPERIENCE FROM A PILOT STUDY

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**Objective:** To evaluate the safety and efficacy of levosimendan (LS) in patients after open heart surgery.

**Methods:** The studied population consisted of 15 patients who received LS the earliest 48 h after open heart surgery (33.3% CABG, 16.7% VR (valve replacement), 50% CABG+VR). 12.5 mg of LS were infused at a rate of 0.1-0.2  $\mu\text{g}/\text{kg}/\text{min}$  (without loading dose). Patients were prospectively selected to receive LS, if: (a)  $\text{CI} < 2.0$  l/min/m<sup>2</sup>, PCWP > 18 mmHg, (b) postoperative LVEF < 35%, instead of support with the use of other inotropic drugs with or without IABP. We investigated the safety and tolerance of LS, the haemodynamic profile, the echocardiographic estimation of LVEF, the duration of IABP and classical inotropic support, the weaning success and the patients, outcome.

**Results:** LS did not provoke arrhythmogenic activity, did not cause changes in the ECG suggesting ischaemia favourable haemodynamic actions and was well tolerated with the simultaneous infusion of norepinephrine, when required. The patients became independent of IABP and high doses of 2 other inotropes within 3 days, with successful weaning for 12 (80%) and reintubation in 2 patients (13.3%). A remarkable urine flow amelioration was also present, which confirms the haemodynamic stabilization of these patients. 3 patients died because of MODS due to sepsis. The rest had a good outcome of 6 months.

**Conclusions:** LS constitutes a promising positive inotropic agent, a really important therapeutic means, safe for patients after open heart surgery with direct and prolonged beneficial effect. It has the potential to treat low cardiac output patients after cardiac surgery, caused by stunning effect, insufficient cardioprotection or perioperative myocardial infarction.



**5. EARLY N-TERMINAL PRO-BRAIN NATRIURETIC PEPTIDE INCREASE DURING ACUTE MYOCARDIAL INFARCTION PREDICTS THE NEED FOR SUBSEQUENT CORONARY ARTERY BYPASS GRAFTING SURGERY**

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**Objective:** Increased N-terminal pro-brain natriuretic peptide (NT pro-BNP) levels in patients with acute myocardial infarction have been shown to correlate with adverse long term outcome. It is unknown, however, if NT pro-BNP level measurement during acute myocardial infarction can be helpful in detecting patients who would benefit from coronary artery bypass grafting surgery (CABG).

**Methods:** We studied 39 consecutive patients admitted in the CCU with an acute Q wave myocardial infarction. NT pro-BNP was measured on admission and 12 h later. Patients were followed for 1 month after hospital discharge. All of them underwent coronary angiography during this period. The patients were considered to be suitable for CABG (CABG Group) if they had three vessel disease, left main disease, or lesions that were not technically appropriate for coronary angioplasty. Otherwise patients were classified in the non-CABG group. All values are expressed as mean (SD). Comparison between numerical variables is performed using unpaired *t*-tests.

**Results:** The clinical profile of patients who needed CABG compared to those that did not is shown. Area under the ROC curve for NT pro-BNP increase from baseline to 12 h was 0.677 (confidence interval 0.51 to 0.82) indicating an ability to predict patients who would need CABG surgery. An NT pro-BNP increase of >70 pmol/l had a positive likelihood ratio of 5.81 and a negative likelihood ratio of 0.67 for the prediction of patients for whom CABG surgery should be required. **Conclusions:** NT pro-BNP level measurement early in the course of acute myocardial infarction is promising for the detection of patients who would benefit from CABG, since it may identify patients with the most severe coronary artery disease.

**6. INTEGRATED MYOCARDIAL REVASCLARISATION: COMBINATION OF PTCA AND CABG**

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**Objective:** Coronary heart disease still remains the main cause of death. Myocardial revascularisation is not always possible to obtain with PTCA or CABG alone. With challenging techniques in coronary angioplasty more and more patients undergo PTCA. Still we have a large group of patients for CABG. But there is a group of patients who undergo integrated myocardial revascularisation: PTCA and CABG.

**Methods:** Each year in our center we perform about 600 CABG operations. During years 2002-2004 we performed 111 CABG after PTCA with or without stent implantations (21 of them off-pump CABG). 81 were male patients (age 39-75 years), 30 female patients (age 58-73 years). Main reasons for necessary CABG was: progression of coronary heart disease- 58, unsuccessful angioplasty 12, restenosis after angioplasty 79, and planned integration 21. 11 operations were performed after emergency life saving angioplasties. 18 patients before surgery had recurrent PTCA (2x-13,3x-4,6x-1). Number of bypass grafts varied from 1 to 5.

**Results:** Reoperation due to bleeding was observed in 15 cases (8 patients had surgical bleeding). Perioperative myocardial infarction with heart failure and inotrope support was observed in 4 patients (2 of them we lost, mortality 1.8%). Acute renal insufficiency with renal function support was observed in 6 cases. **Conclusions:** We suggest integrated myocardial revascularisation could be a method of choice: in high-risk patients with serious comorbidities and low ejection fraction of left ventricle, in younger patients who require smaller incisions and faster recovery, in patients who should avoid use of CPB, in patients after life saving emergency PTCA with residual stenosis in coronary arteries.

**7. IS OFF PUMP CORONARY ARTERY BYPASS FEASIBLE IN ALL HIGH-RISK PATIENTS? RISK FACTORS OF PROGNOSTIC VALUE REGARDING THE NEED TO USE CARDIOPULMONARY BYPASS SUPPORT**

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**Objective:** There is some evidence that high-risk patients benefit the most from avoidance of CPB. Although it has been reported that OPCAB is applicable in 90% or more of all referrals, OPCAB is still not always feasible in unselected high-risk patients. Conversion to on-pump is related to increased morbidity and mortality. In the absence of established indications, defining risk factors of prognostic value regarding the need of pump support is valuable in making early and appropriate choices. The primary end point of this study is to give evidence in this direction.

**Methods:** We reviewed all CABG cases during a period of 14 months that fulfilled at least one of the following: EuroSCORE $\geq$ 6, LVEF  $\leq$ 35%, recent ( $\leq$ 30 days) MI, (*n* = 93, 27% female). Other variables studied were: age, gender, unstable angina, diabetes, number of grafts, circumflex grafting, and redo. The choice for CPB support was made preoperatively or early intraoperatively, with no conversion. All hemodynamically and electrically stable patients, i.e. 69% were operated off-pump, 31% were operated on CPB supported, empty-beating heart. All patients were operated by the same surgeon well after the learning period. Logistic regression analysis defined the independent variables, which correlated with the need of pump support.

**Results:** Although high EuroSCORE (EuroSCORE $\geq$ 6 in 82% of patients operated on-pump vs. 61% of patients operated off-pump) recent MI, unstable angina, diabetes and circumflex grafting were more frequent in the on-pump group, the statistically significant variables which correlated with CPB requirement were: low LVEF (33.8 $\pm$ 8.7% on-pump vs. 41.1 $\pm$ 8.38% off-pump, *P*<0.01), redo (14% on-pump vs. 6% off-pump, *P* = 0.02) and higher number of anastomoses (3.07 $\pm$ 0.7 on-pump vs. 2.75 $\pm$ 0.7 off-pump, *P* = 0.03).

**Conclusions:** The superiority of the off-pump method in high-risk patients, as suggested by retrospective studies, remains to be documented, since these patients were excluded from prospective randomised trials. There is a consensus that old and sick patients are poor candidates for CPB. The patient that in addition to that has cardiac-related risk factors, and therefore tends to be unstable, imposes a dilemma. In our experience OPCAB was not feasible in all high-risk cases. On-pump (or otherwise mechanically supported) BHCABG can be an appropriate compromise. Cardiac related risk factors (recent MI, unstable angina) were more frequent in the group that required CPB, but this did not reach statistical significance. Low LVEF, as well as reoperation and extensive grafting, were found to be risk factors of prognostic value for CPB requirement.

**8. POSTERIOR TRANSPERICARDIAL APPROACH IN SURGICAL TREATMENT OF FALSELY DIAGNOSED ACUTE TYPE-A AORTIC DISSECTIONS**

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**Objective:** Anterior approach is neither usual nor very comfortable approach for the surgical treatment of acute type-B aortic dissections. We present our initial experience using this approach in patients who had been submitted to urgent surgery with false preoperative diagnosis of acute type-A dissection.

**Methods:** Between 2000 and 2004, a total of 5 patients (4 male, 1 female), with mean age of 52 years (38-70), were submitted to urgent surgery with diagnosis of acute type-A aortic dissections. Clinical diagnosis was confirmed by TTE and CT in all, while in 2 patients additional aortography was available. Average time from the onset of symptoms to the operation was 32 h (12-64). Severe haemodynamic instability (sBP<80 mmHg) was present in 4; aortic regurgitation in 3; tamponade in 3; paraplegia in 1 and left pleural effusion in 2 patients. In all of them, transfemoral arterial cannulation was performed prior to median sternotomy. In all patients, intimal tear could not be found in the ascending aorta, so that operation was continued in deep hypothermic circulatory arrest. The sites for distal reconstructions were achieved through a posterior left pericardiotomy. Intimal tear was found in distal arch in 2 and descending aorta in 3 patients. Aortic reconstructions were done with tubular graft and Carrel's re-implantation of the arch branches in all patients. Teflon felt strips were used for proximal and distal reinforcements. Anterograde perfusion was started after the termination of the circulatory arrest. In 2 patients, re-suspension

of aortic valve commissures was necessary. Average time of circulatory arrest was 27 min (20-45). Selective cerebral perfusion was not performed. Instead, pharmacological agents and local ice packages were applied.

Results: One patient died intraoperatively (intractable bleeding), and another 1 on the third postoperative day (respiratory insufficiency and deep coma). Average hospital stay for the survivors was 18 days (11-26).

Conclusions: Anterior approach for the surgical treatment of acute type-B aortic dissections, with proximal extension, presented here, is not our common but rather ad hoc surgical strategy. We find this approach feasible from the technical point of view, emphasizing that our results with this small group of patients (40% hospital mortality), could be different with better preoperative evaluation.

#### 9. EPICARDIAL CRYOABLATION OF ATRIAL FIBRILLATION: OUR INITIAL RESULTS

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Objective: Atrial fibrillation (AF) is an arrhythmia with high prevalence in general population, the especially in patients undergoing cardiac surgery and it generates great morbidity and mortality as well as an important increase of health costs. The cryoablation through epicardial application is considered to be a new technique that allows the creation of uniform scars and the decrease of ischemia time. Our objective was to evaluate the effectiveness of epicardial AF cryoablation in terms of electrical and echocardiographical results in a series of patients undergoing major cardiac surgery.

Methods: The cryoablation was employed in 12 patients (7 female and 5 male) that underwent major cardiac surgery in our institution. The mean age was 63,8±10,5 years and the AF was permanent in 11 cases and paroxysmal in one patient. The diagnoses were mitral valvulopathy (8 patients), coronary artery disease (2 cases) and mitroaortic valvulopathy (2 patients); the preoperative ejection fraction was 57±4,2%. The ablation was performed through cardiopulmonary bypass without cardiac ischemia, making lines of right and left pulmonary veins isolation with both atrial appendages amputation, union lines with left atrial appendage and mitral annulus as well as right Maze procedure.

Results: Perioperative mortality was 1 patient (Adult Respiratory Distress Syndrome). Cardiopulmonary bypass and ischemia times were 140,6±20,6 and 75,6±26,9 min respectively and the ablation was performed in 42,6±9,4 min. Associated procedures were mitral valve replacement (7 cases), mitral repair (3 cases), coronary artery revascularization (2 patients), aortic valve replacement (2 cases) and tricuspid annuloplasty (4 patients). No episodes of AF or flutter (sinusal rythm present in 10 patients and nodal scape rythm in 2 cases). All the patients received oral anticoagulation and amiodarone 6 months after surgery. Sinusal rythm was present at discharge in 8 patients (72,7%) and AF in 3 (27,3%). In the follow-up, sinusal rythm persisted in 72,7% of patients (score IV of Santa Crus), atrial flutter was present in 18,1% (score I) and AF in 9,2% (score 0) six months after the ablation.

Conclusions: 1) Epicardial cryoablation is a safe and effective technique in surgical treatment of AF, with more than 70% of success at six months of follow-up in our series. 2) The cryoablation creates uniform scars and allows the decrease of ischemic time required for endocardial application with an assumable learning curve.

#### 10. SIDE-TO-SIDE SUTURELESS DISTAL CORONARY ARTERY BYPASS ANASTOMOSES WITH MAGNETS (MVP SYSTEM)—A PRELIMINARY REPORT

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Objective: In 1893 Abbe questioned whether it is impossible to restore an arterial blood supply after complete vessel transection. In June 1902 Alexis Carrel published a technique of vascular anastomosis that slowly became a standard surgical reality. A hand-sewn microanastomosis remains, however, a time-consuming procedure especially in less invasive approaches such as OPCAB, MIDCAB or TECAB. There still is a demand for a faster, easier, minimally traumatic and reliable procedure to create a coronary anastomosis. To date we performed one cCABG and four OPCAB procedures using distal, sutureless magnetic connectors to assess their clinical performance and feasibility.

Methods: From December 2004 to date a total of 5 patients (9 MVP and 4 hand-sewn grafts) received the MVP device that uses magnetic force to create a rapid and secure distal coronary artery anastomoses. We performed the following procedures: cCABG (1) LIMA-LAD; OPCAB (4) LIMA-LAD (1), Y-grafts LIMA-LRA-LAD, RCA (2), SV-RCA (1)+hand-sewn Y-graft LIMA-LRA-LAD, OM1, OM2. All were done through a median sternotomy. 12 to 24 h preoperatively patients received a single loading dose of 100 mg of aspirin and 150 mg of clopidogrel. The MVP connection time range was 2-12 min. Anastomotic patency was evaluated by means of angiography or angio-CT during the first postoperative week.

Results: A successful anastomosis was performed in all the cases. There were no deaths in this series. One patient (Y-graft) suffered a myocardial infarction in the direct postoperative period and underwent a reintervention. Heart ischemia was related to the occlusion of the grafts due to thrombosis. He was converted to a hand-sewn anastomosis. There were no re-explorations for bleeding. 2 patients had a postoperative coronary angiogram and one an angio-CT prior to hospital discharge. 5 MVP anastomoses were evaluated with a patency rate of 100%.

Conclusions: The MVP anastomotic system is rapid, precise and applicable to both venous and arterial conduits and it requires minimal intraluminal manipulation. The most important disadvantage is the lack of long term follow-up which is common to all evolving technologies.

#### 11. BACTERIAL ENDOCARDITIS FROM PERMANENT INTRAVENOUS PACING LEADS — SURGICAL TREATMENT

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Objective: We report the surgical treatment of bacterial endocarditis from permanent intravenous pacing leads in a series of patients referred to our department.

Methods: Eighteen patients, 12 male and 6 female, aged 58-73 years old (median age 66) were referred to us with active bacterial endocarditis despite a lengthy antibiotic treatment. Twelve patients had erosion of the pacemaker pocket, and the causative organism in blood cultures was *Staph. epidermidis* in 16, *Enterococcus* in one and *Peptostreptococcus* in another. Fifteen patients had a permanent DDD pacemaker, two had a VVI one and one had a defibrillator. Vegetations and thrombi were identified in the atrial lead in the majority (16 patients), two patients had documented septic emboli in the left lower lobe and four patients had vegetations and infiltration of the tricuspid valve. Under normothermic cardiopulmonary bypass in 16 and cardioplegic arrest in 2, and bicaval cannulation, the right atrium was opened, the leads were successfully removed, the right auricle was repaired with pericardium and the involved tricuspid valve was repaired when necessary. A permanent DDD pacemaker was implanted with epicardial leads and the battery pocket was created in the left upper quadrant of the abdomen with the exception of the defibrillator case in which a medical decision was made not to be replaced. After closure of sternotomy, the previous upper thoracic pacemaker pocket was extensively debrided and drained. The culture of infected pacemaker leads was positive only in 10 cases.

Results: The postoperative course was uncomplicated with a mean hospital stay of 7 days. The intravenous antibiotic regimen was continued as indicated. All patients remain free of endocarditis 2-8 years later (median 5 years).

Conclusions: Bacterial endocarditis secondary to infected pacemaker transvenous leads is successfully managed with normothermic cardiopulmonary bypass, direct vision and inspection of right cardiac chambers including the tricuspid valve, debridement of previous pockets and insertion of permanent epicardial pacemaker leads. Since all cases were referred from medical clinics it is inferred that with the changing profile in our practice, we will be faced with this devastating problem and should be as aggressive as possible in managing it.

#### 12. THE MYTH OF MYOCARDIAL CONTUSION AS A RESULT OF ISOLATED STERNAL FRACTURE

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Objective: Isolated sternal fractures are seen with an increasing frequency in traffic road accidents, especially after the introduction of the seatbelt legislation. In most cases, the victims are young, otherwise healthy individu-

als. Aim: Based on single center experience, practical guidelines and common knowledge, we would like to develop the approach towards this type of injury and the need for hospitalisation.

Methods: The medical records of all patients who were treated with a diagnosis of isolated sternal fracture over the last 3 years were retrospectively reviewed. Clinical status, correlated with echocardiographic, ECG and cardiac enzyme abnormalities were the main outcome measures.

Results: Twenty-three patients with sternal fracture arrived to the emergency department in the above mentioned period, mean age 43.6 (19-80). All had a normal physical examination with 95% of them complaining of chest pain while direct pressure was applied. All patients were hospitalised for observation with a mean stay of 2.08 days (1-5). Enzymes were measured in 16 patients, CPK in 9, CPK-MB in 3 pts and troponin levels in 14 pts. All results were normal. 7 pts had no assessment of enzymes. Echocardiography was performed in 14 pts, with no trauma associated findings. Five patients had a widened mediastinum on chest X-ray and an additional chest CT-angio was performed which returned normal in all cases.

Conclusions: The routine admission for observation of patients with abnormal clinical, ECG, enzyme or echocardiographic findings is unquestionable. Based on our findings and on the fact that sternal fracture is mainly a non-surgical situation, shouldn't the inpatient treatment be reserved for patients whose clinical condition, social circumstances or other injuries necessitate admission?

### 13.

#### SUBXIPHOID PERICARDIAL WINDOW AND PERCUTANEOUS CATHETER DRAINAGE FOR TREATMENT OF CARDIAC TAMPONADE

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Objective: In the current study we compared the results of the subxiphoid pericardial window and percutaneous catheter drainage techniques in the patients with cardiac tamponade.

Methods: Between May 1998 - September 2004, 33 patients with cardiac tamponade were treated with either subxiphoid pericardial window ( $n = 21$ ) or percutaneous catheter drainage ( $n = 12$ ). We compared two techniques according to mortality, complication and recurrence rates.

Results: In subxiphoid pericardial window technique, there was no operative deaths and complication. In contrast, percutaneous catheter drainage had significantly higher mortality and complication rates of 8.3% (1 of 12) and 16.6% (2 of 12), respectively. Symptomatic recurrence of a pericardial effusion after percutaneous catheter drainage occurred in 3 (25%) of 12 patients. However, the overall effusion recurrence rate among patients undergoing subxiphoid pericardial window was 4.8% (1 of 21) ( $P < 0.05$ ).

Conclusions: Subxiphoid pericardial window technique is a safe and effective technique for management of cardiac tamponade. Percutaneous catheter drainage should be reserved for patients with hemodynamic instability.

### 14.

#### BISOPROLOL PLUS MAGNESIUM PREVENTS POST-CABG ATRIAL FIBRILLATION: RESULTS OF A RANDOMIZED CLINICAL TRIAL

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Objective: Bisoprolol, a highly cardioselective  $\beta_1$ -blocker is widely used to treat elderly patients with hypertension, coronary artery disease and heart failure. Current literature lacks evidence regarding its potency to prevent atrial fibrillation (AF) following cardiac surgery. Therefore, the aim of this study was to evaluate the efficacy of bisoprolol in association with magnesium (Mg) in the prophylaxis of AF after CABG.

Methods: A total of 100 consecutive patients subjected to elective on-pump CABG (84 men, age  $65 \pm 8$  [SD] years) with no prior history of AF were ran-

domly assigned to the prophylaxis group ( $n = 50$ ) receiving after surgery bisoprolol ( $5 \text{ mg day}^{-1}$ ) plus Mg (intravenous infusion of 2 g of Mg on arrival in the intensive care unit, followed by oral Mg at  $1800 \text{ mg day}^{-1}$  for 1 week), or to the control group ( $n = 50$ ) receiving no combined study medication, however remaining on their preoperative drugs including  $\beta$ -blockers. All patients were continuously monitored to identify the onset of AF.

Results: In the prophylaxis group the incidence of postoperative AF was significantly lower with 20% (10/50) as compared to 42% (21/50) among controls ( $P = 0.030$ ). Particularly in the elderly bisoprolol plus Mg was effective in preventing AF: in the prophylaxis group only six of 36 (16%) patients = 65 years of age developed AF as compared to thirteen of 20 (65%) in the control group. This was associated with significantly ( $P = 0.022$ ) shorter hospital stays in the prophylaxis group.

Conclusions: The combination of bisoprolol plus Mg effectively reduces the incidence of postoperative AF following CABG, particularly in elderly patients and is associated with shorter hospital stay.

### 15.

#### EVALUATION OF THE INFLAMMATORY RESPONSE IN CORONARY ARTERY SURGERY: COMPARISON OF EXTRACORPOREAL CIRCULATION AND BEATING HEART TECHNIQUES

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Objective: The inflammatory response after beating heart and conventional coronary artery bypass surgery is compared. Tumor necrosis factor- $\alpha$  is used as a determinant.

Methods: Twenty patients who will undergo elective coronary artery bypass graft (CABG) operation were divided into two groups. In the first group (Group I), CABG operation was performed at the beating heart. Patients in the second group (Group II) were operated under cardiopulmonary bypass. Blood samples were collected 24 h before and 4 h after surgery, and TNF- $\alpha$  values were noted.

Results: Postoperative values of TNF- $\alpha$  in Group II were significantly higher than Group I ( $P = 0.026$ ). Postoperative intensive care unit (ICU) and hospital stay were also higher in Group II than Group I, and these were statistically significant ( $P = 0.013$  and  $P = 0.008$ , respectively).

Conclusions: Tumor necrosis factor- $\alpha$  levels were significantly higher in conventional cardiopulmonary bypass technique than the beating heart operations. But, this increase in the inflammatory response did not cause any difference in ICU and hospital stay among patients who underwent coronary artery bypass.

### 16.

#### DISTRIBUTION OF THE MOST COMMON POSTOPERATIVE COMPLICATIONS AFTER CABG AND OPCAB SURGERY

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Objective: Postoperative complications (PC) increase the length and cost of ICU stay. The aim of this study was to analyze the distribution of the most common postoperative complications after CABG and OPCAB.

Methods: Postoperative course of 977 consecutive adult patients who underwent isolated CABG or OPCAB surgery during a 12 month period was prospectively analyzed. Most common early postoperative complications were registered by the supervising ICU team on a daily basis. Descriptive statistics,  $t$ -test and  $\chi^2$  test were used.  $P < 0.05$  was considered significant. Data are expressed as mean  $\pm$ SD or  $n$  (%).

Results: Among 977 patients, there were 609 (62.3%) CABG patients and 368 (37.7%) OPCAB patients. Number and percentage of patients with each category of complications have been compared.

Conclusions: In our material, OPCAB patients had comparable amount of complications to CABG patients with the exception for postoperative drainage and respiratory complications.

### 17.

#### SURGICAL MANAGEMENT OF NON-SMALL CELL LUNG CANCER WITH AORTIC INVASION

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**Objective:** Invasion of mediastinal structures (T4) is considered as an absolute contraindication to surgical management of non-small cell lung cancer (NSCLC). The authors studied the role of surgical treatment in case of direct aortic involvement.

**Methods:** From 1995 to 2000, 16 patients with left lung NSCLC invading descending aorta were admitted for surgical management. Their mean age was 58 years and were all male. All patients were N2 negative by non-invasive (CT) and invasive methods (mediastinoscopy-mediastinotomy). Aortic invasion was evaluated with chest CT and MRI. Surgery was indicated in case of absence of intraluminal extension. The pathology results and 5-year survival were recorded and analyzed.

**Results:** In 3 patients (19%), full thickness aortic wall invasion with intraluminal tumor extension was disclosed by CT scanning. Non-surgical management was advised. Lung resection was performed in the other 13 patients, which included 8 lobectomies (61.5%) and 5 pneumonectomies (38.5%). Among these patients: a) in 3 cases (23%) the tumor was adhered to the parietal pleura overlying descending aorta, which was resected en block with tumor-associated lung parenchyma. b) Aortic adventitia invasion by tumor led to local resection of adventitia (<1 cm<sup>2</sup>) in 9 patients (69%). c) Invasion deeper than adventitia was encountered in 1 case (8%), which was managed with aortic partial occlusion, resection of aortic wall and repair of the defect with Gore graft patch. All resections were radical (R0). Pathology results revealed adenocarcinoma in 4 (31%) cases and squamous cell carcinoma in the other 9 (69%). Mediastinal lymph node dissection was positive for N2 disease in 4 cases (31%). Pathologic staging was T4N2M0 in 4 cases (31%), T4N1M0 in 8 (61.5%) and T4N0M0 in one (8%). Neither associated postoperative complications nor operative mortality was recorded. Five-year survival was 30.7%, while median survival was 38±9 months.

**Conclusions:** Aortic invasion in patients with NSCLC identified preoperatively at CT or MRI is not a contraindication if aortic inner layer is intact. Radical resection is feasible without increase of operative risk. Furthermore no additional influence on long-term survival was recorded. Patients with NSCLC invading aorta are classified in stage IIIB, which have dismal prognosis. This is maybe inaccurate, since radical resection of the primary tumor along with aortic involvement disclosed favorable long-term survival comparable to stage.

#### 18. SUPERIOR VENA CAVA INVOLVEMENT IN PATIENTS WITH NON-SMALL CELL LUNG CANCER. THE ROLE OF SURGICAL MANAGEMENT

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**Objective:** Invasion of superior vena cava is traditionally considered as a contraindication to surgical management for non-small cell lung cancer (NSCLC). The purpose of this study was to define the role of extensive resection in case of superior vena cava (SVC) involvement.

**Methods:** From 1995 to 2000, 9 patients with right upper lobe NSCLC and SVC invasion were subjected to thoracotomy for lung resection. Although complete clinical and invasive preoperative staging, SVC involvement was not detected but was identified intraoperatively. All patients were subjected to right upper lobectomy with en block resection of the affected part of SVC. Mediastinal lymph node dissection was performed in all cases. The surgical technique, the postoperative course, the pathology results and the 5-year survival were recorded.

**Results:** In 3 patients (33%) the SVC wall was involved by the tumor 1-3 cm in length and 2-4 mm of the circumference. Partial clamping of SVC and resection of the affected part was performed. The defect was repaired with direct suturing in one layer using prolene 4-0. In 5 patients (56%) the area of SVC wall that was invaded was 3X2 cm. Both central and distal total clamping of SVC and resection of the affected part was performed. The defect was repaired with Dacron patch. The mean time of exclusion of SVC from the circulation was 5.6 min. In 1 patient (11%) almost all of the

SVC circumference was invaded by the tumor. In this case, after central and distal clamping of SVC and removal of the involved part, an arterial 14 graft was end-to-end interposed. The SVC occlusion time was less than 11 min. No associated early complications were recorded, especially neurologic ones. In one case (11%) that patch repair was employed, SVC stenosis occurred 12 months postoperatively. It was managed with endovascular stent grafting. Mediastinal lymph node dissection revealed positive N2 nodes in 5 cases (56%). Adjuvant radiotherapy was performed in these cases, while all patients were subjected to postoperative chemotherapy. The postoperative mortality was 0%. The survival ranged from 18 to 60 months and median 5-year survival was 36±9 months.

**Conclusions:** SVC partial or total resection is indicated in every case of SVC invasion that is detected intraoperatively. Repair or even graft interposition is followed by low morbidity and mortality along with long term patency. Survival of these patients is comparable to that of patients with the same T and N.

#### 19. THE INFLUENCE OF PREOPERATIVE LEFT VENTRICULAR SYSTOLIC AND DIASTOLIC DYSFUNCTION ON EARLY AND LATE RESULTS AFTER ISCHEMIC MITRAL VALVE REPAIR

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**Objective:** The aim of the study was to assess the impact of left ventricular (LV) systolic and diastolic dysfunction on early and late results of ischemic mitral valve (MV) repair.

**Methods:** The study group consisted of 94 pts who underwent coronary artery bypass grafting with MV repair: with annuloplasty alone (56%) and annuloplasty with valvuloplasty (44%). Mean follow-up - 13,9±1,3 months. Study protocol included evaluation of general clinical data, functional status, echocardiographic parameters of MV and LV ejection fraction (EF) morphometry pre, intra and postoperatively.

**Results:** 66 pts were divided into two groups according to LVEF and LV dimensions - end diastolic diameter index (LVEDI): group 1 - LVEF<35%, EDDI ≥32 mm/m<sup>2</sup> 33 pts, group 2 - EF>35%, EDDI<32 mm/m<sup>2</sup> - 33 pts. NYHA functional class was worse in group 1, other indices did not differ significantly. Postoperatively LV end systolic diameter decreased from 28,3±1,2 to 26,5±1,6 mm/m<sup>2</sup> (P<0,05) only in group 1, LVEF increased from 24,8±1,4 to 28,8±2,0% (P<0,05) in group 1 and from 45,7±1,5 to 49,9±1,2% (P<0,01) in group 2. Hospital and late mortality did not differ between the groups: in group 1 - 7/33 and 5/33, group 2 - 4/33 and 2/33, respectively. Postoperative complications rate was the same: 8/33 in group 1 and 6/33 group 2. 94 pts were divided according to LV diastolic dysfunction type: group 1 - 37 pts with restrictive LV filling and group 2 - 57 pts with non-restrictive LV filling. Hospital mortality in group 1 - 24,3%, group 2 - 8,8% (P<0,05). Late after surgery LVEF improved in both groups. The was a significant reduction of LVESDI from 22,4±0,8 to 20,3±0,9 mm/m<sup>2</sup> and mean PA pressure from 34,1±1,1 to 30,3±1,1 mmHg (P<0,05) only in patients with non restrictive LV diastolic function.

**Conclusions:** Preoperative LV systolic dysfunction does not effect mortality, rate of early postoperative complications, functional status and LV function changes in pts undergoing ischemic MV repair, while LV diastolic dysfunction type has impact on hospital mortality (24,3% and 8,8%, P<0,05) and LV function changes early or late after surgery.

#### 20. EXTERNAL RESHAPING

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**Objective:** 1) In the era of thrombolysis, large myocardial aneurysmatic areas are rarely seen. 2) In clinical practice, there is no surgical technique for the isolation of dyskinetic areas of lateral and inferior wall without CPB. 3) The experience in the off pump surgery is growing in the presence of a porcelain aorta. 4) The surgical treatment of any LV aneurysm on CPB is dangerous. Our aim, is to describe a new technique of left ventricle (LV) external reshaping, seeleing to obtain a near normal conal shape, on a beating heart operation.

**Methods:** Following total arterial revascularization without aortic manipulations, on a beating heart, the heart was positioned appropriately and the dilated area was identified. Using continuous sutures, reinforced by

pericardial strips, the defined area was plicated effectively, excluding it from the contractile tissue of the LV. This way, the geometry was almost normalized and the LV end diastolic volume was reduced. From September 2001 to February 2005, off-pump coronary revascularization was performed on 885 pts. The external reshaping technique was applied on 50 cases (5.65%). 44 pts were male and 6 female. Mean age was  $64 \pm 12.3$  years. Mean EF was  $31.2 \pm 7\%$ . In 19 pts the lateral wall was plicated while the inferior and anterolateral wall was plicated in 7 and 24 pts, respectively. A mitral insufficiency of  $2 \pm 3/4 \pm$  was observed in 21 pts.

Results: 48 pts had uneventful outcome. 1 patient died due to severe RV dysfunction and 3 pts developed PVCs, responded successfully to intravenous amiodarone. A slight elevation of troponin1 levels was observed in the whole study population. Comparing the preoperative and postoperative echocardiographic data, a statistically significant improvement of the LV function with a mean EF  $42.2 \pm 4\%$ , a reduction of the end-diastolic LV diameter, improvement of the geometry of the ventricular cavity and reduction of mitral insufficiency in 19/21pts to  $1 \pm 2/4 \pm$  were observed. During the follow up 1 patient died due to unknown reasons. The survival rate was 96%. Conclusions: The external reshaping of the LV on a beating heart surgery is technically feasible, without major complications and has promising results.

## 21.

### SIMPLE METHODS TO REPAIR POSTINFARCTION VENTRICULAR FREE WALL RUPTURE

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Objective: Although advanced therapeutic interventions in the management of acute myocardial infarction have dramatically decreased the overall mortality, the number of cardiac ruptures remained relatively high. The traditional surgical methods (infarctectomy with prosthetic patch or direct closure) have high mortality. We evaluated a new surgical method for the complex management of this complication.

Methods: When the symptoms of cardiac rupture slowly evolve surgical intervention is possible. After immediate pericardiocentesis, these patients were stabilized with intra-aortic balloon pump insertion and mechanical ventilation, and promptly delivered to the operating room. In 3 patients we found haemorrhagic necrosis of the right ventricle with pulsatile or diffuse bleeding in that field. In one of these patients where intramural hematoma was the largest, we injected concentrated solution of thrombin around the bleeding site. Another case of right ventricular rupture presented smaller necrotic site and oozing. An absorbable sponge containing fibrinogen and thrombin was gently compressed against this place. The third case had serious laceration and bleeding at the posterior right ventricular wall. This time we applied autogenous pericardium adhered to the necrotic field with biological glue. We had 2 patients with left ventricular involvement. In the first case we observed pulsatile bleeding from the anterior free wall, but relatively healthy myocardium surrounded it. Pledged prolipropilene suture was placed around this point, and then covered with the mentioned hemostatic sponge. The other case of left ventricular rupture with oozing type of bleeding was also treated with this hemostat.

Results: From January 1st, 2003 until December 31st, 2004 we have performed 1143 percutaneous balloon dilatation in patients with myocardial infarction. During this period we have recognized 22 cases of cardiac free wall rupture. In 17 patients sudden death occurred promptly, in 5 cases of subacute form of rupture we performed sutureless, off-pump reconstruction using hemostats or biological glue. 4 of these patients survived, 1 died 10 days after the operation due to the hemodynamic consequences of the extensive myocardial necrosis. 1 year follow-up showed acceptable cardiac function, and no signs of pseudoaneurysm formation.

Conclusions: The classical forms of surgical interventions using prosthetic patch after infarctectomy imply the use of cardiopulmonary bypass and have very high mortality. With new surgical methods using biological glue and hemostats without extracorporeal circulation survival can be increased.

## 22.

### EVALUATION OF NEUROCOGNITIVE FUNCTION IN OFF PUMP CORONARY SURGERY

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Objective: Neuropsychological dysfunctions are one of the most important complications of coronary artery bypass graft surgery (CABG). It has been reported in 19-80% ratio among the patients in different studies. The main causes of this injury are thought to be hypoperfusion, the systemic inflammatory response and cerebral emboli. The neuropsychological (NP) outcome after coronary bypass surgery has not been improved despite the continuing evolution in CPB techniques. Off pump coronary artery bypass (OPCAB) technique is expected to show some decreased morbidity due to not using cardiopulmonary bypass, but the results of the studies in this subject are still inconsistent. The aim of this study was to evaluate neuropsychological dysfunction occurring in patients undergoing CABG with (on-pump) and without (off-pump) cardiopulmonary bypass.

Methods: 50 patients undergoing CABG operations with 2-3 vessel diseases are enrolled in this study. 25 of them were operated with conventional CABG and 50 of them were operated with OPCAB technique. Neuropsychological assessment was performed with six cognitive tasks, which was performed one day before the operation and at the 7-8th days after the operation using Mini Mental State Test (MMST) and Neuropsychological tests (NP) were selected to evaluate attention, concentration, memory, visual-spatial recognition and psychomotor rate.

Results: The postoperative neuropsychological status deteriorated in both groups significantly compared with the preoperative status. In the off pump group the short memory status, frontal lobe function, Trial making test, attention and concentration was well preserved according to the on pump group, the difference was statistically significant.

Conclusions: This study has revealed that neuropsychological status is deteriorated in both off pump and on pump coronary surgery. The NP functions are partially well preserved in the off pump coronary surgery. Since the study groups were small, further studies are needed.

## 23.

### SINGLE VENTRICLE'S PHYSIOLOGY: SURGICAL STRATEGY AND EARLY RESULTS

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Objective: A wide range of congenital heart lesions presents as single ventricle's physiology. Surgical strategy and proper selection of patients is of significant importance in both short-and long-term outcome. This study presents surgical strategy and early results in a series of patients with single ventricle's physiology who referred to our department for surgical treatment.

Methods: Between September 1997 - January 2005, 76 patients (36 male, 40 female), aged 3 days to 29 years old (median 2,9 years), with a diagnosis of single ventricle's physiology were referred to our department for surgical management and underwent 107 operations. A 1st stage operation to control pulmonary blood flow was necessary in 42 cases: In 28 of them a modified Blalock-Taussig shunt (B-T shunt) to improve pulmonary flow was performed, in 8 patients pulmonary artery (PA) banding was done to reduce excessive pulmonary blood flow, and finally 6 patients underwent a Norwood operation. A 2nd stage operation (Glenn shunt) was done in 32 cases, from which 19 had a 1st stage operation in the past (12 had a PA band, 6 a B-T shunt, and 1 a Norwood operation). Finally 31 patients underwent a 3rd stage operation (modified Fontan operation), and 2 patients had a Kawashima operation.

Results: A total survival of 91% was noted in this series. Median ITU stay was 6,5 days (3 - 26 days), and median hospital stay 19,3 days (8 - 44 days). There was no early death in patients who underwent 2nd or 3rd stage operation. There were 7 deaths in patients who had a 1st stage operation: 4 cases post B-T shunt (14%), and 3 cases post a Norwood operation (50%). During a follow up of 1 month to 7 years all patients are in NYHA class I or II.

Conclusions: These results show that proper selection and surgical strategy in patients with single ventricle's physiology, as we do in our department is followed by good surgical outcome, considering the complexity of these cases.

## 24.

### AN IMPORTANT COMPLICATION AFTER OPEN HEART SURGERY: EMERGENCY REOPERATION

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**Objective:** Emergency reoperation for bleeding is an important source of morbidity and mortality in the postoperative period. The proportion of patients undergoing open heart surgery that requires reoperation for bleeding has been reported to be between 2% and 6% and excessive bleeding and cardiac tamponade are the two major reasons for emergency reoperation. In this study, we aimed to investigate the frequency of emergency reoperations, reasons for reoperations and to compare results in order to study the precautions to be taken for prevention in open heart surgery patients.

**Methods:** In our study, 447 consecutive patients undergoing primary elective open heart surgery between September 2000 and October 2004 at Trakya University Cardiovascular Surgery Department were retrospectively analysed. In our clinic, reoperation is the routine practice in patients with a bleeding volume 200 ml/h during the last 4 h.

**Results:** In 447 patients included in the study; mean age was 59±10.7 (19-78) years, male to female ratio was 332/115. Emergency reoperation was performed in 24 (5.4%) patients; of those 20 (83.3%) for excessive bleeding and 4 (16.7%) for cardiac tamponade. The mean duration to reoperation was 8.5±2.1 h, the mean drainage before reoperation was 1100±204 ml.

We didn't identify a definite site for bleeding in a large proportion of patients (41.6%). Internal thoracic artery branch (20.8%) and the vascular structures at the sternal inferior surface (12.6%) were the most common detected sites. 3 of the reoperated patients died (12.5%) due to low cardiac output.

**Conclusions:** Emergency reoperation after open heart surgery is an important problem, but still in a large proportion of patients a definite site of bleeding can't be identified. Maximum care should be taken for surgical homeostasis in order to reduce surgically correctable causes and to reduce morbidity and mortality.

## 25. CHANGES IN SELECTED IMMUNOCOMPETENT CELLS IN PATIENTS UNDERGOING CARDIOPULMONARY BYPASS (CPB) VERSUS OFF-PUMP CORONARY ARTERY BYPASS (OPCAB)—IS THERE A NEED TO MEASURE INFLAMMATORY FACTORS

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**Objective:** It is accepted that the use of CABG (coronary artery bypass grafting) is the main inducing factor of immune and inflammatory response in cardiac surgery operations. Numerous reports indicate that the use of less invasive operative techniques, such as OPCAB, can effectively diminish inflammatory response and thus lower the number of complications and deaths among patients after cardiovascular surgery. The objective of this study was to compare the number of selected immunocompetent cells in two groups of patients with ischemic heart disease: operated with use of CPB and without CPB using OPCAB technique. Additional aim was to find the elements useful for evaluation of invasiveness of conducted cardiosurgical interventions.

**Methods:** The group of evaluated cases consisted of 24 patients divided in two groups: operated using CPB, operated using OPCAB technique. The following receptors were investigated: CD4 (helper lymphocytes), CD8 (cytotoxic lymphocytes), CD3 (receptors of mature lymphocytes), CD16 (NK cells), CD19 (B-lymphocytes), CD25 (Interleukin-2 receptor), CD45RO, CD45RA (naive T-lymphocytes), CD11b/CD18 (neutrophils receptors), CD35 (complement CR1 receptor). Blood for the investigation was taken: before heparin administration, 5, 15, 30, 60, 120 and 240 min after start of surgical procedure.

**Results:** The most pronounced differences among two groups of patients were visible for cells expressing receptors: CD16, CD19, CD25 and CD35. In both groups there was significant increase of neutrophils possessing CD11b/CD18 receptor but there were no significant differences in the amount of this receptor between two investigated groups. During the experimental period the lower number of cells positive for the selected receptors was observed in the OPCAB group.

**Conclusions:** In the cardiosurgical treatment of ischemic heart both methods have a different influence on number of T-lymphocytes and B-lymphocytes and on number of cells expressing complement CR1 receptor (CD35). The receptors for CD16, CD19, CD11b/CD18 and CD35 can be especially useful to evaluate degree of invasiveness of different operative techniques. The increase of neutrophils (CD11b/CD18) observed in both groups can suggest

that OPCAB technique targets only one arm of complex inflammatory cascade, they can reduce but not eliminate the immune response.

## 26. IS IT NECESSARY TO ATTACH AN EPICARDIAL TEMPORARY PACING WIRE IN ALL OPEN HEART SURGERY PERFORMED PATIENTS?

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**Objective:** In this study, we proposed to investigate the frequency of epicardial temporary pacing wire requirement after open heart surgery.

**Methods:** In our study, 455 consecutive patients undergoing open heart surgery at Trakya University Cardiovascular Surgery Department were retrospectively analysed and they were classified in 4 subgroups. Group 1 = coronary bypass surgery performed patients under cardiopulmonary bypass ( $n = 284$ ). Group 2 = off pump coronary bypass surgery performed patients ( $n = 87$ ). Group 3 = valvular surgery performed patients ( $n = 69$ ). Group 4 = adult congenital surgery performed patients ( $n = 15$ ). All operations were performed via median sternotomy. Cardiopulmonary bypass was used in groups 1,3 and 4.

**Results:** The frequency of epicardial temporary pacing wire requirement due to postoperative cardiac dysrhythmias was 5.3%, with the lowest ratio being 1.1% in the off pump group and more frequently being in valvular surgery performed (13.0%) and adult congenital surgery performed (13.3%) groups. Permanent dual chamber pacemaker was placed in two patients; one after aortic valve replacement and the other after mitral valve replacement.

**Conclusions:** Necessity of epicardial temporary pacing wire in the postoperative period may vary due to performed procedure. Although epicardial temporary pacing wires are less frequently required after coronary bypass surgery, we recommend that it is especially more necessary to attach epicardial temporary pacing wire after valvular and adult congenital surgery.

## 27. EARLY RESULTS IN CABG IN PATIENTS WITH LOW EJECTION FRACTION ( $EF \leq 35\%$ ).

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**Objective:** Patients with ischemic heart failure are still a high-risk group in cardiac surgery. Conservative treatment correlates with poor results. Accordingly, coronary artery bypass grafting, especially in cases of maintained myocardial viability is still for these patients one of the most important methods of treatment. The aim of the study was to evaluate results in CABG in patients with low ejection fraction ( $\leq 35\%$ ), and determination of factor's influence on early mortality. The outcomes were referenced to the EuroSCORE prediction scale.

**Methods:** The retrospective analysis was performed in a group of consecutive 345 patients with ejection fraction lower than 36% who underwent coronary artery bypass grafting from January 2001 to December 2004. The patients ages were 36-79 (59±8) years, with EF between 15-35% (30,3±5,8). In 8,1% patients previous PCI was performed, and in 18,3% left main stenosis was the indication for surgery. Advanced stenocardia (III and IV CCS class) and advanced heart failure (III and IV NYHA class) was observed properly in 55,3% and 23,3% patients. The mortality risk (EuroSCORE) fluctuated from 1 to 14 points (mean >5). Urgent or emergency surgery was required for 18,1% of the patients. In 127 (31,3%) patients off-pump coronary artery bypass grafting was performed.

**Results:** The most common postoperative complication was: low cardiac output (18,8%), prolonged mechanical ventilation (15,6%) and ventricular arrhythmia (3,8%). Perioperative myocardial infarction was observed in 5,3% of the patients. Hospital mortality was 3,2%. Statistically significantly important mortality risk factors in this group were left main stenosis and urgent or emergency operation. Low cardiac output, ventricular arrhythmia, perioperative myocardial infarction and renal failure significantly frequently occurred in patients who died in early observation. There were no significant differences in mortality between OPCAB and CABG patients.

**Conclusions:** Coronary artery bypass grafting in patients with advanced left ventricular damage is a safe method of treatment. In our material hospital mortality was lower than predicted in EuroSCORE. LM stenosis and non-

elective surgery decreased outcomes in CABG in patients with low ejection fraction. The manifestation of postoperative complications like low cardiac output, ventricular tachycardia, perioperative myocardial infarction, as well as renal failure are significant when related to hospital mortality.

## 28. INFLUENCE OF MINISTERNOTOMY IN RESPIRATORY RECOVERY AFTER AORTIC VALVE REPLACEMENT

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**Objective:** Ministernotomy for AVR has been employed so far but the influence in postoperative outcome is unclear. The aim of this perspective study was to investigate the results of this mini-invasive technique, particularly the influence in postoperative respiratory recovery

**Methods:** Between 01/99-01/04, 122 consecutive patients, undergoing elective AVR, were divided in two groups: Group I ( $n = 61$ ), undergoing ministernotomy approach (reverted-C or L,) and Group II ( $n = 61$ ), undergoing conventional sternotomy.

**Results:** The length of skin incision was significantly shorter in I ( $7.7 \pm 0.9$  cm vs.  $24.1 \pm 2.9$  cm,  $P < 0.001$ ). There were no significant differences in associated procedure, CPB and ACC times. The total operating time was longer in Group I ( $3.6 \pm 0.32$  vs.  $3.1 \pm 0.7$  h). Similar incidence of cardiac, neurological, and renal complications were present in both groups. The mean mediastinal drainage and the mean blood transfusion per patient was greater in Group II ( $P < 0.004$  and  $P < 0.001$ , respectively). The number of patients requiring postoperative blood transfusion was greater in II ( $P = 0.02$ ). Mechanical ventilation time was significantly higher in Group II ( $7.6 \pm 2.5$ h vs.  $4.2 \pm 1.2$  h,  $P = 0.002$ ). At postoperative day 5, the spirometric data analysis demonstrated a significantly lower total lung capacity, maximum inspiratory and expiratory pressures in II versus I,  $P = 0.002$ ,  $P = 0.005$  and  $P < 0.001$ , respectively. These differences remained significant at discharge.

**Conclusions:** According to our results, ministernotomy has not only important cosmetic advantage but also beneficial effects in blood loss and transfusion, postoperative pain and in sternal stability. It also improves respiratory functional status recovery, and allows earlier extubation.

## 29. PROGNOSTIC VALUE OF MYOCARDIAL VIABILITY RECOGNIZED BY LOW-DOSE DOBUTAMINE ECHOCARDIOGRAPHY IN SEVERE LEFT VENTRICULAR DYSFUNCTION

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**Objective:** Dobutamine stress echocardiography (DSE) can identify myocardial viability and predict improved outcomes, but most previous studies have included pts with mild or moderate LV dysfunction. The present study was undertaken to identify the prognostic value of DSE in pts with severe LV dysfunction.

**Methods:** A retrospective review of pts who underwent DSE for viability assessment according to a standard protocol, and myocardial revascularization, was undertaken. Myocardial viability was identified as an improvement of  $>10\%$  in wall motion score index (WMSI). We analyzed the prognostic value of DSE (Cox's analysis) in two groups of pts: group1 - 39 pts with moderate LV dysfunction (LVEF ranged from 22 to 45% mean  $35.7 \pm 7.5\%$ ), group2 - 66 pts with severe LV dysfunction (LVEF ranged from 20% to 35%, mean  $29.8 \pm 4.8\%$ ).

**Results:** In group1 (39 pts) - 27 pts had viable myocardium and in 12 pts contractile response was absent. WMSI improved from  $1.58 \pm 0.31$  at rest to  $1.34 \pm 0.32$  at a low dose ( $P < 0.01$ ) in pts with viable myocardium and remained similar in the 12 pts subgroup:  $1.9 \pm 0.22$  at rest and  $1.85 \pm 0.24$  at a low dose. At follow-up 82% pts were in functional class (F) I-II in subgroup with viable myocardium, LVEF WMSI improved in 81.4% of these pts. In 83.3% of pts who had not viable myocardium, LVEF doesn't improve after revascularization and 58% of these pts were in F III-IV. In Cox's analysis chi-square

$= 7.7$ ,  $P < 0.01$ . In group2 (66 pts) - 39 pts had viable myocardium and 27 pts - had not. WMSI in subgroup of 39 pts improved from  $1.85 \pm 0.31$  at rest to  $1.55 \pm 0.29$  at a low dose ( $P < 0.01$ ). In 27 pts subgroup without contractile response WMSI was  $1.90 \pm 0.40$  at rest and  $1.81 \pm 0.37$  at a low dose ( $P < 0.01$ ). 30.8% of pts with viable myocardium and 33.3% without contractile response to inotropic were in F I-II at follow-up. Approximately 70% of pts were in F III-IV at follow-up in both subgroups. In Cox's analysis chi-square = 0.048,  $P = 0.82$ .

**Conclusions:** Late functional outcome after myocardium revascularization in pts with severe LV dysfunction remains suboptimal. DSE has prognostic value in prediction of improved outcomes in pts with moderate LV dysfunction and is doubtful in pts with severe LV dysfunction.

## 30. THE ROSS PROCEDURE IN CHILDREN AND ADULTS

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**Objective:** To evaluate late follow up results and quality of life after the Ross procedure.

**Methods:** 110 Ross procedures were performed between 1993 and 2005. Mean age was  $23 \pm 7$  years (range from 4 to 67). 56 (50,9%) patients were less than 18 years. All operations were performed as a total root replacement with supporting of the root with pericardial strips in 95, with synthetic strips in 5 patients, without strips in 10 patients. Clinical and echocardiographic follow-up was done early (within 30 days), 3 to 6, and yearly after surgery.

**Results:** There were 6 (5,4%) early deaths (no deaths since 1999), 5 (4,5%) reoperations: 3 due to homograft, two due to autograft failure. Aortic root dilatation was detected in all patients with progression of insufficiency in one patient. 104 patients were in I and 6 in II NYHA functional class. Pulmonary autograft (PAG) was competent or with trivial regurgitation in 75 patients, mild in 31 patients, moderate in 4 patients. There were no stenosis of the PAG at rest and during exercise. Aortic valve annulus changes in growing patients was related to the body surface area, without changing of the valve hemodynamics. Mean gradient through the homograft was 12 mmHg. It was one balloon dilatation of the homograft stenosis. 3 patients had gradient more than 45 mmHg.

**Conclusions:** Excellent hemodynamical performance after the Ross procedure is associated with good quality of life without anticoagulation. Supporting of the aortic root with strips does not prevent root dilatation. Progression of insufficiency was not detected.

## 31. OFF-PUMP RE-DO CORONARY BYPASS OPERATIONS IN VILNIUS HEART SURGERY CENTER

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**Objective:** Off-pump coronary artery by-pass surgery is becoming increasingly popular. The aim of our study was to examine the role of off-pump revascularization in selective patients and compare the results of repeated CABG with cardiopulmonary by-pass.

**Methods:** All patients included in the study had repeated coronary grafting on cardiopulmonary bypass or without it. Patients having other simultaneous cardiac procedures were specifically excluded. We reviewed results of 17 patients who underwent repeated coronary artery by-pass grafting without cardiopulmonary bypass and compared them to results of 126 patients who underwent coronary artery by-pass grafting with cardiopulmonary bypass.

**Results:** 17 patients underwent repeated coronary artery by-pass grafting without cardiopulmonary by-pass. There were 16 men and 1 woman. Mean age was  $64.2 \pm 7.5$  years, mean left ventricle ejection fraction  $47.3 \pm 6.0$ , mortality 5.8% (1 patient). 126 patients underwent repeated coronary artery by-pass grafting with cardiopulmonary by-pass. Mean age was  $55.5 \pm 6$  years, mean left ventricle ejection fraction 47%, mortality 3.2%.

**Conclusions:** Coronary artery surgery without CPB is a safe and low risk operation and is more economic necessitating less manipulations, free of side effects of CPB, less time-consuming surgical procedure compared to reoperations performed with CPB.

### 32. RISK FACTORS, TREATMENT OPTIONS AND LATE OUTCOME FOR DEEP STERNAL WOUND INFECTION

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**Objective:** Deep sternal wound infection (DSWI) is a serious complication of cardiac surgery. The risk factors surgical treatment and the late outcome of DSWI are reported

**Methods:** From 1993 to 2004 DSWI developed in 68 patients undergoing cardiac surgery (incidence 0.6%), and follow-up was obtained on 94% of these patients.

**Results:** Multivariable predictors for development of DSWI in all patients were (odds ratios and 95% confidence intervals in parentheses) (1) diabetes mellitus (2.8; 1.8 to 4.3), (2) postoperative multi organ failure (2.5; 1.3 to 4.9), (3) age >72 years (3.0; 1.4 to 8.4) and (4) preoperative IABP (2.7; 1.2 to 8.2). Bilateral internal thoracic artery grafts increased the risk in diabetics, obese and COPD patients (3.4; 1.4 to 7.6). Abdominal surgical procedures in cardiac patients with abdominal postoperative complications had a 38% incidence of DSWI. The principal micro-organisms are as follows; *Staphylococcus aureus* (23), *Enterobacter cloacae* (14), *Pseudomonas aeruginosa* (4), *Klebsiella marcescens* (3), *Escherichia coli* (1) *Bacteriodes* (2) and in 2 other cases not identified. Patients with DSWIs received either sternal debridement with primary closure ( $n = 53$ ) or sternectomy with flap reconstruction ( $n = 15$ ). All patients received intravenous antibiotics therapy according to the antibiograms. The 12-month freedom from adverse event rate (reoperation, or death) was 76%.

**Conclusions:** Diabetes, MOF and age >72 years, preoperative IABP, are predictors of DSWI in all cardiac surgical patients. Bilateral internal thoracic artery grafting may be contraindicated in diabetic, obese and COPD patients. The relationship between these preoperative conditions and DSWI is probably due to mediastinal tissue relative hypoperfusion and ischemia.

### 33. MICROWAVE ABLATION FOR ATRIAL FIBRILLATION

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**Objective:** Left atrial ablation for atrial fibrillation is a widespread surgical procedure. After our initial experience with cryoablation, we decided to experience microwave energy in order to shorten the procedure time and to prepare a different surgical approach for the procedure.

**Methods:** From July 2001 to May 2002 38 patients underwent left atrial ablation for atrial fibrillation. Initially (group 1: 15 pts) the applied lesion pattern "figure 7" proved effective with the cryoablation. The next step (group 2: 8 pts) was to develop a complete epicardial approach (on by-pass pump beating heart), trying to repeat the same lesion pattern epicardially (the lesion from the left-inferior-pulmonary-vein (LIPV) to the mitral-annulus (MA) was spared, due the risk of circumflex artery lesion). Finally, (group 3: 15 pts) due to the uncertain results of the complete epicardial approach, a mixed epicardial-endocardial approach was developed (the lesion from the LIPV to the mitral-annulus MA was performed at open atrium, as well as the lesion from the LIPV to the left appendage).

**Results:** At discharge sinus rhythm (SR) was present on 66% of the patients (cardioversion any-kind 27%); group 2 had 50% SR at discharge (cardioversion 63%), and on group 3 66% of SR (80% of cardioversion). At follow-up (average 2.34 years for the 3 groups), the SR was respectively 45%, 80% and 40%. In each group 13% of the patients were free of any medical therapy. 4 patients died at follow-up. Overall, in average 12 min procedure time were saved with the microwave, compared to the cryoenergy.

**Conclusions:** In our limited experience microwave ablation was not able to produce the same level of results of our previous experience with cryoenergy. The percentage of patients discharged in SR is overall acceptable. At the follow-up the rate of SR is low, and the patients in SR are all but 1 per group in maximized antiarrhythmic medical therapy. According to the results of our limited experience, microwave does not represent an alternative to cryoenergy for left epicardial ablation; the procedure time saved by this technique is not great enough to justify this approach.

### 34. OUR SERIES OF HEART WOUNDS: WHICH PRACTICAL LESSONS CAN BE DRAWN?

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**Objective:** Heart wounds are vital emergencies requiring optimal medico-surgical management. The goal of this retrospective study is to evaluate the results of heart wound surgery in our department, and to improve on the results.

**Methods:** From January 1984 to December 2002, 17 patients were operated on in the department of thoracic and cardiovascular surgery for a traumatic lesion of the heart. There were 6 blade lesions, 4 gunshot, 4 iatrogenic lesions and 3 road accidents. The population was comprised of 11 men and 6 women, an average age of 42 (16-80 years). Patients benefited from a pre-admission optimal reanimation before surgery. 11 patients benefited from a sternotomy approach and 6 from a thoracotomy approach. In each case cardio-pulmonary bypass (CPB) was available. During the same period, at least 3 patients were referred to the emergency unit from a peripheral hospital for heart wound and died before admission in our cardiovascular surgery department.

**Results:** The outcome was simple in 11 cases. Two patients of the series died. Three others had simple outcomes on the cardiac level but more prolonged because of associated lesions (especially digestive) and one had a myocardial infarction. CPB was never used in our series, because it was not necessary to repair coronary, valvular or septal complex lesions. The patients profited only from simple gestures of pericardial drainage and simple cardiac suture with felt and glue.

**Conclusions:** As CPB was unnecessary in a very large majority of cases, rescue surgery of cardiac wounds, among patients with hemodynamic instability, should be carried out in any surgical service, in order to perform pericardial drainage and haemostasis, before emergency transfer of the stabilised patient to a cardiovascular surgery and intensive care unit.

### 35. SURGICAL VENTRICULAR RESTORATION IN THE TREATMENT OF ISCHEMIC LEFT VENTRICULAR DILATATION

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**Objective:** Operative techniques that reduce the volume and restore the shape of the left ventricle (LV) are better defined as "surgical ventricular restoration" (SVR). These are a surgical option in the treatment of post-ischemic cardiomyopathy. Aim of this study was to investigate the impact of SVR on survival and quality of life in this subset of critically ill patients.

**Methods:** From August 2002 to October 2004, 20 consecutive patients (90% male, mean age 65.9±10.3 years) underwent SVR at our Department. Preoperative mean ejection fraction was 29.6±11.1%. The mean left ventricular end-diastolic diameter was 63±8.6 mm. Sixty percent of patients were in NYHA functional class III and IV. Mitral regurgitation was moderate or severe in 55% of cases. Moderate hypothermia and cold cardioplegic arrest was employed for all patients. Asymmetrical left ventricular reconstruction according to DOR technique was the operation of choice in all cases. Associated surgical procedures included coronary artery bypass grafting in 90% of patients (2.5 graft/patient) and mitral valve annuloplasty in 65% of cases.

**Results:** Thirty-day mortality was 5%. No major postoperative complications occurred. Mean CPB time was 162±33 min; mean aortic cross-clamp time was 101±23 min. Postoperative IABP was associated with prolonged ventilator support (>5 days) ( $P = 0.003$ ). During a mean follow-up time of 24±2.5 months (95% CI: 19.1; 28.8) 3 late deaths occurred. At last control 87.5% of patients were in NYHA I-II ( $P = 0.003$ ), with a significant improvement in exercise tolerance. The LV mean ejection fraction rose to 41.9±8.9% ( $P = 0.001$ ), and this was associated with a significant reduction of the LV end-diastolic diameters ( $P = 0.003$ ). Freedom from readmission to the hospital for congestive heart failure at 29 months was 80.4±13.4%.

**Conclusions:** Techniques of surgical left ventricular reconstruction seems to reduce mortality and improve the clinical status of patients affected by post-ischemic heart failure.



### 36. RIGHT AXILLARY CANNULATION AS A STANDARD APPROACH FOR CONTINUOUS ANTEGRADE CEREBRAL PROTECTION

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**Objective:** Axillary cannulation is easy to perform and in addition to the benefit of providing antegrade flow, allows for continuous brain perfusion during systemic circulatory arrest by clamping the innominate artery. To prospectively evaluate the feasibility and safety of right axillary cannulation as a standard method in cardiopulmonary bypass, and the possible resulting neurological benefits.

**Methods:** Fifty-three patients (30 males, 23 females) benefited from right axillary artery cannulation. Mean age was 63.9 years old. Eighteen patients (34%) were urgently operated. Indications for axillary cannulation were ascending aortic aneurysm ( $n = 20$ ), type A aortic dissection ( $n = 18$ ) and previous operation ( $n = 15$ ). Redo's included 8 CABG and 7 aortic valve replacements. Open distal anastomotic technique was routinely used when the ascending aorta or aortic arch were replaced.

**Results:** Axillary cannulation failed in 2 patients because of very small arteries. Systemic circulatory arrest was performed in 38 patients at 27°C, with a mean arrest of 26.2±4.5 min. Cardiopulmonary bypass time was 160±70 min and aortic cross-clamp time was 110±42 min. There were no perioperative deaths, no hemorrhagic or ischemic cerebral strokes, and no local neurovascular complications related to the cannulation site.

**Conclusions:** Right axillary cannulation provides additional benefits of safe and continuous antegrade cerebral perfusion and cerebral protection under circulatory arrest. This technique is easy and safe to perform and does not prolong operation time. It should completely replace femoral artery cannulation in reoperations, ascending aortic replacement, and type A aortic dissections.

### 37. FUNCTION OF CRYOPRESERVED HOMOGRAPHS AND DECELLULARIZED HOMOGRAPHS IN THE RVOT AFTER ROSS PROCEDURE USING ECHOCARDIOGRAPHY AND COMPUTED TOMOGRAPHY

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**Objective:** The cause of dysfunction of conduit in the RVOT is most likely due to immune factors. The immune response against human-leucocyte-antigens on donor-cells may be one of the most important factors. We have used two types of homografts (cryopreserved homografts, decellularized homograft). In our study, we compared the echocardiographic and computed tomographic [CT scan] findings of the two types of homografts.

**Methods:** 14 patients who received a decellularized pulmonary homograft during Ross-procedure, underwent CT with angiography and resting echocardiography (median: 12 months postoperatively). 14 randomly chosen patients who underwent a Ross-procedure with cryopreserved homografts served as controls (median: 33 months postoperatively).

**Results:** Neither the pressure gradients (mean: 9±4 vs. 10±4 mmHg;  $P = 0.64$ ) across the homograft, nor the indexed effective orifice area [EOAI] ( $0.93 \pm 0.80$  vs.  $0.93 \pm 42 \text{ cm}^2/\text{m}^2$ ;  $P = 0.96$ ), or the degree of regurgitation differed between the decellularized and control patients. The EOAI showed a significant correlation with the smallest homograft-conduit-area measured on CT ( $r = 0.81$ ;  $P < 0.001$ ) which was most frequently ( $n = 14$ ) measured on the level of the proximal anastomosis or valve and only occasionally found on the mid-tubular or distal level ( $n = 5$ ). In the intermediate follow-up, the diameter of the homograft conduits was significantly smaller than at implantation (18 and 19 mm vs. 23 mm at implantation in both groups;  $P < 0.001$ ). There were no radiological differences between the decellularized and control patients.

**Conclusions:** Despite a significant shorter follow-up in the decellularized pulmonary homograft group, no functional or radiological differences were observed as compared to the control-patients. The smallest diameter is located almost exclusively at the proximal level of homograft-conduits.

### 38. APICAL BIVENTRICULAR HYPERTROPIC CARDIOMYOPATHY (HCM) WITH SPONTANEOUS VENTRICLE PERFORATION

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**Objective:** Hypertrophic cardiomyopathy is a cardiac disease that causes a decrease in the left ventricular dimension and abnormality in the diastolic function. Here we report a 49-year-old woman with apical biventricular hypertrophic cardiomyopathy associated with spontaneous apical left ventricular rupture with its diagnosis and surgical treatment.

**Methods:** A 49-year-old woman presented with fatigue, palpitation, exertional dyspnoea. On physical examination systolic murmur was heard at left sternal border. In addition jugular venous distention, hepatomegaly and pretibial edema was observed on physical examination. On admission electrocardiography revealed atrial fibrillation with high ventricle response. Her chest X-ray revealed cardiomegaly. Echocardiography demonstrated biatrial enlargement, mild mitral regurgitation, severe tricuspid regurgitation and apical HCM including both right and left ventricle. In addition echocardiographic examination demonstrated a mass image at apical localisation in pericardial space without a myocardial connection. CMR imaging was performed and apical biventricle asymmetric hypertrophy confirmed and an intrapericardial mass was seen at apical neighborhood. Coronary angiography; right heart catheterization and ventriculography were performed. The coronary arteries were normal, however, severe tricuspid regurgitation (TR) and a filling defect seen in right ventricle apex. Left ventriculography showed spade sign and a contrast agent transition towards intrapericardial mass from left ventricle. Fine needle aspiration was performed under computerized tomography (CT) guidance. The result of the biopsy was reported as an organised thrombus. Despite aggressive medical treatment the clinical status worsened in apical HCM. Finally tricuspid annuloplasty was performed. Heart failure symptoms did not occur during the postoperative follow up period. The pathological specimens revealed HCM. The pathologic report of excisional mass was reported as an organised thrombus with a pericardial capsule.

**Conclusions:** Typical features include a characteristic spadelike configuration of the left ventricle during angiographic study. Hypertrophic cardiomyopathy is classically considered a disease of the left ventricle, right ventricular (RV) or biventricular involvement have also been rarely reported. Spontaneously perforation related to apical HCM have also been reported rarely. Echocardiography has been the first line imaging modality for patients with suspected apical HCM. However, echocardiography has limitations for visualising the apex and apical hypertrophy and may miss apical HCM. These limitations are not encountered with cardiovascular magnetic resonance imaging (CMR).

### 39. LOW-DOSE RECOMBINANT ACTIVATED FACTOR VII IN CARDIAC-SURGERY: A RANDOMIZED DOUBLE-MASKED CASE-CONTROL STUDY

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**Objective:** We evaluated the efficacy of a low-dose of recombinant activated factor VIIa (rFVIIa) in patients with intractable bleeding after cardiac surgery.

**Methods:** Twenty patients undergoing cardiac surgery complicated by intractable bleeding between January 2004 and February 2005, were eligible for the study. Ten patients, randomly assigned to the study group (Group I) were treated with 1.2 mg of rFVIIa, whereas 10 untreated patients were controls (Group II). The study was double-blinded to participants and it was designed to reach a statistical power of 80%.

**Results:** Median, 25th-75th 24-h blood loss percentiles were 1685, 1590-1770 ml and 3170, 2700-3850 ml in Group I and II, respectively ( $P = 0.0004$ ). Median, 25th-75th of red blood cells (RBCs), fresh frozen plasma (FFP), and platelet (PLT) units transfused in study group and controls were: 6, 4-8 U vs. 21.5, 13-23 U,  $P = 0.001$ ; 7.5, 6-11 U vs. 11, 9-15 U,  $P = 0.003$ ; 0, 0-4 U vs. 9, 6-13 U,  $P = 0.001$ . In addition, a significant improvement of PT ( $P = 0.01$ ), INR ( $P = 0.006$ ), aPTT ( $P = 0.01$ ) and PLT count ( $P = 0.003$ ) was detected in the study group vs. controls. Furthermore Group I-patients showed a lower ICU length of stay (LoS;  $\chi^2 = 15.9$ ,  $P = 0.001$ ) and experienced a low surgical re-exploration rate ( $\chi^2 = 16.2$ ,  $P < 0.001$ ).

**Conclusions:** In our experience, low-dose rFVIIa showed satisfactory results in cardiac patients with intractable bleeding. Further larger randomized series are necessary to confirm our findings.

### 40. OPERATIVE RISK FACTORS AND LONG-TERM OUTCOME IN OCTOGENARIANS UNDERGOING CARDIAC SURGERY: IS THE RISK JUSTIFIED?

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**Objective:** With the progressive aging of the Italian population, cardiac operations are being performed more frequently in patients aged 80 years and older.

**Methods:** Between January 1997 and December 2003, 287 consecutive octogenarians (median age 81 years, age range 80 to 90 years) underwent cardiac surgery in our Department. We retrospectively analyzed patients' preoperative characteristics, postoperative complications, short and long term outcome, and freedom from cardiac events (reoperation, cardiac-related re-hospitalization, and percutaneous cardiologic procedure).

**Results:** 159 patients (55.4%) were male; 269 (93.7%) patients had a EuroSCORE = 6, 84 (29.3%) a NYHA functional class III-IV, and 67 (23.3%) a left ventricular ejection fraction <50%. Operations included coronary artery bypass grafting in 58.5% cases, valve procedures in 19.9%, coronary artery bypass grafting plus valve procedures in 18.5%, and other procedures in 3.1%; in 78 (27.2%) patients the timing of intervention was urgent or emergent. The 30-day mortality rate was 9.1%. Multivariate predictors ( $P < 0.05$ ) of early death were a left ventricular ejection fraction <50%, a preoperative diagnosis of unstable angina, and an urgent or emergent surgical priority. Atrial fibrillation (35.2%), renal failure (9.8%), and type 2 neurological deficits (9.4%) were the postoperative complications occurring more frequently. Kaplan-Meier survival rates at 1-year, 3-year and 6-year were  $83.8 \pm 2.2\%$ ,  $73.1 \pm 3\%$ , and  $51.6 \pm 5.4\%$ , respectively males and patients with a preoperative left ventricular ejection fraction <50% had a significantly lower survival than females and patients with a preoperative left ventricular ejection fraction = 50%. Clinical follow-up was complete in all the 203 survivors. Mean length of follow-up was  $59.6 \pm 2.5$  months (range, 2.3 to 83.6 months). 184 (91%) patients were in a NYHA functional class I-II and 179 patients (88.2%) rated their present health as excellent or very good. Freedom from a new cardiac event at 3-year and 6-year was  $94.9 \pm 2.1\%$  and  $75.5 \pm 7\%$ , respectively.

**Conclusions:** Cardiac surgical procedures can be performed in octogenarians with reasonable operative risk and satisfactory long-term outcome. Elderly patients benefit from improved functional status and quality of life.

#### 41.

##### SURGICAL TREATMENT OF ATRIAL FIBRILLATION FOR EVERY OPERATED PATIENT - INSTITUTIONAL ALGORITHM OF SURGICAL TREATMENT OF ATRIAL FIBRILLATION IN 102 PATIENTS

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**Objective:** We present experience of first 102 patients who underwent ablation of AF according to "warsaw algorithm"—the clinical strategy based on different ablation systems and techniques which make possible and effective surgical ablation of atrial fibrillation as concomitant procedure in every patient regardless of primary indication for surgery.

**Methods:** Between January 2002 and December 2004, 102 patients (47 males, 55 females) in mean age of  $63,3 (\pm 10,3)$  years, with AF underwent surgical treatment of AF. 52 (51%) patients had chronic AF and 50 (49%) had paroxysmal AF. Average duration of AF was 4,2 years, and mean left atrium preoperative diameter was  $48 (\pm 8)$  mm. Average EuroSCORE logistic risk was 12,8%. Surgical ablation was performed with use of liquid nitrogen cryotherapy or radiofrequency ablation system. With respect to primary surgical procedure and type of AF the ablation was performed either with endocardial or epicardial approach. Ablation procedure was performed concomitantly to mitral valve surgery (MVS) in 37 (36,2%) patients, aortic valve replacement (AVS) in 12 (11,7%) patients, MVS and AVS in 5 (4,9%) patients, coronary artery bypass grafting (CABG) on-pump or off-pump in 2 (1,9%) and 17 (16,6%) respectively, MVS and tricuspid valve plasty (TVP) in 9 (8,8%) patients, MVS and ASD II closure in 2 (1,9%) patients, MVS and CABG in 5 (5,8%) patients, AVR and CABG in 6 (5,8%) patients, MVS and AVR and TVP in 3 (2,9%) patients, AVR and aortic root replacement in 2 (1,9%) patients, myxoma surgery in 1 and pericarditis surgery in 1 (0,9%) patient.

**Results:** In group of endocardial cryoablation (33 patients) at discharge sinus rhythm (SR) was observed in 71,4% of patients and in 70,5% of patients after 6 months. In group of endocardial radiofrequency (31 patients) SR at discharge and in 6 month-long follow-up was observed in 65,5% and 78,5% of patients, respectively. 60% of patients who underwent epicardial cryo-

ablation was in SR at discharge and 61% of patients after 6 months still were in stable SR. In group of epicardial bipolar radiofrequency ablation (21 patients) SR were found in 72% of patients at discharge and in 90% of patients after 6 months.

**Conclusions:** Current technology allows to treat every patient with AF undergoing any type of cardiac surgical procedure. Short- and mid-term results prove its feasibility, safety and efficacy.

#### 42.

##### REOPERATIONS LATE AFTER CORRECTION OF TETRALOGY OF FALLOT

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**Objective:** Correction of tetralogy of Fallot has excellent long-term results. Reoperations even late after correction may complicate results. The aim of this study was to investigate incidence and indications for reoperations late after correction of tetralogy of Fallot.

**Methods:** A retrospective data analysis of 812 consecutive patients who underwent correction of tetralogy of Fallot from 1960 to 2001 in our department was performed.

**Results:** In 90 patients 105 reoperations were performed late after correction of tetralogy of Fallot. The indications were: residual ventricular septum defect (VSD)  $n = 29$  (27.6%), residual VSD combined with right ventricular outflow tract (RVOT) aneurysm  $n = 13$  (12.4%), residual VSD combined with pulmonary stenosis  $n = 7$  (6.7%), RVOT aneurysm  $n = 6$  (5.7%), isolated peripheral pulmonary stenosis  $n = 9$  (8.6%), replacement of primary implanted pulmonary artery conduits (including combinations with peripheral pulmonary stenosis)  $n = 14$  (13.3%) and replacement of the pulmonary valve in  $n = 12$  (11.4%). In the remaining 5 cases were performed: transannular patch plasty ( $n = 1$ ), re-infundibulectomy ( $n = 1$ ), RVOT aneurysm resection combined with surgery for peripheral pulmonary stenosis and pulmonary valve reconstruction ( $n = 1$ ), closure of atrial septal defect ( $n = 1$ ), and ligation of persistent ductus arteriosus ( $n = 1$ ). In the last decade of the study period the rate of residual VSD with or without concomitant procedures decreased ( $n = 4$ ). There was no correlation between the type of corrective surgery and reoperation late after correction.

**Conclusions:** Reoperation late after correction of tetralogy of Fallot was necessary for residual VSD with or without combined procedures for more than 50% of the patients with declining incidence during the last years. Primary use of conduits led to an increasing number of reoperations for conduit exchange, due to degeneration or failure.

#### 43.

##### A NEW VENOARTERIAL MODIFIED ULTRAFILTRATION

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**Objective:** Conventional ultrafiltration is performed during cardiopulmonary bypass (CPB) to reduce excess water in the circulating volume but this has limitations. Modified ultrafiltration (MUF) is a process in which the total circulating volume of blood in patient and residual volume of the CPB circuit are haemoconcentrated after separation from bypass. The aim of this study is to compare a new method of MUF to a conventional one.

**Methods:** Different techniques of performing modified ultrafiltration were explored at our hospital which includes: conventional arteriovenous MUF, simple venoarterial MUF, venovenous MUF and a new venoarterial MUF system. This new system has been uniquely designed by the first author. It entails removal of blood from the patient via a leucoplaced in the venous line, circulating it through a separate pump and then through a haemoconcentrator. Blood is returned to the cardiomy reservoir and back to the patient through the normal arterial route of the bypass circuit.

**Results:** This study included 65 patients who underwent MUF (40 conventional MUF and 25 new MUF system). Seventy percent of the patients were paediatric (weight range from 4.5 kg to 20 kg) and 30% were adults (weight range from 40 kg to 95 kg). Haemodynamically the difference was negligible (mean arterial blood pressure was  $56 \pm 11$  mmHg and  $58 \pm 9$  mmHg between the techniques, respectively) both MUF techniques were effective in decreasing total body water and increasing haematocrit (patients were left with a positive calculated volume of  $\pm 100$  ml) thus reducing the need for homologous blood transfusion.

Conclusions: The new system of MUF is comparable to the conventional one regarding haemodynamics and clinical parameters but it seems to be a less complicated system.

44.

**QUALITY OF LIFE AND BENEFIT AFTER CORONARY SURGERY**

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Objective: Our previous reports suggest that quality of life (QOL), measured by QOL-index (QOLI-NS) which is ranged from 0-100, increases significantly and remains stable 7 years after coronary surgery. The aim of this study: to calculate benefit from myocardial revascularisation.

Methods: We analysed 525 consecutive coronary patients operated from September 1995 to December 2002 at our Clinic. At each check-up time, the observed average QOLI-NS index was multiplied with appropriate cumulative survival rate at the point of time (titled Survival adjusted QOLI-NS ranged from 0-100). In the absence of a control group of non operated patients, with the same health conditions, we calculated benefit from coronary surgery as hypothetical value expressed as a difference between observed adjusted QOLI-NS in each period of time and its preoperative QOLI-NS value (41.3).

Results: The obtained benefit is presented.

Conclusions: The benefit from coronary surgery at 1 year is 40.2 and decreases to 22.6 at 7 years. The mean 7-year benefit is 31.3.

45.

**SIMULTANEOUS LUNG RESECTION AND OPEN HEART SURGERY**

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Objective: The aim of this study was to review retrospectively the outcome of 14 pts, who underwent lung resection and cardiac operation at the same procedure over the last 10 years.

Methods: The pts had a mean age of 65 years (59-74 years) and there were 11 men and 3 women. 9 of them had a right-sided lung tumor, 2 of them on the left side and 1 ipsilaterally. All the tumors were primary and were resected completely along with local lymph nodes. In 13 cases the median sternotomy was the incision of choice while in one case left lower lobectomy and single coronary artery bypass graft to the left anterior descending was carried out via left thoracotomy. The concomitant cardiac operations were in 13 cases coronary artery bypass graft and in one case aortic valve replacement. The arterial revascularization was done on cardiopulmonary bypass in 6 cases and in the remaining 7 the procedure was performed off pump. In all cases coronary revascularization was done prior to lung resection, unless the other way round was more feasible.

Results: We had no operative mortality. Mean blood loss was significantly higher as compared to the overedge cardiac procedures (1650 vs. 750 per patient). The mean hospital stay was 13 days above the average hospital stay for either procedure alone. The survival of these patients was within the expected limits and was based on the stage of the lung tumor.

Conclusions: Simultaneous lung resection and cardiac operation can be done safely, especially using the off-pump techniques

46.

**UNCHANGED LV FUNCTION, BUT REDUCED SCAR SIZE IN SOME CASES AFTER AUTOLOGOUS BONE MARROW CELL THERAPY DURING CABG SURGERY IN PATIENTS WITH MYOCARDIAL INFARCTION**

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Objective: Cardiac cell therapy is an attractive novel strategy to support cardiac regeneration after myocardial infarction (MI). The aim of this ongoing study is to establish a hybrid intervention of isolating mononuclear bone

marrow (BM) cells, CABG surgery and cell injection in patients with chronic MI, and to investigate the therapeutic potential of such strategy.

Methods: 18 patients with transmural scar were enrolled (63±3 years, 15 male), who underwent elective CABG surgery 2.1±0.6 months post MI. Infarct area and hibernating myocardium were identified by Tc-99m-MIBI Single-Photon Emission Computed Tomography (SPECT) and F18-FDG-Positron-Emission-Tomography (PET). LV function was assessed by SPECT and MRT. During surgery, 10 ml of sternal BM were obtained, and mononuclear cells (MNC) were isolated. At the end of surgery MNC were injected into the center and the border zones of the infarct (10 injections, 2 ml total volume containing  $7.5 \pm 1.8 \times 10^7$  MNC (FACS analysis:  $1.9 \pm 0.2\%$  CD34+;  $0.02 \pm 0.006\%$  CD34+/KDR+,  $0.8 \pm 0.2\%$  CD133+ and  $0.8 \pm 0.2\%$  CD34+/CD133+). No major complications attributable to cell therapy were observed.

Results: 17 patients were evaluated at 3 months after cell therapy and CABG (15 male). In ergometry they performed  $104 \pm 10$  W for  $6.2 \pm 1.4$  min without angina or ECG changes. Global LV function at rest remained unchanged (MRT,  $36.7 \pm 4.5\%$  vs.  $32.1 \pm 3.1\%$  prior to surgery,  $P = 0.4$ ; SPECT  $41.0 \pm 3.0$  vs.  $39.5 \pm 2.4\%$ ,  $P = 0.7$ ), as well as LV function during dobutamine stress test ( $10 \mu\text{g}/\text{kg} \cdot \text{min}$ ) (MRT,  $36.2 \pm 3.8\%$  vs.  $29.3 \pm 3.6\%$ ,  $P = 0.2$ ). In 5 of 17 patients (29%) scar size was reduced (PET, average reduction  $60.0 \pm 6.1\%$ ), but also in these patients no improvement in global LV function was observed ( $47.8 \pm 4.5\%$  vs.  $39.4 \pm 5.7$ ,  $P = 0.3$ ). 6 months follow up is currently underway.

Conclusions: The results show that mononuclear cells from bone marrow can be recovered, isolated and injected during a single hybrid intervention together with CABG surgery without additional risk for the patient. Scar size was reduced in about 30% of the patients possibly reflecting an enhanced regeneration of the infarcted tissue. Nevertheless, global LV function remained unaffected in all patients, also in those with improved vitality. Thus, the therapeutic benefit of BM cell transplantation may be limited, at least under the specific conditions of this study at 3 months follow up.

47.

**THE LUNG INJURY AFTER OFF PUMP CORONARY SURGERY**

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Objective: Cardiopulmonary bypass induces an inflammatory process, which leads to major organ dysfunction. Inflammatory process also occurs in the lung and induces nitric oxide metabolites synthesis and depression of respiratory function, especially in the patients with preoperative respiratory dysfunction. Nitric oxide metabolites are known to be a good marker of the inflammation in the lung. The strategy of off-pump coronary artery bypass (OPCAB) has regained interest in recent years, as CPB is not performed during OPCAB, it is expected that this surgical procedure might allow patients to avoid some of the morbidity of CABG surgery especially about the major organ dysfunction. The aim of this study is to evaluate the effect of not using cardiopulmonary bypass in the lung injury after coronary surgery in different patient subgroups.

Methods: 30 patients with coronary artery disease were involved in this study and they were grouped into two, the first 15 patients are operated with the OPCAB technique and the second was operated with the conventional CABG technique. Patients were evaluated according to their respiratory functional status. Endotracheal aspiration (ETA) samples were obtained just after the intubation in the operating room, at the start of the reventilation period during the operation and at the postoperative 3rd h in the ICU unit, from all of the patients. The nitrite, nitrate and 3-Nitrotyrosine metabolites were measured with the Griess technique.

Results: The NO metabolites were increased gradually in both groups. The increase in the OPCAB group was significantly lower. There was no significant difference in the preoperative hemodynamic variables of the patients. The respiratory function was well preserved in the OPCAB group. The decrease in the respiratory capacity was higher in the patients with poor respiratory function preoperatively.

Conclusions: We evaluated that, OPCAB procedure, known to be associated with decreased incidence of inflammatory response, may lower the lung injury after the coronary bypass surgery and improve the clinical outcome especially in the patients with respiratory dysfunction.

48.

**CRYOPRESERVATION OF PORCINE AORTIC VALVE ON CLOSED STATUS INCREASED MATRIX GLYCOSAMINOGLYCANS STRUCTURAL MAINTENANCE**

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**Objective:** Cryopreservation of aortic valve and extracellular matrix damage may result in increased valve structural failure and calcification. The bending stresses are greatest in the leaflets and on the lines of their attachment to the aortic wall. The main component of flexion zone of the leaflet is a semifluid matrix composed of a complex sugars-glycosaminoglycans (GAG) synthesized and secreted by connective tissue cells. The present study was undertaken to evaluate the effect of cryopreservation on GAGs content on aortic leaflets on closed and open position.

**Methods:** 8 porcine aortic valves were obtained from a local slaughterhouse immediately after sacrifice and placed into a transport medium. Mean cold ischemia time was 1 h  $\pm$  20 min. The aortic valves were dissected and placed in a container in 100 ml of a low dose of antibiotic solution for 24 h at 4°C. 4 aortic valves are placed in closed position and 4 in open position using a prolene 6-0 stitches in Hemofreeze Bag with cryopreservation solution; then were cryopreserved in a programmed freezer that lowered the temperature  $\pm$ 1°C per min down to a temperature of -80°C. Finally the allograft is maintained in liquid nitrogen vapours (-196°C). After 48 h of storage, the specimens were thawed, thoroughly rinsed, deprived of adventitia layer and analyzed. Three different zones were cut and separately processed: aortic wall, zone of leaflet flexion and leaflet. After peeling and segregating the three different types of tissue, their wet weight was determined. The methodology used for isolation and characterization of GAGs includes delipidation, proteolytic digestion, anion-exchange chromatography, ethanol precipitation and acetate cellulose electrophoresis.

**Results:** The three selected areas under study were significantly different in their total GAG content. Moreover, comparing the same areas, some differences following cryopreservation procedures were detectable. The qualitative nature of GAGs eluted by the two step chromatographic procedure of the three selected areas were different. The electrophoretic patterns obtained from GAGs purified from the leaflet of aortic valve were qualitatively similar to that obtained from its zone of flexion, but higher relative percentages of H were detected.

**Conclusions:** Quantitative analysis of total GAGs from aortic valves suggest that alterations could be produced following cryopreservation procedure. Moreover, electrophoretic data, combined with those from the degradation of GAGs with specific eliminases, indicate possible structural dissimilarities in GAG chains depending on their topographic localization. We conclude that the cryopreservation of aortic valve in open position can better preserve the cellular matrix of leaflet.

#### 49. FACILITATED MIDCAB WITH AN AUTOMATED MAGNETIC DISTAL ANASTOMOTIC SYSTEM

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**Objective:** Minimally invasive direct coronary artery bypass grafting (MIDCAB) is a well established operative procedure. However it is technically demanding and is therefore somewhat under-utilised. We evaluated the clinical and angiographic outcome of patients undergoing a MIDCAB procedure with the Ventrica Magnetic Vascular Port MVP® System.

**Methods:** A Ventrica MVP® System was used in 34 selected MIDCAB patients. The system consists of 6 magnetic clips, 3 clips forming a set. One magnetic clip set is positioned at the arteriotomy of the target artery and of the bypass graft using a pre-loaded delivery system. These ports then form an anastomosis by magnetic coupling.

**Results:** The mean age of the 34 patients (22 male) was 64.4 $\pm$ 11.8 years. 12 patients had an angiogram at the time of discharge and 14 returned for a 6-month angiogram. The total procedure time was 120.5 $\pm$ 10.5 min. The mean anastomotic time was 139. The mean ischemic time during the anastomosis was 142 $\pm$ 140 s. There were no in-hospital complications and no device-related adverse events. All 12 pre-discharge and all 14 6-month angiograms showed patent anastomoses. One patient had to be reoperated 12 months after implantation due to intimal hyperplasia in the anastomosis.

**Conclusions:** The magnetic vascular port facilitates the MIDCAB procedure significantly and reduces the ischemic time during the anastomosis. This minimally invasive procedure has the potential to be an alternative to PTCA and stenting in proximal LAD stenosis. It may expand the acceptance of hybrid procedures in which a LIMA to LAD graft optimally supplies the

anterior wall and the septum while the circumflex and right coronary artery may be treated interventionaly.

#### 50. AORTOPULMONARY COLLATERAL ARTERIES AS A CAUSE OF COMPLICATIONS AFTER FONTAN OPERATION: DOES OCCLUSION IMPROVE CLINICAL OUTCOME?

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**Objective:** Different manifestations of heart failure are most common within complications occurring after Fontan operation. The role of aortopulmonary collaterals in deterioration of patients with Fontan-type circulation is sometimes underestimated. However, excessive pulmonary blood flow leads to ventricular overload, which results in heart failure, prolonged pleural effusions and other deteriorating events. Effectiveness of aortopulmonary collateral occlusion, performed after these complications have already occurred, remains disputable. The aim of our study is to reveal whether embolization of aortopulmonary collaterals is able to improve clinical outcome.

**Methods:** We performed a retrospective analysis of hospital charts in 280 consecutive patients who underwent Fontan operation from March 1983 through December 2004. Ten (3.6%) of them had aortopulmonary collaterals confirmed by aortography. Methods of Fontan operation used in these patients were extracardiac conduit (9) and lateral tunnel (1). In 9 cases, aortopulmonary collaterals were occluded by means of transcatheter coil embolization and/or dissection. Dissection was performed if a selective catheterization of small and/or curved vessels had failed.

**Results:** One patient underwent embolization of the collateral prior to uncomplicated Fontan operation. In 9 patients, aortopulmonary collaterals were either unrecognized or considered insignificant during preoperative examination. After surgery, 7 of them demonstrated prolonged pleural effusion, 1 pericardial effusion, and 1 pulmonary hemorrhage. The mean volume of daily transudation ranged from 200 to 3000 ml (mean, 600.0 $\pm$ 301.8 ml). Only in one case, conservative treatment combined with pericardial fenestration was successful. Eight patients required embolization of aortopulmonary collaterals. The number of occluded arteries ranged from 2 to 9 (mean, 4.4 $\pm$ 1.0). All embolizations were successful, and pleural effusion as well as pulmonary hemorrhage completely stopped 5-15 (mean, 8.9 $\pm$ 1.1) days after the procedure.

**Conclusions:** Aortopulmonary collaterals should not be underestimated in Fontan candidates and require occlusion before surgery. Patients with prolonged postoperative pleural or pericardial effusions resistant to conservative treatment, and with pulmonary hemorrhage, require aortography. Transcatheter embolization of aortopulmonary collateral arteries effectively resolves pleural effusions and pulmonary hemorrhage after Fontan procedure.

#### 51. SURVIVAL AND QUALITY OF LIFE AFTER CARDIAC SURGERY COMPLICATED BY PROLONGED STAY IN INTENSIVE CARE

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**Objective:** To determine survival, factors determining survival and evaluate quality of life after 1 year, in patients who had prolonged intensive care unit (ICU) stay after cardiac surgery.

**Methods:** In the year 2001, 804 patients underwent various cardiac procedures utilising cardiopulmonary bypass. Eighty-nine consecutive patients surviving multiple organ failure requiring ICU stay of 35 days constituted the study group. Survival was determined in the study group after 1 year. Patients with an uncomplicated postoperative course were matched to the survivors in the study group with respect to age, gender, type of surgery, risk scores and duration of follow-up and constituted the control group. The Short Form Health Survey (SF36) was used to assess quality of life (QOL) at the end of 1 year in these patients. Quality of life was compared between the study group and the control group and to that of general population.

**Results:** Seventy percent of the patients in the study group suffered from failure of at least three organ systems. Mean ICU stay was 13 $\pm$ 3 days (median 9, maximum 53). At the end of 1 year the mortality in the study group was 34%. The independent predictors of mortality were: preoperative cardiac support, lower ejection fraction, higher Parsonnet score, higher EuroSCORE, pulmonary complications, renal failure necessitating hemofiltration, CNS complications and failure of three or more organ systems. The QOL was

lower in the study group than the control group in all eight dimensions measured (significant in five  $P < 0.05$ ): physical function, role physical, vitality, mental health, general health, and bodily pain.

Conclusions: One year mortality in patients with prolonged ICU stay after cardiac surgery remains high. Identification of risk factors will help to reduce the mortality with help of regular follow up. The QOL remains low in all dimensions especially those measuring physical aspects and pain.

## 52.

### DETERMINANTS OF HOSPITAL SURVIVAL FOLLOWING REOPERATIVE MITRAL VALVE REPLACEMENTS IN RHEUMATIC MITRAL VALVE DISEASE

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Objective: We analyzed the risk factors for hospital death in patients who underwent reoperative valve replacement.

Methods: We reviewed totally 480 patients who underwent mitral valve surgery and 94 patients who underwent reoperative mitral valve surgery. The incremental effect of the reoperative procedure on hospital mortality and morbidity was studied by comparing primary and reoperative procedures and analyzing a series of possible predisposing factors.

Results: Operative mortality for redo procedures was found significantly higher (12.76%) than the first operations (4.3%). Risk factors affecting the hospital mortality in reoperation group were determined as advanced age, diameter of left atrium, total pump time and development of postoperative low output state. The indication for surgery influenced outcome. Mortality is significantly higher in cases operated due to endocarditis or mitral mechanical valve thrombosis compared to other reoperation groups. By multivariate analysis age was found to be an independent risk factor that has an effect on hospital mortality. But age, left atrial diameter, total pump duration, development of low output state postoperatively and reoperation due to endocarditis in combination affect hospital mortality statistically very importantly.

Conclusions: Better evaluation of the risk factors, adequate operative timing and enabling myocardial protection in the perioperative period are essential for the prevention of hospital mortality and morbidity. Patients underwent mitral valve repair for the first operation, reoperative procedure did not lead to increase in mortality. For rheumatic mitral valves, in current conditions we can say that mitral valve repair is a good alternative to the mitral valve replacement and should be considered for the first time operations.

## 53.

### CARDIAC VALVE SURGERY ON THE BEATING HEART WITH RETROGRADE CORONARY SINUS WARM BLOOD PERFUSION

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Objective: Beating heart (off-pump) coronary artery bypass grafting (CABG) techniques have led us to consider the possibility for performing the mitral and aortic valve surgery (mitral valve repairs and replacements—with or without CABG) on the beating heart with the technique of retrograde oxygenated.

Methods: We used the technique of retrograde oxygenated coronary sinus perfusion in 85 patients, 35% were in New York Heart Association (NYHA) class 4 and 65% in NYHA class 3. The procedures were: double and triple valves - 23 patients, mitral and tricuspid - 41 patients, double valves (and CABG) - 4 patients, mitral valve (and CABG) - 17 patients. In two patients RF ablation of arterial fibrillation was done on the beating heart. Mean age: 60.59 (31-76), male:female = 50:36.

Results: Mean cardiopulmonary bypass time was 90,34 min, mean aortic X-clamp time was 62,65 min and the mean flow through the coronary sinus was 422 ml/min. The total mortality was 4,7% (4 of 85 patients), two out of these were in-hospital deaths. None of these deaths were cardiac related.

Conclusions: Good exposure of the mitral and aortic valve during this type of surgery is necessary. The main advantages of beating-heart surgery are 1) the perfused myocardial muscle, 2) no reperfusion injury, 3) the possibility for ablation of arterial fibrillation on the beating heart, and 4) testing of the mitral valve repair is done in real physiologic conditions in the state of left

ventricle beating tonus. The procedure could be the procedure of choice for the valve operation or combined operations (valve operation and CABG) in high-risk patients with low ejection fractions.

## 54.

### DOBUTAMINE STRESS ECHOCARDIOGRAPHY IN ASSESSMENT OF EXERCISE FUNCTION OF SMALL-SIZE AORTIC VALVE PROSTHESES

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Objective: The aim of the study was the use of dobutamine stress echocardiography in the assessment of the function of aortic valve prostheses sizes 19, 21, 23 mm in comparison with small-size (19, 21 mm) On-X® valves.

Methods: Exercise echocardiography was performed in 42 consecutive patients (mean age 53.6±23 years; 12 males, 30 females) who underwent aortic valve replacement for severe aortic stenosis. Sorin valves were implanted in 10 patients, Medtronic Hall in 14 patients, St. Jude in 9 patients, Carbomedics in 2 patients and On-X (Medical Carbon Research Institute) in 7 patients. Mean EF of all patients was 51%. Dobutamine infusion was increased up to 40 mg/kg/min. Mean stress HR was 120/min. Patients' pre- and post-operative exercise capacity (NYHA class) was analyzed as well as LV mass, aortic valve transvalvular gradient with reference to valve type and diameter, time of operation and body surface area (BSA).

Results: In over 2/3 of patients, marked postoperative improvement of NYHA class was observed. The LV mass decreased nonsignificantly from 300 g to 241 g. 19 mm valves produced higher mean stress gradient in comparison to 21 and 23 mm valves ( $P < 0.05$ ), especially in patients with BSA  $> 1.7$  m<sup>2</sup>. The mean stress gradient of all small valves increased significantly after valve replacement between 3rd and 4th year ( $P < 0.05$ ). Analyzed group of small-size On-X valves present significant lower peak and mean stress transvalvular gradient, independent of BSA.

Conclusions: Good clinical outcome after valve replacement was not correlated with high stress gradient of small aortic valves. Small-size On-X valves show excellent performance in aortic position.

## 55.

### ADVANCED EARLY MITRAL RECONSTRUCTIVE PROCEDURES IN ACTIVE INFECTIVE ENDOCARDITIS BASED ON FUNCTIONAL ANATOMY

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Objective: The timing of mitral surgery has changed considerably to an early surgery concept preceding not only the signs of left ventricular dysfunction but severe destructive changes. The purpose of this study was to review the risk–benefit ratio of mitral valve repair in active IE patients with mild or moderate mitral regurgitation.

Methods: From September 2001 to September 2004, 34 patients were operated on for mitral regurgitation following IE. Patients were in New York Heart Association class I or II with grade II-III mitral regurgitation. Mean age was 33.1 years (52,9% of patients younger than 23 years old). While performing preoperative transecho studies the changes of the leaflets were evaluated using developed protocol based on precise Lam's anatomical classification of the MV. Leaflet prolapse or flail leaflet following destructive changes were the mechanisms responsible for regurgitation in 26 (76,5%) patients. All patients were operated during 2-4 weeks since the onset of the disease. In 8 patients were observed perforations. Mitral valve repair was performed in 34 patients. A standard rigid prosthetic ring was used in 12 patients and in 2 patients the dosage segmental suture annuloplasty was performed as additional procedures.

Results: Hospital mortality was 2.9%. In the early post operative period in 3 patients it was necessary to fulfill MV replacement (8.8%). During 1 year after operation 4 patients were reoperated (2 underwent MV replacement and 2 repeat valvuloplasty). Trivial residual mitral regurgitation observed in 3 patients.

Conclusions: 1) Mitral valve repair for mitral regurgitation in active IE patients can be performed with low mortality and good valve function. 2) Early repair may be advocated on the basis of pathomorphological changes and valve reparability rather than regurgitation and symptoms.

#### 56. COMBINED SURGICAL AND ENDOVASCULAR TREATMENT OF AORTIC TYPE A DISSECTION

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**Objective:** We describe a combined approach for treatment of a type A aortic dissection with surgical repair of the ascending aorta and transluminal stenting of the descending aorta hence minimizing the consequences on the untreated aortic arch and descending aorta.

**Methods:** From December 2002 to June 2004, 8 consecutive patients (6 men and 2 women) suffering from type A aortic dissection were treated with resection of the ascending aorta or aortic hemi-arch. Prior to the open distal aortic anastomosis the Endofit endovascular graft (Endomed inc, 10220 South 51st Street, Suite 1, Phoenix, AZ 85044, USA), was deployed under direct vision distally to the origin of the left subclavian artery.

**Results:** Intraoperative stent graft placement was successful in all patients. There was no hospital mortality. Early results were satisfactory with a completely thrombosed false lumen in 4 patients and a partially thrombosed false lumen in 3 patients, 10 days after operation. Follow-up CT scan showed a completely thrombosed false lumen in 5 patients and a partially thrombosed false lumen in 3 patients.

**Conclusions:** This study shows that combined surgical and endovascular treatment of acute type A dissection is a feasible option but further evaluation is necessary.

#### 57. PRESERVATION OF RIGHT VENTRICULAR FUNCTION AFTER TRANSATRIAL-TRANSPULMONARY REPAIR OF TETRALOGY OF FALLOT: A SEVEN-YEAR EXPERIENCE

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**Objective:** Increasing awareness due to development of late adverse events (including severe pulmonary valve insufficiency (PI), residual/recurrent right ventricular outflow tract obstruction (RVOTO) and right ventricular (RV) dysfunction) has fueled the debate as to the optimal surgical method of TOF repair: transventricular versus transatrial/transpulmonary (TA/TP), which emphasizes maximal preservation of RV function. This study evaluates surgical results, reoperation and RV functional outcome after TA/TP repair of TOF over a 7 year period.

**Methods:** Between 9/1997 and 9/2004, 159 consecutive patients with TOF were referred to our department for surgical treatment. Of these, 157 patients (aged 6 months to 45 years, median 2 years) had complete TA/TP repair, including 2 of 4 who had initially undergone shunting, and 5 patients with anomalous LAD from the RCA. Patients with pulmonary atresia, absent pulmonary valve and complete AV canal are not included in this study. In 134 patients main pulmonary artery (MPA) was augmented with autologous pericardium which extended to repair PA branch stenoses in 31 and to enlarge pulmonary valve ring in 121 patients. A monocusp autologous pericardial valve was inserted in 14 patients. All patients underwent pre-discharge echocardiographic (ECHO) evaluation. Serial follow-up included both clinical and ECHO assessment.

**Results:** There was no death in this series. One patient required early (POD 4) reoperation to relieve residual RVOTO. Median ICU and hospital stay were 3 and 11 days, respectively. At hospital discharge, RVOT gradient was  $14 \pm 13$  (median, 10) mmHg, most patients (94%) had up to moderate PI (1+ in 64.5%, 2+ in 29.5%), up to mild tricuspid insufficiency (84%), and normal (94%) or mildly reduced (5%) RV function. One patient required late reoperation (5.5 years postoperatively, mitral repair) for progressive mitral insufficiency (mitral cleft). At follow-up (100% complete, mean  $2.9 \pm 1.2$  years), all patients are in NYHA class I or II. Echocardiographically, the degree of PI was stable (72% of patients had none to mild and 22% moderate PI). None to moderate TI was noted in 96% whereas RV function was normal in 94% and mildly impaired in 6% of patients. RVOT gradient remained unchanged.

**Conclusions:** TA/TP repair of TOF in this series is associated with no mortality and minimal reoperation rate. Furthermore, in medium term follow-up, pulmonary insufficiency remains modest, while the absence of significant RVOTO and the stability of good RV function provide hope for reduced long-term adverse event rates. Truly long-term follow-up is necessary to confirm these findings.

#### 58. BOVINE VALVED XENOGRAFT FOR RIGHT VENTRICULAR OUTFLOW TRACT RECONSTRUCTION: MID-TERM RESULTS

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**Objective:** To evaluate the outcome of bovine valved xenograft (Contegra®) for right ventricular outflow tract (RVOT) reconstruction.

**Methods:** From April 2000 to April 2003, 54 patients with a mean age of  $7.3 \pm 6.9$  years (range: 13 days to 35.2 years), and a mean weight of  $20.9 \pm 13.2$  kg (range: 2.5 to 75 kg), underwent RVOT reconstruction with a Contegra® conduit. Concerning reasons for Contegra® placement, patients can be divided into three groups: a. primary repair of congenital heart disease (Group A,  $n = 26$ ); b. conduit change (Group B,  $n = 13$ ); and c. Ross procedure (Group C,  $n = 15$ ). Underlying pathology was: in Group A, pulmonary atresia ( $n = 13$ ), truncus arteriosus ( $n = 4$ ), double outlet right ventricle ( $n = 3$ ), Fallot's tetralogy ( $n = 3$ ), other complex cardiac malformations ( $n = 3$ ); in Group B, change of homograft ( $n = 11$ ), or Contegra® ( $n = 2$ ) plus residual VSD closure ( $n = 2$ ); in Group C, aortic stenosis ( $n = 7$ ), aortic regurgitation ( $n = 1$ ), mixed lesion ( $n = 7$ ). Patients were followed-up with echocardiography performed early (within 30 days), 3 to 6 months, and yearly after surgery; when needed, cardiac catheterization was performed.

**Results:** There were no perioperative deaths. During follow-up for 22.9 months (range: 7 to 56 months), there was one death (sudden death, 1.8%). In last echocardiography follow-up, transconduit Doppler velocities were:  $< 2$  m/s in 21 cases (38.9%);  $2-3$  m/s in 29 (53.7%),  $> 3$  m/s in 4 (7.4%). Cardiac catheterization was performed in 13 patients. Four patients (7.4%, all in Group A) were reoperated, two for conduit related reasons (conduit-to-pulmonary confluence stenosis; conduit compression of aorta). The explanted Contegra® conduit had no signs of calcification, or peel formation. Three patients (5.5%, all in Group A) underwent interventional procedure: conduit balloon dilatation ( $n = 2$ ), and conduit stenting ( $n = 1$ ). Four patients (two with conduit-pulmonary confluence stenosis; one with infundibular stenosis; one with distal pulmonary artery stenosis) are awaiting a new cardiac catheterization/intervention, or surgery.

**Conclusions:** The Contegra® conduit is an attractive concept for RVOT reconstruction. It showed very good haemodynamics during the mid-term follow-up. Its long-term performance has yet to be evaluated.

#### 59. STUDY OF QUALITY OF LIFE IN PATIENTS WITH ISOLATED CORONARY SURGERY AND ASSOCIATED CORONARY AND VALVULAR SURGERY

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**Objective:** There are different reports regarding the characteristics of examined quality of life (QOL) in patients with combined coronary artery and cardiac valvular surgery. Objective was to compare the quality of life changes after isolated coronary and associated coronary and valvular surgery.

**Methods:** From February to May 2002, we prospectively studied 243 consecutive patients, who underwent elective CABG. The Nottingham Health Profile Questionnaire part I (NHP part I) was used as a model for QOL determination. NHP part I contains 38 subjective statements divided into six sections: physical mobility (PM), social isolation (SI), emotional reaction (ER), energy (En), pain and sleep. The scores ranged from zero to 100, by adding the item weight, determined by Thurstone method of paired compares, to every positive answer. We distributed the questionnaire to all patients before and 6 months after CABG. 226 patients filled in the postoperative questionnaire.

**Results:** An isolated coronary heart disease was present in 218 patients (89.71%), and associated coronary and valvular disease in 25 patients (10.29%). Preoperatively, there is no difference in QOL among the examined groups. After operation, quality of life was improved in 84.65% (171/202) of patients using coronary surgery and in 79.17% (19/24) of patients using combined (coronary and valvular) surgery. Quality of life was statistically improved in the first group of patients in all sections, and in the second group of patients in 4 sections (PM, En, pain and sleep) ( $P < 0.05$ ). There is no significant correlation between the quality of life changes after operation and the type of surgical procedure. By univariate and multivariate logistic regression, combined procedure distinguished as the independent predictor of QOL worsening in the ER section ( $P = 0.012$ , OR = 3.62, 95% CI 1.32-9.92).

Conclusions: Six months after CABG quality of life was significantly better in most patients in both studied groups. Associated coronary and valvular surgical intervention distinguished as the independent predictor of quality of life worsening in the ER section.

## 60.

#### IS TROPONIN T AN INDICATOR FOR POSTOPERATIVE RESULTS IN EMERGENCY OFF-PUMP CORONARY ARTERY BYPASS GRAFTING?

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Objective: Approximately 2% of coronary artery disease cases require emergency revascularisation. The cause is reported to be due to higher mortality following preoperative ischemic myocardial damage. We present the results of our experience to show the feasibility of off-pump coronary artery surgery as an emergency revascularisation technique and compare the respective preoperative troponin T levels.

Methods: From March 2000 to August 2004, 47 emergency off-pump coronary artery bypass grafting (CABG) procedures were performed on patients with unstable angina pectoris or acute myocardial infarction (operations were within 24 h of hospitalization). The patients with unstable angina were divided into three groups depending on myocardial damage. We measured troponin T (ng/ml) levels preoperative: group 1 with negative troponin T (16 pat.), group 2 with troponin T under 2 (20 pat.), and group 3 with levels over 2 (11 pat.). All patients were operated on with the intention of complete coronary revascularisation.

Results: There was no statistically significant difference in age, sex, ejection fraction, or preoperative clinical data. Complete revascularisation was performed 75% in group 1, 70% in group 2, and 72,7% in group 3. There were two events of intraoperative cardiac instability in group 2 leading to immediate conversion to cardiopulmonary bypass. Intra-aortic balloon pumping was required in 6,25%, 15% and 54,5% in the three groups, respectively ( $P < 0,03$ ). Exitus in tabula occurred in no cases. Hospital mortality rate (30-days postoperative) was 6,25% (1 of 16) in group 1, zero in group 2 and 45,5% (5 of 11) in group 3, all highly statistically significant. There was 100% follow-up with a mean observation period of 31,26 months (15,7-58,39). Midterm mortality rate showed a no more statistically significant difference (2, 4 and 5 patients respectively). In group 3, two patients suffered postoperative stroke and three needed hemofiltration for acute renal failure.

Conclusions: Emergency off-pump coronary artery surgery was found to be safe and feasible for patients with unstable angina pectoris and low troponin T elevation. However, the outcome for high risk patients with massive myocardial infarction was not satisfactory and should be reconsidered.

## 61.

#### THE SIGNIFICANCE OF CHOLESTERYL ESTER TRANSFER PROTEIN IN PATIENTS UNDERGOING REOPERATIVE OR PREMATURE CORONARY ARTERY SURGERY

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Objective: With more than 500.000 operations every year world-wide, coronary artery bypass grafting (CABG) stands as the heaviest bulk of a cardiac surgeon's practice. The study of occluded grafts and CABG in patients younger than 40 years has been aimed to assess atherogenetic process in terms of cholesteryl ester transfer activity in the plasma.

Methods: Patients undergoing re-operative CABG (Group I) or primary CABG at an age younger than 40 years (Group II) between June, 2003 and November, 2004 were prospectively compared to control groups (20 patients undergoing primary, isolated CABG at an age older than 40 years—group III and 20 patients undergoing isolated non-ischemic valvular procedures—group IV) for CETP activity, pre-, peri- and postoperative data including hospital mortality and mortality. For the sake of statistics, groups I and II (progressive atherogenesis group, group A) were cumulatively compared to III and IV (group B) when appropriate.

Results: 20 patients in group I and 20 patients in group II were included as the study groups. Preoperative Cleveland risk scores were  $4.85 \pm 0.81$ ,  $2.05 \pm 2.32$ ,  $1.71 \pm 0.64$  and  $1.15 \pm 1.04$  in groups I-IV, significantly higher in I and II than the controls ( $P < 0.05$ ). CETP activity was highest in group I ( $14.28 \pm 3.87$ ;  $12.58 \pm 4.34$ ;  $5.42 \pm 3.59$ ;  $7.08 \pm 3.87$  in groups I-IV, respectively;  $P < 0.05$ ). 50% of patients in group I had a three-graft CABG ( $2.85 \pm 0.99$  grafts/patient). One patient expired in group I; two of three cases of perioperative

myocardial infarction were observed in group I. CETP activity higher than 9.34 was recognized as the limit of progressive atherosclerosis. Area under the receiver operator curve was 0.085 indicating that the analysis was very good. ICU stay was similar between groups A and B; however, hospital stay was significantly longer in group A, possibly due to higher morbidity rate in group I. Perioperative MI and low cardiac output state (11, 6, 2 and 11 patients in groups I-IV, respectively) was significantly more common in group I. Groups were similar for CPB and aortic clamp times ( $P > 0.05$ ).

Conclusions: Since the CETP activity was highest in group A, screening of younger patients undergoing CABG for CETP activity and the use of "athero-resistant" grafts (e.g., arterial grafts) in particularly those with high activity may be suggested.

## 62.

#### THE ACUTE CARDIOPROTECTIVE EFFECT OF CORTICOSTEROIDS IN MYOCARDIAL ISCHEMIA-REPERFUSION INJURY OCCURRING DURING CARDIOPULMONARY BYPASS

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Objective: The purpose of this study is to evaluate the acute cardioprotective effect of high dose methylprednisolone (25 mg/kg) in the controlled in vivo model of myocardial ischemia-reperfusion injury occurring during cardiopulmonary bypass.

Methods: Forty non-diabetic male patients with three vessel disease undergoing first-time bypass surgery were enrolled for this double blind prospective study. Patients were randomized to be given 25 mg/kg intravenous methylprednisolone (Group I) and the saline (Group II) 1 h before cardiopulmonary bypass. The levels of cardiac troponin-I (cTnI) during postoperative period were used as a marker of myocardial tissue damage. The cTnI levels were measured before surgery, at second hour after cardiopulmonary bypass, at postoperative 6th, 24th h and on the postoperative 5th day.

Results: There was no significant difference between the two groups in respect to the duration of ischemia and reperfusion. The preoperative cTnI levels were  $0.22 \pm 0.29$  in Group I and  $0.23 \pm 0.28$  in Group II. cTnI levels increased to  $2.40 \pm 1.0$  ng/ml in Group I and  $3.19 \pm 0.88$  ng/ml in Group II at 2nd hour after aortic cross-clamp period ( $P = 0.015$ ). The cTnI levels measured at 6th h after CPB were  $1.98 \pm 0.63$  ng/ml in Group I and  $2.75 \pm 1.15$  ng/ml in Group II ( $P = 0.049$ ). cTnI levels decreased to  $0.22 \pm 0.10$  ng/ml in Group I and  $0.49 \pm 0.25$  ng/ml in Group II on the postoperative 5th day ( $P = 0.0001$ ). Linear regression analysis showed that preoperative high dose corticosteroid usage was an independent predictive factor in patients who underwent coronary artery bypass surgery with cardiopulmonary bypass ( $r^2: 0.12$ ,  $P < 0.05$ ) when regarding the degree of myocardial ischemia-reperfusion injury (cTnI levels) at second hour after CPB.

Conclusions: Single dose of intravenous methylprednisolone (25 mg/kg) given 1 h before ischemia reduced myocardial ischemia-reperfusion injury. These results demonstrated that the acute cardioprotective effect of corticosteroids is much more promising in future to decrease the ischemia-reperfusion injury occurring during cardiopulmonary bypass when it is inevitable.

## 63.

#### SURGICAL TREATMENT OF CONGENITAL HEART DISEASE IN ADULTS. A CHALLENGE OF OUR TIME

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Objective: The long term consequences of untreated or residual/recurrent lesions pose unique challenges in the growing population of adults with congenital heart disease. This study summarizes our surgical experience with the treatment of these patients.

Methods: From October 1997 to October 2004, 289 patients aged 18-72 ( $35 \pm 13.6$ ) years, 143 male and 146 female with congenital heart disease presented for surgery to our unit. Thirty-eight patients (13%) had 1 to 3 prior surgical procedure(s). Although 137 patients (47%) were asymptomatic (NYHA I), 117 (40.5%) had mild (NYHA II), 34 (11.7%) moderate (NYHA III) and 1 (0.3%) severe (NYHA IV) symptoms. Thirty-four patients had an established arrhythmia, requiring treatment in 25 (8.6%). Chromosomal anomalies were identified in 10 (3.4%) and diagnostic catheterization was required in 178 (61.5%) patients. All patients underwent complete surgical correction and in 275 (95%) of them this was performed with cardiopulmonary by-pass of  $107 \pm 74$  min mean duration.

Results: There was 1 early death (0.34%) due to embolic stroke related to atrial fibrillation. Complications occurred in 50 patients (17%) and included re-operation for bleeding (5), stroke (3), pneumothorax (12), atrial fibrillation (22), complete heart block requiring permanent pacemaker implantation (2), wound dehiscence (1), pericardial (7) or pleural (3) effusion requiring drainage and peripheral neuropathy (1). Median intensive care unit and hospital stay were 1 (range 1-10) and 8 (range 5-42) days, respectively. Two late deaths (0.7%) occurred in patients with AF and pulmonary hypertension. At mean follow-up of 45±24 (range 1-82) months, all other patients are well with resolution or significant improvement in their symptoms.

Conclusions: Despite the long term deleterious effects of congenital heart disease in adult patients, surgical correction can be achieved with low mortality and acceptable morbidity. All deaths and most significant complications are related to arrhythmias.

#### 64. THE INCIDENCE OF ATRIAL TACHYARRHYTHMIAS AFTER VALVE REPLACEMENT FOR AORTIC STENOSIS

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Objective: To establish risk groups for the development of atrial tachyarrhythmias early after aortic replacement for aortic stenosis that could benefit from prophylactic pharmacologic therapy.

Methods: Observational study on 118 patients undergoing aortic valve replacement for aortic stenosis. Univariate and multivariate analyses were performed on a number of clinical, hemodynamic, radiographic, electrocardiographic, operative and postoperative variables.

Results: 47 patients (40%) experienced atrial tachyarrhythmias at a median 3 days after surgery (70.2% atrial fibrillation, 22.7% atrial flutter and 6.38% junctional tachycardia). Preoperative descriptors associated with an increased prevalence of atrial tachyarrhythmias were age 70 years or older, mitral regurgitation, history of paroxysmal atrial fibrillation, or antiarrhythmic therapy, diabetes mellitus, and elevated pulmonary systolic, mean, and capillary wedge pressures. Postoperative descriptors were prolonged respirator therapy, use of catecholamines or vasodilators, and prolonged stay in the ICU. Multivariate analysis of these 12 variables showed advanced age, diabetes mellitus, and prolonged respirator use to be independently associated with atrial tachycardias and to predict them with a sensitivity of 62% and a specificity of 77%.

Conclusions: 1. We found a series of risk factors for the development of postoperative atrial tachyarrhythmias after aortic replacement for aortic stenosis. 2. Anticipation of atrial arrhythmias in patients with specific clinical descriptors may be used to guide prophylactic therapy.

#### 65. ISCHEMIC PRECONDITIONING IN HUMAN HEART: ISOFLURANE VS. DESFLURANE

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Objective: Recent clinical and experimental data indicate that volatile anesthetics may precondition the myocardium against ischemia and infarction. The present study was designed to assess the clinical relevance of cardioprotective effects of isoflurane and desflurane in patients undergoing elective coronary artery bypass grafting.

Methods: 30 patients undergoing elective coronary artery bypass grafting, were randomly assigned to three groups: control group (Group C), isoflurane group (Group IS), desflurane group (Group DS). Preconditioning was achieved with a 5-min exposure to isoflurane or desflurane, followed by 10 min of drug-free bypass. Isoflurane and desflurane were added to the gas mixture admitted in the oxygenator. The following data were obtained every 4 h after the end of cardiopulmonary bypass: pulmonary capillary wedge pressure, heart rate, cardiac index, left ventricular stroke work index, and systemic and pulmonary vascular resistances. Troponine I concentrations were measured in blood samples obtained from the coronary sinus cannula. Venous blood samples were taken for measurement of troponine I 6 and 12 h after the end of surgery. Statistical analysis of data was performed with multiple analysis of variance followed by application of the Student *t*-test with Duncan's correction.

Results: Postoperative Cardiac Index was constantly higher in DS-group than in C-group and IS-group. Also the LVSWI was constantly higher in DS-group.

The systemic vascular resistances were lower in desflurane treated group. The troponine I levels were lower in desflurane group.

Conclusions: The hemodynamic data and the troponine values suggest that the preconditioning effect of desflurane is higher than the effect of isoflurane.

#### 66. SURGICAL TREATMENT OF CORONARY SUBCLAVIAN STEAL SYNDROME

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Objective: The internal mammary artery (IMA) is the conduit of choice for cardiac revascularization. Atherosclerotic disease of the coronary artery may simultaneously involve the subclavian artery. Proximal stenosis in left subclavian artery may result in recurrent myocardial ischemia in patients with patent left internal mammary artery (LIMA), because of coronary steal syndrome through the LIMA.

Methods: A 71-year-old man presented 11 years following coronary artery bypass grafting (LIMA to left anterior descending artery, saphenous vein graft to the first obtuse marginal artery and a saphenous vein graft to right coronary artery). Following surgery, the patient had an initial resolution of chest pain, but angina symptoms returned 10 years later. Significantly he experienced chest pain on exercising the left hand. Examination demonstrated a significant difference of blood pressure between the arms (right 125-60 mmHg, left 80-55 mmHg). The coronary angiography revealed patent venous grafts. The subclavian steal syndrome was present, as diagnosed in coronary angiography by the contrast medium coursing down the LAD during injection and flowed up slowly into the LIMA and faintly opacifying the left subclavian artery. The angio-MRI examination demonstrated a total occlusion of the left subclavian artery (LSA).

Results: A carotid to subclavian bypass by a transverse left supraclavicular incision was performed. A PTFE, 8 mm diameter, graft was used. Postoperatively the patient remained under treatment with clopidogrel and aspirin. At 3 months after surgery, a CTA multi-slice (16 slice) coronary examination demonstrated a patent carotid-subclavian PTFE graft as well as normal opacification of LAD through the LIMA.

Conclusions: Since 1980, carotid-subclavian artery bypass grafting was considered the procedure of choice for treatment of CSSS. The excellent patency rate of carotid-subclavian bypass grafting with synthetic materials and its minimal operative risk have been documented by several reports. Since 1990 endovascular management with balloon angioplasty of subclavian artery stenosis has been suggested for treatment of CSSS. The relative simplicity, the low periprocedural morbidity and complications of endovascular procedure, may favor its use over surgical bypass grafting for most symptomatic proximal subclavian artery stenosis. However, when this is not possible because of complete occlusion, extent of disease or stent failure, extra-anatomic reconstruction provides a durable treatment option.

#### 67. SIMULTANEOUS CARDIAC AND ABDOMINAL AORTIC SURGERY: DOUBLE OR HALF-RISK

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Objective: Most deaths following major vascular procedures have cardiac causes. On the other hand perioperative AAA rupture or critical limb ischaemia following cardiac surgery are not exceptional. In successive procedures myocardial revascularization decreases the risk of future aortic operation. However, postoperative unstable circulation and SIRS predispose to aneurysmal rupture and survival is also influenced by the double major procedure risk. Simultaneous operation slightly elevates actuarial total procedural risk but it solves both problems at once, obvious risk of aortic cross-clamping is decreased with the ECC use and total operation time is not substantially prolonged when performed by two synchronously working surgical teams. It also does not discriminate high-risk patients whose candidacy for successive major operations would otherwise be probably dropped.

Methods: Four men of average age 72,5 years and severe comorbidities were operated in our institution in the years 2002 till 2004. In two CABG



and in other two OPCABG were performed. Simultaneously, three AAA were resected transperitoneally (two aortobiliac aneurysms and one subrenal aortic aneurysm) and in one, aortobifemoral bypass was performed via extraperitoneal approach.

Results: Perioperative morbidity reached 75% (including tachyarrhythmias, prolonged ICU stay due to pulmonary dysfunction requiring prolonged ventilatory support, pneumonia etc., one transient renal insufficiency). There were no in-hospital deaths and all patients were eventually discharged in stable condition.

Conclusions: The target group for the combined simultaneous procedure is a selected population of patients with both CAD unsuitable for PTCA/stenting and significant aortic surgical pathology (e.g., huge or symptomatic AAA, Leriche syndrome, etc.) unsuitable for EVAR. Left ventricular function and coronary surgical anatomy will determine the expected outcome of the two procedural risk groups (i.e., low/medium till 4%, high 10 - 20%). The risk of simultaneous operation is not determined by combined procedures but by impact of individual severe cardiovascular and comorbid conditions.

#### 68.

##### SURGICAL TREATMENT OF POLYVASCULAR PATIENTS

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Objective: Aim of the study was to evaluate the surgical risk in the treatment of polyvascular patients.

Methods: During the period of 20 years, 12844 patients underwent myocardial revascularization at our Clinic. Particular surgical tactics are necessary for particular group of patients with polyvascular atherosclerotic disease. In the group with combined carotid and coronary atherosclerotic lesions of patients we had 556 (4.3%) patients, with high incidence of coronary endarterectomy of 33%.

Results: Simultaneous procedure was performed in 78 (14.0%) patients with perioperative mortality of 7.7%. Two stage procedure (unilateral carotid) was performed in 366 (65.8%) patients with perioperative mortality of 1.4%. Three stage procedure (bilateral carotid) was performed in 112 (20.2%) patients, with perioperative mortality of 1.8%. Combined carotid, coronary and abdominal atherosclerotic disease was in 15 patients. This group of patients we treated operatively in sequential manner (carotid, coronary and aortic surgery). Combined coronary and aortic atherosclerotic disease was present in 35 patients.

Conclusions: Despite the fact that this severe group of patients has a high operative risk, they can be treated operatively with acceptable risk which closely corresponds to the risk for single vessel surgery.

#### 69.

##### MILD-HYPOTHERMIA AND PRESSURE CONTROLLED CEREBRAL PERFUSION DUE TO ASCENDING AORTA SURGERY

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Objective: Various techniques are used for brain protection during aortic surgery. This study examines effects of cerebral protection during circulatory arrest, with antegrade pressure-controlled cerebral perfusion in mild hypothermia (30°C).

Methods: Right subclavian artery was used for arterial cannulation, right atrium/femoral vein in emergencies for venous cannulation. After starting the CPB, innominate artery was clamped. During circulatory arrest (CA) flow was antegrade through right subclavian and right carotid artery. Flow rate was 400-1400 ml at 70-100 mmHg. Rectal temperature was 28-30°C.

Results: Over 47 months, 55 pts (35 with acute dissection and 20 with aneurysm) were operated on this method. Mean CPB duration in uncomplicated cases was 109±30.5 min, mean cross-clamped and CA time were 66.5±6.2 and 29±13 min. Mean rectal temperature was 30.9±2.4°C. In complicated cases, mean CPB duration was 238.5±34 min, mean cross-clamped and CA time were 132±30 and 31.5±17 min. Mean rectal temperature was 28.8±2.7°C. ICU data showed average ventilation time 16.9±6.5 h, chest tube drainage 885±96.5 ml, ICU and intermediate care stay 54±6.7 h, hospital stay 9.7±3.1 days. 5 patients had psychoorganic reactions, one get a stroke 12 h postoperatively. 1 patient died perioperatively due to aortic rupture, and 2 early postoperatively (1 due to right heart failure and 1 was with preoperatively cerebral hypoxia).

Conclusions: Ante-grade pressure-adjusted cerebral perfusion via right subclavian artery in a mild hypothermia, is effective method for ascending aorta replacement. This temperature management and pressure controlled perfusion technique may reduce CPB and operating time with less postoperative neurological disorders and other complications.

#### 70.

##### EMERGENCY PULMONARY EMBOLCTOMY WITH CARDIOPULMONARY BYPASS IN CARDIAC ARREST EVOLVING FROM ACUTE MASSIVE PULMONARY EMBOLI

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Objective: The treatment of acute pulmonary embolism remains troublesome especially when cardiogenic shock or arrest is involved. In such events, conventional cardiac resuscitation is usually not effective. Prompt surgical intervention with extracorporeal membrane oxygenation for cardiopulmonary support and pulmonary embolctomy has been a life-saving treatment.

Methods: A 59-year-old man presented with hypotension, severe cyanosis and loss of consciousness. Echocardiography and cardiac MRI detected the pulmonary thrombus in the main pulmonary artery. Median sternotomy was performed and extracorporeal membrane oxygenation was initiated to improve cardiovascular status. Subsequently pulmonary emboli was extracted.

Results: The patient was intubated for 36 h and kept in the intensive care unit for 2 days. The patient was discharged from the hospital at the 12th day postoperatively. No complication occurred during the postoperative course.

Conclusions: In massive pulmonary emboli with refractory cardiac arrest, emergent extracorporeal membrane oxygenation is needed for cardiovascular support. Open pulmonary embolctomy with the use of extracorporeal membrane oxygenation is a life saving treatment. Echocardiography and cardiac MRI are useful

#### 71.

##### LATE OCCLUSION OF SUBCLAVIAN ARTERY AFTER INTERNAL MAMMARY ARTERY BYPASS GRAFTING

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Objective: The left internal mammary artery is the conduit of choice for bypass to the left anterior descending artery. It is relatively protected from atherosclerosis and the long-term patency rate is excellent. The same observation can not be applied to its inflow vessel, the left subclavian artery. Stenosis of the left subclavian artery can lead to recurrent myocardial ischaemia. We report 2 cases of late occlusion of subclavian artery after internal mammary artery bypass grafting

Methods: Case 1: A-45 year-old man complained of sudden occurrence of left hand ischaemia. Three years before, he underwent double coronary artery bypasses: left internal mammary-anterior descending artery and right internal mammary-lateral artery for unstable angina. Since he was asymptomatic. The hand ischaemia resolved spontaneously. At duplex scan, an occlusion of left subclavian artery was found. Myocardial scintigraphy found a defect on the anterior wall. The patient underwent a subclavian-carotid transposition. The postoperative course was uneventful.

Results: Case 2: A 48-year-old man complained of recurrent angina while using his left hand. Four years before, he underwent double coronary artery bypasses: left internal mammary-anterior descending artery and right internal mammary-lateral artery for unstable angina. At physical examination, no pulse was found on his left arm. At duplex scan, an occlusion of left subclavian artery was found. He underwent a subclavian-carotid transposition. The postoperative course was uneventful and there was no more symptoms of angina.

Conclusions: Regular clinical and duplex scan follow up of patients with prior coronary artery bypass graft using the internal mammary artery is necessary and detected stenosis of subclavian artery should be treated with subclavian-carotid transposition.

## 72.

**METASTATIC SARCOMA INVASION THROUGH PULMONARY VEIN TO LEFT ATRIUM; AN UNUSUAL WAY OF METASTASIS**

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**Objective:** Neoplasms of heart can be divided in to primary and secondary cardiac tumors. Secondary involvement of the heart is relatively uncommon; ten to twenty percent of patients dying of disseminated cancer have metastatic involvement of the heart or pericardium. The usual ways of malignancy spreading to heart are through systemic circulation and coronary arteries, lymphatic channels, and direct extension.

**Methods:** This article presents two cases of metastatic sarcoma in lung that invaded through pulmonary vein to left atrium.

**Results:** Case 1 is a 21-year-old man with femoral bone osteosarcoma, which had metastasized to the left atrium through pulmonary vein. At operation, a large polypoid mass, white to pink, was found with multiple fragmentations. The mass was pedunculated to left ventricle and attached to atrial wall and the origins of right inferior and right superior pulmonary veins were occluded. This tumor was apparently developed intravascularly and migrated through right pulmonary veins to left atrium. Because of involvement of pulmonary veins, right pleural cavity was opened; multiple nodularity in the middle and inferior lobes with extensive adenopathy around pulmonary hilum was present; therefore a right pneumonectomy was performed. The histopathologic feature of atrium and lung tumor was identical to the primary malignancy. Despite postoperative chemotherapy, he died due to brain metastasis 6 months later. Case 2 is a 42-year-old woman with liposarcoma of the small bowel. At operation, 3 polypoid pedunculated masses in different sizes were found. They were attached to the posterior wall of the left atrium, between the right and left pulmonary veins, and had extension to the left pulmonary veins. Tumor was resected and shaved off from the atrial endocardial surface. The pathologic feature of the tumor was metastatic sarcoma.

**Conclusions:** It seems that there is a tendency of primary cardiac sarcoma to invade pulmonary veins. Sarcoma have this ability to invade and extend antegradely through pulmonary veins to left atrium and more surprising sarcoma could invade both sides of heart in spite of the carcinoma that nearly always invade the right heart.

## 73.

**SURGERY FOR TRICUSPID REGURGITATION LATE AFTER MITRAL VALVE REPLACEMENT**

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**Objective:** To determine the role of surgical treatment in patients with tricuspid regurgitation late after mitral valve replacement. To assess the utility of a more aggressive approach in regard to a tricuspid procedure at time of mitral valve surgery.

**Methods:** A retrospective study on 16 adult patients undergoing tricuspid valve repair or replacement 4 months to 14 years after mitral valve replacement. Mild tricuspid valve insufficiency at the time of mitral valve replacement was present in 10 patients (62.5%); 13 patients (81%) had New York Heart Association class IV disability. Tricuspid annuloplasty was performed in 8 patients, and the remainder received various prosthetic valves. Concomitant repair of mitral valve periprosthetic leak and/or replacement of the aortic valve was necessary in 9 patients (56%).

**Results:** Hospital mortality was 25%, and all early deaths were related to low cardiac output. Among hospital survivors there have been 14 late deaths for 3 and 5 year actuarial survival rates of 65 and 44%. Six of the 7 patients who died late and one of 5 patients who were alive at the end of the follow-up period had little or no functional improvement after tricuspid valve repair or replacement. The high early and late mortality and poor functional outcome for patients undergoing tricuspid valve surgery late after mitral valve replacement contrast with our good overall results in reoperation for prosthetic heart valves.

**Conclusions:** 1. It appears that serious tricuspid valve regurgitation after mitral valve replacement frequently signals right ventricular failure and dilatation. Restoring tricuspid valve competence seems rather palliative.

2. This experience encourages us to use a policy of liberal indications for tricuspid annuloplasty at initial mitral replacement.

## 74.

**VDD-PACEMAKER IN CHILDREN - A LONG TERM THERAPY?**

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**Objective:** The transvenous AV-synchronous pacing in children started with the invention of small sized VDD leads and miniaturization of pacemakers. Whether or not this is a favourable long term therapy, we investigated our records retrospectively.

**Methods:** From May 1977 to July 2001 we implanted pacemakers in 104 children younger than 15 years of age. In 55 patients transvenous leads were implanted. Twelve of these (21,8%) received a VDD pacemaker for hemodynamic reasons.

**Results:** Mean age was 7,7±4,3 years (range 11 months to 14,5 years). Mean size was 105,9 cm (67 cm - 141 cm) and mean weight was 22.5 kg (5,3 - 62,0 kg). The mean follow-up period was 47,5±15,1 months. In 86,3% of the time during follow-up, pacemakers from which we obtained data were working in VDD mode. Five of the VDD patients (41,7%) had to be reoperated because of severe traction to the leads. In all five patients the VDD systems were explanted and changed to dual chamber pacemakers.

**Conclusions:** VDD pacemakers can be implanted safely even in children with a low complication rate perioperatively. 41,7% of our VDD patients had to be reoperated within the surveillance time because of severe lead tension due to thoracic growth. In our experience VDD pacemaker in smaller children seems to be a temporary solution to bridge AV-synchrony from young age to DDD pacing in young adulthood.

## 75.

**MINI J STERNOTOMY FOR THYMECTOMY CASES**

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**Objective:** Tymomas, 40-50% of the whole anterior mediastinal tumors, rarely make (3-7%) near or distant metastases. They are usually benign tumors (40-70%). In this study we studied the patients who had diagnosis as benign thymoma. We performed mini right j sternotomy for the cases.

**Methods:** We studied seven patients who were operated between March 2001 and February 2005 in our clinic. Four of them were male and three of them were female. The mean age was 32 (29-38). We performed mini j sternotomy with an incision that was performed from 2 cm below fossa jugularis to fourth intercostal space with a deviation to rightwards by motor-driven sternal saw. In two patients we changed the mini j sternotomy to median sternotomy because of the wide-spread invasion of the thymomas to surrounding tissues. The extracted tumor samples were sent to histopathological laboratories for further research.

**Results:** There were no early or late postoperative complications. All of the patients were discharged at postoperative third day. The histopathological investigations have shown benign thymoma. There was no nearby or distant metastases.

**Conclusions:** 40-70% of the whole thymoma cases are benign characterized and without metastases. By using the mini j sternotomy we could make the extraction of the tumor safely and comfortably, and with short incision we could get wide range of vision, and fine rehabilitation of the patients. We saw no postoperative complications in these patients without metastases. and also we can enlarge the incision easily if it is needed. We believe that because of the successful results for the benign thymoma cases mini j sternotomy with deviation to right can be performed easily and safely.

## 76.

**HEART INJURIES: OUR EXPERIENCE IN 80 PATIENTS**

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**Objective:** Heart injuries are one of the most emergent subjects in cardiovascular surgery. Most of the cases have been lost because of the late

intervention and insufficient transportation. In this study we evaluated our experience in heart injuries.

**Methods:** Between June 1985-January 2005, 80 patients were operated. 74 patients had penetrant trauma, 4 patients had fire-arm injury and 2 had blunt trauma. By using their physiological situations the cases were classified in 3 groups. In first group there were patients with bad general condition, close or half-close conscious and very low arterial tension. In this group there were 30 patients. In the second group there were 29 patients with hypotension and the arterial tension was below 80 mmHg, the patient was conscious and had enough respiratory functions. In the third group, there were 21 patients with stable general condition, arterial tension above 80 mmHg. The patients in the first group were operated immediately. In the uncertain cases of the second group diagnostic tests were applied and then operated. These diagnostic tests were echocardiography and PA telegraphy. There were 37 patients in this group and 10 of them had tamponade, 24 of them had pericardial effusion, 28 of them had left hemothorax, 6 of them had right hemothorax. The closest place to the injury has been chosen as an incision area. To 65 patients left anterolateral thoracotomy was applied, to 14 patients right anterolateral thoracotomy was applied, to 1 patient median sternotomy was applied.

**Results:** We saw that the most common injury area was right ventricle. Injured sites were sutured primarily with pledgetted sutures, two large injuries at the left ventricle were repaired by using pericardial patch. Also the injuries of the other organs were very common and they were repaired, too. The mortality in first group was 6 patients and in the second group was 1 patient and in total seven patients (mortality rate 8.7%). In 2 cases in the first group, neurological problems were observed. All of the other patients were discharged and no problem was observed during their external observations. **Conclusions:** If the patient has clinical findings, thoracotomy must be done immediately. Diagnostic tests must be done to the patients with stable general condition. The criteria that saves lives in cardiac injuries, are evaluation of the patient carefully, if necessary with echocardiography, PA telegraphy and emergent interventions.

#### 77.

##### AXILLARY ARTERY CANNULATION FOR AORTIC REOPERATION

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**Objective:** Reoperations for aortic pathology have always been troublesome for the surgeons and most surgeons created their own approach for these kinds of complex aortic pathologies. Nevertheless, reoperation for the aortic pathology is together with high mortality and morbidity. We evaluated the aortic pathologies that occurred after prior cardiac operations and investigated surgical outcomes.

**Methods:** We performed 15 reoperations in our institution for aortic pathology between April 2001 and July 2004. Mean age of the patients was 55.6±9.9 years, ranging from 27 to 68 years. Six of the patients were female and nine were male. All cases were operated under moderate degree hypothermia with a rectal temperature of 24-28°C. Antegrade cardioplegic cardiac arrest and retrograde maintenance of the arrest are achieved. Distal aortic reconstruction is done during continuous antegrade selective cerebral perfusion (ASCP) by clamping the brachiocephalic and left carotid arteries.

**Results:** Total hospital mortality was 20% with 3 patients. The seven patients with the diagnosis of acute Stanford type A aortic dissection had urgent operation and had a mortality with 2 patients. One of these patients was lost due to arrhythmia and the other one was lost due to acute lung edema. One of the patients who had elective operation died due to arrhythmia. One patient with severe mediastinal bleeding required reoperation. No cerebral complication was met in the postoperative period. Mean hospital stay was 6.9 days.

**Conclusions:** Axillary artery cannulation either by direct way or by side graft provides acceptable outcomes after reoperation for aortic disease. It provides safe re-entry to the chest. Moderate hypothermia and continuous ASCP attain good cerebral protection during the operation.

#### 78.

##### SURGICAL REPAIR OF A HUGE RIGHT VENTRICLE–RIGHT CORONARY OSTIUM FISTULA. CASE REPORT

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**Objective:** Coronary fistulae is a rare congenital anomaly which accounts for 0.27-0.40% of all congenital cardiac defects and comprises 14% of congenital coronary anomalies. Most of these fistulae involve the right coronary artery (50%) and drain in the right ventricle (40%). However, to our knowledge, there are only a few reports of right coronary artery-right ventricle fistula in the English literature.

**Methods:** We present a case of a right coronary artery-right ventricle fistula which was repaired surgically. A 14-year-old girl presented with shortness of breath on exertion, and diastolic murmur. Echocardiography showed a right coronary artery-right ventricle fistula, which was confirmed by coronary angiography. The young girl was treated surgically. Under cardiopulmonary bypass and cardioplegic arrest aortotomy was performed. A probe was inserted through the huge right coronary ostium to the dilated right coronary artery and finally to the right ventricle (RV). Right ventricle was opened via a small incision. The site of entry of the fistula to the right ventricle cavity was confirmed with cardioplegia administration through the RCA. The opening from the coronary artery was carefully sutured with 5-0 prolene and the right ventricular side was closed separately with a patch (SAUVAGE).

**Results:** The patient had an uneventful postoperative course and an MRI scan showed no residual defect.

**Conclusions:** Surgical strategy for coronary fistulae should be determined on a case-by-case basis. Even though recent studies have emphasized the percutaneous transcatheter embolization techniques, surgery is the treatment of choice for large fistulae.

#### 79.

##### CORONARY BYPASS GRAFTING IN PATIENTS WITH CAROTID ARTERY DISEASE

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**Objective:** To present the management protocol of patients who undergo coronary bypass grafting (CABG) and have coexistent symptomatic or asymptomatic carotid artery disease (CAD).

**Methods:** According to our protocol, patients who undergo CABG and are >65 years old, or have left main coronary artery disease or have a history of carotid endarterectomy or present with asymptomatic carotid bruit or have a history of transient ischemic attack (TIA), routinely undergo carotid Triplex or angiography during their coronary angiogram. During the period Oct 2000 - Oct 2004 in a total of 636 patients who underwent CABG, 5 patients with symptomatic carotid bruit and internal carotid artery (ICA) stenosis >70%, underwent simultaneous percutaneous angioplasty or open endarterectomy (Group A), 4 patients with asymptomatic >85% stenosis of ICA and occluded the contralateral carotid, underwent carotid angioplasty before CABG at the same day of operation (Group B) and 65 patients with asymptomatic >85% of one carotid underwent only CABG, maintaining a MAP during cardiopulmonary bypass >85 mmHg (Group C).

**Results:** In all groups with the exception of one patient in group A, the postoperative course was uneventful. Patients in group C were instructed to undergo either angioplasty or carotid endarterectomy at a second stage.

**Conclusions:** The presence of carotid artery disease in patients who undergo CABG, symptomatic or not, continue to be a difficult and controversial entity both for the surgeon and the anesthesiologist. Our experience has shown that each case except the detailful medical history and preoperative study, should be managed accordingly, having the support of the cardiesthesiologist and the perfusionist.

#### 80.

##### CALCIFIED ANEURYSM OF THE LEFT VENTRICLE PRESENTING AS A CALCIFIED ECHINOCOCCAL CYST OF THE LUNG

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**Objective:** A case of a calcified aneurysm of the left ventricle presenting as a calcified echinococcal cyst of the lung is presented.

**Methods:** A 65-year-old woman with congestive heart failure and presumably calcified echinococcal cyst of the lung was admitted to our department for investigation and treatment. Chest radiography showed a calcified cyst in the middle thoracic cavity adjacent to the left ventricle. Computed tomog-

raphy demonstrated a calcified cyst (echinococcus?) of about 8 × 4 cm in diameter in continuity with the left ventricle. On physical examination the patient was in NYHA functional class IV. Cardiac catheterization confirmed the presence of a large anterolateral aneurysm of the left ventricle. The left anterior descending coronary artery was occluded. At surgery, the pericardium was adherent to a large calcified aneurysm of the anterolateral surface of the heart, possibly due to a previous pericarditis. CPB was instituted and the aorta was cross-clamped. Heart arrest and myocardial preservation was maintained with the use of antegrade cold crystalloid cardioplegia. The aneurysm was excised (Dor procedure). There was a thrombus in the aneurysmal cavity. On gross examination, the aneurysm measured 8×4×4 cm and was thoroughly calcified. Microscopically, the aneurysm showed large areas of hyaline, degeneration and calcification and few areas containing myocardial cells.

Results: The postoperative period was uneventful. The patient's condition improved two classes (from IV to II) of the New York Heart Association Functional Classification and she was discharged on the 10th post-operative day.

Conclusions: The uncommon presentation of a large anterolateral aneurysm of the left ventricle with hyaline degeneration and calcification, mimicking a calcified echinococcal cyst of the lung is a very rare condition and its origin is obscure. Commonly, cardiac aneurysms are not calcified. Echocardiography, computed tomography and cardiac catheterization are necessary to confirm diagnosis of a calcified "cyst" adjacent to the heart. Surgical approach and remodelling of the left ventricle to improve cardiac performance is recommended. We present this case because of its unique features. To the best of our knowledge, a cardiac aneurysm with hyaline degeneration and calcification, mimicking an echinococcal cyst of the lung, has not been reported previously.

#### 81.

##### ACUTE TYPE A AORTIC DISSECTION: A SINGLE CENTER EXPERIENCE SINCE 15 YEARS

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Objective: To assess the results of our strategy for acute type A aortic dissection (AAD); in the case of a high suspicion of AAD, patients are directly admitted to the operative theater where the diagnosis is confirmed using TEE under general anesthesia, according to a regional protocol for acute aortic syndrome; after surgery, a systematic CT-scan follow-up is performed with endovascular treatment of malperfusion syndrome

Methods: From our prospective database, we reviewed all consecutive AAD (<14 days) operated in our department, from January 1, 1990, to December 31, 2004. Exclusion criteria: patient presented with cardiac arrest before setting in the operating theater. We assessed: preoperative clinical status, aortic surgery, mortality, morbidity and interventional radiology. Clinical and radiological follow-up, rate of reoperation and long-term survival rate are evaluated.

Results: 217 patients were operated (150 males, mean age 61.5±13.5 years, range 18-89.2). More than two thirds of patients were directly admitted to the operating room according to our protocol. Operations: 145 ascending aortic replacements (67.1%), 67 Bentall (31%), 4 aortic valve replacements + ascending aortic replacements. In 57 cases (26.4%) an associated aortic arch procedure was performed. Thirty-days mortality: 36 patients (16.6%), whose one aortic rupture at sternotomy. Overall in-hospital mortality: 43 patients (19.8%); 9.6% <65 years, 33.7% >65 years ( $P<0.001$ ); 56.2% >80 years. Aortic arch procedure had a significant higher mortality rate (33.3% vs. 14.5%,  $P = 0.002$ ), but not Bentall procedure (Bentall: 14.9% vs. 22%,  $P = 0.22$ ). 87 patients had no complications (40,1%), 60 patients had at least one reoperation (27,6%). Morbidity among survivors: hemofiltration or dialysis, 16 patients (9.2%); neurological deficits, 22 patients (12,6%). Complications were highly dependent on age and preoperative clinical status. Endovascular intervention (since 1995): 24 patients (15.1%). Mean length of stay: 22.9 days (+ 20.5); median hospital stay: 16.5 days (interquartile 12 days). Results are better since 1999 but not always statistically significant: overall in-hospital mortality (15.2% vs. 24.7%,  $P = 0.07$ ), patients with no complication (44.6% vs. 36.5%,  $P = 0.22$ ), mean length of stay (20.1 vs. 26.3 days,  $P = 0.04$ ).

Conclusions: AAD is a life-threatening emergency despite an active management. Some subgroups of patients (>80 years, preoperative resuscitation) remain at increased risk of death.

#### 82.

##### ADVANTAGE OF CATHETER ABLATION IN THE SURGICAL TREATMENT OF AF IN MITRAL VALVE PATIENTS: FOLLOW UP DURING 24 MONTHS

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Objective: Chronic atrial fibrillation (CAF) is the most common arrhythmia in mitral valve patients. Our aim was to compare a 24 months follow up for patients after mitral valve replacement (MVR) with/without pulmonary vein isolation (PVI) by means of radiofrequency catheter ablation (RFCA) technique.

Methods: In 2000-2002 there were performed 63 PVI (PVI group) simultaneous with MVR for patients with CAF by means of two methods: bilateral PVI (bPVI) 26 pts and bilateral PVI with linear lines (LL) till mitral annulus 37 pts (modo lornett). We compared the results of 24 months with analogous MVR patients without RFCA (MVR group, 70 pts). Mean age in groups was 59 years, CAF had been more than 6 months before MVR, LA sizes were 4.5 to 6.4 cm, mean 5.2 cm.

Results: During the first 48 h sinus rhythm (SR) was obtained for 61 pts in PVI group (97%) and for 51 pts in MVR group (73%), but on the 7th day in PVI group for 59 pts, in MVR group for 44 pts. With stable SR were discharged 55 pts in PVI group (87.3%) and 41 MVR pts (58.5%). After 3 months SR in PVI group was observed for 49 pts (78%), besides, 81.8% (30 pts) of them were in MVR "lornett" group; in spite of AAD and recurrent DC, stable SR was maintained for 18 pts, (25.7%), besides, for 12 pts preoperative size of LA was <5.0 cm. During further follow up stable SR with AAD in PVI group in 18 months remained for 47 pts (75%), in modo 7 group 30 pts (81%), bPVI group 17 pts (65%). In MVR group SR remained for 11 pts (15%), frequent relapses of AF in 11 pts (15%), the rest regained CAF 45 pts (64%), 2 pts died. The Kaplan-Meier curves showed the effectiveness of SR maintenance significant ( $P<0.0009$ ) in PVI vs. MVR groups (75% vs. 16%), as well as in bPVI and modo lornett groups ( $P<0.05$ ), between different NYHA class ( $P<0.006$ ) and different devices.

Conclusions: PVI with RFCA is a safe and effective method for SR maintenance in valve surgery patients when compared with conventional replacement. Electroanatomical approach for SR maintenance is more efficient as PVI. AAD in postoperative period must be used permanently and are more efficient for AF prevention in early postoperative period after RFCA.

#### 83.

##### MORTALITY IN CARDIAC SURGERY AND EUROSCORE PERFORMANCE

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Objective: The aim of this work was to assess the mortality in cardiac surgery—overall mortality, coronary mortality, and valve surgery mortality—, and to validate the performance of European System for Cardiac Operative Risk Evaluation or EuroSCORE to predict this mortality.

Methods: Prospective observational study of 1545 consecutive cardiac surgery patients in a tertiary referral center. Clinical and physiologic data for several cardiac surgery risk models were prospectively collected applying the criteria and definitions described by the developers. Statistical analyses were performed using SPSS (SPSS 11.0 inc. Chicago IL). Predicted hospital mortality was calculated and was compared with the actual mortality. The performance of the system was assessed by evaluating calibration with the Hosmer-Lemeshow goodness-of-fit test, and discrimination with the area under the receiver operating characteristic (ROC) curve.

Results: The operations performed were 50.7% ( $n = 784$ ) coronary surgery, 43.2% ( $n = 667$ ) valve surgery, and 6.1% ( $n = 94$ ) mixed (coronary & valve surgery) surgery. The sex ratio was 37.2% women ( $n = 575$ ) vs. 62.8% men ( $n = 970$ ), and the mean age was 61.3±14. The overall hospital mortality was 5.6%. The coronary surgery mortality was 3.8%. The valve surgery mortality was 6.9%. The mixed surgery mortality was 11.7%. Lemeshow-Hosmer chi-square was 5.64 for overall cardiac surgery, 5.15 for coronary surgery, and 5.97 for valve surgery. The area under the ROC curve was 0.819 (CI 95%: 0.767-0.875) for overall cardiac surgery, 0.837 (CI 95%: 0.758-0.916) for coronary surgery, and 0.804 (CI 95%: 0.736-0.871) for valve surgery.

Conclusions: In our experience, mortality remains adjust to predictions in every group of pathology and EuroSCORE performs well to predict mortality following cardiac surgery, with high calibration and discrimination, and it is an appropriate tool to assess this mortality. In our experience, EuroSCORE performs better in coronary surgery than valve cardiac surgery. Predictive models should be validated in the population to which they are finally applied.

#### 84. OVERVIEW OF USE OF INTRA-AORTAL BALLOON PUMP AT THE CARDIOSURGERY DEPARTMENT RIJEKA

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**Objective:** There is a huge difference in frequency of use (5,9% to 16,4%) of the intra-aortic balloon pump (IABP) between the cardio-surgical centers. Mentioned data relate to pre-operative and peri-operative placement of IABP. If the indications to implement IABP are narrowed and placed peri-operative, the frequency of its use is significantly lower (1,2% to 4,5%). The purpose of this work is to show frequency in use of IABP in our Institution.

**Methods:** We have retrospectively processed 1200 patients, operated in the period 1998 until 2004, that were surgically treated by isolated operation of myocardial revascularization. All patients were operated using extracorporeal circulation. Technique of myocardial protection was the intermittent aortal cross-clamping, with induced fibrillation and mild hypothermia.

**Results:** IABP was implanted in 23 patients (1,91%). Ejection fraction was on average 34±5,3%. Average time of extracorporeal circulation was 112±21,4 min, and ischemia 24±6,8 min. Left internal thoracic artery was used in all patients, and the average number of made bypasses was 2,8.

In 16 (70%) patients, IABP was surgically implanted intra-operative. In 11 (69%) patients of that group, IABP was implanted upon stopping extracorporeal circulation due to occurrence of low minute heart volume, and 5 (31%) due to impossibility to take the patient off the extracorporeal circulation. In 7 (30%) patients, IABP was implanted percutaneously post-operatively in the intensive care unit 5 to 8 h after operation. In 3 (42%) patients of the mentioned group, IABP was implanted due to development of low cardiac output volume, and 4 (58%) patients during reanimation due to cardiac arrest. IABP has not been implanted pre-operatively in any of patients. In all patients where IABP was implanted percutaneously, we used the ultrasound due to secure identification of femoral artery. Average time of use of IABP was 36±12 h. 2 (9%) patients showed a critical ischemia of extremities. After taking IABP out in 1 (4,5%) patient, femoral amputation was performed. 1 (4,5%) patient developed local infection at the place of insertion of IABP. Cause of death in 1 (4,5%) patient was multi-organic dysfunction.

**Conclusions:** It is evident from the above that we have been placing IABP in strictly narrow indications (1,9%). Since there is no strictly mentioned algorithm in the literature for IABP use, and that our mortality in isolated operation of myocardial revascularisation is low (1,8%), we deem our narrow indication for application of IABP justified.

#### 85. EARLY AND MID-TERM RESULTS OF COARCTATION REPAIR IN NEONATES

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**Objective:** Aortic coarctation (CoA) repair in neonates (<30 days) is associated with higher mortality and increased incidence of restenosis compared to older children. We present our early and mid-term results in neonatal CoA repair.

**Methods:** From June 2001 to May 2004, 26 neonates (mean age 17.8 days; mean weight 3 kg) underwent CoA repair in our institution. Additional cardiac defects (besides PDA) were: VSD 10, hypoplastic arch 2, aortic stenosis 1. Surgical techniques for CoA repair included: resection and end-to-end anastomosis (ETE) 16, extended ETE anastomosis (EETE) 3, radically extended ETE (REETE) 2, subclavian flap (SCF) alone 2, SCF + ETE 1, SCF + synthetic patch (SP) 1, SP alone 1. Pulmonary artery banding was performed in 4 cases with unrestrictive VSD.

**Results:** There was no perioperative death. Follow-up of 22 patients (84.6% of the total) for 9 to 44 (mean: 21.3) months, revealed no late death; two patients (9.1%) had successful balloon dilatation 2 and 5 months postoperatively (both in ETE group); five patients (22.7%) are under antihypertensive treatment; two patients had successful repair of their intracardiac defect (VSD closure and pulmonary artery debanding). Age, weight, and surgical technique were not identified as risk factors.

**Conclusions:** CoA repair in neonates is performed with very good early and mid-term results.

#### 86. POST OPERATIVE EXTRACORPOREAL LIFE SUPPORT IN PEDIATRIC CARDIAC SURGERY. RECENT RESULTS

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**Objective:** To assess our recent results with post operative extracorporeal life support (ECLS).

**Methods:** From January 2002 to January 2004, 19 ELS have been performed following cardiac surgery in 15 patients. We retrospectively reviewed the files of these patients.

**Results:** We placed 16 arterio-venous ECLS with oxygenator, 2 veno-venous ECLS with oxygenator and 1 biventricular ECLS without oxygenator (graft dysfunction after heart transplant). Mean age was 4,9±7 years (median 5,9 months, 11 days to 21 years). All patients were operated on for congenital heart disease except for the patient who had a heart transplant. Indications were hemodynamic failure in 12 cases, respiratory failure in 5 cases and mixed failure in 2 cases. Four patients were undergoing cardiopulmonary resuscitation during ECLS placement (no deaths). Mean delay between surgery and ELS placement was 3,2±3,4 days (median 2 days). Mean ELS duration was 3,4±5,8 days (mean 6 days, 3 to 16 days). Three patients were re-operated for residual lesion. Thirteen patients (86,7%) survived to ELS weaning, 12 patients survived to hospital discharge (80%). No survivor presented obvious neurological damage. Morbidity included mostly re entry for bleeding and multiple transfusions.

**Conclusions:** In our experience, early placement of ELS after heart surgery in children undergoing refractory hemodynamic or respiratory failure achieved excellent results.

#### 87. THE EFFECTS OF ASPARTATE-GLUTAMATE ENRICHED BLOOD CARDIOPLEGIA ON MYOCARDIAL FUNCTIONS OF CASES WHO UNDERWENT A CABG POSTOPERATIVELY

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**Objective:** Many different techniques have been used to protect the myocardium since the first years of cardiac surgery and after 1955 certain cardioplegy techniques especially in patients with poor ventricle. One of these new cardioplegic techniques is the glutamate-aspartate enriched blood cardioplegia. In this study, we studied the effects of aspartate-glutamate enriched blood cardioplegia on myocardial functions of patients who went under a coronary artery bypass grafting postoperatively.

**Methods:** In the study we grouped 20 patients who were electively given a coronary artery bypass grafting as a control group of 10 patients (group I) and a study group of 10 patients. The patients were given blood cardioplegia without aspartate-glutamate whereas aspartate-glutamate was added (20 mg/l) to the study group. Intraoperatively and postoperatively myocardial damage, contractile functions were compared via the cardiac enzymes, Troponin-T and hemodynamic measurements.

**Results:** No significant difference between CK, CK-MB and Troponin-T levels, which show the myocardial damage, was found in between the two groups. In the study group, cardiac output and cardiac index were found to be significantly high at the postoperative 12th h (2,87±0.07 versus 4.51±0,30; P<0,005), but in the remaining h (24th h postoperatively) a significant difference was not found.

**Conclusions:** In this study, we showed that there may be need for an aspartate-glutamate usage (20 mg/l) in the patients whose poor left ventricular functions were saved. It would be beneficial to use aspartate-glutamate in patients who are thought to have difficulties in weaning from CPB, in long lasting cross clamping cases and in high risk patients especially in cases with poor left ventricle.

#### 88. THE COMPARISON OF THE PREOPERATIVE AND EARLY POSTOPERATIVE HEART RATE TURBULENCE VALUES OF THE CABG PATIENTS

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**Objective:** Verifying the high risk group of patients with cardiovascular diseases is of great importance in preventing death. The measurement of heart rate turbulence (HRT) provides enormous information about the relationship between the autonomic balance and cardiac mortality. The study aims to detect the patients with high risk and determine the early postoperative mortality of these patients who will undergo CABG by using HRT measurements. **Methods:** 35 patients aged between 43 and 75 (mean age  $63 \pm 8$  years) were included in the study. Preoperatively 24 h of Holter recording and echocardiographic examinations were done. 1 week after the operation 24 h of Holter monitoring of the patients were recorded. One month after the operation the patients were called back for routine examination, 24 h of Holter recording and echocardiographic measurements. The turbulence onset (TO) and the turbulence slope (TS) which are the parameters of HRT were calculated. Values less than 0% for TO and values greater than 2.5 msn/RR for TS were accepted as normal.

**Results:** The TO values in the first week postoperatively ( $0,002 \pm 0,02$ ) were seen to deteriorate whereas an improvement in the first month values ( $-0,006 \pm 0,02$ ) was observed when compared to the preoperative values ( $-0,005 \pm 0,02$ ). On the other hand the TO parameters were found statistically insignificant and TS values in the first week postoperatively ( $2,3 \pm 3$ ) were found to worsen when compared to the preoperative values ( $6,6 \pm 8,6$ ). The first month TS values ( $4,4 \pm 4,3$ ) were better than postoperative first week values but were worse than the preoperative values. This difference in the results was statistically insignificant for the TO parameters but was significant for the TS parameters. The use of beta-blocking agents was seen to lessen the TS values. No significant correlation between the HRT parameters and the left ventricle ejection fraction and the perfusion time was detected. The relation between the cross clamp time and the postoperative first week TO values was statistically significant ( $r: 0,383$   $P: 0,031$ ).

**Conclusions:** CABG blunts the HRT values in the early postoperative period. The deterioration of a noninvasive prognostic determinant, the HRT value, in the early postoperative period might be related to the increased risk of postoperative arrhythmic mortality after CABG. The examinations of the late term results may enhance the use of HRT in the prediction of the prognosis in CABG patients.

#### 89. SOLUBLE INTERCELLULAR ADHESION MOLECULE-1 IS RELATED TO ENDOTHELIAL FUNCTION MEASURED BY PULSE WAVE ANALYSIS

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**Objective:** Inflammation is an important pathogenetic feature in all stages of the atherosclerotic disease process. Intercellular adhesion molecules are expressed on the vascular endothelium in response to several inflammatory stimuli. These molecules promote transendothelial migration of leucocytes and formation of atherosclerotic plaque. It has been shown that soluble adhesion molecules are elevated in patients with atherosclerosis, but their prognostic significance in determining endothelial dysfunction and cardiovascular risk is still unclear. The aim of this study was to assess endothelial function by pulse wave analysis (PWA) and intercellular adhesion molecule-1 (ICAM-1) level in patients with peripheral arterial disease (PAD) as well as in matched controls and to investigate relationship between these parameters.

**Methods:** We studied 23 male patients with PAD (Fontaine stages II-IV) and 23 well-matched control subjects without cardiovascular diseases or risk factors. All patients were recruited from the Clinic of Cardiovascular and Thoracic Surgery, University Clinics of Tartu, Estonia. The subjects were studied and plasma samples were collected between 08:00 and 10:00 am, after an overnight fast and abstinence from any medications, tobacco, alcohol, tea or coffee. Endothelial function was assessed by PWA combined with pharmacological testing (salbutamol, nitroglycerin). The data were analyzed using the unpaired two-tailed Student *t*-test and linear regression analysis (Statistica 6.1). Significance was defined as  $P < 0.05$ .

**Results:** There were no significant differences between the groups in age, body mass index, mean arterial blood pressure, endothelium-independent vasodilation, levels of glucose, triglycerides, total cholesterol, HDL-cholesterol, LDL-cholesterol and creatinine. The patients with PAD showed a significantly reduced endothelium-dependent vasodilation (EDV) ( $-3.3 \pm 3.8\%$  vs.  $-9 \pm 3.6\%$ ;  $P < 0.001$ ) and increased values of ICAM-1 ( $255 \pm 60$  ng/ml vs.  $212 \pm 37$  ng/ml;  $P = 0.007$ ) compared with the control subjects. There was linear association between EDV and ICAM-1 in all study subjects ( $r = 0.38$ ;  $P = 0.01$ ).

**Conclusions:** Patients with PAD have impaired endothelial function and elevated ICAM-1 level. Correlation between endothelial vasodilatory function and ICAM-1 level indicates that non-invasive PWA methodology with measurement of ICAM-1 level could be useful for assessment of vascular health and cardiovascular risk.

#### 90. VIDEO-ASSISTED THORACOSCOPIC ABLATION OF PULMONARY VEINS FOR LONE ATRIAL FIBRILLATION

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**Objective:** The pulmonary veins have been demonstrated to play an important role in generating atrial fibrillation (AF). Experience has grown in isolating the pulmonary veins using catheter-based techniques. Nowadays, in patients with lone AF, epicardial ablation can be successfully performed with minimally invasive cardiac surgery techniques. We present a video-assisted thoracoscopic (VATS) epicardial pulmonary veins microwave ablation performed on a beating heart.

**Methods:** A 66-year-old man affected by paroxysmal AF was scheduled for an epicardial ablation procedure. The surgical approach utilized 3 right and 3 left thoracoscopy ports using video assistance. Pulmonary veins were encircled and electrically isolated by the epicardial application of microwave energy at 65 W for 90 s (Flex-10 probe, AFx, Inc.). The procedure was carried out in 3.5 h.

**Results:** There was no postoperative complication. The patient was extubated in 4 h and moved to the ward on the second post-operative day. Early post-operative self-terminating episode of AF was treated increasing the dose of his pre-operative antiarrhythmic drugs. Prophylactic coumarin oral anticoagulant was started. Post-operative course was uneventful. A stable sinus rhythm has been persisting since his discharge (one month).

**Conclusions:** The procedure showed to be feasible. A longer experience is required. Once established, it might become an appealing first line option for treating lone AF.

#### 91. EFFECT OF CLOPIDOGREL ON POSTOPERATIVE BLEEDING

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**Objective:** It has been reported that preoperative aspirin increases postoperative bleeding and re-exploration incidence after coronary artery bypass grafting (CABG). But there aren't any reports evaluating the affects of clopidogrel. Our aim was to compare the postoperative drainage and requirement of blood products following CABG in patients using clopidogrel additional to aspirin.

**Methods:** A total of 300 patients who underwent coronary artery bypass surgery were enrolled in this study, and divided into two groups. In the first group there were 150 patients using 300 mg aspirin, and in the second group, again 150 patients were using 75 mg clopidogrel additional to 300 mg aspirin. The amount of postoperative bleeding, incidence of reexploration, requirement of blood products and clinical outcomes were compared between two groups.

**Results:** There were five deaths in both groups, 2 in Group I and 3 in Group II. The mean amount of postoperative drainage in the first 24 h were  $450 \pm 88$  ml in the first group and  $515 \pm 94$  ml in the second group, the difference was non-significant. Twelve patients were reexplored for bleeding, 7 of these were in aspirin group and 5 were in the combination group. The amount of blood and blood products used were similar in both groups. Also duration of intensive care unit and hospital stay were non-significant between two groups.

**Conclusions:** Clopidogrel used in combination with aspirin doesn't increase the incidence of bleeding and requirement of blood products after coronary artery bypass grafting when compared with single aspirin use.

### 92. SHELHIGH NO-REACT AORTIC VALVE CONDUIT: EARLY HEMODYNAMIC AND CLINICAL RESULTS

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**Objective:** Shelhigh NR-2000C stentless is a porcine valve conduit, glutaraldehyde cross-linked, detoxified and heparin-treated with No-React® process. The aim of this present contribution is to evaluate the short-term clinical and hemodynamic performance after its implantation.

**Methods:** During a 43-month period, 31 patients (21 males; mean age 67±7.7 years) were operated on using this conduit. The patients were affected by acute type A aortic dissection (5 pts), ascending aortic aneurysm with compromise aortic valve (24 pts) and dilated aortic root associated with bioprosthesis degeneration (2 pts). The follow-up was complete (median 25; range 5 to 42 months). Preoperative and postoperative (discharge/follow-up) two-dimensional echocardiography data were collected.

**Results:** There were two non-conduit related deaths. Overall, all patients were improved in terms of NYHA class. There were no evidence of valve-related complications or reoperations for structural valve deterioration. No calcification was detected on the echocardiography. Transconduit pressure gradient remained stable during follow-up and aortic regurgitation was absent or mild in all cases.

**Conclusions:** Ease of implantation and favourable effective orifice area and pressure gradients, as well as No-React anticalcification treatment, are promising factors. Furthermore, this conduit offers the hemodynamic advantages of a stentless valve including the avoidance of long-term anticoagulation.

### 93. SOCIO-CULTURAL DIFFERENCES BETWEEN PERIPHERAL ARTERIAL AND CORONARY DISEASE PATIENTS

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**Objective:** Both peripheral arterial and coronary disease are related to the development of atheromatous lesions in the vessels. Clinical practice gives the feeling of socio-cultural differences between the two sorts of patients. The aim of this study was to find if there are objective socio-cultural differences between these groups.

**Methods:** This retrospective study collected the files of 104 patients (14 female), mean age 67.6 years (39 to 86). Among them 41 had exclusively a coronary disease, 45 a peripheral arterial disease. The patients with both (18) were excluded from analysis. A questionnaire focused on atheromatous risk factors as described by the WHO, and socio-cultural characteristics was elaborated and completed by a physician. The socio-cultural factors explored were the profession, the income, the number of rooms in the house, the number of cars, the number of holidays per year, the educational level. Continuous variables were studied by the Student's *t*-test and categorical variables by a Chi<sup>2</sup> test.

**Results:** The usual atheromatous risk factors (smoking, diabetes, dyslipidemia and hypertension) were equally distributed in both groups. In our study, the two populations are mainly rural (77%), and retired persons from rural professions (70%). The only socio-cultural factor that appeared significantly different was the number of cars per home that was higher for coronary patients (1.6 versus 1.2, *P* = 0.028).

**Conclusions:** This study would suggest that there are almost no socio-cultural differences between peripheral arterial and coronary patients. Nevertheless, the selection of the sample, monocentric in a rural region, can affect the results.

### 94. A FOLLOW-UP ANALYSIS OF SURGICAL PULMONARY VEIN ORIFICE ISOLATION WITH SIMPLE ISOLATION LINE

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**Objective:** We have performed a simple left atrial procedure for eliminating CAf associated with mitral valve diseases and reported good outcomes.

Recently, we developed a less-invasive surgical procedure, pulmonary vein orifice isolation (PVOI) using radiofrequency (RF) or cryo ablation (CR), consisting of simple isolation of four pulmonary veins. This report aims to analyze the mid-term results of this procedure.

**Methods:** 49 patients were enrolled for this procedure concomitant with or without mitral valve surgery. Patients were divided into two groups (15 cases in RF group and 34 cases in CR group), and efficacy of this procedure was examined. **Results:** There was no hospital death and no major complication such as cerebral infarction. The AF eliminating rate at discharge was 71% (73% and 71% in RF group and CR group, respectively). Among the AF free cases, implantation of permanent pacemaker was needed due to sick sinus syndrome in 4 cases of CR group (17%) and none of RF group (0%). Sustained atrial tachy-arrhythmia (AT) occurred in 2 cases in CR group (9%) but in none of RF group (0%). These AT cases required catheter ablation against persistent arrhythmia; which revealed macroreentry in the right atrium due to atrial incision and common type atrial flutter.

**Conclusions:** A less-invasive procedure, PVOI with single ablation line, was effective for eliminating CAf in over 70% of cases. However, our results also suggest that pulmonary vein is not the only factor for triggering and maintaining Af.

### 95. POSTCARDIOTOMY HEART FAILURE AND PARACORPOREAL PULSATILE VENTRICULAR ASSIST DEVICE: SINGLE CENTRE EXPERIENCE

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**Objective:** Circulatory support devices are required in postcardiotomy shock, the use of IABP is reported to occur in 4%, and more advanced support is necessary in 0.2% to 1.2%. Literature reported postcardiotomy survival average between 25% and 30%. We report our clinical experience with MEDOS VAD for postcardiotomy heart failure (PHF).

**Methods:** At our Institution since 1/2002 more than 650 pts underwent cardiac surgery. 7 pts (0.7%) needed an advanced mechanical circulatory support for PHF. 5 pts were male (median age 54 years; range 7 - 62 years). 5 pts underwent myocardial revascularization for unstable angina. 2 of them received combined mitral surgery (2 annuloplasty, 1 replacement with biological valve). Two pts received aortic valve replacement with bioprosthesis. Postoperative IABP were used in ischemic pts and all received Swan Ganz before LVAD implantation. Wedge pressure ranged from 19 to 35 mmHg, mean cardiac index were 1,2 l/min. In all cases the inflow cannula was positioned in the left atrium while the outflow cannula in ascending aorta. Mean support time was 112 h. Complete neutralization of heparin was performed at the end of CPBP. For the first 24 h continuous Dipyridamole infusion (1 g/die) was used. According to thromboelastography, when the profile of the thrombus starts to seem normal continuous heparin infusion was initiated (max 100 U.I./h). 4 pts received NO therapy as RV support.

**Results:** One pt died 24 h after LVAD implantation due to MOF. One was scheduled for switch to long-term LVAD but the treatment was suspended due to cerebral ischemia—monitored by MRI—caused by preimplantation multiple cardiac arrest. 4 pts underwent LVAD removal and were discharged from the hospital after 15, 18, 20 and 23 days, respectively. One pt is on support waiting for long term LVAD implantation as destination therapy. No bleeding nor thromboembolic adverse events were observed. At a mean follow of 12 months all discharged pts recovered to a normal quality of life. Left ventricular ejection fraction improved to 45% in 2 pts and to 40% in 1 pt.

**Conclusions:** Aggressive perioperative management of PHF may improve results. MEDOS VAD represent an excellent option for this population of pts both for bridge to recovery or for bridge to bridge. Pump performance, easy implantation and pulsatility permits to recover end organ function from cardiogenic shock. The choice to implant MEDOS without in situ technical support is crucial for timing optimization.

### 96. CORONARY ARTERY COLLATERAL PRESSURE AND POSTOPERATIVE COMPLICATIONS DURING BEATING HEART AORTO-CORONARY BYPASS SURGERY

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**Objective:** Rhythm problems occurring during postoperative period can be life threatening. Many predictors of postoperative rhythm problems in patients undergoing coronary revascularization have been explored to decrease the incidence. We have researched the relation of collateral flow and postoperative rhythm problems and other postoperative complications in patients undergoing coronary revascularization operation with off-pump technique.

**Methods:** Fifty-four patients undergoing coronary operation with off-pump technique were enrolled in this study. In all patients left internal mammary artery (ITA) was anastomized to left anterior descending coronary artery (LAD) and other vessels were revascularized by saphenous vein. At the conclusion of the ITA anastomosis mean distal LAD pressure and simultaneous radial artery pressures were recorded while LAD and ITA were still occluded. Coronary artery collateral pressure index (CPI) was calculated as described in literature. The patients were followed in the postoperative unit prospectively and all perioperative and postoperative complications were recorded. The patients were divided into two groups according to the collateral pressure index. Group 1 consisted of patients with CCI less than 45 mmHg and group 2 patients had CCI greater than 45 mmHg.

**Results:** Mean age of whole patient group was 59,1±9,4 years and 6 of them were female. Mean CPI was 22,6±8,5 and 45,9±16,6 mmHg in group 1 and group 2, respectively. No hospital mortality was recorded in whole group. Preoperative variables including timi flow, functional capacity were comparable between 2 groups. Postoperative atrial and ventricular arrhythmias, intraaortic balloon usage and postoperative stay days were statistically significant in low CPI group ( $P<0,050$ ).

**Conclusions:** This study documents that postoperative complications in patient undergoing off pump coronary revascularization is intimately related with collateral coronary pressure.

**97. THE IMPACT OF CORONARY SHUNTS AND APICAL VACUUM POSITIONING DEVICES ON THE PRACTICE OF BEATING HEART SURGERY; A SINGLE SURGEON EXPERIENCE**

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**Objective:** The efficacy of coronary shunts and apical vacuum heart positioner devices to prevent ischemia and positional hemodynamic instability in the practice of off pump coronary surgery. End points of the study were the differences between use and no use of these devices on the on pump conversion rates, on the completeness of the revascularization achieved, and on the long term freedom from recurrent ischemic events.

**Methods:** we retrospectively compared two groups of off pump coronary bypass patients operated by the same surgeon. The first group of 102 patients had primary myocardial revascularization without the use of coronary shunts and the apical vacuum stabilizer, while in the second group of 156 patients coronary shunts and the vacuum stabilizer were used routinely. The first entry into the study was in June 2002 and the last in January 1, 2004. All the patients were placed in a registry and followed postop till January 1 2005, time when the last entry completed a one-year follow up.

**Results:** The on pump conversion rate in the first group of patients was 12.7% (13/102) with a 7.6% (1/13) conversion mortality and a 15.6% (16/102) overall postmyocardial infarction rate. With the use of coronary shunts and vacuum stabilizers in the second group of 156 patients there was a 1.2% (2/156) conversion rate with 0% conversion mortality and a 2% (3/156) overall postop myocardial infarction rate. During an average of 21 months (30-12) follow-up recurrent ischemic events were 16.6% (17/102) vs. 3.8% (6/156) between the two groups.

The majority of recurrent ischemic events was managed medically, however in one third of the ischemic patients from the first group an invasive treatment (PCI or reoperation) was necessary.

**Conclusions:** The use of coronary shunts and apical vacuum heart positioners in the practice of off pump coronary surgery offers significant protection against intraoperative ischemia, positional hemodynamic instability, the opportunity to revascularize the myocardium completely with safety and thus offer long-term results comparable with the traditional on pump method.

**98. LESS INVASIVE SURGERY FOR PATENT DUCTUS ARTERIOSUS WITH EXTRAPLEURAL APPROACH AND CLIPPING**

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**Objective:** To determine the effectiveness of a combination of minimally invasive techniques such as smaller incisions, extrapleural approach and clipping of the patent ductus arteriosus.

**Methods:** From March 2002 through October 2004, 47 children with PDA and four children with PDA and coarctation of the aorta, 4 to 52 months, underwent surgical correction using extrapleural dissection, and double clipping. Criteria for selection were age under 5 years, and ductus 9 mm in diameter or less. Left minithoracotomy was performed through fifth intercostal space, followed by blunt dissection of the parietal pleura to allow access to the thoracic aorta. Then two titanium clips were placed at the ductus. In four patients, an aortoplasty was performed to correct an aortic coarctation. Postoperative medical records were reviewed, including at least one echocardiographic evaluation.

**Results:** Fifty-one patients underwent surgery at a mean age of 21.2 months. The mean hospital stay was 2.1 days. Mild complications were observed in 15 patients, most of them with postoperative fever (10), atelectasis (4) and disphony (1). Moderate complications were present in 6 patients, consisting in pneumonia (2), small extrapleural hematoma (3) and postoperative pneumothorax in one. No major complications were observed. Mean follow up time was 8.1 months.

**Conclusions:** Patent ductus arteriosus using this approach is a feasible alternative to endovascular closure. In some selected cases with coarctation of the aorta this technique can be used also with no additional risk to the patient.

**99. SURGICAL TREATMENT OF AORTIC ABSCESS AND FISTULA: RECONSTRUCTION OF THE AORTIC ANNULUS WITH AUTOLOGOUS PERICARDIUM IN COMPLEX AORTIC ROOT INFECTION**

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**Objective:** The formation of annular abscess and fistulous communication are the most devastating complications of destructive aortic valve endocarditis (AVE) and require extensive surgical debridement.

**Methods:** Five male patients with destructive native AVE and ascending aortic dilatation/aneurysm experienced with congestive heart failure and hemodynamic deterioration developing from severe aortic regurgitation. For eradication of the AVE, aortic annular skeletonization was performed by dissecting all infectious and necrotic tissue containing abscess cavity and fistula between ventriculoarterial junction to sinotubular junction and aortic annular skeletonization. The completely resected annular area was covered with glutaraldehyde-treated autologous pericardial patch by suture at firm fibrous tissue for secure proximal anastomosis. The reconstruction of the aortic root was followed by implantation of the Freestyle stentless bioprosthesis using aortic root replacement technique.

**Results:** There was no mortality after surgery. The permanent conduction tissue complication was not recorded. All patients have been followed in NYHA Class I or II postoperatively (range 8 to 56 months). Echocardiography showed no signs of valve dysfunction, recurrent endocarditis or fistulation.

**Conclusions:** Annular skeletonization and reconstruction of the aortic annulus with glutaraldehyde-treated autologous pericardium permits a more radical removal of infected tissue and effective treatment for aortic annular abscess with less risk of valve dehiscence from the fragile aortic annulus.

**100. DOES THE TYPE OF PROSTHESIS INFLUENCE THE INCIDENCE OF PERMANENT PACEMAKER IMPLANTATION FOLLOWING ISOLATED AORTIC VALVE REPLACEMENT**

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**Objective:** The incidence of conduction disorders requiring permanent pacing (PPM) in patients operated on for aortic valve replacement (AVR) has been reported to be 5.7%. However, perioperative risk predictors for PPM



following AVR are not well characterised and debate exists regarding selection of the prosthesis type most likely to minimise this incidence. The aim of the study was to assess whether the type of the prosthesis used influences the prevalence of PPM following aortic valve replacement.

**Methods:** 782 consecutive patients with predominant aortic stenosis accepted for isolated non-emergent AVR were studied over a 3-year period. 305 patients (Group A) received mechanical prostheses; 335 received stented tissue prostheses (Group B) and the remaining 142 received stentless tissue valves (Group C). A stepwise logistic regression analysis was used to identify the independent predictors for PPM and statistical significance was accepted at a level of  $P < 0.05$ .

**Results:** Univariate and multivariate analysis showed a significant relationship between the preoperative factors (poor ejection fraction  $< 35%$  [ $P < 0.001$ ], left atrial enlargement [LAE;  $P < 0.001$ ] and left bundle branch block [LBBB;  $P < 0.001$ ]), the perioperative variables (bypass time  $> 100$  min with x-clamp time  $> 70$  min [ $P < 0.001$ ]) and the incidence of PPM.

**Conclusions:** The proposed predictive model correlated highly with actual pacemaker use, suggesting that the requirement for PPM results from either operative trauma or increased ischaemic burden and the incidence of PPM is independent of prosthesis type implanted.

#### 101.

##### MYOCARDIAL REVASCLARIZATION WITHOUT CARDIOPLEGIC ARREST IN PATIENTS WITH LEFT VENTRICULAR DYSFUNCTION

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**Objective:** We evaluated the results of myocardial revascularization in patients with ischemic LV dysfunction on beating heart, with or without pump support. Complete revascularization is crucial even in the presence of adverse coronary anatomy. Myocardial preservation is an issue of major concern especially in borderline patients with no cardiac reserve. Despite improvement of cardioplegic techniques some myocardial stunning has been observed during the first critical days postoperatively. Avoidance of cardioplegic arrest can be beneficial.

**Methods:** We reviewed the records of all consecutive patients with  $LVEF \leq 35%$  who underwent isolated CABG during a 14-month period ( $n = 37$ , 8% women). The mean LVEF was  $31 \pm 5.6%$  ( $LVEF \leq 30%$  in 49% of patients). The mean age was:  $67 \pm 6.6$  years. 35% of patients were in NYHA class IV, 65% in class III. All patients had angina, 22% had symptoms of heart failure, and 44% had recent MI. Dobutamine echocardiography documented the presence of viable myocardium in all patients with symptoms of heart failure. Our main concern was complete revascularization, off-pump whenever feasible. All patients were operated on beating heart, without cardioplegic arrest, with intracoronary shunts. 51% were operated off-pump, 49% were operated on pump-supported, empty, beating heart. The mean number of grafts was  $2.84 \pm 0.76$ , in 86% of cases at least one arterial graft was used. Complete revascularization (as planned before surgery) was achieved in all patients. Graft patency was documented with transit Time Flowmeter.

**Results:** Early mortality was 2.7%, cardiogenic morbidity was 2.7% (VT in 1 patient with recent MI). The mean hospital stay was  $9.8 \pm 6.1$  days. No new myocardial infarctions were noted, and minimal cardiac enzyme release. Echocardiogram at discharge revealed LVEF improvement in 64.8% of patients and LVEF preservation in the remaining 35.2%. Mid term follow up (mean 7.7 months) revealed a total 94% survival and clinical improvement in all survivors (80% NYHA class I, 20% NYHA class II).

**Conclusions:** Our patients with ischemic LV dysfunction had diffuse disease and poor vessels, and tended to be unstable with cardiac manipulation. In order to achieve complete revascularization and good quality of anastomoses we had to put about half of them on CPB. Myocardial preservation was achieved, operating on beating heart with intracoronary shunts, avoiding global and regional ischemia. Myocardial revascularization in patients with ischaemic LV dysfunction on beating heart, with or without CPB support, resulted in acceptable early mortality, good mid-term survival and improvement in quality of life.

#### 102.

##### SURGERY FOR PROSTHETIC VALVE THROMBOSIS: A SINGLE CENTER EXPERIENCE

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**Objective:** Thromboembolic complications after heart valve surgery constitute life-threatening morbidity, repeated surgical intervention and mortality risk during early and late postoperative course.

**Methods:** From 2000 through 2005 were implanted 1316 valve prostheses in 1164 patients at our institution. Of this cohort, 13 prosthetic valve thrombosis cases (1.12%) were presented since year 2000 and they all underwent surgical treatment (including 2 repeated surgical procedures in 1 patient). Five male and eight female patients aged between 19 and 60 years (mean 43.8) experienced prosthetic valve thrombosis over the period from 3 months to 15 years after primary surgery, except one patient who developed early postoperative left atrial and mitral valve prosthesis thrombosis within first week during ICU stay. In all patients except one thrombosis affected bileaflet valve prosthesis (one had tilting disc valve). In 12 patients (92.3%) thrombosis took place on mitral valve prosthesis, in 1 patient on aortic valve prosthesis. Most valve thromboses occurred in patients with mechanical prostheses (12 patients - 92.3%). When analyzing these patients we traced anticoagulation regimen mistakes in 6 cases including 2 cases of switch from oral anticoagulation to LMWH during pregnancy. Preoperative diagnosis was routinely confirmed by transoesophageal echocardiography (TEE). In 1 case treatment of temporary preoperative thrombolysis took place.

**Results:** Out of 13 prosthetic heart valve thrombosis cases we lost 1 patient already critical before redo surgery (mortality rate 7.7%).

**Conclusions:** According to our experience we advocate aggressive surgical approach as soon as prompt diagnosis using TEE is established. Inadequate level of anticoagulation is the most important factor involved in the pathogenesis of prosthetic valve thrombosis. Patient education with clear recommendations of necessary anticoagulant regimen in prosthetic heart valve patients may help to avoid this potentially detrimental complication.

#### 103.

##### INTRAPLEURAL BUPIVACAINE ANALGESIA INJECTION THROUGH THE CATHETER OF NEW DESIGNED CHEST TUBE

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**Objective:** Pain management has got specific importance in patients who are suffering from thoracic pains due to different reasons. Pain reduction would cause better and more effective respiration and minimize the postoperative complications. In this article, the effect of intrapleural injection of anesthetic drug through the new chest tube with catheter was studied.

**Methods:** The operation was performed on patient who needed chest tube insertion according to a variety of etiologies such as hemothorax, pneumothorax, and post thoracotomy. They were divided in to two randomized groups ordinary chest tube were inserted in the first group & 5 mg of morphine was injected. In the second group, the new designed chest tube with catheter was used and 0.25 cc/kg bupivacaine was injected through its catheter. The patients, pain was investigated before and after injection by VAS scale and their expiratory ability was measured by peak flow meter.

**Results:** The mean reduction of pain was  $35 \pm 11.9$  and  $37 \pm 11.1$  in the 2 groups respectively. It proved the efficacy of bupivacaine injected through the catheter of the new chest tube in decreasing patients' pain, but the difference was not considered to be significant ( $P$  value = 0.48). The mean increase in expiratory ability was  $2 \pm 0.7$  in the first and  $21.2 \pm 3.7$  in the second group, which showed the significant differences between the two groups and better respiratory function of the second group with the new chest tube ( $P < 0.01$ ).

**Conclusions:** The new chest tube with catheter is a safe and effective device for intrapleural injections, which can be an appropriate substitute for common methods.

## SCIENTIFIC SESSION V1 ABDOMINAL AORTIC ANEURYSMS

### V1.1

#### THE INFLAMMATORY RESPONSE ELICITED UPON AAA SURGERY

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**Objective:** The objective of this study was to investigate whether an inflammatory response occurs in patients undergoing infrarenal AAA repair, the timing of this activation (ischemia and/or reperfusion), the possible interaction among the inflammatory and endothelial mediators, and finally whether it affects postoperative clinical outcome.

**Methods:** Twenty high-risk patients with ASA>3 undergoing open AAA repair were included in the study. Morbidity and mortality were checked during a 30 day postoperative period. Blood samples were obtained at 8 defined time points, pre-, intra-, and postoperatively. The endotoxin, as an indicator of gut-barrier dysfunction, the pro-inflammatory cytokines TNF- $\alpha$ , IL-1 $\beta$ , and IL-6, the latter regarded as a marker of injury, the CD11b expression, as a marker of neutrophil activation, and NO, reflecting the dysfunctional endothelium, were measured.

**Results:** Systemic endotoxemia was found in all patients throughout the observation period. Peak intraoperative plasma endotoxin levels occurred within 30 min of reperfusion ( $P<0,05$ ) and were significantly greater in the patients who developed complications. Plasma levels of TNF- $\alpha$  and IL-1 $\beta$  did not change significantly at any time point. IL-6 levels increased gradually during the reperfusion period, reaching its maximal level on the first postoperative day ( $P<0,05$ ). The mentioned increase of IL-6 correlated both with aortic cross-clamping time ( $P = 0,01$ ) and postoperative morbidity ( $P<0,05$ ). Concerning the CD11b upregulation, 30 min after reperfusion the expression of CD11b increased significantly ( $P<0,05$ ); this increase was significantly greater ( $P<0,05$ ) in the complicated group. There were no significant differences with regard to NO production.

**Conclusions:** Endotoxemia is a universal finding in patients after AAA repair, but the degree of endotoxemia seems to correlate with the postoperative outcome. This study also failed to demonstrate any possible relation between cytokine release (TNF- $\alpha$  and IL-1 $\beta$ ) and remote organ injury. We suggest that the data of this study support the assumption that IL-6 response could primarily assign the impact of ischemia and reperfusion on tissue injury; furthermore, IL-6 assessment is shown to be a reliable predictor of outcome in patients undergoing elective AAA repair. The findings of this study provide further evidence for the suggestion that activated neutrophils play a central role in reperfusion-induced tissue injury early after reperfusion, and we suggest that intraoperative CD11b upregulation could serve as an early marker for the development of postoperative complications after infrarenal AAA reconstruction. The demonstrated "unresponsiveness" of endothelium, as reflected by the unchanged fluctuation of NO, could in part be attributed to the pre-existing dysfunctional endothelium in this group of patients.

### V1.2

#### FACTORS PROMOTING RUPTURE OF AAA

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**Objective:** The risk for rupture of an abdominal aortic aneurysm is widely believed to be related to its maximum diameter. Rupture occurs at the site of maximum wall stress, when it exceeds the tensile strength of the aortic wall. Basic research confirmed that peak wall stress and aortic wall biodegradation contribute to the mechanism of aneurysm rupture. In order to highlight the role of loss in wall strength and increase in focal peak stress, the authors reviewed recent literature. The clinical relevance of these recent insights in the etiopathogenesis of aneurysm rupture is analysed.

**Conclusions:** Surgeons are looking for a more reliable stratification of the risk of AAA rupture. The aneurysm size (its maximum diameter) is undoubtedly a robust parameter related to the rupture risk. Above the 5.5 cm threshold, the risk of rupture increases substantially and intervention to exclude the AAA must be considered. However, aneurysm size is not the sole nor the most accurate predictor of rupture. Aneurysm rupture occurs when the

mechanical stress acting on the wall exceeds the strength of the wall (failing strength of the degenerated aneurysm wall). The presence of thrombus, the focal inflammatory reaction and focal peak wall stress are additional parameters that are implicated in the growth and rupture of AAA. Cellular and extra-cellular matrix homeostasis in the aneurysmal wall are disturbed. Aneurysmal evolution is the result of extra-cellular matrix proteolysis and smooth muscle cell disappearance (apoptosis), which are not compensated by cellular healing processes. There still exists some misconception that a thrombus filled aneurysm has less risk to rupture. The contrary is true. The mural thrombus is not an inert substance, but is biologically active and interferes with the biodegradation of the aortic wall. Another common prejudice is that a calcified aneurysmal wall has a greater capability to resist distention and to withstand intraluminal pressure. However, a calcified aneurysm has not a higher wall strength and is even more prone to fissuration because of peak stress concentration at the edge of the plaques. In the future, finite element analysis and PET scan could become routine investigations, contributive to the evaluation of AAA rupture risk.

### V1.3

#### QUALITY OF LIFE BEFORE AND AFTER OPERATIVE TREATMENT OF ABDOMINAL AORTIC ANEURYSM

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**Objective:** Since 1950 when health was defined by World Health Organization as a "state of physical, mental and social wellbeing" need for its measurement was established. Various questionnaires were constructed. Widespread and most acceptable is the SF 36 Medical Outcomes Study short form survey, developed in a study of social security by Rand Corporation of Santa Monica. There are just a few published data measuring quality of life before and after operative treatment of abdominal aortic aneurysm. Aim of this study was to perceive the change in quality of life before and after operative treatment for abdominal aortic aneurysm.

**Methods:** Prospective study was undertaken, which included 49 patients operated on in our Institution. Change in quality of life before and after surgery of abdominal aortic aneurysm was evaluated. Modified SF-36 survey was used. Modification comprehended five categories of health (working ability, general health perceptions, physical state of a patient including information about pain, mental state and social functioning of a patient). Four measurements were taken: preoperative, immediately after the operation, 3 and 6 months after the operation. Interpretation of the results was done according to manual for filling and criteria for evaluation of this kind of data. Later on logistic regression analysis with Chi Square test was used in every estimated segment and in overall health, comparing pre- and postoperative quality of life.

**Results:** Working ability fell immediately after operation, and rose above starting values 3 months later, then stagnated. General health perceptions showed significant fall in QoL for  $P<0.05$  immediately after operation and significant rise during the postoperative period, with values exceeding preoperative. Measuring physical state we concluded that there was a fall in QoL which occurred immediately after the operation, and a rise afterwards, overtaking initial values, with no statistical significance as well as mental state of patient. Social functioning drastically fell immediately after the operation, and rose over initial values after complete recovery, with statistical significant difference. Overall results demonstrated significant fall in QoL immediately after the operation which then rises and exceeds initial quality, but without significant difference.

**Conclusions:** Immediately after operation of AAA there is significant drop in quality of life comparing to preoperative values. After complete recovery there is significant rise in quality of life comparing to values immediately after the operation. After complete recovery there is a rise in quality of life comparing to preoperative values, but without statistical significance.

### V1.4

#### PREOPERATIVE CARDIOLOGICAL WORK-UP IN PATIENTS WITH ABDOMINAL AORTIC ANEURYSM

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**Objective:** Complication due to coronary artery disease is a major cause of mortality in the surgical treatment of abdominal aortic aneurysm. The purpose of this study is to evaluate the efficacy of the preoperative cardiological work-up in our Institution.

**Methods:** From January 1996 until December 2004, 851 patients submitted to our Institution for abdominal aortic aneurysm. All of them underwent a detailed medical history interview, an electrocardiogram and an echocardiogram. If all these three parameters were negative, the patient underwent surgery. If one or more were positive or dubious the patient underwent a stress-echocardiogram with the use of dobutamine. If that was positive or dubious, the patient underwent coronary angiography. If the angiogram was negative for significant coronary artery disease the patient underwent aortic surgery. If the angiogram showed significant lesions, the patient received transluminal angioplasty or underwent cardiac surgery before the abdominal aortic aneurysm treatment (two-stage).

**Results:** 22% of the patients underwent coronary angiography. 7% of the patients received percutaneous transluminal angioplasty and 13% underwent coronary artery by-pass grafting. In 2% of the patients that underwent coronary angiography, there was no indication for surgical or interventional treatment of the coronary disease. Overall mortality of the patients undergoing abdominal aortic aneurysm repair was 0.5%. None of the patients died from myocardial infarction.

**Conclusions:** The cardiological work-up adopted in our Institution is safe and efficient in preventing the major cause of mortality in the surgical treatment of abdominal aortic aneurysms.

#### V1.5

##### **SURGICAL TREATMENT OF ABDOMINAL AORTIC ANEURYSMS ASSOCIATED WITH HORSE-SHOE KIDNEY**

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**Objective:** Although rare, abdominal aortic aneurysm surgery associated with a horse-shoe kidney (HSK) is a serious technical challenge to the surgeon. We reviewed our 14-year experience of abdominal aortic aneurysm surgery.

**Methods:** We reviewed 127 patients operated for elective abdominal aortic aneurysm between 1990 and 2004. Patients with and without horse-shoe kidney were compared for pre-, peri- and postoperative data.

**Results:** Seven patients were recognized to have had a HSK, 5 of whom were known to have a HSK preoperatively. Mean age of patients with HSK was 67.29±2.43 years. Preoperative serum creatinine levels were similar in patients with or without HSK (1.0±0.08 vs. 0.9±0.12 mg/dl, NS). In 5 of the patients with HSK, re-implantation of the anomalous renal artery was necessary. In all 127 patients, 5 patients expired and none belonged to HSK group. Dealing with HSK seemed to increase aortic clamp times (30.43±3.55 vs. 27.04±3.92 min;  $P<0.05$ ) slightly. Patients with or without HSK were given similar amounts of intravenous fluid replacement (2214.2±441.3 vs. 1923.3±433.6 ml/patient, NS) and allogeneic blood transfusion (0.71±0.49 vs. 0.9±0.4 units/patient, NS) and had similar ICU stay.

**Conclusions:** Patients with AAA associated with HSK can be operated with a left retroperitoneal approach without any significant increase in transfusion rate, volume replacement, ICU and hospital stay in comparison to those without HSK. High preoperative creatinine levels may be predictive for a possible perioperative renal compromise; a prompt re-anastomosis of the anomalous renal artery is of importance for preserving renal function.

#### V1.6

##### **AORTO-CAVAL FISTULAS**

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**Objective:** The surgical repair of 25 aorto-caval fistulas (24 male and one female patient; average age of 65.04 years) is reviewed.

**Methods:** Twenty three fistulas were caused by aneurysm erosion, one by iatrogenic injury, while one followed abdominal blunt trauma. The interval from presumed occurrence to diagnosis ranged from 6 h to 2 years. The presence of an abdominal bruit (21-84%) was the most reliable physical finding. Congestive heart failure was prominent in 5 (20%) cases, while severe lower extremity edema in 15 (60%). Four patients (16%) had hematuria, four (16%) renal insufficiency, while 6 (24%) scrotal edema. The diagnosis was not recognized before the surgery in 10 (40%) cases. In all 25 cases after transaortic suture of the fistula, aortic reconstructions were performed.

**Results:** Four operative deaths (16%) occurred, in patients who were not correctly diagnosed before surgery. In one case the cause of death was massive bleeding, and in three MOFS. All other patients were followed from 6 months to 18 years (mean 5 years and 2 months). All grafts are patent, and there are no lower extremity venous insufficiency or pelvic venous hypertension.

**Conclusions:** Surgical repair of aorto-caval fistulas is mandatory to prevent serious complications.

#### V1.7

##### **"DIFFICULT" CASES OF ABDOMINAL AORTIC ANEURYSMS (AAA)**

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**Objective:** We present our experience of diagnosis and surgical management of "difficult" cases of AAA. In this category are included those inflammatory, associated with horseshoe kidney (HSK) or with venous abnormalities such as a retroaortic left renal vein.

**Methods:** During the last 2 years 5 "difficult" cases of AAA were treated in our department: two inflammatory, one in association with HSK and two with a retroaortic left renal vein.

**Results:** One AAA with retroaortic left renal vein was ruptured. A CT scan was performed preoperatively in all patients, while in the case with the HSK a digital subtraction angiogram (DSA) and intravenous pyelography have been used. None was suitable for an endovascular treatment. All repairs were attempted via a transperitoneal approach through a median laparotomy. Successful resection of the aneurysm and Dacron graft insertion was achieved in all patients. The patient with AAA and HSK had an extensive parenchymatous isthmus overlying the aneurysm which remained intact. The postoperative course of the patients was uneventful.

**Conclusions:** Although "difficult" AAA are unusual, they can cause serious hazards to the vascular surgeon during AAA repair mainly in cases of a ruptured AAA. Preoperative anatomic studies facilitate the surgical procedure.

## SCIENTIFIC SESSION V2 CEREBROVASCULAR INSUFFICIENCY (1)

### V2.1

#### VERY EARLY CAROTID ENDO-ARTERECTOMY AFTER ACUTE CEREBRAL ISCHEMIA: A PROSPECTIVE MULTICENTER NOT RANDOMISED STUDY ACCORDING TO A PREDEFINED STUDY PROTOCOL

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**Objective:** To verify the safety of very early CEA according to a predefined study protocol in a consecutive series of patients with acute ischemic stroke observed in the emergency department stroke units.

**Methods:** Prospective not randomised multicenter study, conducted in 13 Italian hospitals. Ninety six enrolled patients. In each centre the participating team included neurologists, neuroradiologists and vascular surgeons on duty in the Emergency Department. At entry the neurologist scored the neurological status by the National Ischemic Health Stroke Scale (NIHss). The same neurologist re-assessed the clinical status of the patients before surgery and at discharge. The study protocol previewed plain and Contrast spiral Cerebral CT Scan, ultrasounds of the supra-aortic vessels to assess carotid artery stenosis and Transcranial Doppler to record patency of the middle cerebral artery. None of the patients underwent angiography. Patients with impaired level of consciousness (NIHss >22) or an infarct larger than one third of the middle cerebral artery territory on CT scans were excluded from surgery. Mortality, neurological morbidity by NIHss and hemorrhagic conversion of the infarct were considered primary end points of the study.

**Results:** Clinical presentation of the patients before operation is shown. CT scan or MRI showed evidence of recent cerebral infarct in 58 patients (60%), in 3 a blood brain barrier breaking was present. The mean time of interval from onset of stroke and endarterectomy was 1.5 days ( $\pm$  2 days) (range: 8 h - 11,5 days). The overall 30 days mortality rate was 2%. No neurological mortality occurred. Three patients (3%) experienced worsening of the neurological deficit at hospital discharge (NIHss 1 to 2, 1 to 3 and 9 to 10, respectively) which did not change until one month. Two more patients operated on at 40 and 60 h respectively from the onset of the stroke had a transient worsening of their deficit in the first 24 h from operation accompanied by postoperative headache. Postoperative CT did show neither new cerebral infarcts, nor hemorrhagic transformation. At the hospital discharge 11/96 (11,5%) had no improvement in NIHss postoperatively while 36 were asymptomatic and 46 did show decrease of NIHss of 4,5 points (median) (range 1-18).

**Conclusions:** Provided that strict selection criteria are applied, very early CEA (within 2 weeks) for acute ischemic stroke is safe, confirming that a delayed operation is in most cases not justified. Large randomised trials are warranted before implementing emergent and early CEA in routine clinical practice.

### V2.2

#### URGENT CAROTID SURGERY IN PATIENTS WITH CRESCENDO TRANSIENT ISCHAEMIC ATTACKS AND STROKE-IN-EVOLUTION

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**Objective:** To audit operative risk in patients undergoing urgent carotid surgery for crescendo transient ischaemic attacks (CTIAs) or stroke-in-evolution (SIE).

**Methods:** Interrogation of the vascular unit database (January 1992-July 2004) identified 43 patients operated upon urgently for CTIAs (= 3 TIAs within preceding week) and 8 for SIE. Stroke, death, and any major cardiac events were analysed.

**Results:** 48 patients underwent conventional endarterectomy and 3 patients underwent interposition vein bypass. CTIA patients had suffered a median of 5 TIAs (range 3-20) in the 7 days prior to surgery. Three patients either died or suffered a stroke following surgery giving a combined stroke/death rate of 7%. This compares with 2.4% in 1000 patients undergoing elective carotid endarterectomy in this unit. However, the combined stroke/death/cardiac event rate in the CTIA group was 19% (8 patients). In the SIE group, there was one death from cardiac causes and no patient extended their preoperative neurological deficit. The combined stroke/death/cardiac event rate was 37.5% (3 patients).

**Conclusions:** This study has shown that the combined risk of neurological and cardiologic complications following urgent carotid surgery for unstable neurological symptoms is very high. This would suggest the prevailing view that a systemic trigger may mediate atherosclerotic plaque disruption.

### V2.3

#### NEUROLOGIC COMPLICATIONS AFTER CAROTID SURGERY

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**Objective:** The aim of the study was to define causes of postoperative predictive factors for central neurological complications; risk for central neurological complications in group of patients divided preoperatively according to Vollmar modification of Natalie-Thevenet scale; preoperative, intraoperative and postoperative prevention for central and peripheral neurological complications.

**Methods:** This is a prospective study on 269 consecutively operated patients with 313 carotid endarterectomy of atherosclerotic lesions on carotid bifurcation. Patients are divided in three groups according to Vollmar modifications. Patients are divided in three groups according to Vollmar modification of Natalie-Thevenet scale.

**Results:** Five patients had TIA lasting a few hours caused by heart rhythm disturbances and left ventricular malfunctioning. Four patients had CVI (1,3%) (3 in I stadium, 1 in II stadium of carotid disease) caused by carotid artery thrombosis due to technical error. Peripheral neurological complications were n. auricularis magnus (7.3%), n. hypoglossus (0.6%), r. mandibularis n. facialis (1.9%), n. glossopharyngeus (0.3%), n. laringeus superior (1.9%).

**Conclusions:** Central neurological deficit was mostly due to technical error. There is no difference in incidence of postoperative central neurological complication in different stadium of carotid disease.

### V2.4

#### CAROTID RESTENOSIS AFTER SURGERY: ENDOVASCULAR TREATMENT OR RE-DO SURGERY

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**Objective:** Consensus has not yet been established on the best treatment of thigh carotid restenosis. Many authors advocate carotid angioplasty and stenting (CAS) because of higher complication rate associated with surgical treatment but few single centers present excellent results of carotid surgery for restenosis. Different primary procedures like CEA with primary closure, CEA with patch, eversion CEA and common-to-internal bypass, can produce different features of the restenotic tissue. Plaques can be fibrous, calcified or soft and friable. Since restenosis is not a homogeneous condition indications to vascular or endovascular treatment can be selected based on the different features of each patient.

**Methods:** From January 1999 to January 2004, 50 patients underwent vascular or endovascular reintervention for a >75% restenosis. 86% of patients were asymptomatic. Primary surgery was CEA with primary closure (36 pts, 72%) and CEA with patch closure (13 pts, 28%). Indication to open surgery versus endovascular approach was based on the type of primary intervention and the morphologic characteristics of the restenotic plaque. All patients undergoing surgical treatment had a soft plaque on duplex scan examination, and in the majority of them (77%) the primary procedure was CEA and patch.

**Results:** CAS with cerebral protection device was planned on 37 patients. Angioplasty was technically successful in 34 cases (92%). Open surgical reintervention was primarily carried out in 13 patients, and in 3 secondarily after the failed endovascular attempt. In the endovascular group, postoperative complications included asymptomatic stent occlusion (1 pt), amarois fugax (2 pts), homolateral cerebral hemisphere edema (CT scan confirmed) with transient specific neurologic symptoms (3 pts) and femoral artery access dissection and thrombosis (1 pt). In the vascular group, postoperative complications included major stroke (2 pts), vocal cord palsy (5 pts, 3 transient) and transient (resolved within 18 day post-op) swallowing problems (6 pts). Mean follow-up was 26 months (range 2-60). One patient in the open surgery (venous bypass) showed a new significant restenosis after 20 months, underwent a bypass revision and is currently free of restenosis.

**Conclusions:** CAS with cerebral protection devices is an acceptable alternative to surgery in the management of internal carotid artery restenosis

following endarterectomy. An accurate patient selection is the basis for excellent results and low relevant neurologic complication rate can be expected. Restenosis showing soft tissue features after CEA is not common in patients with patch. In these cases CAS could present a very high risk of embolization during the procedure.

## V2.5

### THE USE OF A WELL DEFINED PROTOCOL CAN KEEP COMBINED MORTALITY - NEUROLOGICAL MORBIDITY RATE OF CAROTID SURGERY UNDER 1%

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**Objective:** To evaluate the results of carotid bifurcation surgery (CBS) performed using a well defined protocol.

**Methods:** Prospective non-randomized clinical study. From January 1999 to October 2004, all patients admitted for CBS were managed according to precise pre, per and postoperative protocol. Preoperative evaluation included duplex scan and angioscan or MRI of extra and intracranial vessels and brain. Cardiac evaluation included clinical evaluation, ECG and cardiac echography. Coronaropathy was managed according to a defined algorithm, in collaboration with cardiologists and anesthesiologist. All patients were operated upon under general anesthesia, and monitored with radial catheter and digitalized ECG. The precise level of carotid bifurcation was identified and marked using duplex scan in the operating room. Systemic heparin was routinely used (0.5 mg/kg). Selective shunting was based upon preoperative data and subjective evaluation of reflux. Peroperative control arteriography was routinely performed. Postoperatively, all patients were observed and monitored during 24 h in their own room using the same monitoring process. Maximal blood pressure was kept under 160 mmHg. Anticoagulation used aspirin and low-molecular weight heparin. Daily ECG and troponine I titration were routinely performed during three days. Pre- and postoperative neurological evaluation by a neurologist was performed since September 2003. 261 procedures were performed in 243 patients (56% asymptomatic). A shunt was used in 25% of the procedures. Endarterectomy and prosthetic patch closure was used in 196 procedures (75%), and eversion endarterectomy or bypass in 65 (25%).

**Results:** There was no mortality. Two patients had a stroke, one permanent due to a peroperative embolus, and one, regressive in few days, due to hyperperfusion. Three patients had a cervical hematoma. Combined neurologic morbidity and mortality rate was 0.8%. Five patients had myocardial ischemia (2 cardiac infarcts) and 4 a coronary bypass (1) or angioplasty (3).

**Conclusions:** The use of a well defined protocol may help to significantly reduce morbidity and mortality rates of carotid surgery.

## V2.6

### CAROTID DATA REGISTRY

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**Objective:** In Germany each hospital is obliged to participate in quality assuring measures. The Data are sampled at the agency for quality assurance (Bundesgeschäftsstelle Qualitätssicherung GmbH, Düsseldorf) and will there evaluated. One of 28 programs be concerns the carotid endarterectomy. The data for the year 2003 will be presented.

**Methods:** A total of 19.335 operations from 437 hospitals were documented and evaluated. 50.65% operations in asymptomatic lesions, 49.35% in symptomatic lesions and 14.33% operations under certain circumstances like crescendo TIA, acute progressive stroke, acute carotid occlusion, carotid artery aneurysm, combination of coronary surgery or peripheral reconstructive surgery and carotid endarterectomy, reoperations.

**Results:** Good indication in asymptomatic lesions: 88.85% according to AHA-guideline. Good indication in symptomatic lesions: 95,26% according to AHA-guideline,

M/M-Rate in asymptomatic lesions: 2.02%.

M/M-Rate in symptomatic lesions: 4.0%.

From all 19335 patients suffered 1.67%, a severe stroke (Rankin 4,5,6) or died.

**Conclusions:** In Germany the total number of CEA shows overall a careful quality of the indication, the results are good and meet the international standard presented in the guidelines for carotid endarterectomy. Dependence on the numbers of cases to the quality of the results can not be proven. Risk-adjustment will be developed.

## V2.7

### 5000 CAROTID ENDARTERECTOMY PROCEDURES USING EVERSION TECHNIQUE - 14 YEARS' EXPERIENCE

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**Objective:** The aim of this paper is to present our experience in treating cerebrovascular insufficiency using eversion carotid endarterectomy (CEA) in a large cohort of patients

**Methods:** From 1992-2003 we performed 5194 CEA in 4783 patients. Neurological examination and Duplex-scan were done in all patients, but preoperative CT scan was done in 47% of patients only! Indications for surgical treatment were as follows: asymptomatic, TIA and stroke. Crescendo TIAs and stroke in progression were analyzed with particular attention. Follow-up comprised clinical and Duplex-scan examination after a month, after 6 months, and annually afterwards.

**Results:** In the observed period there were 184 (3.5%) asymptomatic pts, 3220 pts with TIA (62%) and 1790 (34.5%) pts with stroke. Crescendo TIA was seen in about 5% of all pts. In elective patients indication for surgical treatment was set up after Duplex-scan findings of stenosis 75% or more, with permanent decrease in number of angiography performed, so that it was done in less than 40% of pts in the last 2 years. Total hospital mortality (up to 30 days) was about 1%, and total morbidity was 4%.

**Conclusions:** Stenosis of the ICA of 75% verified by Duplex-scanning or angiography was an indication for surgical treatment, both in asymptomatic, and symptomatic pts. Duplex-scan proved to be reliable, but was strongly examiner dependent. Eversion CEA in our series proved to be a reliable surgical technique in treating carotid disease, with very good postoperative morbidity and mortality outcome.

## SCIENTIFIC SESSION V3 DOS SANTOS

### V3.1

#### NOVEL MUTATION IN EXON 6A OF THE COLLAGEN XI ALPHA-1 GENE IN PATIENTS WITH ABDOMINAL AORTIC ANEURYSMS

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**Objective:** Collagen XI isoform alpha-1 (Col11a1) is a major component of articular cartilage. It is thought to play an important role in collagen synthesis and fibrillogenesis and is known to occur in vascular tissues. Previous studies from our group have shown that Col11a1 was the most upregulated mRNA (among 15,000 genes studied on a chip array) in aortic fibroblasts from a patient with an abdominal aortic aneurysm (AAA). It has also been characterized that Col11a1 undergoes alternative splicing and its isoform with exon 6A is the only detectable epitope in the aortic wall. We hypothesized that mutations in exon 6A may occur in patients with AAA.

**Methods:** Genomic DNA was extracted from 26 AAA surgical specimens and subjected to real time polymerase chain reaction using specific primers which flanked Col11a1 exon 6A. Col11a1 exon 6A was isolated in 25 from 26 specimens, purified and submitted for nucleotide sequence analysis.

**Results:** Col11a1 exon 6A consists of 117 nucleotides and encodes 39 amino acids. In all 25 specimens a frame shift mutation was detected (insertion of a guanine, 90-91G). The peak height of this insertion was different among 25 specimens. In 12 specimens (48%) the peak height of the 90-91G insertion was between 100% and 200% of C92, in 8 specimens (32%) the peak height was between 50% and 80% and in 5 specimens (20%) the peak height was between 10% and 40% of C92. This insertion resulted in the occurrence of a stop codon. **Conclusions:** We are describing a novel mutation in exon 6A of Col11a1 which occurred in at least 20 of 25 (80%) patients with AAA. This frame shift mutation led to a stop codon and the possible truncated Col11a1 protein product suggests that abnormal Col11a1 synthesis may be the key element in the pathogenesis of AAA.

### V3.2

#### FIBRINOGEN AND SMOKING ARE ASSOCIATED WITH THE INTRALUMINAL THROMBUS IN ABDOMINAL AORTIC ANEURYSM (AAA) PATIENTS

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**Objective:** Abdominal aortic aneurysm (AAA) is a common condition in men over the age of 65 years. A common pathological feature associated with AAAs is the presence of intraluminal thrombus which is associated with AAA expansion and rupture. The aim of this study is to investigate the role of the known haemostatic factors associated with cardiovascular disease in the formation of the intraluminal thrombus.

**Methods:** Demographic data and plasma samples were obtained from 110 AAA patients and 110 age-sex matched controls. The demographic data (age, sex, height, weight, waist:hip ratio, body mass index, and ankle brachial pressure index) and the cardiovascular risk factors (alcohol consumption, hypertension, hyperlipidaemia, myocardial infarction, diabetes) are well matched for both groups. All subjects had an abdominal ultrasound scan to determine the size of the aneurysm, and the percentage of the intraluminal thrombus occupying the lumen was assessed at the point of maximal AP diameter. Plasma fibrinogen level was measured by the Clauss method. The results were analysed using non-parametric Spearman rank correlation and Mann-Whitney *U*-test.

**Results:** Fibrinogen concentration was significantly higher in AAA patients 2.89 g/l (2.45-3.40) than in controls 2.53 g/l (2.1-3.07) median and inter-quartile range, respectively,  $P < 0.0001$ . The AAA size and the intraluminal thrombus were positively correlated,  $r = 0.658$ ,  $P < 0.0001$ . AAA patients who currently smoke have a larger AAA (median) than those who don't smoke (4.50 cm vs. 4.30 cm) ( $P < 0.034$ ). AAA patients who currently smoke have larger clots within the lumen (median) than those who don't smoke (40% vs. 30.0%) ( $P < 0.046$ ). Fibrinogen was positively correlated with the size of AAA,  $r = 0.323$ ,  $P < 0.007$ . Fibrinogen was positively correlated with percentage of the intraluminal thrombus occupying the lumen,  $r = 0.323$ ,  $P < 0.003$ .

**Conclusions:** In this well matched case-control study, fibrinogen level was higher in the aneurysm group. We also demonstrated positive correlations between the aneurysm size, intraluminal thrombus and the fibrinogen concentration. Smoking as a cardiovascular risk factor was associated with larger aneurysms and greater percentage of clots within their lumen.

### V3.3

#### ABDOMINAL AORTIC ANEURYSMS; WHEN AND WHERE DO THEY RUPTURE—THE ROLE OF FINITE ELEMENT ANALYSIS

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**Objective:** Abdominal aortic aneurysm (AAA) intervention is offered when risk of rupture surpasses risk of intervention. Finite element analysis as used in the aeronautical industry is used to identify the distribution of stresses within a structure, and can pinpoint the areas and values of peak stress. Recent studies have linked aneurysm wall stress and risk of rupture. The objective was therefore to compare values of peak wall stress in ruptured and non-ruptured AAAs with 80% power and significance at the 5% level, and identify areas of high wall stress using finite element analysis.

**Methods:** 70 patients undergoing abdominal CT scanning for AAA were recruited consecutively into 2 groups (ruptured & non-ruptured). 3D geometry of the aneurysm was obtained from the CT images with the help of a semi-automated, in-house programme aided by commercial software (Rhinoceros 2.0). Blinded finite element analysis (Ansys 8.1) was carried out, and peak wall stress was calculated for each aneurysm as well as localization of high stress points. The Mann-Whitney Test for non-parametric data tested statistical significance.

**Results:** 30 ruptured AAAs were compared to 40 non-ruptured AAAs. The 2 groups were comparable with regard to age, sex, incidence of hypertension, and chronic obstructive pulmonary disease, but not with regard to ischaemic heart disease (50% rupture group vs. 24% non-ruptured group,  $P = 0.049$ ). Median Peak Wall stress was 0.83 (IQR 0.62-1.1) in ruptured AAAs compared to 0.64 (IQR 0.49-0.85) in non-ruptured AAA ( $P = 0.01$ ). Location of high stress points were calculated and 60% were found in the anterior segment and 40% in the posterior segment.

**Conclusions:** Ruptured AAAs are significantly associated with a higher peak wall stress than non-ruptured AAAs. This is a value that can be obtained from routinely performed CT scans. Also of interest is the observation in this cohort that high stress points are more common in the anterior segment of AAAs and this needs further investigation, as it contradicts the common observation that ruptures are more often seen posteriorly.

### V3.4

#### PRESERVATION OF VEIN ALLOGRAFT'S VIABILITY DURING LONG-TERM STORAGE

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**Objective:** The aim of this study was to compare vein allograft's viability following cryopreservation with that remaining after prolonged refrigerated storage.

**Methods:** Great saphenous vein (GSV) biopsies had been cryopreserved, and the remaining samples were divided into two matched groups and stored in tissue culture medium (TCM) for 42 days at +4°C, either with or without regular medium replacement. Each vein allograft was biopsied and assayed for viability on every third day by the methyl tetrazolium (MTT) reduction assay. Viability indexes of vein allografts harvested from brain-dead multi-organ donors and of cadavers whose warm ischemic period were maximum 24 h were also compared.

**Results:** Vein allografts stored for 42 days at +4°C showed similar viability (58,9±1,2%) to cryopreserved (59,7±2,3%). This was true even when cryopreserved and thawed allografts was subjected to 3 days post thaw incubation under presumably favorable condition (58,7 ±1,6%). There was no viability index difference between the medium replaced and non replaced and two differently harvested groups.

**Conclusions:** Long-term storage of vein allografts at +4°C is a valuable option for regular banking practice. Sufficient amount can be procured from cadavers similar to the tissue donors.

**V3.5****EFFECTS OF ANTIOXIDANT AGENTS (COENZYME Q10, BETA GLUCAN AND N-ACETYLCYSTEINE) ON LIMB ISCHEMIA REPERFUSION INJURY**

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**Objective:** Ischemia reperfusion (I/R) injury is a complex inflammatory process, based on the reintroduction of fully oxygenated blood into the targeted areas of myocardium previously modified by ischemia. Endothelial cells, neutrophils, the complement system, cytokines and ROS such as superoxide anion hydroxyl peroxide and hypochlorous acid play a major role in this process. The aim of this study was to evaluate and compare the effects of Coenzyme Q10, beta glucan and N-acetylcysteine on limb I/R.

**Methods:** The rabbits were enrolled into four groups (11 rabbits in each). Group 1 was the control group, Group 2 was medicated with Coenzyme Q10 (5 mg/ kg per day for 2 weeks), Group 3 was medicated with beta glucan (250 mg/kg per day intraperitoneally for 7 days) and Group 4 was medicated with N-acetylcysteine (50 mg/kg IV perfusion preoperatively). Under anesthesia, blood samples and a segmental biopsy from iliac artery were taken and then the left iliac arteries of the rabbits were clamped for 15 min. After the ischemic period the clamp was taken and blood samples were taken. After 15 min of reperfusion blood samples and segmental biopsy was repeated. Lipid peroxidation, oxygen radicals, nitric oxide derivatives were evaluated in blood samples. Endothelial functions were compared.

**Results:** The markers of I/R were significantly higher in control group. Between the antioxidant groups, Coenzyme Q10 was found to be mostly effective on oxygen radicals, beta glucan on lipid peroxidation and N-acetylcysteine on nitric oxide derivatives and oxygen radicals. The endothelial functions were found to be significantly better in antioxidant groups.

**Conclusions:** I/R injury is a morbid and mortal complication. Antioxidants may help to decrease the injury. We found that Coenzyme Q10, beta glucan and N-acetylcysteine significantly decrease I/R injury. Selective or combined medication of these in humans may be clinically helpful in I/R injury.

**V3.6****THE CEREBROVASCULAR RISK OF ABDOMINAL AORTIC ANEURYSM REPAIR**

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**Objective:** The management of coexistent carotid stenosis in patients undergoing abdominal aortic aneurysm (AAA) repair remains controversial. This study documents the incidence of cerebrovascular complications after elective and emergency AAA repair.

**Methods:** Consecutive patients undergoing elective and emergency open AAA repair over a 7-year period were identified from a prospectively compiled database. Preoperative carotid duplex surveillance was not performed routinely. Perioperative cerebrovascular complications were recorded and related to demographic and clinical factors.

**Results:** 670 patients underwent attempted open AAA repair over the study period. Of these, 288 (43%) underwent an elective procedure, 95 (14%) had an acutely symptomatic non-ruptured AAA and 297 (44%) had a ruptured AAA. Of 288 patients undergoing elective operation, three (1.0%) suffered a perioperative stroke, none of which were fatal. Of 95 patients undergoing repair of an acutely symptomatic AAA, two (2.1%) suffered a perioperative stroke; both patients survived. Of 297 patients undergoing attempted repair of ruptured AAA, one (0.3%) suffered a perioperative stroke, and later died, while a further patient suffered a transient ischaemic attack.

**Conclusions:** The rate of a perioperative stroke following AAA repair is less than 1%. These data do not support a policy of routine preoperative carotid duplex imaging and prophylactic carotid endarterectomy for asymptomatic stenoses prior to aneurysm repair.

**V3.7****EVALUATION OF DIGITAL PLAQUE IMAGE ANALYSIS: INTER-OBSERVER AND INTRA-OBSERVER VARIABILITY**

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**Objective:** Atherosclerotic plaque characterization for detection of instability has been the target of extensive vascular research. Computer assisted image analysis has been used for the assessment of atherosclerotic plaque ultrasonographic characteristics. However, information with regard to the methods' variability (intra- and inter-subject) is quite limited. Aim of this study has been the evaluation of the intra- and inter-observer variability of atherosclerotic plaque image characteristics, obtained by a computer image processing software, mainly due to heterogeneity of plaque definition.

**Methods:** Ultrasonographic images of 17 plaques (12 carotid plaques, 5 femoral plaques) were collected by an experienced ultrasonographer. The inter-observer variability was evaluated by measurement of image plaque characteristics made by three different examiners who independently analysed the atherosclerotic plaque images. All examiners followed a previously specified standardized protocol of image assessment using a commercial image processing software. The intra-observer variability was assessed by measurement of the image plaque characteristics twice by one of the observers. For calculation of image characteristics, the examiner has to subjectively define the gray scale level of adventitia and blood, and delineate the outline of atherosclerotic plaque. In order to evaluate the potential variability due to plaque delineation, specific points of adventitia and blood were chosen for each one of the images. Furthermore, the image analysis software was assessed for reproducibility and validity. The reproducibility of the software was evaluated by repeated measurements of specifically defined ultrasonographic image areas, by two different observers. The validity of the computer program was assessed against Adobe Photoshop™ software, which is currently the method of choice for computer assisted image plaque analysis. The methods used for the statistical analysis included the correlation coefficient, the intra-class correlation coefficient, the within-subjects standard deviation and the repeatability coefficient as required.

**Results:** The software program was proved to be valid as compared with Adobe Photoshop software, and the obtained results reproducible. However, statistically significant inter-observer and intra-observer variability was found regarding atherosclerotic plaque image parameters.

**Conclusions:** Digital image processing enables the maximum information from plaque images to be obtained. However the results of plaque characterization are subject to considerable variability due to the subjective estimation of atherosclerotic plaque outline. Further investigation is required to eliminate subjectivity of estimations and allow for reproducibility of measurements.

**V3.8****INFLUENCE OF DIABETES ON PRIMARY VASCULAR ACCESS FOR HEMODIALYSIS—A MATCHED CASE—CONTROL STUDY**

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**Objective:** Diabetic nephropathy is nowadays one of the major causes of end-stage renal failure (ESRF). It is also known as a risk factor of inferior function of vascular access for hemodialysis. The aim of the study was to evaluate the possibility of creation and function of primary vascular access dependent on the coexistence of diabetes.

**Methods:** From 272 patients from 5 dialysis centres we chose 30 patients whose cause of ESRF was diabetic nephropathy (group D). The control group (group C) consisted of individually matched in respect to age, sex and diabetes duration, 30 patients with other causes of ESRF. We compared possibility of creation and function of a-v fistulas in both groups.

**Results:** In group D 17 (57%) primary radiocephalic fistulas (RCFs) were performed in comparison to 27 (90%) in group C. This difference was significant for both groups ( $P < 0.01$ ). In all remaining cases arm fistulas using either basilic or cephalic vein were performed as a primary vascular access. In 17 forearm fistulas there was a necessity of 20 interventions to maintain vascular access. Intervention index was 1,18 per fistula in group D. Similar index in group C was 0,44. Interventions consisted of either endovascular or surgical reconstruction. Cumulative patency rates of a-v fistulas performed on arm vessels were comparable in diabetic and non-diabetic patients.

**Conclusions:** Indications for a-v fistula creation using forearm vessels in diabetic patients need careful evaluation. Diabetes is an independent factor of malfunction of vascular access created on forearm vessels.

## V3.9

**SUBTLE CEREBRAL DAMAGE AFTER SHUNTING VS NON SHUNTING CAROTID ENDOARTERECTOMY EVALUATED BY S100 NEURON SPECIFIC ENOLASE PROTEINS, INTERLEUKIN 6 AND NEUROPSYCHOLOGIC TEST.**

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**Objective:** Subtle cerebral damage (SCD) during carotid clamping without shunt and cognitive impairment (CI), due to subclinic cerebral ischemia, is an underestimated complication of carotid endarterectomy (CEA). The evaluation of S100 neuron specific enolase (NSE) and IL6 protein blood levels after CEA has been described as a marker of brain subtle injury. The aim of our study is to detect differences in SCD and its subsequent CI by measuring S100 neuron specific enolase (NSE) and interleukin-6 (IL-6) blood levels and by neuropsychologic testing in patients undergoing left CEA with or without shunt employment.

**Methods:** Between October 2000 and March 2002, 37 out of 55 patients with unilateral  $\geq 70\%$  left internal carotid artery (ICA) stenosis, after successful (Score  $>24$  points) Mini State Examination (MMSE) were enrolled in the study. Exclusion criteria included: bilateral ICA stenosis, dementia, previous disabling stroke, brain tumours and neuroleptics

therapy. All patients underwent brain CT scan pre-operatively. Group A (non shunting CEA) included 20 patients and Group B (shunting CEA) included 16 patients. There was not statistical differences as regards age and sex. Serum concentration of S100, NSE proteins and IL6 were measured before and after ICA cross clamping taking a blood sample from the internal jugular vein (IJV). Galveston orientation and amnesia test (G.O.A.T.) were performed in all patients at the awaking from the general anaesthesia. In the 3rd post-operative day all patients underwent brain CT scan.

**Results:** The mean clamping time for the no shunt group was 61 min (range 23-145 min) and 32.7 min (range 30-120 min) for the shunt group. The post operative CT scan doesn't show a new lesion. There were no significant differences between pre and post clamping NSE ( $P = 0.37$ ), S100 ( $P = 0.30$ ) and IL6 ( $P = 0.07$ ) concentration. There were, also, no significant differences in NSE ( $P = 0.4$ ), -NSE ( $P = 0.75$ ), S100 ( $P = 0.44$ ) and -S100 ( $P = 0.79$ ) between shunting vs. no shunting CEA. The differences of NSE ( $P = 0.10$ ) and S100 ( $P = 0.62$ ) between symptomatic and asymptomatic patients was, also, not statistically significant. There was not a variation in the pre and post neuropsychologic tests.

**Conclusions:** Ours results suggest that CEA without shunt employment is not associated with a significant deterioration of global cognitive functions. Between the two groups a significant variation in serum S100, NSE, IL6 and cognitive tests has not been detected.



## SCIENTIFIC SESSION V4 PERIPHERAL VASCULAR SURGERY (1)

### V4.1

#### AUTOGENOUS VASCULAR RECONSTRUCTION: THE ROLE OF THE DEEP FEMORAL VEIN

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**Objective:** The greater saphenous vein (GSV) is the preferred substitute for reconstruction of middle size and smaller arteries, but often not available in sufficient length and caliber. In those cases we started ten years ago to harvest the contralateral deep femoral vein (DFV) as an additional or as the only substitute. In patients with damage to the deep venous system and in those with valvular insufficiency the caliber of the GSV is mostly to a small and the DFV can serve as an ideal substitute.

**Methods:** The DFV has been used in 21 patients (arterial replacement 16, venous 5). Indications concerned reconstruction for iatrogenic trauma of popliteal vein, renal vein at the time of kidney transplantation, carotid trauma, infected carotid and femoral arteries, visceral artery reconstruction, subclavian vein replacement, extension of infrainguinal bypass below the knee by composite grafts, and others.

**Results:** Nineteen out of 21 reconstructions were successful and remained patent (10 years-3 months observation time). In the two cases with failure one reinfection occurred and one graft thrombosed. No dilatation or other graft complications were observed. The donor site did not show oedema or other dysfunctions.

**Conclusions:** We have used the deep femoral vein for various indications in reconstructive vascular surgery and obtained very good results. The DFV proved to be a valuable substitute, the harvesting of which did not cause negative side effects. The possibilities to find a simple solution for complex arterial and venous reconstructions are numerous. To our knowledge we are the first group to describe the DFV as a substitute for this kind of vascular reconstruction.

### V4.2

#### ASYMPTOMATIC POPLITEAL ARTERY ANEURYSM: ENDOVASCULAR TREATMENT VERSUS OPEN REPAIR

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**Objective:** The aim of this prospective randomized study was to evaluate the relative risks and advantages of using the Hemobhan graft for popliteal artery aneurysm (PAA) treatment towards open repair (OR). Primary end-points were: patency rate, limb salvage; secondary end-points were hospital stay, length of surgical procedure.

**Methods:** The study was a prospective randomized clinical trial carried out at a single centre from January 1999 to December 2003. Eligible patients were those with a PAA diameter = 2 cm at the angio-CT scan, revealing an anatomy suitable for endovascular treatment (ET). Exclusion criteria were: 1. age <50 years, 2. proximal and distal neck with a length <1 cm, 3. poor distal run-off, 4. contraindication to anti-platelet, anti-coagulant or thrombolytic therapy, 5. symptoms of nerve and vein compression. The enrolled patients were thereafter prospectively randomized in a 1-to-1 ratio between OR or ET. The follow-up protocol consisted of duplex ultrasound scan, ankle-brachial index (ABI) measured even during force leg flexion at 1, 3 and every 6 months. Patients of Group B underwent an angio-CT scan with leg flexion at 6, 12 months and then early.

**Results:** Between January 1999 and December 2003 a total of 30 PAAs (15 OR Group A, 15 ET Group B) were performed in the cohort of 26 randomized patients (4 with bilateral PAA). Bypass and exclusion of the PAA was the preferred method of OR; no perioperative graft failure was observed. Twenty stent-grafts were placed in 15 PAAs. Endograft thrombosis occurred in 1 (6.7%) case in the postoperative period. The mean follow-up period was of 46.1 months (range 12-72) for Group A and of 45.9 months (range 12-65) for Group B. The Kaplan-Meier analysis showed a primary patency rate of 81.8% at 48 months for OR and of 80% at 48 months with a secondary patency rate of 100% for ET; limb salvage rate was of 100% in both groups. No statistical differences were observed at the log-rank test. The mean operation time

(195.3 min, OR, -75.4 min ET) and hospital stay (4.3 days OR, 7.7 days ET) were statistically longer for OR with respect to ET ( $P < 0.001$ ).

**Conclusions:** We can conclude, with the power limitation of the study and waiting for a prospective randomized trial with larger number of patients, that PAA treatment can be safely performed using either OR or ET. The choice of the ET has several advantages such as quicker recovery and shorter hospital stay.

### V4.3

#### JUXTA-ARTICULAR POPLITEAL ANEURYSMS TREATED BY SUPERFICIAL FEMORAL ARTERY TRANSPOSITION: SHORT AND MIDDLE TERM RESULTS

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**Objective:** Juxta-articular popliteal aneurysms can be treated by superficial femoral artery (SFA) transposition in order to avoid problems of congruence or when a saphenous vein graft is not available. The aim of this study was to show short and middle term results of SFA transposition.

**Methods:** From October 1997 to January 2005, 19 popliteal aneurysms were treated by AFS transposition. Mean age of patients was 72 years old (56-92). Eighteen aneurysms were treated during elective procedures and one as an emergency for acute ischaemia. Fourteen patients were asymptomatic. From the remaining five, three presented minor symptoms, one presented gangrene of 2 toes and one patient presented in acute ischaemia. All aneurysms were located in the middle portion of the popliteal artery. Three of them presented also a more proximal aneurysm in the supra-articular popliteal artery. Mean diameter of the aneurysms was 28.6 mm (14-50). Surgical exposure was achieved by a medial approach. Aneurysm resection was performed in 8 cases, aneurysmography in 9 cases, and exclusion in 2 cases. The femoral artery was harvested from the ipsilateral thigh and was replaced by a ePTFE graft.

**Results:** There were two post-operative complications. One patient was re-operated for evacuation of a hematoma. The second patient presented an occlusion of the distal popliteal artery (lesion due to the clamp) and underwent a distal popliteal-anterior tibial artery bypass 5 days after the first operation. Duplex scan control before discharge showed a good congruence and graft patency in all cases. Mean follow up was 21 months (2-91). One patient died 3 months after the operation from heart failure. Two other patients died 2 and 51 months post-operatively from general health status deterioration. There were no septic complications and no aneurysmal evolution of the transposed arterial graft. Patency during the follow-up was of 100%.

**Conclusions:** Superficial femoral artery transposition (when available) seems to be an interesting alternative and became lately the treatment of choice for juxta-articular popliteal aneurysms in our institution.

### V4.4

#### FEMORAL ANASTOMOTIC ANEURYSMS: A CONTINUING CHALLENGE. A STUDY OF 136 CASES

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**Objective:** Despite the use of modern operative technique and improved graft and suture material, femoral anastomotic aneurysms (FAAs) continue to produce significant morbidity and mortality among a minority of patients undergoing lower extremity vascular reconstruction. This retrospective study investigates the clinical presentation, the infect as cause of FAAs, the interval between the original operation and the development of FAAs. This analysis evaluates the outcome of treatment, deaths and amputations of patients with FAAs.

**Methods:** We reviewed the records of 124 patients (102 male and 22 female) mean age 66 years (range: 46-88) who presented with 136 FAAs. The most frequent previous vascular surgery was an aortobifemoral bypass in 91 cases, 21 had femorodistal bypass, 11 had iliofemoral bypass, 9 had a femoral thrombendarterectomy and 2 an axillofemoral bypass.

**Results:** With regard to usual risk factors 73% were smokers, 28% had diabetes, 60% were hypertensive, 59% had heart disease, 72% had peripheral arterial occlusive disease (PAOD), 10% had a prior limb amputation. There was a total of 13 infected and 14 recurrent FAAs. The time lapse between the initial operation and the development of the FAAs was 56.9 months (range 1-219) (for the infected FAAs 8, for non infected FAAs 62 months and for the

recurrent FAAs from the first correction was 38.8 months). The most common surgical procedure was a prosthetic bypass from the proximal prosthesis to the profunda femoral artery in 97 cases. In postoperative period was observed local complications in 21 (15.4%) cases and general complications in 7 (5.1%). The postoperative mortality was 3.7%. The overall survival at 1 year was 91.3% (S.E.:  $\pm 2.5\%$ ) and at 2 years 85.4% (S.E.:  $\pm 3.3\%$ ). Kaplan-Meier analysis showed a cumulative limb salvage of 94.2%, 93.3% and 89.2% after 6 months, 1 and 2 years, respectively. We detected based on bivariate log-rank tests significant relationship between amputation and the following parameters: infected FAAs (Log rank test: 26.1,  $P$ -value $<0.001$ ), diabetes (Log-rank test: 12.9,  $P$ -value $<0.01$ ), PAOD (Log-rank test: 3.1,  $p$ -value = 0.08) and prior limb amputation (Log-rank test: 9.9,  $P$ -value $<0.01$ ). The mean time to amputation for infected FAAs was 49.6 months (95% CI: 24.3-74.8) and for non infected 98.8 months (C.I.: 93.4-104.2).

Conclusions: Complicated FAAs are still responsible for significant morbidity and mortality. Elective treatment produces the maximum benefit.

#### V4.5

##### LONG-TERM PROGNOSIS OF FEMOROPOPLITEAL BYPASS

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Objective: Femoropopliteal bypass is the commonest procedure for lower limb revascularization. The aim of the present study was to determine the long-term outcomes of femoropopliteal bypass and evaluate the prognostic significance of various clinical factors on the long-term results.

Methods: From 1995 to 2004, 149 consecutive primary femoropopliteal bypass operations were performed on 114 patients at the Department of plastic and microvascular surgery Bakoulev Scientific Center of Cardiovascular Surgery. Indications for operation included claudication ( $n = 35$ ) and limb-threatening ischaemia ( $n = 114$ ). Univariate and multivariate analyses of 14 clinical variables were undertaken to identify significant prognostic factors affecting the graft patency, limb salvage and patient survival rates.

Results: The overall primary patency rates of femoropopliteal bypass were 88%, 79% and 76% at 1, 3 and 5 years, respectively. Type of graft material and age of patient were independent prognostic factors of graft patency. The cumulative limb salvage rates were 90%, 86% and 86% at 1, 3 and 5 years, respectively. No clinical factor was found to be predictive of ultimate limb loss. The overall survival rates were 89%, 85% and 78% at 1, 3 and 5 years, respectively. Coronary artery disease was the main cause of late death. Gender and indication for operation were the significant predictive factors of long-term survival.

Conclusions: Femoropopliteal bypass using reversed long saphenous vein provided the most durable long-term patency. Autologous saphenous vein should be the choice of vascular conduit if available. Male gender and limb-threatening ischaemia were associated with a poor survival.

#### V4.6

##### SHOULD THE PROXIMAL SEGMENT OF THE GREAT SAPHENOUS VEIN BE PRESERVED IN REVASCUARIZATION PROCEDURES?

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Objective: Amputation is inevitable in the case that the compensating mechanisms of ischemia are insufficient in patients having unreconstructable arterial bed. Vascular surgeons still search for alternative revascularization procedures for these cases. There have been trials on perfusion of the extremities by venous route when it is impossible to perfuse the tissues by arterial route. However, reperfusion of the extremities by venous route has not become a routine procedure. In situ bypass techniques for antegrade venous perfusion applied by venous valvular destruction have also been tried which have low patency rates in the long term. Perfusion of the

crural tissues by retrograde venous way is possible when the arterial flow is brought to the great saphenous vein just above the level of medial malleolus. When the great saphenous vein is ligated below the knee, not only does it avoid the significant arteriovenous shunt but also it avoids the need for a valvular destruction. One way of the flow is upwards to the knee whereas the other way is towards the feet in a descending fashion.

Methods: Ten patients who were undergoing CABG were included in the study. Venographies of these patients were studied in the operating room. The patients' saphenous veins and dorsal venous arches were evaluated angiographically.

Results: It was shown that there was not any valvular barrier in the great saphenous vein in the ascending route. However, dorsal venous arch may resist the retrograde flow by the venous valves at 6-8 cm distal to the medial malleolus. The dorsal venous arch was shown in 2 patients. But retrograde flow was blocked by the venous valve in 8 patients.

Conclusions: The venous arterialization procedure is actually an arteriovenous fistula. The valvular coaptation is disturbed in three weeks in the arteriovenous fistulas. Therefore, we can say that the dorsal venous arch arterialization in a retrograde way will become an active perfusion way in three weeks. So the saphenous vein at the level of and a few centimeters above medial malleolus may be used as alternative revascularization sites. Therefore, this segment of the saphenous vein should be preserved in the patients who have peripheral arterial disease and who are undergoing femoropopliteal bypass procedures or CABG with saphenous vein grafts because of the reason that the atherosclerosis is a progressive disease and revascularization with the conventional procedures might not be possible later on.

#### V4.7

##### PEDAL BYPASS IN SALVAGE OF CRITICALLY ISCHEMIC LIMB WITH UNSATISFACTORY PREOPERATIVE ANGIOGRAPHY

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Objective: The cause of chronic critical lower limb ischemia is often the combination of diabetic angiopathy and atherosclerotic disease of crural arteries. Foot gangrene is the terminal stage in this case and pedal bypass grafting is often the only method of limb salvage.

Methods: In 2000 to 2004, 64 pedal bypasses were performed in 63 patients with chronic critical lower limb ischemia. Fifty-six (87.5%) patients had gangrene or ischemic ulcer, 44 (69.8%) had diabetes. In some of the patients (17.2%), previous percutaneous transluminal angioplasty of the crural arteries had failed. Preoperative angiographic findings were unsatisfactory in the majority of the patients; the pedal arch was not visualized in 40 (62.5%) limbs. The cumulative primary and secondary graft patency rates and limb-salvage rate were assessed by Kaplan-Meier's survival analysis. Fisher's exact test was used to investigate whether the absence of the pedal arch on preoperative arteriograms was related to an increased risk of graft occlusion.

Results: During 60 months of follow-up, 14 grafts (22%) failed. Early thrombectomy resulting in long-term graft patency salvaged 8 limbs. One limb with graft occlusion, occurring after foot ulcer had healed, was also salvaged. However, one amputation had to be performed despite a patent graft. The perioperative mortality rate was 3.2%. Cumulative primary and secondary graft patency rates and limb-salvage rates at 60 months were 76%, 78% and 81%, respectively (Graf I). The 14 occluded grafts were recorded in nine limbs (22.5%) that, on preoperative arteriograms, had no visible pedal arch ( $n = 40$ ) and in five limbs (20.8%) with a visible pedal arch ( $n = 24$ ). The difference in the risk of graft occlusion between these two groups was not significant (Fisher's exact test,  $P = 1.000$ ).

Conclusions: Pedal bypass grafting is a safe method with good long-term outcomes. Since the absence of the pedal arch on preoperative arteriograms does not increase the risk of graft occlusion, unsatisfactory preoperative angiographic findings need not be taken as a contraindication to pedal vascular reconstruction.

## SCIENTIFIC SESSION V5 ENDOVASCULAR TREATMENT OF ABDOMINAL AORTIC ANEURYSMS

### V5.1

#### ENDOVASCULAR AND OPEN ABDOMINAL AORTIC ANEURYSM REPAIR IN SIX PATIENTS WITH RENAL ALLOGRAFT: INDICATIONS, TECHNIQUES AND LONG TERM RESULTS

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**Objective:** Atherosclerotic vascular disease continues to be the most frequent cause of morbidity and mortality in renal transplanted patients (RTPs). Wider indications for kidney transplantation (KT) and increasing survival, increase the number of RTP undergoing aortic reconstruction. The purpose of the study deals with indications to endovascular vs. open abdominal aortic aneurysm (AAA) repair. Moreover, among the various techniques of graft protection from ischemic damage during the treatment of the AAA, a temporary axillo-femoral shunt (AFS) is proposed, as the safer, less invasive and cheaper technique.

**Methods:** 6 consecutive patients (5 men, 1 woman), out of 2555 transplanted at our institution between 1969 and 2004, were submitted to AAA reconstruction at our institution between 1991 and 2004. All RTPs had received their graft from a cadaver, one of them for the second time. Their mean age at transplantation was 35.1±11 years (range: 18-50 years). The AAA was detected by ultrasound scanning during periodic postoperative controls. The mean interval between KT and aortic reconstruction was 20.3±11.0 years (range 4 to 31 years); the mean age of RTPs at aortic reconstruction was 55.3±7.0 years (range 45 to 64 years). Heavy comorbidities were assessed in 83% of the patients at preoperative evaluation. As a patient presented a sacculated AAA, arisen after a previous renal artery reconstruction, a tangential resection could avoid KT protection. A temporary axillo-femoral shunt was placed in 3 cases and an aortofemoral extracorporeal perfusion was adopted in one patient. A modular bifurcated endovascular AneuRx stent graft was inserted under spinal anesthesia by a transfemoral route in another patient, whose cardiac situation had been judged too serious for an open approach under general anesthesia.

**Results:** All patients had an uneventful postoperative course, with a mean length of hospital stay of 8.3±3.7 days after the operation (range 5-14 days); the renal function was unchanged at discharge. One patient died from sudden myocardial infarction 37 months later. 5 patients are alive with a normal renal function for more than 13, 10, 6, 5 years and 10 months, respectively, after the AAA repair. Particularly, the patient operated on by endovascular repair is alive after 64 months.

**Conclusions:** Although RTPs have an increased risk of having cardiac, peripheral and cerebrovascular events in the postoperative period, an individualized approach for repairing AAA offer the same prognosis of success, if compared to that of non transplanted population.

### V5.2

#### LOCAL INFLAMMATORY REACTION AND PERIANEURYSMAL FIBROSIS AFTER ENDOVASCULAR ABDOMINAL AORTIC REPAIR

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**Objectives:** The aim of this study was to document if after endovascular aortic repair (EVAR) there is a periaortic inflammatory response that could lead to periaortic fibrosis (PAF).

**Methods:** To assess the presence of an early post-procedural inflammation after EVAR the scintigraphic examination with a radiodiagnostic agent consisting of a murine monoclonal antibody Fab fragment, towards activated granulocytes, was used. The scintigraphy was performed 24 h before the procedure and 48 h after. The dual phase contrast CT-scan was used to detect the presence of PAF. PAF was defined as a thickening of the aortic wall of minimum 1 mm.

**Results:** In 20 patients a preoperative and postoperative scintigraphy was performed. In all cases no differences were observed between the preoperative and postoperative scintigraphy. Particularly no areas of fixation of the radio diagnostic agent emerged in the aortic region. For 64 patients that

underwent EVAR at our institution from January 2002 to December 2003 the preoperative, postoperative and follow-up CT scans were available. No one had a preoperative PAF at the CT scan and no case of PAF after EVAR was observed at the dual phase contrast CT scan performed at 3, 6 and 12 months.

**Conclusions:** Results of this study seem to demonstrate that there is not an early inflammatory response after EVAR in the aortic region and that endograft deployment is not responsible for new cases of PAF at 12 months of follow-up.

### V5.3

#### ENDOVASCULAR ABDOMINAL AORTIC REPAIR: EFFECT OF TRANSRENAL VERSUS INFRA RENAL FIXATION ON RENAL FUNCTION

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**Objective:** The purpose of this prospective study was to assess the effect of endovascular aneurysm repair (EVAR), both with transrenal fixation (TRF) and infra renal fixation (IRF), on renal function, detected with serum creatinine (SCr), creatinine clearance (CrCl) and renal perfusion scintigraphy (RPS).

**Methods:** A prospective study was carried out at the Department of Vascular Surgery-University of Padua, for a period of 18 months (January 2003 to June 2004). To have the same number of patients in both TRF and IRF group it was decided to consider after every EVAR with IRF the subsequent patient who underwent a TRF. Exclusion criteria were: renal artery stenosis, renal accessory artery, single functioning kidney, preoperative hemodialysis and kidney transplant. SCr, CrCl (estimated with the Cockcroft and Gault formula) and RPS were performed preoperatively and in the 4th postoperative day. Variation of SCr, CrCl and glomerular filtration rate (GFR) estimated at the RPS, = 20% were considered relevant. The follow-up included: dosage of SCr, CrCl, RPS and Angio-CT at 6, 12 months and then yearly.

**Results:** The patients included in the study were 60; 30 with an IRF and 30 with a TRF. Preoperative SCr concentration, intraoperative blood loss and contrast were not significantly different between the two groups. Similarly no significant changes were observed for SCr and CrCl from the preoperative to the postoperative period (4th day) in both groups. A significant reduction of the GFR at the RPS was observed in 9 patients (15%), 4 (13.3%) from the TRF group and 5 (16.7%) from the IRF group in the absence of relevant variation of SCr and CrCl. In 4 patients (6.7%; 1 TRF, 3 IRF) the decrease was limited to a single kidney. Renal function during the follow-up period remained unchanged.

**Conclusions:** An early decrease of renal function is seen after EVAR at the RPS, regardless of fixation level and independently of renal insufficiency and of renal artery occlusion. The renal function impairment is probably related to the administration of contrast agent and/or to microembolism during procedural manoeuvres. SCr and CrCl, estimated with the Cockcroft and Gault formula, are inadequate methods to detect early renal function impairment after EVAR. The RPS is a basilar test to detect it correctly and especially to localise the impaired kidney.

### V5.4

#### EARLY AND LATE OPEN SURGICAL CONVERSIONS OF AORTOILIAC ANEURYSM STENTGRAFTS

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**Objective:** Treatment of aortoiliac aneurysms by stentgrafting is nowadays a well established method. However technical insufficiency of various stentgraft devices or problems during deployment led to later device failure and forced surgeons to explant stentgraft (SG) and treat aneurysm with open surgical procedure.

**Methods:** In the years 1996-2004 296 patients went through SG implantations into aortoiliac subrenal aneurysms. There were 41 tubular, 31 aortouniliac and 224 bifurcated SG implanted. Conversion to open surgical procedure following SG implantation was necessary in 28 (9%) patients. In 14 patients this occurred early after endovascular procedure, in 14 cases after a prolonged follow-up period. During all surgical procedures SG were extracted and aneurysms treated in a conventional manner.

**Results:** 30-day mortality was 4/28 (14%), in-hospital mortality was 7/28 (25%). Perioperatively 4 (14%) patients expired because of excessive blood

loss and its sequels. Three (10%) patients died during 3 months after surgical procedure due to respiratory or renal insufficiency. Serious postoperative complications occurred in another 9 (32%) patients. The main reason for surgical conversion was endoleak (46%), displacement of SG (18%), aneurysm rupture due to undiscovered endoleak and endotension (18%), renal arteries occlusion (7%), endovascular access problems (7%) and SG thrombosis (3%). Conclusions: Failure of SG deployment and its complications requiring device explantation and open surgical conversion represents a challenging procedure for a high-risk patient. This should be kept in mind during primary indication of endovascular AAA treatment.

#### V5.5

##### EVALUATION OF CLINICAL OUTCOME AND COMPLICATIONS AFTER OPEN AND ENDOVASCULAR REPAIR OF ABDOMINAL AORTIC ANEURYSM

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**Objective:** Despite good results of endovascular treatment of abdominal aortic aneurysm (AAA), there is still considerable debate about the precise indication for this method. The purpose of this study was to compare the clinical outcome and complications of open and endovascular repair for elective treatment of AAA.

**Methods:** Follow-up analysis of a patient series at a single center who underwent endovascular AAA repair ( $n = 61$ ) or open repair ( $n = 27$ ). Among the patients with endovascular repair, 47 had bifurcated stentgraft implanted and 14 patients had unilateral procedure. The stentgraft group included significantly more high risk patients (ASA III and IV) than the open repair group.

**Results:** Patients in the stentgraft group had significantly shorter operating time (109 min vs. 157 min  $P < 0,001$ ) and shorter hospital stay (6,9 days vs. 10,5 days,  $P < 0,001$ ). Endovascular repair required fewer transfusions (1,9 units vs. 4,6 units,  $P < 0,005$ ). Early overall complication rate was markedly reduced in the stentgraft group (28% vs. 55%,  $P < 0,001$ ). The perioperative mortality was 4,9% after endovascular repair and 3,7% after open repair. Four patients required reintervention in the follow-up period: two patients for endograft thrombosis, one for Type-II endoleak and one for newly developed iliac aneurysm.

**Conclusions:** In our 4-year experience, endovascular repair of AAA can be performed safely and successfully with significantly lower perioperative complication rate even in high risk patients as compared with the open method. Although clinical outcome and perioperative morbidity suggests that endovascular repair of AAA may be superior to open procedure, controlled, randomised trial would be necessary to evaluate long term durability of this procedure.

#### V5.6

##### ENDOASCULAR REPAIR OF ABDOMINAL AORTIC ANEURYSM USING AORTOUNILIAC ENDOFIT-ENDOMED ENDOPROSTHESIS AND FEMOROFEMORAL CROSSOVER BY-PASS: TWO YEARS EXPERIENCE

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**Objective:** In some abdominal aortic aneurysms (AAA) or iliac aneurysms, endografting with bifurcated endoprosthesis is contraindicated due to anatomical restrictions, such as a narrow terminal aorta and a tortuous, narrow or calcified contralateral iliac artery. In these circumstances, aortouniliac endograft and femorofemoral crossover bypass, could overcome the limitations and exclude difficult AAAs in high risk patients. Our purpose

was to evaluate the feasibility and efficacy of this technique using a specific endograft. Moreover, to evaluate the durability of the femorofemoral bypass during follow up.

**Methods:** We analyzed 39 high-risk patients (ASA III+) with AAA (33) or AAA and common iliac aneurysm (6), who were submitted to endovascular aortic repair (EVAR) using aortouniliac endograft and femorofemoral crossover bypass, from 2002 to 2004. In all patients Endofit (Endomed, Phoenix, AZ, USA) aortouniliac stent-graft, with proximal bare stent, was deployed. The contralateral iliac axis was obstructed with endoluminal occluder. Patients were followed with abdominal iv contrast CT scan, during 1st, 6th, 12th and 24th month.

**Results:** The method was feasible in all patients (100% technical success). Median follow-up was 14 months. Patients ranged in age from 63 to 84 (median 74), with a median aortic aneurysm diameter 67 mm. The median operative time was 104 min and the median fluoroscopy time was 13 min. Perioperative mortality was zero. Moreover during follow-up all patients were alive. Endoleak occurred in three cases (7.7%). One of them was proximal type I endoleak, and the rest were type II. Thrombosis of the femorofemoral graft occurred in one case during the immediate postoperative period, due to insufficient inflow caused by a residual stenosis of the endograft (primary patency 96.67%). The deficit was treated at once with thrombectomy and balloon dilatation (secondary patency 100%). None of the aneurysms ruptured, or converted to open procedure. In two cases tunnel hematoma occurred and was treated conventionally (5.1%). Graft migration, graft infection, paraplegia, distal embolization or any other serious complication was not observed.

**Conclusions:** In high surgical risk patients, with complex iliac anatomy, aortouniliac endograft and femorofemoral crossover bypass is feasible and efficacious. Moreover, the early patency of the extra-anatomic bypass is quite satisfactory.

#### V5.7

##### ENDOASCULAR MANAGEMENT OF ABDOMINAL AORTIC ANEURYSM WITH TALENT BIFURCATED STENT-GRAFT

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**Objective:** The aim of this study is to investigate the safety and efficacy of abdominal aortic aneurysm repair with modular bifurcated Talent stent-graft.

**Methods:** Between September 2000 and September 2004, 68 patients with infrarenal abdominal aortic aneurysm underwent treatment with Talent stent-graft. There were 66 men and 2 women with a median age of 69,3 years. Anatomy of the abdominal aorta and the iliac arteries was investigated with high resolution contrast CT together with digital subtraction angiography (DSA). The majority of patients had comorbid illnesses like arterial hypertension (60%), CAD (38%) and previous CABG (26%). Duration of follow-up period ranged from 1 to 48 months (median 18 months).

**Results:** Repair was performed with transrenal fixation of the bifurcated Talent stent-graft under regional anesthesia in 80% of all cases. Technical success rate was 97%. Aneurysm related mortality was 3% due to aneurysm rupture in the postoperative period. Overall mortality rate was 11,8%. Morbidity rate was 17,6%. Immediate conversion to open repair was necessary in one patient (1,5%). Endoleak rate was 5,9% at one month follow-up period. Secondary intervention was required in 1,5% of patients. Iliac limb occlusion was detected in one patient (1,5%).

**Conclusions:** Talent stent-graft exhibits a high degree of technical success in abdominal aortic aneurysm repair in patients with comorbid conditions with a low perioperative morbidity and mortality rate.

## SCIENTIFIC SESSION V6 CEREBROVASCULAR INSUFFICIENCY (2)

### V6.1

#### CAROTID ENDARTERECTOMY IN DIABETIC PATIENTS: A WORD OF CAUTION

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**Objective:** The importance of diabetes mellitus (DM) as an independent risk-factor for perioperative neurological morbidity and mortality after carotid endarterectomy (CEA) is controversial. The aim of our study was to prospectively evaluate early and long term results of CEA in patients with DM, compared with results in patients without it in a single centre series.

**Methods:** A review was conducted of a prospectively compiled database on all CEA performed between 1996 and 2003. Operations performed in 500 patients with diabetes (group 1) were compared with those performed in 2064 patients without diabetes (group 2). All the interventions were performed under general anaesthesia, with cerebral monitoring with somatosensory evoked potentials (SEPs); superselective criterion for shunt was used. Clinical and ultrasonographic follow-up was performed at 1, 6 and 12 months and then once a year.

**Results:** No significant differences were found concerning preoperative neurological status dependent on operated carotid: 55% of the patients of group 1 were asymptomatic; in group 2 asymptomatic patients were 53%; there were no differences also in clinical status dependent on contralateral side. SEP values and shunt insertion rates were similar between the two groups, as well. Neurological morbidity was 1.2% in group 1 and 0.8% in group 2 ( $P < 0.01$ ); in group 1 there were 8 deaths (1.6%), as in group 2 mortality was 0.3% (6 deaths;  $P < 0.001$ ). Cumulative 30-day stroke and death rates were 2.8% in group 1 and 1.1% in group 2 ( $P < 0.005$ ). Stepwise logistic regression analysis confirmed diabetes to be an independent risk factor for 30-day stroke and death ( $P = 0.02$ ). Follow-up was performed in 2383 patients (92,8%), with a mean duration of 24 months (range 1-96). Cumulative survival at 24 months was 94.5% in group 1 and 97% in group 2 ( $P = 0.08$ ); ipsilateral stroke rate was 1.4% in group 1 and 0,6% in group 2 ( $P = 0.03$ ) and the rate of severe restenosis was similar between the two groups. Multivariate analysis showed that diabetes was associated with a significant increasing in risk of ipsilateral neurological events during follow-up ( $P = 0.01$ ; log-rank 14,1).

**Conclusions:** In our experience, the presence of DM in patients undergoing CEA is the only factor associated with a significantly higher risk of early and late complications rate. These data suggest the need for further study comparing results of different treatment in this "high risk" group of patients.

### V6.2

#### THE CAROTID ATHEROSCLEROTIC PLAQUE: CORRELATION AMONG ULTRASONOGRAPHIC, IMMUNOHISTOCHEMICAL AND CLINICAL FEATURES

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**Objective:** Echo-duplex scanner is widely used for the diagnosis of the carotid pathology. Previous studies that have examined the correlation between plaque echographic and clinical features found that hypoechoic features are often associated with clinical signs of plaque destabilization.

**Methods:** Our aim was to examine the morphological features of carotid plaques by using software for the analysis of echographic images and their structural characteristics, through histological and immunohistochemical analyses. The end-point of the study was to establish the correlation between the morphological and structural features of the carotid plaques, with particular interest in plaque inflammation. Ultrasonographic analysis, supported by structural investigations, could allow to modulate the therapeutic approach (borderline plaques; primary stenting). Plaques were obtained from 40 consecutive patients undergoing carotid endarterectomy and divided into 2 groups (symptomatic and asymptomatic) according to clinical evidence of recent ischemic attack, according to NASCET classification. The diagnosis of carotid stenosis was performed by echoduplex scanner and validated with

2nd level radiodiagnostic (RM mostly or angiography cerebral-TC). Plaque ultrasonographic images were acquired and analyzed with a computer-based Image Analysis System, focusing on plaque echogenicity, extension and homogeneity. The specimens were analyzed by immunohistochemistry to detect inflammatory cells (T lymphocytes, macrophages) and COX-2. MMP-9 activity was evaluated by zymography. We excluded from the study patients with high carotid bifurcation and subjects whose plaques did not allow an adequate analysis of the plaque, because of particular anatomical conformations or calcifications. We collected anamnestic data of the patients, with particular regard to the presence of symptoms related to carotid pathology. The data provided by the carotid echo-color Doppler, percentage and localization of the stenosis; evaluation of plaque echogenicity (hyper-, iso- and hypoechoic); evaluation of the plaque surface (regular; irregular); plaque structure (homogeneous, heterogeneous). The image has been examined with the I.A.S., optimized at the Institute of Clinical Physiology of the CNR in Pisa.

**Results:** The results of the study, examined by  $\chi^2$  analysis, show that hypoechoic features are significantly correlated with the presence of clinical signs of plaque destabilization ( $P < 0.01$ ). The levels of immunohistochemical markers of plaque instability are significantly higher in hypoechoic plaques, while they are not correlated with the features of homogeneity.

**Conclusions:** The high inflammatory burden within plaques that ultrasonographically appear to be hypoechoic and the observation that this feature is significantly associated with the incidence of cerebral ischemic events, provide important elements that should be considered in addition to quantitative evaluation of vessel stenosis. These observations could be useful in the choice of a therapeutical approach or a surgical intervention, mainly for border-line stenoses, or an endovascular treatment.

### V6.3

#### NEW FACTORS INFLUENCING CAROTID RECURRENT STENOSIS

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**Objective:** The purpose of the study was to investigate the putative role of inflammatory, haemostatic and genetic factors and markers in severe carotid artery stenosis and restenosis.

**Methods:** We prospectively studied 137 patients who were undergoing elective carotid endarterectomy (2001-2003). The control group consisted of 104 healthy blood donors. Traditional risk factors for atherosclerosis were recorded and plasma soluble thrombomodulin (sTM), fibrinogen and serum C-reactive protein (CRP) concentrations were determined in each patient before surgery and at 6 weeks and 12 months postsurgery. 308 tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ) and mannose-binding lectin (MBL) promoter polymorphisms were also studied. Patients had duplex scan examinations before surgery and 6 weeks, 6 months and 12 months after the operations.

**Results:** 1. Negative correlation was found between the preoperative duplex scan values and the plasma sTM concentrations ( $R = -0.418$ ,  $P = 0.0006$ ). Patients with 308 A TNF- $\alpha$  genotype had significantly lower ( $P = 0.0415$ ) preoperative sTM values than their counterparts with no such polymorphism. Soluble TM concentrations measured in plasma samples taken at the end of the postsurgical follow-up period of 12 months duration were significantly higher compared to the preoperative values ( $P < 0.0001$ ). 2. During the follow-up period we observed a sharp, highly significant drop in the serum and plasma concentrations of both acute phase proteins ( $P < 0.0001$ ). 3. In our prospective study the carotid duplex scan values increased highly significantly in patients with homozygous for the normal MBL genotype ( $P < 0.001$ ), while no significant increase was seen in the variant allele carriers ( $P > 0.05$ ). The protective association with MBL variant alleles was gene dose dependent ( $P = 0.007$ ).

**Conclusions:** These results suggest that sTM may be adsorbed to the atherosclerotic plaques, while the acute phase proteins can be produced by these plaques. Mannose-binding lectin may play a significant role in the pathophysiology of the development of early restenosis after carotid endarterectomy.

### V6.4

#### EXTRACRANIAL ANEURYSMS OF THE CAROTID ARTERY: EARLY AND LONG TERM RESULTS AFTER SURGICAL TREATMENT

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**Objective:** The purpose of this study was to analyse the clinical mode of presentation, surgical treatment, and early and long-term results of a large series of extracranial carotid artery aneurysms (ECAA).

**Methods:** 58 patients with a total of 64 ECAA were diagnosed and treated over an 18-year period. Patient follow-up was obtained by a surveillance protocol, with physical and neurological status and duplex scanning performed 3 months after surgery and yearly thereafter. Patients lost to follow-up were contacted via telephone interview.

**Results:** Atherosclerosis was evident in 29 cases, 32 aneurysms resulted from earlier carotid artery surgery, and only 3 cases were caused by trauma. There was no significant difference in local clinical symptoms between aneurysms caused by atherosclerosis and postreconstructive aneurysms. Two aneurysms presented with rupture (one in each subgroup). 10 cases (34.5%) of the atherosclerotic aneurysms and 16 cases (50%) of the postreconstructive aneurysms presented with a transient neurological deficit, one patient (3.4%) with an aneurysm of atherosclerotic origin had a complete stroke preoperatively vs. 2 patients (6.2%) in the postreconstructive group. All patients were treated by means of open surgical repair. Early morbidity in patients with atherosclerotic aneurysms included three cases (10.3%) with postoperative hemiplegia (2 early thrombotic occlusion of the reconstruction, and 1 thrombotic complication), mortality rate was 6.9% (1 acute cardiac decompensation and 1 patient with an early carotid occlusion, surgical reintervention and large cerebral infarction). In patients with a postreconstructive aneurysm morbidity included 1 case of postoperative prolonged arm paresis (resolved without sequelae within 30 days) and 2 cases (6.2%) with fixed hemiplegia (1 patient with an early carotid occlusion, 1 patient with clamping ischemia), there was no early postoperative death in this subgroup. The primary patency rate (PPR) was 86.9% after 1 year (80% after 5 years) in the atherosclerotic group vs. 96.0% after 1 year (93.3% after 5 years) in the postreconstructive group.

**Conclusions:** Extracranial carotid artery aneurysms are a rare but dangerous condition, an early vascular surgical intervention is mandatory in order to prevent serious complications. There were no significant differences between atherosclerotic aneurysms and postoperative false aneurysms in terms of preoperative clinical presentation, aneurysm morphology and size, surgical technique and postoperative outcome. Long-time patency rates were satisfactory and independent of the reconstruction technique. A subgroup analysis for the postreconstructive aneurysms showed a variation of incidence, morphology and histopathological genesis dependent on the primary surgical procedure.

#### V6.5 MORPHOLOGICAL FEATURES OF EXTRACRANIAL CAROTID ARTERY ELONGATION

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**Objective:** Possibility of detection, quantitative and qualitative analysis of extracranial carotid artery elongation, as well as 3D reconstruction of angle deviation according to MRA.

**Methods:** Four vessel MRA were evaluated in a period from 01.06.1999 until 01.06.2004. Total of 363 series of images were evaluated, of which 163 satisfied Metz and Herrshaft criteria (17 coilings and 146 kinkings). Quantitative and qualitative analysis using computer 3D reconstruction were performed afterwards according to the same criteria.

**Results:** Angle deviation was recognized in 146 of 863 analysed series of images. 17 were bilateral. Most often, in 95% of cases, disease engaged common carotid artery. Left to right ratio was 1,42 in a kinking series and 2,4 in a coiling series. Elongation syndrome was predominant in women (1,25:1) in a median age group (45±5 years of age). Negative significant correlation was found comparing stenotic grade and age as well as comparing angle deviation and age of patients. Distribution according to previous criteria was; Metz 1:68, Metz 2:52, Metz 3:40. Hershaft Ic:22, Is:93, Il:17, III:45 Horsh 4:12. High level of clinical applicability of 3D reconstruction was achieved.

**Conclusions:** Owing to highly sophisticated semi invasive diagnostic (standard four vessel MRA) we can have exact visualisation of extracranial carotid arteries as well as morphologic features of the very same arteries. Use of modern graphic applications for 3D reconstruction makes possible to quantify elongation syndrome features and to estimate its implications on changes in peripheral vascular bed.

#### V6.6 KINKING OF THE CAROTID ARTERY: CLINICAL SIGNIFICANCE AND SURGICAL TREATMENT

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**Objective:** Elongation and tortuosity of the internal carotid artery (ICAET) is a common angiographic, angioMR or Duplex scanning finding: it can be "pure" and, in a great majority of cases, it is not correlated to neurological symptoms. Whether kinking or coiling of the internal carotid artery simply represents a morphological variation without clinical relevance still remains an object of debate. It can be associated with atherosclerotic bifurcation plaque, therefore in this case, indications to surgery follow that of carotid stenosis. On the other hand in some patients ICAET seems potentially correlated to hemispheric or non hemispheric symptoms.

**Methods:** Between June 2002 and February 2005, 156 patients (82 male, 74 female) underwent carotid surgery for 160 surgical procedures. Eight patients, 3 male, and 5 female, presented a pure ICAET; 15 patients, 6 male and 9 female, presented an ICAET associated with a carotid hemodynamically significant stenotic lesion. Patients with isolated ICAET or associated atherosclerotic stenoses presented hemispheric symptoms (41%), non hemispheric symptoms (31%) or both (28%). In all instances straightening was obtained by transection of internal carotid artery at its origin and re-implantation in the lateral aspect of the common carotid. In one case the double kinking lesion of both the internal and the common carotid, associated with atherosclerotic stenosis of the internal, has been corrected by an eversion CEA of the internal carotid, with end-to-side reimplantation and concomitant resection of common carotid with end-to-end reimplantation.

**Results:** After surgery 152 patients fully recovered without neurological complications. One patient died, one patient suffered permanent neurological deficit, two suffered from transient ischemic attacks.

**Conclusions:** Anatomic reconstruction together with the correction and elimination of the affected segments of the carotid artery may prevent progressive cerebrovascular symptoms and is associated with a low morbidity and mortality rate. We recommend a shortening procedure, often associated with endarterectomy for severely kinked vessels (angulation 60 degrees or less), symptomatic or not. Treatment of stenotic coiling or kinking of the internal carotid artery yields satisfactory results, comparable to those of endarterectomy, for isolated atherosclerotic carotid stenoses and is effective in the prevention of ipsilateral ischemic stroke.

#### V6.7 SUBCLAVIAN ARTERY ANGIOPLASTY – IS IT THE ONLY OPTION IN THE TREATMENT OF SUBCLAVIAN STEAL SYNDROME?

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**Objective:** The treatment of subclavian steal syndrome is dominated by endovascular procedures. However, for a minority of patients, subclavian artery angioplasty is not feasible. The aim of our study was to evaluate the indications for surgical treatment.

**Methods:** A total of 207 patients with symptomatic subclavian steal were treated in our department between 1988 and 2005. PTA was performed in 159 and 48 required surgery. Results were evaluated based on Doppler- ultrasound, blood pressure measurements and subjective assessment expressed by the patients in questionnaires.

**Results:** In the PTA group good immediate results were obtained in 147 (92%) of the patients. 123 remained in long-term follow-up. In these, good results were observed in 74%, 16% had recurrent stenosis of less than 50% and 10%, i.e., 13 patients had a recurrence of the subclavian steal, symptomatic in 11 of them. The re-do intervention was angioplasty in 9 cases and surgery in 2. In the primary surgery group, immediate good results were noted in 46 patients (96%). 34 out of the 42 remaining in follow-up have no significant recurrence of the stenosis.

**Conclusions:** Angiograms of the aortic arch branches should be obtained in patients with evidence of subclavian steal on Doppler ultrasound and symptoms of vertebrobasilar circulatory deficit. Whenever angioplasty can be performed, it certainly is the best choice. However, in the patients in whom we opted for surgery because of subclavian artery occlusion or unfavourable prognosis for angioplasty, we observed very good and durable effects, with few complications.

## SCIENTIFIC SESSION V7 DESCENDING THORACIC AORTA ANEURYSMS

### V7.1

#### ENDOVASCULAR TREATMENT OF DESCENDING THORACIC AORTA DISEASE

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**Objective:** Endovascular repair has been proposed for its less invasiveness and low complications rate as an alternative technique to conventional surgery in the treatment of descending thoracic aorta diseases. The aim of this study is to retrospectively evaluate the feasibility and the efficacy of endovascular treatment in terms of technical success and early and midterm results.

**Methods:** From May 2001 to December 2004, 52 patients, 45 males (86.6%) and 7 females (13.4%) with a mean age of 65±16.8 years (range 16-86), affected by descending thoracic aorta diseases underwent endovascular treatment at our Institution. Twenty-four had a thoracic aortic aneurysm (TAA), 13 a type B thoracic aortic dissection (TAD), 10 a traumatic aortic rupture, 2 an intramural hematoma (IMH) and 3 a penetrating aortic ulcer (PAU). In 4 cases (7.7%) there was a concomitant abdominal aortic aneurysm, treated simultaneously by open surgery. Nine procedures (17.3%), 6 for traumatic aortic ruptures, 1 for ruptured TAA and 2 for PAUs, were conducted as urgencies while the remaining 43 cases (82.7%) were elective. All patients were preoperatively evaluated by spiral computed tomography (CT) and digital subtraction angiography (DSA). All procedures were performed in an operating room and monitored with DSA and transesophageal echocardiography (TEE) in TAD cases. Follow-up was performed at 1, 3, 6, and 12 months after treatment and early thereafter by CT.

**Results:** Technical success was obtained in all the patients and no conversion to open repair was necessary. Early endoleak was observed in 7 patients (13.4%): 1 proximal type 1 endoleak, corrected with extension cuff, 3 type 2 endoleak, spontaneously resolved, and 3 type 3 endoleak, treated with an additional stent-graft. No intraoperative mortality or complications occurred. The mean hospitalization time was 5±11.3 days. In-hospital complications included 1 case of transient monoparesis and 1 case of transient paraplegia. The overall 30-day mortality rate was 7.7% (4 patients). The mean follow-up duration was 13.4±6.3 months (range 1-42). Two deaths, not related to the procedure, occurred in the follow-up period. Two patients required secondary endovascular procedures for distal type 1 endoleak.

**Conclusions:** Our experience shows the feasibility of endovascular treatment of descending thoracic aorta diseases with a high percentage of technical success and low perioperative and midterm morbidity and mortality. However studies with longer follow-up are worthwhile to demonstrate the long term efficacy of this technique.

### V7.2

#### THORACIC AORTIC DISEASE: IMPACT OF ENDOVASCULAR SURGERY

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**Objective:** Management of patients (pts) with thoracic aortic pathology (aneurysm, dissection and trauma) represents a continuing challenge. Despite improvements on perioperative care and surgical techniques conventional surgery still carries substantial risk of serious complications.

**Methods:** From March 2001 to June 2004, 32 pts were submitted to endovascular surgery: 5 pts (15.6%) had a traumatic rupture, 11 (34.4%) an atherosclerotic aneurysm and 16 (50.0%) a type B dissection. The infrarenal abdominal aorta was involved by dissection in 2 pts and aneurysm in 1, requiring simultaneous or delayed endovascular treatment. An emergency procedure was required in 21 pts (62.5%). Computed tomography (CT-scan) was diagnostic in all patients. The stent-graft was delivered in the catheterization laboratory under general anesthesia with induced hypotension and heparinization. Stent-grafts and implant strategy were selected on the basis of evaluation of aortic morphology by angiography and CT-scan. Two

different stent-grafts were implanted: 74 Talent (Medtronic) in 31 pts and 2 Thoracic Excluder (Gore) in one pt. The number of implanted stent-grafts varied from 1 to 4. In 15 pts (46.9%) was covered the entire descending aorta and in 4 (12.5%) the left subclavian artery. Criteria for successful deployment included absence of death or surgical conversion, exclusion of the aneurysm or transected tract and occlusion of thoracic tears.

**Results:** There were no perioperative deaths. No surgical conversions or paraplegia occurred. Laceration of the right iliac artery occurred in a 19-year-old woman. The intraoperative angiography and CT-scan performed on discharge showed no significant endoleaks. At follow-up an 84-year-old pt died of pneumonia 78 days after hospital discharge and 1 pt with a type I endoleak was successfully treated with a new endovascular procedure.

**Conclusions:** Endovascular surgery is a valid alternative to treat thoracic aortic pathology also in pts considered otherwise unsuitable for conventional surgery.

### V7.3

#### ENDOVASCULAR REPAIR OF THORACIC AORTIC ANEURYSMS: MID-TERM RESULTS

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**Objective:** Our purpose was to evaluate the feasibility and efficacy of descending thoracic aortic aneurysm (DTA) endovascular exclusion by a low volume vascular surgical team in the operating theater, using a specific endograft (Endofit, Endomed, Phoenix, AZ, USA). Moreover, durability, complications and the need for reinterventions were determined.

**Methods:** Seven (7) patients (5 were ASA III+ and 2 refused open repair) with DTA were submitted to endovascular repair, from 2003 to 2004. In all patients Endofit (Endomed, Phoenix, AZ, USA) self-expanding thoracic stent-graft, with proximal bare stent, was deployed. Preoperative evaluation and postoperative follow-up was obtained with thoracic and abdominal iv contrast CT scan with 3D reconstruction.

**Results:** The method was feasible in all patients (100% technical success). Median follow up was 12 months. Patients ranged in age from 45 to 84 (median 66). The median operative time was 133 min and the median fluoroscopy time was 18 min. Surgical exposure of the left branchial artery and ipsilateral femoral artery with contralateral femoral catheterization was the typical surgical procedure. One single stent-graft was used in one patient, while the other six required two stent-grafts with overlapping. All endografts were attached proximally beyond the left subclavian artery leaving the aortic arch branches intact. None of the patients required blood transfusion. 30-day mortality was zero. Furthermore, during follow-up all patients were alive. A distal type I endoleak occurred in one case. It was detected during the 1st month follow-up CT-scan, and was repaired with reintervention and deployment of an extension endograft. None of the aneurysms ruptured, or converted to open procedure. In one case acute myocardial infarction occurred during the 6th month. Graft migration, graft infection, paraplegia, cerebral or distal embolization, renal impairment or any other serious complication were not observed.

**Conclusions:** The treatment of descending thoracic aortic aneurysms with an endovascular approach using this specific endograft is feasible by a low volume vascular surgical team. Mid-term results in this small cohort is promising as complications were acceptably low. More cases and longer follow-up is necessary to prove long-term efficacy.

### V7.4

#### THORACIC AORTA EMERGENCIES: ENDOVASCULAR TREATMENT

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**Objective:** Open surgery for the treatment of pathology of the thoracic aorta is still associated with significant morbidity and mortality rates in spite of recent technical improvement. Endovascular treatment is appealing because of its lower invasiveness. The use of this technique in emergencies is often limited by clinical and haemodynamic instability of the patient and unavailability of adequate facilities. In this report, we review our experience in the emergency endovascular treatment of pathology of thoracic aorta.

**Methods:** In the period between June 1999 and December 2004 we treated in emergency 4 cases of rupture of penetrating aortic ulcer, 4 case of acute

type B aortic dissection, 1 case of aorto-esophageal fistula caused by acid ingestion, 1 case of aorto-bronchial fistula, 1 case of aortic pseudoaneurysm caused by arterial wall lesion from an intraaortic catheter for selective intrahepatic chemotherapy. In all these cases diagnosis was confirmed by CT scan and aortography. Haemodynamic stability, a suitable vascular anatomy and co-morbidities contraindicating open aortic surgery were considered as the main indications for endovascular treatment. The endovascular procedures were performed within 24 h from diagnosis, under general anesthesia in all the cases. We deployed a Zenith (Cook) graft in 6 cases, an Excluder (Gore) graft in 4 cases, a Talent (Medtronic) graft in one case and an Endofit (Endomed) graft in another one. The mean postoperative hospital stay was 5.7 days.

**Results:** In all the cases endograft deployment was possible with a primary technical success of 100%. We reported a case of perioperative mortality due to massive hemorrhagic Ictus Cerebri in a patient treated for a type B dissection. We did not report other perioperative complications. During follow up, we did not report any procedure-related complication.

**Conclusions:** In our experience, emergency endovascular treatment of the pathology of the thoracic aorta is feasible and effective. This procedure is often limited by frequent haemodynamic instability of the patients and by difficult supply of facilities in urgencies. Lack of large series and of mid and long term follow up results limits its widespread application only to specialized vascular departments.

#### V7.5

##### A 7-YEAR EXPERIENCE OF EMERGENCY STENT-GRAFT PLACEMENT FOR HEMORRHAGE CONTROL IN ACUTE THORACIC AORTIC RUPTURE

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**Objective:** To report the results of stent-graft (SG) implantation in acute thoracic aortic rupture as alternative to conventional open surgery with its associated high morbidity and mortality rates.

**Methods:** From January 1998 to January 2005, 27 patients (15 men and 12 women, mean age 50±19 years, range 20-81-years-old) were treated on an emergency basis for hemorrhage control and underwent thoracic aortic SG implantation. The indication for SG placement was acute traumatic aortic rupture in 13 patients (48%), type B dissection with contained rupture in 3 patients (11%), acute haemorrhage from aortobronchic fistula in 2 patients (8%), and thoracic aortic aneurysm rupture in 9 patients (33%). Preoperative assessment was done by computed tomography (CT) scanning and echography. Patients were treated with the help of intravascular ultrasound (IVUS), by implantation of self-expanding grafts. General anaesthesia was the most frequently used anaesthesiologic technique.

**Results:** Technical success rate of SG deployment was 100%. The early postoperative mortality was 18% (5 of 27). The postoperative morbidity was 15% (4 of 27). There was no intervention-related mortality during the follow-up. Two secondary endoleaks were successfully treated with additional SG placement.

**Conclusions:** Emergency SG repair to control hemorrhage in patients with an acute thoracic aortic rupture is a less-invasive attractive and rational treatment option, especially if associated lesions or co-morbidity may interfere with the surgical outcome. Long-term follow-up results will be helpful to clarify procedure durability bounded by material failure and postoperative aneurysm or aortic wall remodelling.

#### V7.6

##### SURGICAL OR ENDOVASCULAR CORRECTION OF KOMMERELL'S DIVERTICULUM: WHICH IS THE BEST CHOICE?

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**Objective:** The purpose of this paper is to compare feasibility, safety and successful results of the two different current approaches, surgical or

endovascular, to aberrant subclavian artery aneurysm (Kommerell's diverticulum).

**Methods:** We report four cases of Kommerell's aneurysm: two patients with classic Kommerell's diverticulum of aberrant right subclavian artery (ARSA) and two patients with an aberrant left subclavian artery (ALSA) and dextroposition of descending thoracic aorta. Three patients were symptomatic for extrinsic compression (respectively: dysphagia, violent chest pain not responsive to pharmacologic therapy, dysphagia and recurrent tachycardia); the last patient was asymptomatic and had the subclavian aneurysm discovered during diagnostic CT imaging for an aortic arch aneurysm.

**Results:** We report four cases of Kommerell's aneurysm: two patients with classic Kommerell's diverticulum of aberrant right subclavian artery (ARSA) and two patients with an aberrant left subclavian artery (ALSA) and dextroposition of descending thoracic aorta. Three patients were symptomatic for extrinsic compression (respectively: dysphagia, violent chest pain not responsive to pharmacologic therapy, dysphagia and recurrent tachycardia); the last patient was asymptomatic and had the subclavian aneurysm discovered during diagnostic CT imaging for an aortic arch aneurysm. Two patients (both adult males, one with ARSA, the other with ALSA) underwent surgical open repair via median sternotomy; two patients (an adult female with ALSA and an old man with ARSA) underwent Kommerell's diverticulum endovascular exclusion by thoracic stent-graft and, in the first case, subsequent subclavian to carotid transposition (because of II type endoleak from vertebral artery).

**Conclusions:** Endovascular stent-graft exclusion, eventually associated to subclavian to carotid artery transposition, represent a valid alternative to surgical correction with the same high probability of technical success and really lower rates of invasivity.

#### V7.7

##### COMPLICATIONS OF STENT GRAFTING OF THE THORACIC AND ABDOMINAL AORTA

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**Objective:** Within recent years stent grafting of the aorta has been increasingly adopted by many centers. However, complications and mid-term outcome still remains to be confronted.

**Methods:** In our hospital within the past 3 years commencing March 2002 till recently, 19 selected patients with abdominal aortic aneurysms (infrarenal) have been successfully treated with endoluminal grafts. In 15 of them (79%) a straight graft was used, whereas in the remaining four (21%) a bifurcating graft was used. Moreover, in 10 patients with traumatic rupture of the descending thoracic aorta, stent grafting was successfully applied.

**Results:** Patients who underwent stent grafting of the abdominal aorta had 5 complications: one femoral artery occlusion which was immediately treated with a femoral-femoral bypass, one pseudoaneurysm which was revealed 2.5 years postoperatively in a follow-up basis, one subacute hemorrhage from a perforated femoral artery 5 days postoperatively, one acute thrombosis of the abdominal aorta 15 days postoperatively - treated with subclavian-bifemoral bypass and one with fever postoperatively accompanied by lymphorrhea. Patients who underwent stent grafting of the descending thoracic aorta were treated in an emergency basis and had 3 complications: one death due to portal vein rupture not related to the procedure, one acute femoral artery occlusion treated with femoral-femoral bypass and one septic shock in a patient with multiple fractures.

**Conclusions:** Stent grafting of the abdominal aorta in selected patients, as well as those of the descending thoracic aorta ruptures, in our series provides some evidence that this kind of treatment is a promising therapeutic option. Nonetheless complications and mid-term outcome is still to be addressed concluding from our learning curves.



## SCIENTIFIC SESSION V8 RESEARCH AND MISCELLANEOUS (1)

### V8.1

#### REMOTE PRECONDITIONING PREVENTS CARDIAC EVENTS DURING MAJOR VASCULAR SURGERY

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**Objective:** Ischaemic preconditioning (IP), whereby brief episodes of sub-lethal myocardial ischaemia and reperfusion (I/R) provide protection against subsequent prolonged ischaemia, has been shown to reduce the extent of myocardial necrosis in patients undergoing cardiac surgery. Remote preconditioning is the phenomenon whereby repeated episodes of I/R in a distant organ protect the heart during subsequent ischaemia. Patients undergoing major vascular surgery are at high risk of perioperative cardiac events. It was our aim to investigate whether prior remote preconditioning or cardiac ischaemia offer cardioprotection during major vascular surgery, and which of these confers the greatest degree of protection. We hypothesized that patients with a prior history of claudication and/or angina might have fewer perioperative cardiac events than those without prior ischaemia.

**Methods:** We studied 101 consecutive patients undergoing high risk vascular surgery. We compared cardiac event rates (ACS and/or cardiac death) in those with and without prior claudication, and those with and without angina. Since 20% of our cohort was diabetic, we also assessed asymptomatic patients with inducible cardiac ischaemia (on treadmill or dobutamine stress echocardiography). **Results:** In our high-risk vascular cohort (52% aortic surgery, 21% emergent or semi-emergent cases, with = 3 cardiac risk factors in 53%), the number of cardiac events was significantly lower in patients with pre-operative claudication than in those without (4.9 vs. 22%,  $P = 0.04$ ; OR 0.2, CI 0.03-0.9). In comparison, patients with angina, and those with angina or silent ischaemia had similar event-rates to those without evidence of cardiac ischaemia (7 vs. 20% and 19 vs. 12%,  $P = ns$ ). Pooling patients with either cardiac or remote ischaemia showed no cardioprotection.

**Conclusions:** Our findings indicate a remote cardioprotective effect of lower limb claudication in patients undergoing major vascular surgery. The presence of critical coronary artery lesions in patients with angina may explain the apparent lack of cardioprotection with angina (local IP) compared with claudication (remote IP). Alternatively, remote IP may offer more potent cardioprotection. Prospective studies with experimentally-induced lower-limb I/R in asymptomatic patients prior to vascular surgery are warranted.

### V8.2

#### BIOMECHANICAL MODELS APPLICATION AS GUIDANCE TO ASSESS THE RISK OF RUPTURE OF THE ABDOMINAL AORTIC ANEURYSMS

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**Objective:** The purpose of this study is to supply new instruments for evaluation of the morphological characteristics of the abdominal aortic aneurysms by the creation of biomechanical three-dimensional models.

**Methods:** 12 patients underwent elective surgery for abdominal aortic aneurysm. Samples of aortic tissue were taken intraoperatively and sent to the laboratory to undergo traction tests in order to evaluate how the morpho-histological characteristics are correlated to a specific type of response. Using data derived from 5 mm contrast-enhanced Spiral CT-scans and Duplex scanning relative to the patients and a specific software for the elaboration of the images, three-dimensional models with fluid-structure interaction were created to simulate the real situation. This technique allowed studying the aneurysmatic fluid-mechanics by accounting both for the instantaneous fluid forces acting on the wall and the effects of the wall motion on the fluid dynamic field.

**Results:** From the interpretation of the aortic tissue traction tests and the geometric reconstruction from the CT and Duplex scanning, it seems that the maximal diameter of the aneurysm cannot represent the principal predictive index of rupture. The asymmetrical formulation of the internal of the aortic aneurysm and the presence of endoluminal thrombus, are very important parameters. Unexpectedly, the smaller aneurysms were the most unstable.

**Conclusions:** Currently, the model is used under "standard" assumptions of a basal pressure of 80 mmHg, and an elastic modulus for the wall and the thrombus. Consequently, the results do not give the actual wall stresses of the patient under examination. They provide information on the stress pattern and could be used to compare different aneurysm geometries. High resolution non-invasive imaging techniques, will allow in the future, the segmental analysis of the wall motion which is fundamental for the comprehension of the real wall stress and the risk of rupture.

### V8.3

#### CLOSURE DEVICES FOR VASCULAR ACCESS AFTER CAROTID ANGIOPLASTY AND STENTING

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**Objective:** Control of access site has become an important focus in every endovascular procedure. The aim of our work was to evaluate the safety and efficacy of percutaneous closure devices (PCD) in a cohort of patients undergoing to CAS on an outpatient basis.

**Methods:** From December 2000 to December 2004 we performed 562 CAS in 518 patients. In 237 patients the femoral access site was closed by PCD. The inclusion criteria were: CFA diameter = 6 mm, absence of disease in CFA. We prospectively collected ABI and US scanning of the CFA pre and post procedures, time to hemostasis, ambulation and discharge, major or minor complications. We used the Angioseal in 226 (95,3%) patients, Vasoseal in 7 (2,9%) patients, the Perclose in 4 (1.7%) patients.

**Results:** We had technical success in 233 (98.3%) patients and in 4 (1.7%) patients we had complications: 1 acute limb ischemia, 2 pseudoaneurysm of CFA because the plug was deployed too shallowly, 1 loss of access. At the follow-up in 233 patients we didn't find hematoma, pseudoaneurysm, reduction in intraluminal vessel diameter and the ABI was unchanged.

**Conclusions:** The use of PCD would appear to be beneficial if it allows for early discharge, eliminating the added costs of an observation unit or hospital stay.

### V8.4

#### CAROTID PARANGLIOMAS. OUR EXPERIENCE

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**Objective:** Retrospective evaluation of all patients that underwent surgery for carotid paraganglioma.

**Methods:** Between September 1994 and June 2004 our institute treated 1578 patients for carotid pathologies. Of these 8 were carotid paraganglioma, all in women, average age 65,4 years. Only one subject presented bilateral lesions. There were no cases of a family history of the disease and no pre-operative neurological deficits. All patients underwent duplex scanning, cerebral TC and angiography. Under general anesthesia, surgery was performed to remove the mass and reconstruct the carotid bifurcation. In three cases reconstruction was performed with autologous vein, in four cases the internal carotid artery was resected and reimplanted to the common carotid artery and in one case simple resection of the mass was performed. In all cases an endoluminal shunt was used. Moreover, histological examination was performed on the mass and surrounding lymph nodes. Follow-up involves ultrasonography at 1, 3 and 6 months after surgery and then annually along with endocrinological monitoring.

**Results:** There were no cases of intraoperative or postoperative death. Histology confirmed the neoplastic nature of the masses while no signs were seen of lymph node infiltration. In two cases a second surgical procedure was required because of acute thrombosis of the internal carotid artery while, in all the other cases, patients were discharged on the second day. No postoperative neurological lesions were found. Moreover, to date, no recurrences or metastases have been found and thus none of the patients underwent radiotherapy or chemotherapy.

**Conclusions:** Considering the long-term complications of radiotherapy and the safety of surgery, performed both to prevent tumor evolution and post-operative neurological complications, surgical removal is the therapy of choice for paraganglioma.

## V8.5

**ILOPROST PLAYS MAJOR ROLE IN DECREASING NEURONAL DAMAGE IN SPINAL CORD ISCHEMIA WHEN USED WITH N-ACETYLCYSTEINE**

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**Objective:** Spinal cord ischemic injury is one of the feared complications during aortic cross clamping. The aim of this study was to investigate whether N-acetylcysteine (NAC) and Iloprost have a protective effect on spinal cord during ischemia in an experimental model.

**Methods:** A total of 35 New Zealand white rabbits were studied in five groups, seven rabbits in each. One group served as Sham Group ( $n = 7$ ) in which only laparotomy was performed and closed. All rabbits in other groups had their abdominal aortas cross-clamped below the left renal artery just above iliac bifurcation for 40 min following median laparotomy. In addition, Iloprost was infused in a rate of 25 ng/kg/min started with laparotomy and ceased after aortic cross-clamp was released in one group (Group Iloprost), NAC was infused in a rate of 20 mg/kg/h during aortic cross clamping following a bolus IV dose of 10 mg/kg in the other group (Group NAC), Iloprost and NAC were both given in the same manner in the last group (Group Iloprost+NAC). In Control Group, only saline was infused. Neurological statuses of the rabbits were evaluated according to Tarlov's scale in the postoperative 24th and 48th h in all groups and then they were sacrificed. Their spinal cords were harvested and L4-L6 segments were prepared for pathological examination. Analysis of variance (one-way ANOVA) was used for physiological data; Mann-Whitney *U*-test was used to compare the neurological and pathological findings. Differences were significant when  $P < 0.05$ .

**Results:** There was no significant difference in hemodynamic parameters between experimental and control groups. Rabbits in Sham group did not have any neurologic deficit. However, all rabbits in Control group showed severe neurologic deficits including total paraplegia in five. According to Tarlov's scale, neurological status of the rabbits in the postoperative 24th and 48th h were observed to be in better conditions in the Iloprost, NAC and Iloprost+NAC groups compared to controls ( $P < 0.01$ ). Pathological examination of spinal cord specimen revealed higher viability index in these three study groups compared to controls ( $P < 0.01$ ). When study groups were compared with each other, neurological status of rabbits was significant in better condition in the Iloprost+NAC group than the ones in NAC group ( $P < 0.01$ ) but not than Iloprost group.

**Conclusions:** The results of this study demonstrated that Iloprost and/or NAC infusion during aortic cross-clamping has beneficial effects in decreasing neuronal damage due to spinal cord ischemia whereas Iloprost plays a major role.

## V8.6

**ASCORBIC ACID (VITAMIN C) AND ILOPROST ATTENUATE THE LUNG INJURY CAUSED BY ISCHEMIA/REPERFUSION OF THE LOWER EXTREMITIES OF RATS**

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**Objective:** The objectives of this study were to compare the protective effect of ascorbic acid and iloprost on lung injury caused by ischemia reperfusion (I/R) of the lower extremities of rats.

**Methods:** 34 Wistar Albino rats were divided into five groups. In IR group ( $n = 6$ ), the aorta was cross-clamped for about 3 h, followed by 1 h of reperfusion. In vit C group ( $n = 8$ ), animals were pretreated with 100 mg/kg ascorbic acid via the left jugular vein before aortic cross-clamping. In the iloprost group ( $n = 8$ ), animals were pretreated with 20 ng/kg/min iloprost by constant intravenous infusion via the left jugular venous cannula. In the sham group ( $n = 6$ ), the abdomen was left open at the same period and jugular venous line was established. In the control group ( $n = 6$ ), lungs were removed and blood samples were taken immediately after sternotomy. No treatment was given in this group. After both lungs were removed, biochemical parameters were measured.

**Results:** Although the arterial blood  $pO_2$  and  $HCO_3$  levels were statistically significantly high in both vitamin C and iloprost groups when compared to the I/R group, plasma malondialdehyde (MDA) levels were significantly low. Meanwhile the MDA levels in the lung tissue were statistically significantly low in the vitamin C group when compared to the I/R group. The MDA level in the lung tissue in the iloprost group was also low when compared to the I/R group but it was not statistically significant.

**Conclusions:** The results suggest that both vitamin C and iloprost are useful agents for attenuating the lung injury after a period of ischemia/reperfusion of the lower extremities.

## V8.7

**PERCUTANEOUS CLOSURE OF LARGE FEMORAL ACCESS SITES FOLLOWING ENDOVASCULAR ANEURYSM REPAIR**

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**Objective:** To describe our early clinical experience using the Prostar XL Percutaneous Vascular Surgery device for closure of femoral access sites after endovascular treatment of aortic aneurysm.

**Methods:** Stent-graft repair for aortic aneurysm was performed in 22 patients (AAA:  $n = 12$ ; or TAA:  $n = 10$ ), utilizing the Prostar XL Percutaneous Vascular Surgery device. The devices were introduced through 18Fr ( $n = 1$ ), 20Fr ( $n = 3$ ), 22Fr ( $n = 12$ ), 24Fr ( $n = 5$ ), 25Fr ( $n = 1$ ) sheaths. After stent-graft deployment, hemostasis was achieved by the Prostar sutures that were in place. All femoral access sites were controlled with physical examination, Duplex ultra-sound and CT angiography (CTA) at 3, 6, 12 months after intervention.

**Results:** Follow-up periods have ranged from 1 to 24 months (mean  $10,9 \pm 9,8$ ). The femoral artery access site was successfully closed in 21 patients without any groin haematoma. Surgical conversion was needed in 1 patient. There was 1 arterio-venous fistula. Pseudoaneurysms were detected on follow-up CTA examinations in 2 patients but didn't need any surgical correction. In this series no groin or ischemic complication of lower extremity was observed.

**Conclusions:** Large-bore femoral artery access site for stent-graft treatment of aortic aneurysm can be safely repaired by using Prostar percutaneous device.

## SCIENTIFIC SESSION V9 VEINS

### V9.1

#### SELF-EXPANDING STENTS FOR TREATMENT OF SUPERIOR VENA CAVAL SYNDROME—BRAZILIAN ARMY HOSPITAL EXPERIENCE

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**Objective:** To present the short experience and results in Superior Vena Caval Syndrome stenting for symptomatic obstruction.

**Methods:** Six stents were placed in four patients, 100% with benign causes of superior vena caval syndrome, (70%) hemodialysis patients. All cases were treated with self-expandable stents (Wallstent-Boston Scientific). Patients were followed clinically as well as by various imaging techniques and survival and results were evaluated.

**Results:** Stent deployment was possible in all cases. Reocclusion was seen in two cases. We had no complications and no death in this short group of patients. All the procedures were performed with local anesthesia. Primary patency was over 90%. The femoral vein was used in three cases and in one case we had to use the basilic vein. One case developed occlusion of the stent and was submitted to a new endovascular procedure.

**Conclusions:** Primary stenting of superior vena caval obstructions is a first choice treatment method achieving good mid term patency. Patients must be closely monitored for early reinterventions.

### V9.2

#### TRANS-COMMISSURAL VALVULOPLASTY IN THE TREATMENT OF CHRONIC VENOUS INSUFFICIENCY: AN ANALYSIS OF MID-TERM RESULTS

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**Objective:** Deep venous surgery is still controversial despite advances in the field and studies reporting favorable results. Further studies with longer follow-up periods are clearly warranted before such techniques are widely accepted.

**Methods:** The results of trans-commissural external valvuloplasty procedures performed on 65 extremities in 53 patients between 1996 and 2005 were retrospectively analyzed. Patients with severe insufficiency of the deep veins who had advanced skin lesions or severe symptoms in spite of medical therapy were included in this study. Color Doppler USG performed by the same investigator was used for follow-up assessments. Postoperative follow up data were extracted from patient records.

**Results:** A total of 53 patients were included in the study (31 females). The average age was 44±6 years. Twelve patients had bilateral valvuloplasty. CFV and SFV valves were preferred in 42 and 23 extremities, respectively. In 26 extremities, external sleeve method was also performed. Eighty-five percent of the cases (n = 45) had superficial venous system surgery simultaneously. The average length of follow-up was 2.7±2 years. There was no operative mortality. Surgical wound infection and hematoma formation were observed in 2 (3.7%) and 4 (7.5%) cases, respectively. DVT developed in only 2 patients (3.7%). The average Doppler grade at CFV was 3.6±0.4 preoperatively, which decreased to 1.6±0.9 at the completion of follow up. The corresponding figure in those who had external sleeve was 1.5±0.9. Preoperatively, the average Doppler grade in SFV was 3.6±0.4, which fell to 2.2±1.1 at the end of follow-up. The corresponding figure in those who had external sleeve was 1.2±0.4. A rapid healing was observed in 75% of patients with active ulcers, while no improvement was observed in 20.8% (n = 5) of them. The average preoperative and postoperative VCSS values were 12.1±4.8 and 2.9±1.6, respectively (P<0.001).

**Conclusions:** The main objective of treatment in chronic venous insufficiency is to decrease the venous hypertension in the lower extremity by re-establishing the flow dynamics from caudal to cranial direction, and from the superficial system towards the deep system. It is not possible to achieve this goal only by means of superficial venous surgery in patients with insufficiency of deep venous system. Trans-commissural external valvuloplasty can improve the quality of life of patients with its low morbidity and high durability of outcomes.

### V9.3

#### THERMOSCLEROSIS BY ENDOLASER IN THE TREATMENT OF VARICOSE DISEASE

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**Objective:** Classic treatment of varicose veins is an aggressive method, specially over safena vein. Less invasive procedures based in different energy applications are available. A diode laser source is tested.

**Methods:** From February 1999 to February 2005, 52 legs from 36 patients were treated by means of endolaser thermosclerosis applied inside sphenomagna (35 cases), sphenomagna minor (4 cases) or both sphenomagnas (30 cases). Truncular veins are treated with endolaser or classic Müller micro-surgery method. All procedures were performed under local anesthesia on ambulatory way after echo Doppler mapping. Sphenomagna magna was treated from upper leg to groin in 32 cases and in only 3 cases in full length. Chi square and Student's t tests were applied. Kaplan-Meier actuarial study was performed.

**Results:** No mortality or big trouble were found on surgical procedures. No hyposthesia, or sphenomagna nervous disorder, oedema, haematomas or major post-surgical disorders were found. A 3.6 C.E.A.P. pre-operative functional status became in 1.3, in a follow up of 3.4 years (5-2 years). Echo-Doppler studies performed at 6 months showed a permeability in 30% of the sphenomagna systems, light in every case, without vein regurgitation. The flow decreased to less than 10% in 2 years follow up studies. Patient satisfaction was obtained in all cases.

**Conclusions:** Endolaser thermosclerosis in surgical treatment of varicose disease is an easy and less invasive ambulatory method with good functional results. Further randomized studies will be performed.

### V9.4

#### ANALYSIS OF ETIOLOGIC FACTORS IN DEEP VENOUS THROMBOSIS

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**Objective:** Deep venous thrombosis is still an important source of morbidity and mortality because of its complications. In prevention of this disease, risk factors must be well known. Also taking precautions related to those risk factors has great importance. In this study, we proposed to identify the patients to give prophylaxis by analyzing the risk factors in development of deep venous thrombosis.

**Methods:** In our study, patients diagnosed and treated for deep venous thrombosis between January 2000 to December 2004 were retrospectively analysed. In patients with complaints of pain at the extremity, oedema and heat difference between extremities, diagnosis was confirmed by Doppler USG in all patients. The patients without evidence of thrombosis on Doppler ultrasonography were excluded. Risk factors defined by Meissner and colleagues were investigated. Protein C and protein S levels were analysed by coagulometric method (STA-Sta clot protein C kit, STA-Sta clot protein S kit, USA). Antithrombin-III levels were measured by nephelometric method. Normal levels are for protein C, 70-130%; for protein S, 65-140%; and for antithrombin-III, 21.9-30.2 mg/dl.

**Results:** Mean age for patients included in this study was 55.1±13.3 years. Body mass index was 27.1±3.9. Risk factors are as shown. We detected that sex and smoking don't increase the risk of deep venous thrombosis development significantly, immobilization was found to be the most common risk factor. Less commonly previous operation and malignancy were found to be the other risk factors keeping their importance. The least frequently detected risk factors were postpartum period and pregnancy. The blood groups of the patients according to their frequency were as follows; A, O, AB and B. Among those we observed A blood group most frequently. We think that A and O blood groups were more common since these blood groups are more frequent in the population.

**Conclusions:** We found immobilization, malignancy and previous surgical intervention were the most common risk factors in development of deep venous thrombosis. Renal failure, chemotherapy and trauma are less commonly seen, but they are also important risk factors. We believe that deep venous thrombosis prophylaxis for the patients with risk factors mentioned above is beneficial to reduce its prevalence.

## V9.5

**PURULENT DEEP VEIN THROMBOPHLEBITIS OF THE LEG: SURGERY OR NOT?**

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**Objective:** Deep vein thrombophlebitis of the lower leg is an uncommon complication with a difficult diagnosis, severe morbidity and mortality but its incidence increases with the development of intensive care units. Case reports and articles on this subject are quite rare, in contrast to post-catheterization thrombophlebitis, superficial thrombophlebitis and deep vein thrombosis of the upper or lower leg. The guidelines for therapy are controversial due to the delay between onset of symptoms and diagnosis; and whereas some authors prefer early surgery, some recommend conservative therapy.

**Methods:** Based on a case report we discuss different therapeutic modalities: anticoagulants combined with compression bandages and broad spectrum antibiotics and surgery (venous thrombectomy, venous thrombolysis or deep phlebectomy) combined with anticoagulants and compression stockings. "Do we have to operate or not? At what time do we have to operate and which operation?" These are the questions we have to answer.

**Results:** Most cases can be managed by conservative treatment. This consists of a combination of superficial thrombophlebitis therapy and deep vein thrombosis therapy. Broad-spectrum antibiotics are added based on cultures, if negative and other sources of infection are excluded they are started on empirical basis and given for at least 6 weeks. Surgical therapy for DVT consists of a thrombectomy with arterio-venous fistula or thrombolysis in patients with cerulea alba dolens and in young patients with thrombosis of the common femoral or iliac vein to avoid chronic venous insufficiency and its sequelae safely. The uncompleted removal of the thrombus (remnants of the thrombus due to adherence at the vein wall) more than 2 weeks after onset of the DVT is a disadvantage of both procedures. Deep phlebectomy is the only operation where every septic focus is resected but has a high risk of morbidity and mortality due to the extent of the operation in a septic patient. If sepsis persists after 4 weeks' broad spectrum antibiotics, anticoagulants and compression stockings, a surgical thrombectomy or thrombolysis with arterio-venous fistula is performed. A full excision of the suppurating vein is avoided, if there is a full adhesion of the clot on surgery without possibility of resection then it's advocated followed by anticoagulants, compression stockings and antibiotics for another 4 weeks.

**Conclusions:** After review of the literature (12 case reports) we recommend our therapy flow chart, but more cases must be reported to support our therapeutic guidelines.

## V9.6

**RECONSTRUCTION OF SAPHENOFEMORAL JUNCTION IN SAPHEN VEIN STRIPPED PATIENTS**

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**Objective:** The comparison of post-operative long-term results of great saphenous vein (GSV) stripped patients who have undergone the anatomic reconstruction of sapheno-femoral junction (SFJ) with patients without reconstruction.

**Methods:** Two groups of patients with total stripping of vena saphena magna (VSM) were retrospectively evaluated. Operations were performed at GATA Haydarpasa Research and Training Hospital and Camlica Hayat Hospital by the same surgical team. Patients with VSM reflux alone or in association with low grade (Grade I-II) saphenofemoral junctional reflux (SFJR) were grouped on the basis of undergoing (Group I) or not undergoing (Group II) sapheno-

femoral junction (SFJ) reconstruction. Postoperatively, the SFJ reflux time (valve reflux time, VRT) was measured by Doppler ultrasonography, and the two groups were compared with respect to the incidence of complications including recurrence of varicosity, ecchymosis, lymphocele, lymphorrhagia, wound infection, and paresthesias in the leg. The clinical status at baseline and endpoint was evaluated with CEAP classification system.

**Results:** After an average follow up of 3.7±1.3 years (2.3-7.8), a non-significant decrease in VRT and a high incidence of recurrent varicosity were noted in patients who had not undergone reconstruction. On the other hand, a statistically significant decrease in VRT was observed in patients who had undergone reconstruction. Similarly, between-group comparisons revealed a greater decrease in VRT in Group II compared to Group I. No significant difference was found between groups in terms of other complications.

**Conclusions:** In conclusion, we believe that optimal results can be achieved with anatomical reconstruction of SFJ following the division of VSM appropriate for the femoral vein diameter, when performing the stripping of VSM.

## V9.7

**THE ROLE OF THROMBOPHILIC FACTORS IN EARLY RECURRENT DEEP VENOUS THROMBOSIS: PRELIMINARY FINDINGS**

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**Objective:** Numerous studies have demonstrated the role of coagulation factors as well as natural anticoagulant factors in venous thrombosis (VT). For some patients, the benefit of continuing therapy never decreases to the point that anticoagulation should be stopped. The optimal duration of anticoagulation, therefore, should be individualized. Foremost, this assessment weighs the risk of recurrent VT if anticoagulation is stopped against the risk of bleeding if treatment is continued. The purpose of this study was to determine risk factors for recurrent VT to individualize the duration of anticoagulation.

**Methods:** Seventy-eight patients were included in this study. All of them had VT, confirmed with Doppler ultrasonography and all received anticoagulant therapy for 6 months. 9 of 78 with recurrent VT (Group I) and 69 of 78 without recurrence (Group II) were evaluated regarding activated protein C resistance, factor V Leiden mutation, factor II G20210A mutation, blood group, as well as demographic data at time of diagnosis. Patients were also evaluated for levels of factor VIII, factor IX, protein C, protein S, factor II, factor V, factor VII, factor X, factor XI, factor XII, antithrombin III activity, von Willebrand factor (vWF) and homocystein at diagnosis and at follow-up. All data were correlated to recurrent episodes of VT.

**Results:** Mean age was 53,56±13,37 and male/female ratio was 41/37. Mean follow-up time was 9,96±3,53 months. Nine (11,5%) patients had recurrent VT. Mean factor VIII level in Group I and in Group II was 299,18±26,24 and 171,48±43,18, respectively ( $P<0,0001$ ). Mean level of vWF was 263,25±52,28 in Group I and 176,72±46,56 in Group II ( $P<0,0001$ ). Levels of factor VIII above 198,44 and levels of vWF above 151,04 at initial diagnosis seem to be risk factors for early recurrence. These cut-off points were calculated statistically using the Roc curve. There was no significant relation between other thrombophilic factors and recurrence. Age, sex, presence of malignancy, hormone replacement therapy, use of oral contraceptives, blood group or family history were not correlated to recurrence statistically. There was no significant change of thrombophilic factor levels in follow-up.

**Conclusions:** High levels of factor VIII and vWF at initial diagnosis of VT are significant risk factors for recurrent VT. Especially those patients with high levels of factor VIII and vWF should get anticoagulant therapy. Duration of anticoagulant therapy remains still unclear, but long-time follow-up is necessary to answer this question.

## SCIENTIFIC SESSION V10 VASCULAR ACCESS

### V10.1

#### DETERMINANTS OF FAILURE OF BRACHIOCEPHALIC ELBOW FISTULAS FOR HAEMODIALYSIS

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**Objective:** The order of preference in arteriovenous fistulas for dialysis access has been set by the DOQI workgroup and includes in that order a radiocephalic fistula, brachiocephalic fistula, and a PTFE loop graft. As patency rates of radiocephalic fistulas may be lower than previously thought, this sequence is debated. The aim of this study is to analyse the results of brachiocephalic fistulas for haemodialysis purposes and to determine possible predictors of failure. **Methods:** Between April 1999 and September 2004, a consecutive series of 100 autologous brachiocephalic fistulas was created in 96 patients. There were 57 men and 39 women with a mean (S.D.) age of 59.2 (15.6) years. Data were prospectively gathered.

**Results:** The mean (S.D.) follow-up was 20.1 (16.4) months. The primary, primary assisted, and secondary patency rates after 6 months were 73.4, 83.2 and 86.4%, respectively. After 1 year, these figures were 54.7, 72.3 and 79.2%, respectively, and after 2 years 40.4, 59.2 and 67.5%, respectively. Predictors of failure with regard to primary patency as determined with Cox regression multivariate analysis included diabetes mellitus (HR 2.81,  $P < 0.001$ ) and a history of contralateral PTFE loop graft (HR 7.79,  $P = 0.007$ ). With regard to primary assisted and secondary patency, respectively, diabetes was also the most evident independent predictor of failure.

**Conclusions:** Primary patency of brachiocephalic fistulas is comparable to that of radiocephalic fistulas. Primary assisted and secondary patency rates can, however, be brought to a much higher level, especially in patients without diabetes and a large-diameter venous outflow tract. Patencies were not influenced by previous inserted central venous catheters, or by previous ipsilateral radiocephalic fistulas. We believe that the order of preference in autologous fistula types should stay as previously suggested by the DOQI workgroup.

### V10.2

#### EARLY USE OF SEAL POLYTETRAFLUOROETHYLENE (SEAL-PTFE) GRAFTS FOR HEMODIALYSIS ACCESS PRELIMINARY RESULTS

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Abstract not available

### V10.3

#### BOVINE URETER AS AN ARTERIOVENOUS GRAFT USED IN HEMODIALYSIS ACCESS SURGERY

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**Objective:** The main objective of the study was to report the early and mid-term outcome of bovine ureter as a hemodialysis access graft, chronic hemodialysis.

**Methods:** Four patients were operated using the bovine ureter SG as conduits for hemodialysis access surgery. The patients had had no suitable superficial venous system to create an arteriovenous fistula for hemodialysis. The xenografts were implanted between the brachial artery and the axillary vein in 2 patients and the radial artery and the deep brachial vein in 2 patients. Early postoperative and late postoperative patency of the grafts were followed in these patients.

**Results:** The early postoperative first day patency of the grafts were perfect. All four grafts implanted were patent. At the end of the third month both of the grafts between the radial artery and the brachial vein were patent and the patient had several times hemodialysis from this site. However, one of the other grafts between the brachial artery and the axillary vein failed

at the end of the second month after four times hemodialysis. A severe aneurysm and pseudoaneurysm formation of the graft occurred in the other one after four or five times intervention for hemodialysis. This necessitated totally excision of the graft and saphenous vein interpositioning to the brachial artery.

**Conclusions:** Bovine ureter graft in hemodialysis access surgery should be cautiously used.

### V10.4

#### ALTERNATIVE GRAFT MATERIALS REDUCE THE INCIDENCE OF DIALYSIS ACCESS RELATED INFECTIONS

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**Objective:** The arteriovenous fistula (AVF) and access with native veins remain the optimal solution for chronic hemodialysis. However, patients who have unsuitable venous conduit require the placement of arteriovenous access grafts (AVG). The most part of AVG is constructed using PTFE, despite its suboptimal results and to date there have been no published long-term results with regard to the use of modern biologic or semibiologic vascular substitutes. This report deals with the incidence of dialysis access related infections (DARI) in 2005 HD permanent vascular accesses in the upper limb or in the lower limb, the most part performed using organic or semiorganic materials, and early/long term results after salvaging procedures.

**Methods:** Our activity includes more than 15000 operations in 37 years, experience in vascular access construction and VA related cares in difficult patients coming from 250 Italian centers. A sample was created for the study of Dialysis-Access-Related-Infection (DARI) by selecting 2005 new vascular accesses consecutively constructed at our Institution between January 1990 and December 2004, in the upper (1883) or in the lower (122) limbs. The infection rate (IR) was defined as the number of new VA infections per 1000 dialysis months (DM). Our strategy forecasts an immediate closure of the VA with excision of the AVF infected wall whenever these occurs a deep infection of a proximal AVF, of an AVG, particularly if placed in the lower limb, and in cases of infections arising close to vascular anastomoses.

**Results:** The IR was 0.37 for 1189 AVFs and 1.7 for 694 AVGs constructed in the upper limb. If one calculates the number of new VA infections separately for the various materials employed in the construction, the IR was 1.4 for 553 biologic AVGs, 2.5 for 124 semi-biologic AVGs, and 6.7 for 17 synthetic materials. The IR in 122 AVGs placed in the groin, the most part (97.5%) constructed using biologic or semibiologic materials, was 3.5 per 1000 DM and one old patient died a few weeks after dismantling his AVG. Surgical corrections allowed to continue using 40 VAs for further 5620 DM in total.

**Conclusions:** The adoption of biologic material for AVG construction, a prompt referral to surgeon and a wise use of central venous catheters, as independent risk factor for VA infection, may reduce the incidence of DARI and offer the greatest potential for improving the access outcome and the quality of life for the difficult patients.

### V10.5

#### ISCHEMIC COMPLICATIONS DUE TO ARTIFICIAL ARTERIOVENOUS FISTULA FOR HEMODIALYSIS

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**Objective:** Ischemic complications due to hemodialysis arteriovenous (HD-AV) access are not common problems, but often associated with seriously disabled hand function or loss of fingers. In the last 7 years 690 patients underwent different types of access surgery, among them 14 patients had ischemic hand syndrome.

**Methods:** Retrospective analysis was performed based on electronic database, and follow-up reports.

**Results:** 14 patients were admitted to our clinic with ischemic hand complications. All but 7 had gangrene on fingers or partial amputation on fingers related to the hypoperfusion. The further 7 patients suffered daily complaints of the hand. 4 patients had aneurysmal dilatation of the shunt. The shunts were operated an average 25 months earlier. The ischemic hand occurred in five cases after basilic shunt, in 6 cases after cubital shunt and in 3 cases after Cimino fistula. The preoperative evaluation consisted of physical, Doppler ultrasound and angiographic investigations of the shunt and peripheral vessels. The angiographic evaluation revealed either radial or ulnar occlusion of

the forearm at all patients. 6 patients had stenotic lesion on the anastomotic site. Our basic strategy based on two columns. From one hand we try to maintain the shunt, on the other hand the upper extremity perfusion should be improved. All patients were operated. In 7 patients (Group 1) a usable shunt could be sustained. In these cases the anastomotic areas were revisited. A small caliber PTFE graft or cuff was implanted in order to shrink the inflow tract. The other 7 shunts (Group 2) were ligated, and in 5 cases the patient underwent an immediate brachial artery reconstruction. If a shunt ligation was the method of choice, 4 patients had a new shunt on the opposite arm before the shunt exclusion. Three patients died in the follow-up period (average 21 months). In Group 1 4 shunts remained patent and are used until now. In group 2 the dialysis was maintained by the other fistula. 3 months after the operation all 14 patients reported the healing of the gangrene or disappearing of the ischemic complaints. No further fingers were lost.

Conclusions: Ischemic complications after access surgery are rare but the incidence of gangrene is high. Restoring the arm circulation has priority but maintaining the shunt at the same time is possible and in 50% of our cases saving of the shunt was achieved. Implantation of a short segment small caliber PTFE graft offers a tolerable result.

#### V10.6

##### AUTOLOGOUS ANTEBRACHIAL FISTULAS: ONE USEFUL STEP PRIOR TO ELBOW FISTULAS

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**Objective:** In order to give the longest possible chance for hemodialysis for the chronic uremic patients, long-term optimization of different anatomic locations of arterio-venous fistulas is important. It is also crucial to create autologous fistulas instead of artificial graft placement. Between the standard wrist and elbow fistulas, atypical antebrachial fistulas can be created.

**Methods:** We performed 1018 arterio-venous fistula creation from 1997 to 2005. Data of 123 cases of autologous antebrachial fistulas were reviewed. Informations were obtained from the patients and the dialysis centers retrospectively. The cases were operated in a single institute by two surgeons.

**Results:** Indication: 123 antebrachial fistulas were operated for early wrist shunt occlusion (11), low flow wrist fistula (22), aneurysm (5), (1), steal syndrome occluded wrist fistula (84). The average age of patients was 55,4 years. Gender distribution: 68 men and 55 women. 30 patients had central venous line at the time of surgery (24,4%). 39 patients were diabetic (31,7%). Kidney transplantation was performed in 15 patients. Death was reported in 15 patients. We lost 7 patients for the follow up. The average follow-up was 38 months, the one and two years cumulative patency rate was 0,90 and 0,84%, respectively.

**Conclusions:** We have always emphasized the priority of autologous fistulas. It has a lower rate of infection, patients tolerate them better, the crew of dialysis centers prefer them, the incidence of post treatment bleedings are less and these fistulas play an important role in the sequence of different fistulas on the long term. Elbow fistulas could be performed later. Based on our results we continue to believe that autologous antebrachial fistulas should always be kept in consideration following the failure of a wrist fistula.

## SCIENTIFIC SESSION V11 MINI POSTER PRESENTATION (1)

### V11.1

#### CAROTID ENDARTERECTOMY: CONVENTIONAL VERSUS EVERSION TECHNIQUE

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**Objective:** The aim of this study was to examine whether results can be improved by applying an eversion technique.

**Methods:** In an eight-year period 535 patients underwent isolate endarterectomy: 381 (70%) conventional (group 1), and 153 (30%) eversion technique (group 2); 40% for asymptomatic lesion. We checked crossclamping and operation time, incidence of postoperative complications, death and incidence of restenosis. A temporary shunt used in 25% of group 1, but only 3 patients of group 2. The mean carotid artery crossclamping time was 26 min (range 8-38) in group 1 and 15 min (range 9-16) in group 2. The mean operating time was 100 min (range 70-120) and 50 min (35-70) accordingly. Three patients in a first group had to be reoperated for bleeding. There were four cranial nerve lesions in each group. In-hospital mortality was 0,75%, neurological morbidity rate of 1,7%.

**Results:** In the follow up from 6 to 80 months in 12 patients was detected restenosis, 7 of them were asymptomatic. Four patients required successful redo operation and two PTA with stent implantation. Only one from 12 patients was in a second group.

**Conclusions:** Eversion endarterectomy seems to be a safe procedure with a better long-term result for carotid artery stenosis. Contrary to certain authors' opinions, we believe that long segment of internal carotid artery stenosis is not a contraindication for eversion method. The role of adjunctive therapy with Clopidogrel for restenosis preservation after carotid artery endarterectomy still needs further investigations.

### V11.2

#### SIMULTANEOUS OR DELAYED EVAR FOR COMBINED THORACIC AND ABDOMINAL AORTIC ANEURYSM

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**Objective:** Despite improvements on perioperative care and surgical techniques, combined thoracic and abdominal aortic aneurysms represent a challenge for surgeons especially in elderly patients (pts) with comorbid medical illness. Recent advances in diagnostic equipment and therapeutic management have led to increase in the number of indications for endovascular aortic repair (EVAR). Our study concerns the feasibility of EVAR in patients with combined thoracic and abdominal aortic aneurysm.

**Methods:** From March 2001 to June 2004, 93 pts underwent EVAR for thoracic in 32 (34.4%) and for abdominal aortic aneurysm in 61 (65.6%). Four male pts (4.3%), with a mean age of 72.5±2.7, showed a combined pathology. Computed tomography (CT-scan) was diagnostic in all pts. Stent-grafts and implant strategy were selected on the basis of evaluation of aortic morphology and vascular access by angiography and CT-scan. Two pts with an atherosclerotic thoracic and abdominal aneurysm had a simultaneous treatment under general anaesthesia. The other two pts were first treated for aortic type-B dissection under general anaesthesia and, 6 and 8 months later, a bifurcated stent-graft was implanted for expanding abdominal aortic aneurysm under epidural anaesthesia. All procedures were performed in catheterization laboratory, with surgical exposure of common femoral arteries; all stent-grafts were loaded on an extra stiff guidewire and delivered under induced hypotension. A Talent (Medtronic) stent-graft was used in all pts: 13 (3.25 stent/pt) at thoracic level and 4 bifurcated at abdominal level. Criteria for successful deployment included absence of death or surgical conversion with complete exclusion of involved tract.

**Results:** There were no perioperative deaths or surgical conversions. Despite extensive covering of entire descending and infrarenal abdominal aorta no paraplegia occurred: the critical region between T9 and T12 was stented in all four pts. One simultaneous EVAR pt showed an acute renal failure requiring a 3 months substitutive renal therapy. The follow-up, ranging between 9 and 28 months (mean 19.5±6.9), included clinical examination and serial CT-scan at 3, 6 and 12 months, and every 6 months thereafter. No deaths and/or endoleaks were observed.

**Conclusions:** Extensive aortic aneurysm involving descending and infrarenal tract requires staged or simultaneous conventional treatment, with high substantial risk of morbidity and mortality. The EVAR represents a more appealing and less invasive approach, also in combined pathology, with immediate and mid-term good results.

### V11.3

#### TRAUMATIC RUPTURE OF THE THORACIC AORTA: IMPACT OF ENDOVASCULAR SURGERY

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**Objective:** Rupture of the thoracic aorta after blunt chest trauma leads to immediate death in 75% to 90% of cases and so a mandatory surgical treatment has been in the past emphasized. Despite improvements on perioperative care and surgical techniques conventional surgery for traumatic aortic rupture still carries substantial risk of serious complications and mortality. In this study we report our experience and results in endovascular treatment as an alternative to conventional repair.

**Methods:** From March 2001 to June 2004, 32 pts were submitted to endovascular surgery. 5 pts (15.6%) had a traumatic aortic rupture after road accident. The age ranged from 19 to 81 years. Four patients showed an unstable clinical picture because of head injury associated to multitrauma and haemorrhagic shock previously treated by splenectomy in one. These patients required an emergency endovascular treatment. The fifth patient in stable condition with history of blunt chest trauma had a delayed endovascular treatment. Computed tomography (CT-scan) was diagnostic in all patients. The stent-graft was delivered in the catheterization laboratory under general anesthesia with induced hypotension. Stent-grafts and implant strategy were selected on the basis of evaluation of aortic morphology and vascular access by angiography and CT-scan. Two different stent-grafts were implanted: 6 Talent (Medtronic) in 4 pts and 2 Thoracic Excluder (Gore) in one. Criteria for successful deployment included absence of death or surgical conversion with exclusion of transected tract.

**Results:** There were no perioperative deaths. No surgical conversions and paraplegia occurred. Laceration of the right iliac artery occurred during the endovascular procedure in a 19-year-old woman requiring an emergency rescue iliac-femoral artery bypass. This complication was the result of a discrepancy between the diameter of the artery (less than 8 mm) and the size of the device (25 French). Two older patients showed a crush syndrome requiring prolonged mechanical ventilation and temporary haemodialysis. The intraoperative angiography and CT-scan performed on discharge showed no significant endoleaks. At follow-up ranging from 11 to 45 months a pt showed a secondary type I endoleak successfully treated with a new endovascular procedure.

**Conclusions:** The endovascular treatment is safer than conventional surgery in emergency or high-risk patients, allows for prompt treatment of associated lesions in complex multitrauma patients in which heparinization and extracorporeal support are not indicated and delayed treatment may be life-threatening and considered as a hypothetical bridge to conventional surgery for younger patients if some unforeseeable device failure should occur.

### V11.4

#### COMPLICATIONS AFTER ENDOVASCULAR TREATMENT OF ABDOMINAL AORTIC ANEURYSMS

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**Objective:** Endovascular techniques during the last few years have become increasingly common in abdominal aortic aneurysm (AAA) repair. Because of a relatively short follow-up of this new method and a general lack of long-term medical studies a careful assessment of occurring complications is necessary. The aim of this study was to assess the complications of endovascular grafting of AAA in patients treated in the Department of General, Vascular and Transplant Surgery of the Medical University of Warsaw.

Methods: From April 1998 to February 2005, 290 patients underwent endovascular repair for AAA. Procedure results were assessed according to the Eurostar protocol. No patients had aneurysm rupture after stentgraft repair in follow-up.

Results: The most common complications observed were endoleaks into the aneurysm sac. A type I endoleak was observed in 28 patients (9,7%). This was treated by either balloon angioplasty or by implanting an additional stentgraft extension with 93% success rate (26 out of 28 patients). A type II endoleak was observed in 23 patients (7,9%). In 4 patients endovascular embolization of the supplying vessels was performed. In the remaining 10 (52,6%) patients in whom a type II endoleak was noted and left for observation, the endoleak receded spontaneously during the first 6 months of follow-up. In no cases a significant increase of aneurysm sac size was observed. In 12 cases thrombosis of either the whole stentgraft or of the device limb occurred. Thrombolysis, endovascular thrombectomy, femoro-femoral bypass graft or conversion to open surgery was performed depending on clinical presentations. Other, seldom observed complications included: stentgraft limb stenosis, peripheral embolisation, hematoma, pseudoaneurysm in the inguinal region and stentgraft infection.

Conclusions: Endovascular treatment of abdominal aortic aneurysms by means of stentgraft is an efficient method of treatment. Systematic patient follow-up is necessary for assessment and intervention in cases with late complications.

#### V11.5

##### ENDOVASCULAR THERAPY IN THORACIC AND ABDOMINAL AORTIC ANEURYSMS: SHORT-TERM RESULTS

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Objective: We report our experience and short-term outcome with endovascular graft-stent implantation on the cases of thoracic aortic aneurysm (TAA) and abdominal aortic aneurysm (AAA).

Methods: Endovascular graft-stents were implanted to 12 patients (8 male, 4 female) with the age of  $62.8 \pm 14.2$  years (range: 28-75 years). Four (33.3%) patients had TAA and 8 (66.7%) had infrarenal AAA. Aneurysm dimensions were calculated by CT and Digital Subtraction Angiography. Graft-stent sizing were made according to the 20-25% oversizing the normal neck diameter and minimum 15 mm of proximal and distal neck. If two stents were planned, minimum 3 cm-overlapping segment was preferred. Etiologies of AAA were atherosclerosis in 6 (50.0%), and Behçet's disease in 2 (16.7%) patients. Diameters were  $5.8 \pm 1.4$  cm (range: 5-10 cm) and lengths were  $7.0 \pm 2.0$  cm (range: 4-11 cm). Body graft-stents were used in two (16.7%) cases diagnosed with Behçet's disease, and bifurcated ones in other 6 (50%) cases. Etiologies of TAAs were dissection in one (8.3%) patient and atherosclerosis in the others (91.7%). Diameters were  $6.9 \pm 0.9$  cm (range: 5-9 cm) and lengths were  $7.3 \pm 2.6$  cm (range: 6-16 cm). In the dissecting aneurysm, flap was extending from the subclavian artery to the iliac arteries, and was treated with single graft-stent. Localization of the other three were at the thoracic aorta and at the isthmus. All of the cases were treated with two overlapped graft-stents. All procedures were performed by common femoral arteriotomy and left axillary access under epidural and local anesthesia. Patients were discharged on 4-7 days of procedure, and followed with CT in the 1st, 6th month, 1st year and yearly thereafter.

Results: Eleven (91.7%) procedures were performed without any complication. One (8.3%) of the patients who had Behçet's disease underwent femoro-femoral bypass because of dissection of the right iliac artery during the procedure. Follow-up period was  $19.4 \pm 12.2$  months (range: 6-43 months). In two (16.7%) patients who were treated with double stents, type III endoleak was diagnosed at the 6th and 12th months of follow-up, respectively. Because aneurysm diameters were stable at monthly CT controls and the patients refused any secondary intervention, they remained on follow-up. For AAA cases, there were no endoleak or need for secondary intervention.

Conclusions: Endovascular graft-stent procedures could be used in high risk patients with TAA and infrarenal AAA with good outcome and should be preferred in selective cases.

#### V11.6

##### THE EFFECT OF DOXYCYCLINE THERAPY ON CHLAMYDIA PNEUMONIAE SEROLOGICAL MARKERS IN PATIENTS WITH ASYMPTOMATIC ABDOMINAL AORTIC ANEURYSM (AAA)

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Objective: The frequent finding of *C. pneumoniae* in atheroma and not in normal artery tissue by different methods and numerous investigators suggests that the organism may play a role in clinical manifestations of atherosclerosis, including AAA.

Methods: 30 patients with AAA and serological markers of chronic *C. pneumoniae* infection were qualified to this examination. They were treated with doxycycline in the dose of 100 mg daily for 3 months. Blood samples were collected to evaluate: serum concentrations of IgG and IgA anti-*C. pneumoniae*; C-reactive protein concentration; WBC count; lipid profile; the presence of *C. pneumoniae* DNA and RNA in blood monocytes (using PCR methods). Patients were examined before taking the first dose of antibiotic and after each month of the therapy. 2 years follow-up was designed, with control examinations every 6 months. Currently we are presenting the preliminary report: the results obtained after 2 months of antibiotic therapy received by 11 patients.

Results: Serological signs of chronic *C. pneumoniae* infection (IgG = 1:128, IgA = 1:32) were present in all patients participating in the research. No significant changes were observed in specific IgG and IgA concentrations after 2 months of antibiotic therapy. 9 patients (82%) had the increased concentrations of C-reactive protein (mean concentration: 13,42 mg/l) before initiating antibiotic therapy. After 2 months of treatment the concentrations of C-reactive protein decreased significantly in all patients (mean concentration 7,37 mg/l). In case of 2 patients there was observed a decrease of AAA diameter (from 42,9 mm to 37,2 mm and from 36,8 mm to 36,1 mm). The other patients showed no increase of AAA diameter.

Conclusions: Our preliminary results suggest that antibiotic therapy can be useful in the treatment of selected patients with asymptomatic AAA. However, not only studies on more numerous groups of patients should be performed to confirm our results but also long-term follow-up should be carried out to evaluate the effectiveness of the therapy.

#### V11.7

##### THE EFFECTS OF ISCHEMIC PRECONDITIONING AND REMOTE PRECONDITIONING IN SPINAL CORD PROTECTION IN A RABBIT MODEL OF TRANSIENT AORTIC OCCLUSION

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Objective: Spinal cord injury is a devastating complication after aortic surgery. The aim of this study was to assess the affectivity of ischemic preconditioning (IPC) and remote preconditioning (RPC) in spinal cord protection during ischemia in an experimental model.

Methods: Thirty-eight New Zealand white rabbits were randomly assigned to five groups: one group served as sham group ( $n = 7$ ) in which only median laparotomy was performed and closed. In all rabbits in other groups, aorta was clamped just distal to the left renal artery above the iliac bifurcation for 40 min. Prior to 40 min of aortic occlusion, no preconditioning method was used in one group (Group Control,  $n = 7$ ), aorta was clamped twice at the same site of aortic occlusion for 5 min followed by 15 min of reperfusion in one group (Group IPC,  $n = 8$ ), left renal artery was clamped twice for 5 min followed by 15 min of reperfusion in the other group (Group RPC,  $n = 8$ ), both left renal artery and then aorta were sequentially clamped for 5 min followed by 15 min of reperfusion in the last group (Group RPC+IPC,  $n = 8$ ). Neurological statuses of the rabbits were evaluated according to Tarlov's scale in the postoperative 24th and 48th h in all groups and then they were sacrificed. Their spinal cords were harvested and L4-L6 segments were prepared for evaluation of their viability indices. Analysis of variance (one-way ANOVA) was used for physiological data; Mann-Whitney *U* test was used to compare the neurological and pathological findings.

Results: Physiological data were similar in all groups. Rabbits in sham group did not have any neurological deficit. However, all rabbits in control group showed severe neurological deficits including total paraplegia in five. According to Tarlov's scale, neurological status of the rabbits in the



postoperative 24th and 48th h were observed to be in better conditions in the IPC, RPC and RPC+IPC groups compared to controls ( $P<0.01$ ). Pathological examination of spinal cord specimen revealed higher viability indices in these three study groups compared to controls ( $P<0.01$ ). When study groups were compared with each other, neurological status of rabbits was observed to be in better condition in the IPC group, however it did not reach statistical significance.

Conclusions: The results of this study demonstrated that ischemic preconditioning prior to aortic occlusion has beneficial effects in decreasing neuronal damage due to spinal cord ischemia. Remote preconditioning was not shown to have any additional benefit in this setting.

#### V11.8

##### PLACENTA GROWTH FACTOR EXPRESSION IN HUMAN ATHEROSCLEROTIC CAROTID PLAQUES IS RELATED TO PLAQUE DESTABILIZATION VIA INFLAMMATION

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Objective: The cellular and molecular mechanisms converting a stable into a vulnerable plaque- contributing to local plaque rupture and symptomatic carotid disease- are incompletely understood but have been proposed to involve local inflammation and neovascularization. The Placenta growth factor (PlGF)-a member of the VEGF (Vascular Endothelial Growth Factor) family-mediates pathological angiogenesis and inflammation in several disorders but its role in the progression and complication of human atherosclerotic lesions is unknown. This study was designed to address the relationship between PlGF expression in human atherosclerotic carotid plaques and local inflammation, neovascularization and clinical features of plaque instability. Methods: Plaque tissue and clinical data from 60 patients undergoing carotid endarterectomy were collected. The expression of PlGF, C-reactive protein (CRP) and CD 40 L were analyzed by Western blot. Cellular inflammatory infiltrate and microvascular network were assessed semiquantitatively by immunohistochemical staining for CD 68, CD3 and von-Willebrand-factor (vWF) . Results: A significantly higher expression of PlGF was observed in the plaques of symptomatic patients compared to asymptomatic patients (115.4±8.2 densitometric units [DU] vs. 83.6±10.5 DU,  $P<0.05$ ). The mean grading for the content of inflammatory cells and neovascularization in the plaques was significantly higher in symptomatic vs. asymptomatic patients (t-cells: 2.330±0.175 vs. 0.664±0.131,  $P<0.001$ , macrophages: 2.464±0.19 vs. 0.875±0.165,  $P<0.001$ , microvessels: 2.339±0.134 vs. 1.556±0.151,  $P<0.01$ ). In addition, the plaque expression of PlGF showed a positive correlation to the expression of the inflammatory markers CRP ( $r = 0.446$ ,  $P<0.001$ ) and CD 40 L ( $r = 0.362$ ,  $P<0.01$ ). Likewise, plaques extensively stained for inflammatory cells showed higher PlGF levels than plaques with weak staining (158.5±10.5 DU vs. 78.5±19.2 DU,  $P<0.001$ ). Local transcription of PlGF was proven by Real Time-PCR in representative patients. Immunohistochemistry confirmed the presence of PlGF in the plaque mainly co-localized to endothelial cells and inflammatory cells.

Conclusions: In conclusion, we have shown for the first time that local PlGF expression within human atherosclerotic lesions is associated with plaque instability as evidenced by the history of ischemic events in the circulation of the internal carotid artery. Furthermore, PlGF seems to be implicated in the process of plaque inflammation suggesting that the proatherogenic effect of PlGF in the development of unstable plaques is mainly mediated through inflammation, rather than neovascularization.

#### V11.9

##### TRACHEO-INNOMINATE ARTERY FISTULA: TWO CASES

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Objective: Tracheo-innominate artery fistula (TIF) is a rare but the most dramatic and most adrenaline producing complication of tracheostomy. We report here two surgically treated TIF cases who presented to our department with an interval of 19 years.

Methods: Case 1: A 28-year-old women was transferred from a provincial hospital in June 1985 where she had been admitted with closed head injury. She had had tracheostomy for respiratory assistance. On the 14th postoperative day, a small amount of bright red blood had been aspirated during "suctioning" for respiratory toilet, and an abundant arterial bleeding from and around the tracheostomy cannula had decreased but did not stop. This patient was transferred to our hospital about 6 h after the initial bleeding and assessed in the emergency room. She was urgently transferred to the operation room and intervened by median sternotomy. The proximal and distal parts of the innominate artery were clamped. A necrotic lesion was seen at the anterior wall of the trachea at the level of the cuff and a 3 mm "kissing lesion" was also found at the same level on the posterior wall of the adjacent innominate artery. The necrotic portion of the artery was resected and both cut ends were oversewn. Case 2: A 64-year-old man who had undergone a total laryngectomy for epidormoid cardicinoma and had been discharged with a silver cannula in March 2004 had subsequently been treated with a full course (6000) of adjuvant radiotherapy. Three months after the completion of radiotherapy, he presented with the complaint of hemoptysis (bloody discharge) from the cannula and the stoma opening. TIF was diagnosed and the patient was urgently operated via median sternotomy. A fistula between the innominate artery and trachea was identified at a similar localisation as in the previous case and the same surgical procedure was followed. Results: The postoperative period was uneventful.

Conclusions: In conclusion, the incidence of this catastrophic complication of tracheostomy may be reduced by being aware of the previously reported etiological factors including radiotherapy, and taking the necessary preventive measures. Once TIF develops, survival is only possible by early recognition and a prompt and organized approach to management.

#### V11.10

##### INFLUENCE OF POSTOPERATIVE INFERIOR MESENTERIC ARTERY PATENCY ON REGRESSION OF ABDOMINAL ANEURYSM SAC AFTER ENDOVASCULAR REPAIR

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Objective: The effectiveness of endovascular abdominal aneurysm repair (EVAR) may be expressed as a reduction in the aneurysm rupture risk. Since rupture rate is diameter dependent, aneurysm size regression can be considered as an index of EVAR effectiveness. The aim of the study was to analyze the influence of inferior mesenteric artery (IMA) patency with no signs of endoleak on aneurysm diameter changes after stentgraft implantation in a 12-month follow-up period.

Methods: From 1998 to 2005, 290 patients underwent EVAR by stentgraft implantation at our Institution. Aneurysm measurements were made by spiral computed tomography and diameter change was considered relevant if there was at least a difference of 5 mm between the initial and control tomography. Data were assessed from 146 endoleak free patients with one year postoperative observation period. The relation between preoperative and postoperative maximum aneurysm diameter and IMA patency was assessed 6 months and 12 months after operation.

Results: Aneurysm sac diameter decreased after 12 months in 83 patients (57%) undergoing EVAR. The relation between IMA patency and sac shrinkage are summarized. Number (%) of patients with a significant decrease in aneurysm size in relation to IMA patency after EVAR. The aortic shrinkage was observed in 95% of patients with thrombosed IMA and only 5% of patients with patent IMA at 6 months after the operation. Similar percentages were observed at 12 months: 94% and 6%, respectively.

Conclusions: The patency of inferior mesenteric artery (with no endoleak signs) can be considered as a possible cause of no aneurysm sac shrinkage after EVAR.

#### V11.11

##### EMERGENCY ENDOGRAFTING OF RUPTURED ABDOMINAL AORTIC ANEURYSMS

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**Objective:** Rupture is the most serious complication of abdominal aortic aneurysms (AAA). Emergency intervention is required which is usually burdened with a high mortality rate ranging from 45 to 70%. The aim of this study was to assess the applicability of endovascular devices in the emergency treatment of ruptured abdominal aortic aneurysms.

**Methods:** From April 1998 to January 2005, 290 patients underwent endovascular repair of an infrarenal aortic aneurysm in the Department of General, Vascular and Transplant Surgery of the Medical University of Warsaw. Among these patients, 5 underwent surgery by means of stentgraft implantation because of a ruptured AAA. In 3 patients the rupture was into the retroperitoneum, and two patients had a rupture directly into the inferior vena cava. All patients had a spiral computed tomography performed with 3D reconstruction and intraoperative angiography. Using this data the following measurements were gathered and used for choosing the appropriate endovascular device and size. Neck length - from 12 mm to 30 mm, infrarenal neck diameter - from 21 mm to 29 mm, maximum aneurysm diameter - from 63 mm to 86 mm. In two cases the aneurysm sac extended onto the common iliac arteries. The following endovascular devices were used for emergency repair (Talent straight tube graft - 1 case, Zenith bifurcated aorto-iliac graft - 3 cases, Zenith aorto-iliac unilateral graft with a femoro-femoral cross-over graft - 1 case).

**Results:** In all cases intraoperative angiography confirmed completed exclusion of the ruptured aneurysm with no evident leak. One patient died directly after surgery as a result of hypovolemic shock. From the patients with aorto-caval fistulas, one died on the 10th and one on the 12th postoperative day from cardiovascular insufficiency. The remaining 2 patients were discharged in the 9th postoperative day, with no signs of endoleak. On a yearly follow-up the patients are still alive with no signs of retroperitoneal hematoma in computed tomography.

**Conclusions:** The use of endovascular devices is currently the least invasive method of treatment of ruptured abdominal aneurysms and could be the method of choice in these patients.

#### V11.12

##### INCIDENCE AND MANAGEMENT OF RECURRENT CAROTID STENOSIS AFTER EVERSION ENDARTERECTOMY

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**Objective:** Recurrent stenosis is an infrequent but not rare late complication after carotid endarterectomy. This study was designed to define the incidence of restenosis among patients undergoing carotid eversion endarterectomy (CeEA), and to show experience of treatment of carotid restenosis.

**Methods:** During the prospective, non-randomized study 915 patients (male: 559, female 356; aged 50-83 years, mean: 66 years) have been followed after eversion endarterectomy (CeEA) since 1994, and results have been analyzed. All patients underwent postoperative duplex ultrasound scanning and clinical follow-up at 3rd, 6th and 12th month, and yearly thereafter. New neurologic events, late occlusion and recurrent stenosis 50% or greater were recorded. Complete follow-up (mean 3,8 years; range 6-120 months) was obtained in 75% of patients (915 of 1220), for an overall average of 75% of procedures (1125 of 1502). Survival analysis was performed with Kaplan-Meier life table method.

**Results:** The combined perioperative stroke morbidity and mortality rate was 1%. The 5-year patient survival rate was 85%, the recurrent stenosis free rate was 88% at 5 years. Non-significant restenosis (between 50-70%) was detected in 169 cases (15%). Only 8,5% of the patients (96 cases) had significant carotid restenosis of more than 70% during this period. Clinically manifested or by duplex ultrasound detected restenosis requiring intervention evolved in 23 patients (2%) during the follow-up. From the 23 redo interventions in 16 cases redo operation, and in seven cases PTA + stenting (CAS) have been performed.

**Conclusions:** The results of the present study demonstrate that CeEA is a safe, effective and durable procedure and it can be performed with excellent results in patients with symptomatic and asymptomatic severe ICA lesions. Our results for recurrent carotid stenosis compare favourably with the 2-34% restenosis rate reported in the literature. Ultrasound and histological findings suggest that myointimal hyperplasia plays a significant role in the development of restenosis after carotid endarterectomy.

#### V11.13

##### VASCULAR THORACIC OUTLET SYNDROME: DIAGNOSIS AND SURGICAL TREATMENT

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**Objective:** Thoracic outlet syndrome (TOS) is one of the most difficult to diagnose or treat entities in thoracic surgery. The aim of this study was to present our 14 year experience in diagnosis and surgical treatment of vascular TOS.

**Methods:** We retrospectively analyzed 31 cases of vascular and vascular /neurogenic TOS treated in our department between 1986 and 2004. The study identified 26 women and 5 men (mean age: 28 years). The patients were divided in 3 groups: arterial (17), venous (4) and arterial and venous (10). Presenting features in the arterial group included hand ischemia (5) and arm claudication or vasomotor phenomena related to prolonged arm hyper abduction (12). One patient with venous TOS presented with positional-related hand edema and (3) effort thrombosis of axillary-subclavian venous. Clinical examination consisted the Adson, Roos and Halsted tests. Laboratory examination consisted of cervical and chest X-rays, cervical CT scan if necessary, nerve conduction velocities, angiography in neutral and dynamic positions and veno-graphy. In all cases Ross procedure (transaxillary first rib resection and scalenectomy) was performed with resection of any soft tissue constricting structures. All patients with subclavian axillary venous thrombosis had initially received anticoagulation therapy.

**Results:** The cause of vascular compression was scalene hypertrophy (30) and anomalous first ribs (5). There was no operative or postoperative mortality. Complications included two pleural lacerations treated with thoracic drainage and one transient injury of long thoracic nerve. Follow-up period ranged from 3 months to 2.5 years and during this period the subclavian arteries remained patent. A complete resolution of symptoms with return to previous activity was achieved in all arterial TOS cases and three of four venous TOS cases. The remaining patient with venous TOS had a mild relief of symptoms and limitation in daily activities.

**Conclusions:** Vascular TOS is seen less frequently than neurogenic and always requires surgical treatment. We report our surgical experience using transaxillary approach which provides a good exposure for the resection of first rib, excision of fibrous bands and scalenectomy as well as a perfect cosmetic result.

#### V11.14

##### HYBRID PROCEDURES FOR THE TREATMENT OF AORTIC DISSECTIONS

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**Objective:** Open surgery for the treatment of thoracic aortic dissections is burdened with a high mortality rate. Although during the last decade there has been a rapid expansion in the indications for use of endovascular devices to treat aneurysmal disease its uses in thoracoabdominal aortic aneurysms (TAAA) until now have been hampered by the fact that the visceral arteries originate from the aneurysm itself. We present an early experience with hybrid endovascular repair of type A dissections associated with TAAA in Marfan disease.

**Methods:** In 2004 two patients were referred to our Department with aortic dissections and concomitant thoracoabdominal aneurysms. Both underwent previous aortic arch surgery with implantation of a mechanical valve and aortic arch replacement. One patient had abdominal aortic aneurysm surgery using a straight aorto-aortic graft. Maximum aortic aneurysm diameter was 78 and 110 mm respectively as measured on 3D helical CT scans. A one time, 2-stage combined endovascular and traditional operative technique was adopted. Firstly a retrograde synthetic bypass graft was connected from the common left iliac artery to the superior mesenteric artery together with autogenous vein grafts from the ilio-mesenteric bypass graft to renal arteries and the common hepatic artery. All visceral arteries were ligated at their orifices. Secondly, the thoracic aorta dissection and abdominal aneurysm were excluded using a straight-tube or bifurcated stent-graft.

**Results:** All patients performed well after surgery, with no technical or neurological complications observed on follow-up. Postoperative 3D CT reconstruction confirmed patency of vascular conduits and no signs of visceral ischemia were observed.

Conclusions: This combination of hybrid procedure techniques with open intra-abdominal visceral artery revascularization enables repair of complex aortic dissections with concomitant thoracoabdominal aneurysms and in the future may become an alternative method of treatment while having a lower complication and mortality rate.

#### V11.15

##### CAROTID ENDARTERECTOMY IN ACUTE SYMPTOMATIC PATIENTS

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Objective: The effectiveness of carotid endarterectomy is well established. In contrast, carotid endarterectomy in acute symptomatic patients remains controversial. The purpose of this report is to present two cases of acute symptomatic patients who were operated, for the first time, within 48 h from the onset of their symptoms in order to demonstrate that such an operation on selected patients is not associated with an increased operative risk and post-operative complications and thus offers a reasonable protection to the patient from further deterioration.

Methods: Two male patients (39 and 52 years) were operated in our department within 48 h from the onset of their carotid symptomatology. Patients were selected on the following criteria: a. remaining consciousness, b. patent ipsilateral middle cerebral artery, c. presence of symptomatic extra-cranial carotid disease, d. acute stroke or recent TIA with crescendo symptoms or aggravation with the last 7 days. Diagnosis of high grade carotid stenosis (70%) or acute occlusion was established by means of Doppler and duplex sonography. Intra-cerebral damage was assessed by CT or MR imaging procedures. Magnetic resonance arteriography (MRA) and/or i.a. D.S.A. was additionally performed for possible multi-vessel involvement, suspicion of pseudo-occlusion, contralateral occlusive disease of the distal ICA and in case of inconclusive non-invasive findings. Neurological impairment was assessed clinically following the RANKIN scale before transfer of the patient to the operating theatre, 8 days after surgery, and during follow-up. The operation was performed under general anesthesia, early clamping of the common carotid, with no shunt, and a synthetic patch for the closure of the arteriotomy (responsible surgeon: Dr D-S G Georgopoulos)

Results: Both patients underwent the procedure very well and demonstrated an improvement of their neurological status which was clinically assessed with RANKIN scale. No ipsilateral recurrent stroke or TIA occurred during the follow-up period which is by now 3 months.

Conclusions: This is a preliminary report and is based on a recent publication. In a future report we will present a number of cases so that a conclusion can be reached. It is our belief by now that carotid endarterectomy in acute symptomatic patients, under proper selection of the patients, can lead to a change of strategy. Thus these patients will benefit more from urgent surgery than from conservative management.

#### V11.16

##### VISCERAL ARTERY ANEURYSMS: A RETROSPECTIVE STUDY

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Objective: Review of the experience of our institute from 1996 to 2004 on aneurysms of the visceral branches of the abdominal aorta.

Methods: From 1997 to 2004, 16 patients have been treated for visceral artery aneurysms. These were located in the renal artery (8 cases), in the splenic artery (4 cases), in the gastric artery (1 case), in the pancreatoduodenal artery (1 case) and in the hepatic artery (2 cases). One patient also had an abdominal aortic aneurysm. There were 11 females and 5 males with mean age 61,1 years (range 22 to 86 years). Ten of these patients were asymptomatic, while one presented hypovolemic shock due to both renal and aortic aneurysm rupture. One subject with left renal artery aneurysm presented dilatation of the contralateral renal artery. Before surgery contrast CT scan and angiography were performed. 15 patients underwent surgical treatment, and in 1 case of renal aneurysm stent grafting was attempted. Aneurysm excision and simple primary repair of the artery was

performed in 9 cases, reconstruction with vein graft in a gastric artery aneurysm, hypogastric graft in renal artery aneurysm and a splenectomy in one case of intrasplenic aneurysm. During surgery, all patients with renal artery aneurysm received protection of the involved kidney by hypothermic perfusion. Follow up involved angiography, contrast tomography and ultrasound examination after 1, 3, 6 and 12 months post surgery. All patients underwent whole blood DNA extraction in order to study genetic polymorphisms with possible association to arterial dilatation, and to compare their frequency with those observed in abdominal aortic aneurysms.

Results: No patient treated surgically presented complications. Average length of hospital stay was 8,1 days. Postoperative mortality was absent except for the patient with the ruptured aneurysm who died after surgery due to myocardial infarction. Endovascular treatment was converted in open surgery due to the presence of a leak. So far no recurrences have been observed.

Conclusions: Visceral artery aneurysms are a rare but important vascular disease. They are usually detected accidentally or at the moment of their rupture, which is associated with high mortality. Treatment depends on the location of the aneurysm and patient condition. Surgical management is a safe procedure with few complications. Radiological interventional techniques can be a valid alternative in cases where surgery is not indicated.

#### V11.17

##### ABDOMINAL AORTIC COARCTATION

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Objective: The aim of this study is to present our experience in surgical and endovascular treatment of a rare vascular disease—abdominal coarctation.

Methods: We registered patients who were diagnosed with abdominal coarctation from 1996 to 2004. We analyzed the symptoms and clinical presentation. The diagnosis was confirmed by angiography. The patients were treated surgically (by-pass with prosthetic graft and patch angioplasty) or using endovascular technique, percutaneous transluminal angioplasty with and without stenting, with angiography control following the procedure. Follow-up period was 15-82 months.

Results: From 1996 to 2004 we treated three patients, two females aged 55 and 50 and a child aged 4. Lower extremity claudication was the dominant symptom in both female patients, whereas the child had hypertensive encephalopathy. Angiography showed severe narrowing of the suprarenal segment of the abdominal aorta in two patients with one female patient having narrowing of the infrarenal segment of the abdominal aorta. Coarctation of the infrarenal segment of the aorta was corrected by percutaneous transluminal angioplasty. Thoraco-abdominal by-pass grafting was performed in the other female patient. In the first act patch angioplasty was performed in the child patient followed by several PTAs of the visceral arteries. All patients were asymptomatic on control check-ups.

Conclusions: Abdominal aortic coarctation is a seldom found entity in vascular surgery. Angiography is of major importance for the diagnosis, endovascular treatment and control of the results of surgical and non-surgical treatment. Combination of surgical and endovascular treatment in our patients yielded very good results in the period observed.

#### V11.18

##### TRANSAORTIC ENDARTERECTOMY AND PERCUTANEOUS TRANSLUMINAL ANGIOPLASTY IN OSTIAL ATHEROSCLEROTIC RENAL ARTERY STENOSES: A PROSPECTIVE RANDOMISED TRIAL

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Objective: Transaortic endarterectomy (TEA) and percutaneous transluminal angioplasty (PTA) with and without stenting are competing methods in the therapy of the atherosclerotic ostial renal artery stenosis (RAS). The indications for both methods are not based on randomised comparative trials up to date. Advantages of PTA are high comfort and short hospital stay whereas surgery seems to provide better long-term results.

Methods: Out of 330 consecutive patients presenting with single or bilateral atherosclerotic RAS 149 needed additional vascular surgical operations and

were treated surgically. 164 from the remaining 181 patients were suitable for TEA and PTA. 50 patients agreed to the randomisation and were assigned to either TEA or PTA. In 114 patients who refused randomisation the therapy was selected by intention to treat. In all patients the inclusion criteria of the study were approved by an interdisciplinary conference of interventional radiologists, nephrologists, and vascular surgeons. Follow up in the randomised and not randomised patients was performed by colour coded duplex ultrasound and additional angiography in cases of suspected restenosis.

Results: 25 patients, mean age 63 years, were assigned to receive PTA, in all cases a stent was implanted. Technical success was 23/25 (92%), one patient underwent surgical removal of a dislocated stent in the iliac artery, in another patient a stent dislocated into a segmental artery leading to an infarction. 25 patients underwent TEA, primary technical success was 24/25 (96%), secondary success was 100%. One patient presented with a renal artery dissection, which was corrected by aortorenal venous bypass grafting. After 2 years primary and secondary patency rate in the TEA group were 96 and 100%, respectively. The patient with aortorenal bypass grafting developed a graft stenosis and underwent PTA and stenting successfully. In the PTA group primary and secondary patency rate were 23/25 (92%). Follow up examinations 3, 4, and 5 years after TEA and PTA, respectively, are still going on. These long-term results will be available in May 2005.

Conclusions: Both, TEA and PTA with stenting, provide satisfactory short and mid-term results in the therapy of ostial atherosclerotic RAS. Long-term results, which will be available soon, will play a pivotal role in the indication for both methods.

#### V11.19

##### CAROTID ANGIOPLASTY AND STENTING UNDER CEREBRAL PROTECTION—BRAZILIAN ARMY HOSPITAL EXPERIENCE

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Objective: To describe the results, complications, and follow-up data after stent placement for occlusive internal carotid arterial disease and to compare the results with those in the literature.

Methods: Carotid arterial stent placement was attempted in 67 arteries in 57 patients. Forty (70%) of 57 patients were symptomatic, while 17 (30%) were asymptomatic. More than 45 (80%) of 57 patients had one to three clinically important comorbidities and were considered at high risk. All patients underwent pre and postprocedural neurologic examinations. All the procedures were performed under cerebral protection with an filter device. Follow up consisted of serial duplex ultrasonography and clinical assessment.

Results: The immediate technical success rate of stent deployment was 98%. Periprocedurally, five of 67 interventions present transient ischemic attacks. Two patients had minor strokes, one major stroke and one death in 30 days (not stroke related). Treatment remained clinically successful in 55 patients. The restenosis rate was 4.4% (three patients).

Conclusions: Carotid arterial stent placement in a high-risk population has morbidity and mortality rates comparable to those of carotid endarterectomy in a lower risk population. Carotid arterial stent placement can be performed with a low restenosis rate. Randomized trials are still necessary for long-term results.

#### V11.20

##### ENDOVASCULAR TREATMENT OF THORACIC AORTIC DISEASES: BRAZILIAN ARMY HOSPITAL EXPERIENCE

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Objective: The objective of this study was to assess the initial outcome of endovascular treatment of thoracic aortic aneurysm and dissections in the Brazilian Army Hospital.

Methods: Twenty patients were treated in the Brazilian Army Hospital with endovascular methods from April 2002 to December 2004. All cases were performed under local anesthesia and dissection of the right femoral artery. The Talent (Medtronic) device was used in 100% of the cases. 11 patients presented thoracic aortic dissections and 9 cases were treated with thoracic aortic aneurysm. The cases were performed in the hemodynamic suite.

Results: Four patients died within 30 days after the procedure. The average hospital stay was 48 h. All the cases could be performed with endovascular technique. One case presented paraplegia before the endovascular treatment of the thoracic aortic dissection. Two cases presented endoleak type I

and were reoperated both with endovascular methods. No bleeding complications during the procedures were noted.

Conclusions: The short group of patients demonstrate acceptable rates for operative mortality and paraplegia after endovascular repair of thoracic aortic disease. Outcome after 30 days between aortic dissection and degenerative aneurysm were similar. The durability of this technique is currently unknown and a longer follow-up is still necessary as well as a larger group of patients.

#### V11.21

##### HEPATIC ARTERY ANEURYSM

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Objective: Hepatic artery aneurysms are rare lesions but of significant clinical importance because rupture is associated with elevated mortality. Historically, most aneurysms had ruptured at presentation or were incidentally discovered at autopsy.

Methods: A 54 year old male patient with complaints such as pain and disturbance in epigastrium and dyspepsia was consulted by cardiovascular surgery department, because of a pulsatile mass detected in upper abdomen at ultrasound. Computed tomogram (CT) with contrast medium showed a 5 cm diametered aneurysm in common hepatic artery which contain mural thrombi in aneurysmal sac. A magnetic resonance aortogram and selective angiogram of the celiac artery (CA) showed a fusiform, true aneurysm in most of common hepatic artery, with normal superior mesenteric, splenic, gastroduodenal, right and left hepatic arteries. Elective laparotomy was performed through a midline incision, and incision of the lesser omentum near the pylorus revealed an aneurysm arising from the common and proper hepatic artery. After resecting the aneurysm, we reconstructed the inflow and outflow arteries with a synthetic PTFE graft interposition. The duration of clamping of these arteries was 50 min.

Results: The postoperative laboratory data did not show any remarkable results, with normal serum transaminase levels. The patient had an uneventful postoperative course. Pathologic examination of aneurysm sac showed intimal thickening with focal atheromas and excess calcification.

Conclusions: Due to the high spontaneous rupture rate, hepatic artery aneurysms greater than 2 cm diameter must usually be treated when the diagnosis is confirmed. Recently, non-surgical interventions such as coil embolization and stented graft insertion into the aneurysm sac have been more frequently applied in treatment of visceral artery aneurysm. Thrombosis of the aneurysm with coil embolization in this patient was not considered because of the risk of ischemic hepatic injury due to the insufficient collateral flow. Aneurysm arises from all of common hepatic artery from celiac to left and right hepatic and gastroduodenal arteries, and the proximal and distal necks of the aneurysm sac were not suitable for stented graft insertion. For this reason, surgical intervention was preferred.

#### V11.22

##### VISCERAL ARTERY ANEURYSMS: OBSERVATIONAL, ENDOVASCULAR OR OPEN SURGICAL MANAGEMENT?

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Objective: Visceral artery aneurysms constitute a potentially lethal group of lesions considering their tendency to rupture in an unpredictable fashion. Although delayed diagnosis and treatment are the cause for high mortality, it is still uncertain which is the best management to optimize treatment: observation, endovascular or open surgery?

Methods: Presentation of a clinical series of the three different approaches (close observation, endovascular obliteration, open surgical excision) in three consecutive patients presenting with visceral artery aneurysms. Observational management for a patient with multiple aneurysms of the celiac trunk due to neuroinomatosis (patient A). Endovascular obliteration for a patient with a ruptured right gastric aneurysm (patient B). Open surgery for a patient with a contained rupture of a giant splenic artery aneurysm (patient C).

Results: Patient A has been followed up for 5 years for a celiac trunk aneurysm because operative risk has been estimated too high for invasive therapy. She has been under antihypertensive therapy and annual CT scan evaluation of the size of the aneurysm. She had no symptoms and her aneurysm is stable in size. Patient B was urgently diagnosed with a ruptured

right gastric aneurysm. He underwent CT scan for acute epigastric pain and syncope, which revealed free peritoneal blood. An angiogram was performed and a bleeding right gastric aneurysm was detected. Endovascular obliteration of the ruptured aneurysm was successfully performed with an uneventful outcome. Patient C presented with a chronic abdominal discomfort and nausea. A CT scan revealed a giant splenic artery aneurysm, angiography reconfirmed the location of the aneurysm, endovascular treatment was not deemed efficient. Open surgical excision of the aneurysm with splenectomy was performed. The patient was discharged 10 days after the operation in excellent clinical condition.

**Conclusions:** Invasive treatment is indicated for all symptomatic visceral artery aneurysms. The choice of therapeutic modality (endovascular or open) depends on location and anatomy, presence of collateral circulation, general condition of the patient and the estimation of risk factors as well as the overall surgical risk. Close clinical observation by frequent CT scan in patients with asymptomatic aneurysms that carry a high surgical risk is an alternative option.

#### V11.23

##### SMOKERS UNDERGOING MAJOR VASCULAR SURGERY HAVE FEWER CARDIAC EVENTS THAN NON-SMOKERS

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**Objective:** Cigarette smoking is a well-known risk factor for cardiovascular disease and sudden death. However, a history of smoking has consistently been associated with better hospital outcome in patients with AMI, although the mechanism for this is not clear. Patients undergoing major vascular surgery are at high risk of peri-operative cardiac events, and the effect of smoking status on the risk of cardiac events in patients undergoing major vascular surgery is unknown. Although long-term smoking is associated with the development of cardiovascular disease, we hypothesized that active smoking immediately prior to a major cardiac insult may reduce the risks of a peri-operative cardiac event.

**Methods:** We studied 101 consecutive patients undergoing high risk vascular surgery. We compared cardiac event rates (ACS and/or cardiac death) in active smokers, ex-smokers and non-smokers.

**Results:** In our high-risk vascular cohort (52% aortic surgery, 21% emergent or semi-emergent cases, with = 3 cardiac risk factors in 53%), an increased risk of peri-operative cardiac events was noted in non-smokers (23%), compared to ex-smokers (13%), and current smokers (3%). There were significantly fewer cardiac events in active smokers than in non-smokers (3 vs. 17%,  $P = 0.04$ ). Compared to non-smokers, the odds ratio of a cardiac event for active smokers was 0.15 (CI 0.01-0.96). There was no significant difference in cardiac event-rates between ex-smokers and non-smokers.

**Conclusions:** In conclusion, although long-term cigarette smoking is clearly associated with the development of cardiovascular disease, our findings indicate a cardioprotective effect of active cigarette smoking in the run-up to major vascular surgery. Further studies are warranted to elucidate the mechanism of this cardioprotection, and develop non-toxic ways of harnessing its benefit.

#### V11.24

##### STATIN TREATMENT PROVIDES RENAL PROTECTION DURING MAJOR VASCULAR SURGERY

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**Objective:** Acute renal failure (ARF) is not uncommon after major surgery and can be life-threatening. HMG co-A reductase inhibitors (statins) have recently been shown to be highly protective against perioperative cardiac complications in patients undergoing noncardiac vascular surgery and appear to confer protection independently of their lipid-lowering effect. Patients undergoing major vascular surgery are at risk of ARF, through mechanisms involving ischaemia/reperfusion injury or cholesterol embolisation. Statins have been shown to reduce the risk of post-ischaemic ARF in an animal model. We hypothesized that statin use may reduce the occurrence of post-operative ARF in high-risk patients undergoing vascular surgery.

**Methods:** We studied 101 consecutive patients undergoing high risk vascular surgery. We compared the occurrence of ARF (acute or acute-on-chronic renal

failure) according to statin use. The statin and non-statin treated groups were matched for incidence of pre-existing renal impairment (16 vs. 19%,  $P = ns$ ).

**Results:** In our high-risk vascular cohort (52% aortic surgery, 21% emergent or semi-emergent cases, 20% diabetic, 17% pre-existing renal impairment), ARF occurred significantly less frequently in patients receiving a statin than in those not receiving a statin (6% vs. 23%,  $P = 0.02$ ). Compared to non-statin treated patients, the odds ratio of ARF in patients taking a statin was 0.2 (CI 0.05-0.8). This benefit of statins on renal function was apparent despite significantly more diabetic patients in the statin arm of the study (27%) than in the non-statin arm (6%,  $P = 0.004$ ).

**Conclusions:** In conclusion, statin treatment is associated with a significant reduction in perioperative ARF in patients undergoing major vascular surgery. Potential mechanisms involve anti-inflammatory effects and inhibition of free radical generation, as well as reduction of cholesterol embolization through plaque stabilization.

#### V11.25

##### ABDOMINAL AORTIC ANEURYSMS. THE INFLUENCE EXERTED BY ATMOSPHERIC PRESSURE AND THE SEASON OF THE YEAR ON THEIR RUPTURE

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**Objective:** A number of factors have been linked with the rupture of abdominal aortic aneurysms. One of these factors involves seasonal variations and, within these, changes in barometric pressure. The aim of this study was to analyse whether variations in the atmospheric pressure and the seasons are related to the rupture of abdominal aortic aneurysms.

**Methods:** We conducted a retrospective study of patients who had received surgery for ruptured abdominal aortic aneurysms (RAAA) in our unit over the last 5 years. The following factors were determined for each patient: the mean atmospheric pressure (Pmed) for the month before, for the week before and for the month in which the rupture occurred. In addition, the number of ruptured aneurysms was also determined according to the season. Pearson's correlation was then employed to relate the variations in the atmospheric pressure and the season with the number of RAAA.

**Results:** Patients receiving surgery: 51; mean age: 73 years old ( $r = 51-87$ ). Month with the highest number of ruptures: November (8). Months with fewest ruptures: February and March (1). Seasons with highest number of ruptures: spring and autumn. An analysis of the results only showed a correlation between the number of ruptures and a drop in the atmospheric pressure during the week prior to the rupture ( $P = 0.006$ ;  $r = -0.744$ ). No correlation was found between the remaining parameters analysed.

**Conclusions:** There is a relation between a rise in the incidence of RAAA and a drop in the atmospheric pressure during the week before the rupture of the aneurysm.

#### V11.26

##### A GIANT AORTACAVAL FISTULA DUE TO ABDOMINAL AORTIC ANEURYSM

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**Objective:** The rupture of abdominal aortic aneurysm into vena cava inferior is a very rare complication, but the fistula development between vena cava inferior and an abdominal aortic aneurysm is a pathology which can deteriorate the clinical status of the patient rapidly.

**Methods:** Male, 62-year-old patient has applied with complaint of sudden chest pain. Cardiological examination did not reveal any acute cardiac disorder. When a palpable pulsatile mass was found during the abdominal examination and a continuous murmur was heard with auscultation, Doppler ultrasonography (USG) was performed. USG revealed an aneurysmal dilatation of aorta originating from the infrarenal section, reaching a 93 mm diameter at the widest part and ending at the beginning of iliac artery and a suspicious fistula track into the vena cava from posterior of aorta. An aortacaval fistula reaching - 3 cm length at the level of L4-5 vertebrae was discovered with contrast spiral CT imaging.

**Results:** All dimensions of the fistula, - 3 cm long and 1 cm wide was exposed. The anterior wall of vena cava inferior was repaired using Dacron external patch and separate sutures supported with Teflon. The continuity of

the aorta was provided by an aorta-biiliac Dacron graft. In the postoperative period, the arterial and venous structures were reported to be patent. The patient was discharged on 30th day.

Conclusions: Today, this pathology can be diagnosed very easily with non-invasive tests, and invasive tests can also be used for diagnostic purposes when needed. Especially spiral CT scan with contrast is usually sufficient to diagnose this pathology. A large-diameter aortacaval fistula case, which to our knowledge never presented in the literature before, and its diagnosis and treatment, have been presented in this article.

#### V11.27

##### CONTAINED RUPTURE AND AORTO-ENTERIC FISTULA IN A PATIENT WITH ABDOMINAL AORTIC PSEUDOANEURYSM AND BEHCET'S DISEASE

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Objective: Vascular involvement in Behcet's disease is rare, but may be at the forefront of the clinical picture with possible life-threatening scenarios.

Methods: A patient with Behcet's disease and abdominal aortic pseudoaneurysm which eventually ruptured and fistulized into intestines during the follow-up is presented.

Results: Patient underwent emergency surgery with PTFE graft interposition to aorta and primary repair of the intestinal wall.

Conclusions: Although arterial involvement is a rare consequence in Behcet's disease, it is a significant medical and surgical situation in the Mediterranean Basin where the disorder demonstrates the highest prevalence. Although EVAR is an attractive alternative for treatment of aortic aneurysms and pseudoaneurysms, open surgery is required in emergency cases.

#### V11.28

##### A SPLENIC INJURY DUE TO RUPTURED ABDOMINAL AORTIC ANEURYSM

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Objective: A ruptured abdominal aortic aneurysm (AAA) can progress to a large abdominal hematoma, which frequently causes anemia, hypotension and shock.

Methods: A ruptured AAA case bleeding to the retroperitoneal splenic cavity is reported. The hematoma had dissected the splenic tissue from the capsule, resulting in splenic injury. A synthetic graft was interposed after resection of the large aneurysm, which began just distal to the renal arteries. Splenectomy was performed because the injured spleen could not be repaired.

Results: The patient was uneventfully discharged from the hospital.

Conclusions: While deterioration of intestinal and renal function due to the mass effect of the abdominal hematoma has frequently been reported in the literature, there are no previous reports of splenic injury due to a ruptured aneurysm.

#### V11.29

##### SHOULD WE CONTINUE USING THE TALENT ABDOMINAL AORTIC GRAFT?

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Objective: Within recent years stent grafting of the aorta has been increasingly adopted by many centers. However, complications, graft choice and mid-term outcome still remain to be addressed.

Methods: Nineteen elderly patients with high preoperative risk and abdominal aortic aneurysms (infrarenal) have been successfully treated with endoluminal grafts. In 15 of them (79%) a straight graft was used, whereas in the remaining four (21%) a bifurcated graft was used. Medtronic Talent grafts (T) were used in 11 patients and other grafts (O) in 8 patients (Gore = 4, Cook = 3, Medtronic bifurcated = 1). The data were analyzed as to sufficiency (power analysis) and T was compared to O utilizing both chi-square and Fisher exact test.

Results: Patients who underwent stent grafting of the abdominal aorta had 5 complications: one femoral artery occlusion which was immediately treated with a femoral-femoral bypass, one pseudoaneurysm which was revealed 2.5

years postoperatively in a follow-up basis, one subacute hemorrhage from a perforated femoral artery 5 days postoperatively, one acute thrombosis of the abdominal aorta 15 days postoperatively - treated with subclavian-bifemoral bypass and one with fever postoperatively accompanied by lymphorrhea. All complications were in T group ( $P = 0.026$ , chi-square test and  $P = 0.045$ , Fisher exact test). As the number of complications ( $n = 5$ ) exceeded 26% of the sample size, both sample size and event size were judged "sufficient data" according to Blackstone.

Conclusions: Stent grafting of the abdominal aorta in selected patients provides evidence that this kind of treatment is a promising therapeutic option by comparison to expected high-risk surgery. The choice of stent however, remains to be addressed judging by our unexpected results and their possible significance in this retrospective study.

#### V11.30

##### TUMOR OF THE DESCENDING THORACIC AORTA IN A YOUNG PATIENT

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Objective: Tumors of the aorta are rather rare and one such a case is discussed.

Methods: An interesting case study of a young male patient 38 years old with initial vague abdominal pain upon admission is presented, in which a descending aortic aneurysm was diagnosed whereas the final diagnosis was an aortic sarcoma.

Results: Although the tumor was thoroughly excised the prognosis is rather poor.

Conclusions: The initial preoperative diagnosis very rarely changes after aortic surgery, however the surgical and pathological diagnosis prevails.

#### V11.31

##### INTRALUMINAL MASS OF THE DESCENDING THORACIC AORTA

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Objective: Intraluminal masses of the aorta are controversial with all preoperative diagnostic methods.

Methods: A 60-year-old male patient was initially admitted for a follow-up of an already known chronic obstructive pulmonary disease. Patient underwent a routine thoracic scanning with computerized tomography which showed an intraluminal mass into the descending thoracic aorta.

Results: Preoperatively, patient was subjected to aortography which revealed a button shaped mass. He was then driven to the operative room where a left thoracotomy was performed and the intraluminal mass was successfully excised.

Conclusions: Different methods (interventional or surgical) can be applied in order to excise such masses. However, the surgical method is the most appropriate in order to have radical results and a better prognosis.

#### V11.32

##### TUMOR RESECTION OF THE INFERIOR VENA CAVA

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Objective: This very rare case is discussed.

Methods: A 67-year-old male patient with recurrent renal adenocarcinoma was admitted and upon preoperative miscellaneous diagnostic procedures an intraluminal inferior vena cava mass was revealed.

Results: Under total circulatory arrest with profound hypothermia the tumor was successfully excised and an inferior vena cava filter was placed in order to avoid pulmonary embolism.

Conclusions: Tumors of the inferior vena cava are extremely rare. However, they are safely excised using total circulatory arrest with profound hypothermia.

## SCIENTIFIC SESSION V12 PERIPHERAL VASCULAR SURGERY (2)

### V12.1

#### THE ROLE OF ECO COLOR DUPLEX IN ENDOVASCULAR TREATMENT OF CRITICAL LOWER LIMB ISCHEMIA

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**Objective:** Diagnostic angiography has for many years been the gold standard for choosing treatment in chronic ischemia of the lower limbs, for both an eventual endovascular or a surgical approach. This study aims to evaluate the role of eco color duplex examination in the correct selection of which lower limb arteropathy patients should undergo angioplasty, and the capacity to correctly plan the type of procedure to be used.

**Methods:** Based on clinical examination, an analysis of pressure indices and of eco color duplex exams, we enrolled 820 patients to endovascular therapies between June 2001 and June 2004. The patients were divided into two groups: Group 1 - claudication at less than 100 m - 612 patients (74,6%) Group 2 - critical lower limb ischemia - 208 patients (25,4%). In all patients, eco color duplex mapping of the iliac, femoral, popliteal and tibial districts was performed.

**Results:** Identification for an endovascular procedure, with correct procedure planning (flow directed or retrograde puncture, cross over access, sub-intimal recanalisation, simple angioplasty or PTA with stent) was corrected in 791 patients (96,5%).

**Conclusions:** This study demonstrates that in expert hands, eco color duplex is capable of guiding the operator towards a correct planning of an endovascular treatment without the need for pre operative angiography.

### V12.2

#### EXTRA ANATOMIC BYPASS IN LOWER LIMB VASCULAR TRAUMA

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**Objective:** To evaluate the role of extra anatomic bypass in severe vascular injuries of the lower limbs with high risk of amputation or severe soft tissue infection.

**Methods:** From September 2000 through June 2004 19 patients with severe vascular injuries of a lower limb were admitted for surgery. 18 male and 1 female, ages from 15 to 49 years. Criteria to decide an extra anatomic bypass procedure were: 1. extensive loss of soft tissue around the injured vessel, 2. important contamination or tissue necrosis, and 3. failed repair due to local infection with thrombosis or dehiscence of the graft or anastomosis. In hemodynamically stable patients a selective arteriogram was done to evaluate the extent of damage and to plan the procedure. All surgeries were performed by the same surgeon. Transoperative arteriography was done in three cases. All patients were clinically evaluated after the procedures. The choice of the procedure was done depending on the segment of the injured artery: iliac to femoral bypass through the obturator foramen in 12, lateral femorofemoral bypass in 3, femoral to posterior tibial in 2 and femorofemoral in 2. The graft types were ring reinforced PTFE in 14 patients and saphenous vein in 5 patients. Mid term patency was determined with clinical and Doppler evaluations for a mean time of 11 months.

**Results:** 19 patients underwent primary repair or reoperative surgery to perform an extra anatomic bypass. The operative findings were: extensive loss of iliac artery and local contamination in one patient, abscess in the iliac fossa with thrombosis of the graft in one patient, extensive loss of soft tissues at the upper hip in 10, necrotizing post repair infection at the hip with the superficial femoral artery involved in 6 and failed graft with abscess and dehiscence at the popliteal artery area. 13 patients were discharged with clinical evidence of patency of the grafts. One patient was discharged with no pulses and no Doppler flow through the graft but with no clinical ischemia. One patient experienced a right first toe amputation for necrosis. Three patients underwent limb amputation above the knee.

**Conclusions:** Extra anatomic bypass is a good option when the surgeon faces extensive lower limb vascular injuries with major loss of soft tissue or failure of the primary repair associated to local necrotizing infection.

### V12.3

#### IMPROVEMENT OF QUALITY OF LIFE AFTER INFRAGENUAL BYPASS SURGERY

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**Objective:** The value of femoro-distal bypass surgery for patients has been questioned due to adverse effects such as delayed wound healing, long hospitalization and repeated interventions for maintenance of graft patency, because these complications would impair health-related quality of life (HRQoL). Therefore, the purpose of this prospective study was to assess changes in HRQoL following infragenual bypass grafting in patients with critical limb ischemia.

**Methods:** In total 86 patients—72.1% male; age (IQR) 71 (64 - 78) years—undergoing infragenual bypass grafting were assessed by the Short Form (SF)-36 questionnaire preoperatively. Follow up after 7 (6-8) months included bypass surveillance and self-assessment of HRQoL by SF-36. Indications for revascularization were rest pain in 18.6% and tissue loss in 81.4%. The subgroups diabetics and non-diabetics included 61.6% and 38.4% of all patients, respectively.

**Results:** Primary patency, limb salvage rate and survival rate were 79.1%, 83.1% and 87.6%, respectively. Following revascularization HRQoL of all patients significantly improved in all eight dimensions of the SF-36. Preoperative comparison of diabetics and non-diabetics only differed in "role emotional index" ( $P = 0.042$ ). However, at the time of follow up HRQoL had improved significantly less in the diabetic group than in the non-diabetic group in all dimensions.

**Conclusions:** An aggressive approach to infragenual bypass surgery for limb salvage is justified, because patients benefit from surgery with regard to HRQoL. However, this improvement tends to be less in diabetic patients.

### V12.4

#### WHY AND HOW TO IMPROVE THE OUTCOME IN SURGICAL PATIENTS WITH ACUTE ISCHEMIA OF LOWER LIMBS? RESULTS FROM A RANDOMISED, DOUBLE-BLIND, ILOPROST VS. PLACEBO STUDY (ILAILL)

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**Objective:** Acute limb ischemia (ALI) is both a limb- and life-threatening condition with high incidence of amputation and death after technically successful surgical revascularisation: 30-day amputation rate 12-35%; mortality risk reported at 9-17% and even higher in elderly patients. Up to now, no adjuvant pharmacological treatment—apart from anticoagulation and standard perioperative care—has been shown as effective. The pharmacological profile of iloprost, a synthetic prostacyclin analogue, makes it potentially interesting for patients with ALI. Aim of ILAILL (Iloprost in Acute Ischemia of Lower Limbs) study was to evaluate the effects of iloprost as adjuvant treatment in ALI patients undergoing surgical revascularization.

**Methods:** In a randomized, double-blind study, performed in 22 Italian Centres of Vascular Surgery, we assigned 300 patients with ALI, undergoing surgical revascularization, to receive perioperative placebo or iloprost (intra-arterial, intra-operative bolus of 3000 ng, plus intravenous infusion of 0.5-2.0 ng/kg/min for 6 h a day for 4-7 days following surgery). The primary efficacy outcome was the combined incidence of death and amputation at 3-month follow-up. Secondary end-points were the incidence of each single major clinical event, as well as total event rate, evolution of symptomatology, and tolerability.

**Results:** The combined incidence of death and amputation was 19.9% in the placebo, and 14.1% in the iloprost group (relative risk 1.56, 95% confidence interval 0.89-2.75,  $P = 0.12$ , Cox regression analysis). A statistically significant lower mortality rate was reported in patients receiving iloprost, as compared to controls, 7 pts as opposed to 16 pts (4.7% vs. 10.6%, relative risk 2.61, 95% confidence interval 1.07 - 6.37,  $P = 0.03$ ). The overall incidence of fatal plus major cardiovascular events was 33.1% in patients treated with placebo and 22.8% in those receiving iloprost (relative risk 1.61, 95% confidence interval 1.04 - 2.49,  $P = 0.03$ ). A Safety Committee monitored tolerability of study treatment throughout the trial: no major concerns were raised. No differences in the incidence of bleeding or hypotension between iloprost and placebo groups were recorded.

**Conclusions:** Though at lower levels than previously reported, our results confirm the severity of clinical outcome in patients with ALI. The use of

iloprost as adjuvant to surgery seemed to significantly reduce mortality at 3-month follow-up, as well as the combined end-point of mortality plus major cardiovascular events. Further data and efforts are needed to support this interesting finding, and to face a still open medical need.

#### V12.5

##### A NEW TECHNIQUE OF FASCIOTOMY FOR ANTERIOR TIBIAL SYNDROME

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**Objective:** To evaluate the effectiveness of the additional incision of membrana interossea for the anterior tibial syndrome (ATS) due to acute limb ischemia.

**Methods:** Twenty-five patients with the final stage of the ATS were operated on. Both cardiac causes of embolism and prolonged time of ischemia (more than 6 h) were found in all cases. The common femoral (8) and popliteal (17) arteries were involved. In addition to embolectomy, routine fasciotomy and complete removing of necrotic muscles of anterior compartment, 11 patients (the main group) underwent a longitudinal incision of membrana interossea. The main goal of this technique was to improve the decompression of the deep posterior compartment. Comparative analysis of early results based on the time of restoration of sensor-motoric dysfunction, length of hospitalization, amputation rate and mortality.

**Results:** Blood flow was restored in all patients. There was no mortality in a main group. Amputation of the leg was performed secondarily in one patient because of persistent ischemia and uncontrolled local infection.

Two patients of control group died of renal failure. These patients developed rhabdomyolysis with myoglobinuria. Three secondary amputations were performed in this group, all resulting from irreversible necrosis of deep posterior compartment and profound ischemia. Patients without incision of membrana interossea had a significantly longer mean length of hospitalization,  $30.1 \pm 6.4$  days compared with  $22.3 \pm 5.7$ .

**Conclusions:** For patients with the final stage of the ATS, priority should be given to additional incision of membrana interossea. This technique could reduce the cost of caring for fasciotomy patients.

#### V12.6

##### THE RESULT OF LONG AND SHORT BYPASS GRAFT WITH AUTOGENOUS SAPHENOUS VEIN IN FIFTY CASES OF DIABETIC FOOT ULCER

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**Objective:** Diabetes is a worldwide disease. About 8-15% of them suffering from foot ulcer.

**Methods:** Prospective randomized study was planned on 50 patients. 25 underwent long bypass graft and 25 short bypass graft. Patency was followed regarding pedal pulses. Wound healing was also studied.

**Results:** Patency were 90%, 84%, 73%, respectively, at 1, 2 and 3 years. There were no differences regarding patency and wound healing rate ( $P < 0.001$ ).

**Conclusions:** Both techniques are effective and can each be elected according to angiographic findings and medical status of patients. Meanwhile I will introduce a new technique for reconstruction of heel skin defect.



## SCIENTIFIC SESSION V13 RESEARCH AND MISCELLANEOUS (2)

### V13.1

#### THE SURGICAL TREATMENT OF ARTERIAL ANEURYSMS IN BEHÇET'S DISEASE: A REPORT OF 18 PATIENTS

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**Objective:** The aim of this study is to report our experience in the surgical treatment of arterial aneurysms in patients with Behçet's disease.

**Methods:** From October 2001 through March 2005, 20 arterial aneurysms were diagnosed in 18 Behçet's patients. All patients were male. The patients ranged in age from 24 to 52 years, with the mean age being 37.4±5.2 years. There were eight abdominal aorta, three common femoral, two iliac, two popliteal, two superficial femoral, two anterior tibial and one subclavian artery aneurysms. All patients, except four, were in remission at the time of diagnosis. Those 4 patients received immunosuppressive therapy before the surgical intervention to induce remission. After hospital discharge, all patients were followed-up regularly at 3-month intervals. The mean duration of follow up was 17±4.2 months (range, 6 to 24 months).

**Results:** All patients underwent a successful surgical intervention. During the study period, we performed six aortic tube graft interpositions, three aortofemoral bypasses, one aortobifemoral bypass, three common femoral artery graft interpositions, two femoropopliteal bypasses. As an initial intervention two popliteal artery, two anterior tibial artery and one subclavian artery aneurysms were repaired. There was no in-hospital mortality. One patient with an abdominal aortic aneurysm had to be reoperated because of postoperative bleeding. Postoperative hospital stay was 8.5±4.3 days. Two patients were lost to follow-up. During the follow-up period, two false aneurysms of the common femoral artery were repaired with a graft interposition procedure. Another patient who had undergone an aortic tube graft interposition was readmitted 9 months later with an external iliac artery aneurysm. External iliac artery was ligated through a retroperitoneal approach and femorofemoral bypass was performed. In addition, one femoro-popliteal interposition graft was detected to be occluded without disabling ischemia.

**Conclusions:** Although aneurysmal disease is rare in Behçet's disease, it can complicate the clinical picture and cause life threatening complications. We believe that the establishment of remission before the surgical intervention decreases the incidence of postoperative complications. Since recurrence at the site of anastomosis is possible, prolonged monitoring is required.

### V13.2

#### MANAGEMENT OF CAROTID BODY PARAGANGLIOMAS

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**Objective:** Carotid body paragangliomas are rare highly vascular neoplasms and should be considered in the evaluation of all lateral neck masses. The purpose of this study is to review a single institution experience concerning the management of these tumors.

**Methods:** During a period of 15 years from 1990 to 2004 14 carotid paragangliomas have been detected in 13 patients. The medical records of these patients were retrospectively reviewed. One patient (7,7%) presented with bilateral disease. There were 8 men and 5 women with a median age of 41 years (range 25-65 years). The most common presenting symptom was a painless lateral neck mass. Diagnostic evaluation included in all patients triplex ultrasonography together with computed tomography or MRI of the neck region. All patients underwent digital subtraction angiography. In 11 cases (84,6%) preoperative embolization of the feeding arteries was performed successfully in order to reduce tumor vascularization.

**Results:** Thirteen tumors (92,9%) underwent surgical resection 48 h after embolization. One tumor (7,1%) that was initially diagnosed as jugular paraganglioma invading the skull base was treated with external beam irradiation with a dose of 4500 rads following tumor embolization resulting in symptomatic relief of the patient. Vascular reconstruction was necessary in one patient (7,7%). No stroke or death occurred during the early or late postoperative period. Seven patients (53,8%) experienced temporary

postoperative nerve deficits most commonly involving the hypoglossal nerve. In one case a permanent sympathetic chain deficit has occurred resulting in Horner's syndrome. All tumors had benign characteristics. There were 12 carotid body tumors (85,8%), one jugular bulb (7,1%) and one vagal (7,1%) paraganglioma.

**Conclusions:** Our experience indicates that combined approach in the management of carotid paragangliomas offers an acceptably safe and effective treatment option. Preoperative tumor embolization facilitates tumor resection. Adequate resection from an experienced vascular team is mandatory concerning the invading nature and the malignant potential of the lesion.

### V13.3

#### SURGERY OF CAROTID BODY TUMOR: 11 CASES IN 7 YEARS

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**Objective:** Unlike the occlusive and ulcerated atherosclerotic lesions of the cervical carotid arteries the carotid body tumors (CBT) are seen with a very low incidence, they are the most common type of paragangliomas in the neck. Early removal of this tumor decreases the morbidity and mortality. A total number of 900 cases have been reported in the literature. Since the localization of the aneurysm is at a site of various vascular and neural structures, the surgery of this pathology gains great importance.

**Methods:** During the period 1998-2005 we performed 11 cases of CBT among with the 723 carotid operations in our institution. The mean age of the patient was 34. Eight of the patients were female. All of the lesions were unilateral. The most common clinical features were painless mass at the angle of mandible. 4 patients had neck pain. No cranial nerve compression was determined. All of the patients were diagnosed with Doppler USG, Arteriography and Magnetic Resonance Arteriography. The mean tumor size was 3 × 2 × 2 mm. Resection was applied to all of the patients. No endoluminal shunt was used. No graft was used. In one patient primary suturing to common carotid artery (CCA) was performed due to vascular injury.

**Results:** There was no mortality. There was only one vascular injury to the CCA. There was one N. Hypoglossus injury. In one patient CBT was accompanied with papillary thyroideal carcinoma. There was no patient with central neurologic deficit at the postoperative period. In 1 of the patients, transient cranial nerve deficit occurred. The mean hospital stay time was 3 days. At the one year follow up no recurrence was determined.

**Conclusions:** Although the localization of the tumor is close to important nerves and vessels, surgery of the CBT can be safely performed with low mortality and morbidity rates with an attentive and patient dissection.

### V13.4

#### CONGENITAL ANGIODYSPLASIAS: DIFFERENT ASPECTS OF PROBLEM

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**Objective:** Surgical correction of congenital malformations still presents great difficulties.

**Methods:** During the recent two decades 128 patients with various forms of angiodyplasias were examined, and 107 of them operated. On the basis of clinical, Duplex US, angiographic, MRA, CT dates, 3 forms were distinguished: truncal (aplasia, hypoplasia, aneurysm, valve abnormalities), arteriovenous (A-V) and venous malformations. A-V forms diagnosed in 21 patients, truncal aneurysm in 12, mixed forms of venous malformations in 18, and venous cavernous haemangiomas in 56 patients. Combined treatment—mechanical or chemical embolisation and surgical resection—was applied in 31 patients, isolate excision, artery skeletalizations, resection of aneurysm in 74 patients, two girls underwent lumbar sympathectomy for femoral artery aplasia; 26 patients needed repeated surgical procedures.

**Results:** Complete resolution of symptoms and significant improvement was achieved in 84% of patients. Only 3 patients with A-V malformations needs limited amputation.

**Conclusions:** The small part of malformations can be managed and controlled medically after comprehensive investigation. Combined—embolisation and surgery—is an effective treatment not for A-V but cavernous venous malformation also.

## V13.5

## LOCAL LANDMARKS FOR THE THORACIC DUCT INJURY PREVENTION

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**Objective:** The goal of the study was to establish individual variability of the thoracic division of the thoracic duct topography and to fix local landmarks for the duct injury prevention while vascular surgeries are done inside thoracic cavity.

**Methods:** 243 corpses were investigated with a complex of update anatomical procedures. The injection of the duct, dissection, local & anthropometric measurements, photo and graphic reconstruction were included in a protocol. Also distances between the duct and nearby anatomical structures were measured.

**Results:** Two marginal forms of the duct topography variability were determined as a result of the study. The first form was common to the long & narrow thorax subjects. The duct in these cases was multi-barreled and right-sided at the lower & middle thoracic divisions. The upper thoracic part was single-barreled and middle-sided. The space between the internal borders of the aorta and azygos vein increased downwards. In these specimens the right third of the vertebral column width was concerned as a risk zone for the thoracic duct damage. The second form was described in cases with wide and short thorax. The thoracic duct was single-barreled and left-sided through all thoracic division. In these cases the left half of the vertebral column width was described as a risk zone for the chylothorax development. In all specimens the space between the duct and the right side of aorta was not more than 2 mm. The distance between mediastinal pleura varied from 2 to 25 mm. The interval between the duct and inferior cava vein differed within 34 - 45 mm. The same rate between the duct and the posterior esophagus wall varied from 7 to 18 mm. From lateral view landmarks for the zone of surgical risk at the middle thoracic part of the thoracic duct looked like rhomboid figure. From the right hand side the rhomb was boarded with the azygos vein arch - from above, pulmonary veins - from below, right principal bronchus from anterior side and 5th intercostal vein drainage point - from back side. From the left hand side the same figure was bordered with the aortic arch - from above, pulmonary veins - from below, left principal bronchus from anterior and descendens aorta anterior surface from back side.

**Conclusions:** The accepted data provide increase of safety while thoracic surgery is done and allow to predict the features of the thoracic duct topography for chylothorax prevention.

## V13.6

## SURGICAL MANAGEMENT OF DISSECTING ANEURYSM OF THE SUPERIOR MESENTERIC ARTERY

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**Objective:** Spontaneous dissection of the superior mesenteric artery is rare. Surgical treatment is indicated in case of chronic disabling abdominal pain or signs of intestinal ischaemia. We are reporting our experience of the surgical treatment of dissecting aneurysm of the superior mesenteric artery.

**Methods:** From January 2000 to June 2004 we operated 3 patients having an isolated dissecting aneurysm of the superior mesenteric artery (SMA). They were three men of 63, 58 and 56 years with history of smoking in the 3 cases and hypertension in 2 cases. They presented with 7 to 24-months history of abdominal pain.

**Results:** In 2 patients the pains were accompanied by signs of chronic intestinal ischaemia with weight loss and diarrhoea. CT scan and angiography

showed a dissecting aneurysm of the SMA. The intervention consisted of opening the aneurysm after control of all the jejunal branches which were born from the true channel. The false lumen was partially filled with thrombus. The true lumen was compressed by the false lumen. The intimal flap was resected. The arterial reconstruction was made with a mesenterico mesenteric bypass in 2 cases and with an aortomesenteric bypass in one case. An 8-mm ePTFE was used.

**Conclusions:** The postoperative course was uneventful. Control angiography showed the absence of abnormalities with no residual dissection or stenosis. Abdominal pains and signs of intestinal ischaemia resolved and the patients were free of symptoms at follow-up.

## V13.7

## INDEPENDENT PREDICTORS OF MORTALITY IN OPERATED PTS WITH MULTIFOCAL ATHEROSCLEROSIS

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**Objective:** Approximately 10% of people aged >55 years have asymptomatic peripheral atherosclerotic disease (PAD), 5% have intermittent claudication (IC, the cardinal symptom), and 1% critical leg ischemia (rest pain or gangrene). Potentially modifiable factors that predispose to the development and progression of both symptomatic and asymptomatic PAD include smoking, diabetes mellitus, hyperlipidemia, and hypertension. Since the same risk factors for PAD predispose to the development of systemic atherosclerosis, identification of PAD increases the likelihood of coexistent coronary heart (CHD) and cerebrovascular disease (CVD). To study the independent predictors of mortality in patients operated on legs and brachiocephalic arteries. Part retrospective, part prospective open study.

**Methods:** 87 consecutive patients with multifocal atherosclerosis undergoing different vascular reconstructions on low extremities and on brachiocephalic artery between 1980 and 1989 were studied. 41 were operated simultaneously, 21 pts operated by "stage tactic" previously on brachiocephalic arteries, 25 pts were operated previously on low extremities. Their medium at the time of first operation was 54 years (range 37-71 years). All pts were questioned on personal and family history of CHD, CVD, PAD, risk factors and symptoms. We performed physical examination, every patient underwent an ECG, EchoCG, angiographies recording. Blood sample was taken for plasma glucose, total cholesterol and lipoprotein assay. To verify the independent predictors of mortality, we use the Wilcoxon statistic Survival Variable, from SPSS for Windows (9 version). Cox proportional hazards models were used to assess the relation between a predicting factor and mortality after adjusting for age, sex, and prevalent cardiovascular disease.

**Results:** Follow-up was 98%. The 5 and 10 years mortality was 39% and 69% correspondingly. The cerebrovascular events were found in 16% and 24,8% for 5 and 10 year periods, 37,5% of them were lethal. MI was found in 11,5% and 23,24% correspondingly. Coronary heart disease was the leading cause of death and accounted for 47%, cerebrovascular incidents for 29% of all death. During follow-up, 11% of the patients needed amputation at a high level (7.07% were lethal).

By multivariate analysis we found 6 predictors of mortality in follow-up, as follows: ischemic heart disease ( $P = 0.024$ ), MI ( $P = 0.001$ ), critical leg ischemia ( $P < 0.001$ ), bifurcated carotid stenosis ( $P = 0.052$ ), occlusion of subclavian-vertebral segment ( $P = 0.023$ ), distal limb reconstruction ( $P = 0.013$ ).

**Conclusions:** Results of multivariable analysis demonstrated a statistically significant increase in the risk of death in persons with a CHD, severe PAD even after distal limb reconstruction and severe atherosclerotic damages of brachiocephalic arteries.

## SCIENTIFIC SESSION V14 MINI POSTER PRESENTATION (2)

### V14.1

#### PREVIOUS LONG SAPHENOUS VARICOSE VEIN SURGERY AND INFRAINGUINAL ARTERIAL BYPASS

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**Objective:** Previous long saphenous vein (LSV) surgery for varicose veins is often regarded as a reason to seek an alternative source of conduit for infrainguinal bypass. However, despite such prior operation, suitable LSV conduit may remain usable as an arterial graft.

**Methods:** A review was undertaken over an 8-month period (December 2001 to July 2002) of venous duplex scans from consecutive patients with a past history of LSV operation.

**Results:** The study comprised 112 patients (37 men and 75 women) of median (range) age 56 (21-79) years. All patients had undergone at least one episode of previous groin dissection and 155 limbs met the criteria for entry to the duplex assessment protocol. Of these 155 limbs, 91 (59%) had a patent but incompetent LSV running from groin level distally, and a further 10 (6%) had a vein running from mid-thigh distally. No saphenofemoral communication was noted in 44 of the 155 limbs, but in 17 (39%) of these 44 there was a patent residual LSV vein running distally from at least mid-thigh level.

**Conclusions:** A history of previous LSV surgery does not exclude the existence of a suitable LSV (or portion thereof) for future infrainguinal bypass. Patients with a history of varicose vein operation should undergo venous duplex before alternative conduits are considered.

### V14.2

#### EFFICACY OF PREOPERATIVE COMPUTED TOMOGRAPHY ANGIOGRAPHY IN THE DIAGNOSIS OF CAROTID STENOSIS

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**Objective:** In carotid surgery computed tomography vascular imaging has been the first choice for the last decade to evaluate significant stenosis because of its minimal invasivity compared to conventional DSA. Nevertheless, its efficacy in the measurement of carotid stenosis is controversial, and subjective factors are involved in the diagnosis. The aim of this study is to compare the preoperative value of carotid stenosis based on three dimensional CTA scan and the real degree of stenosis measured on biopsy slices of the removed intimal cylinder.

**Methods:** Thirty consecutive carotid intimal specimens were sent to pathological examination. Fixation, embedding and slices were made, and the maximal stenosis was measured and calculated digitally (diameter and area stenosis). Results were compared to preoperative CTA scan values as well as to duplex ultrasound findings. Special attention was paid to those cases where calcification was present.

**Results:** The preoperative CTA and the pathologic finding were equivocal in 26 cases (86%). In three cases (10%) CTA underestimated the degree of stenosis more than 10%; all of them were high calcified plaques. One case was underestimated by 20% which was due to a technical problem.

**Conclusions:** The efficacy and predictivity makes CTA highly useful and valuable in carotid surgery. In addition its complication rate is much lesser than conventional DSA.

### V14.3

#### PROSTHETIC ARTERIOVENOUS GRAFT IN DISTAL THIGH

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**Objective:** Lower extremity is considered to be an access of "last resort" for dialysis because of high frequency of complication. The groin and the upper thigh are the frequent implanted sites, but they still expose the risk of infection. This report describes our limited experience constructing a prosthetic arterio-venous graft (PAVG) in the distal thigh.

**Methods:** From August 2002, we had constructed 10 distal thigh loop PAVGs in nine patients. In all patients, upper extremity access had been exhausted. The vessels, distal superficial femoral artery and vein, were dissected out in the medial aspect of lower thigh. The graft was placed with the tunneler

device and the loop was located in the lower half of the thigh. The anastomoses were done with 7-0 PTFE suture. No drain was necessary in all cases. The PAVGs were routinely used 3 weeks postoperatively.

**Results:** There were no major graft-related complications during the follow-up period, and the patients were satisfied with the grafts.

**Conclusions:** Distal thigh PAVGs provide satisfactory short-term vascular access for hemodialysis. Use of this modification may provide longer patency rate, reduce the risk of infection, and have the great advantage of easier accessibility for self-cannulation. And if the graft failed and was abandoned, we could construct a second graft easily with more proximal vessel.

### V14.4

#### THE REPLACEMENT OF INJURED INFERIOR VENA CAVA WITH A DACRON VASCULAR GRAFT

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**Objective:** Inferior vena cava (IVC) injuries are potentially devastating insults that continue to be associated with high mortality, despite advances in prehospital and in-hospital critical care. In the present study, we report the use of a dacron-graft to manage a traumatic rupture of the infrarenal inferior vena cava (IVC).

**Methods:** A 21-year-old male patient was admitted to our hospital with findings of haemodynamic shock following a severe abdominal trauma. An intense resuscitation process was started with intravenous colloidal fluids and several units of whole blood infusion. Blood biochemistry showed a very low level of hemoglobin (7.5 g/dl), increased liver enzymes and urea, and a severe electrolyte imbalance. The patient underwent explorative laparotomy without any delay. Intraabdominal free blood and a huge retroperitoneal hematoma was seen to be developed from a rupture of the infrarenal IVC. IVC was seen to be lacerated from the distal point of right vena renalis to the proximal site of right vena iliaca interna. Proximal and distal sides of IVC were occluded by help of vascular clamps. A self-expanding fenestrated stent-graft, 12 cm in length, was implanted using an interrupted suture technique with 6/0 prolene.

**Results:** The emergent procedure was successful in repairing the IVC injury and maintaining hepatic venous return. The patient was monitored in the Intensive Care Unit. Hemoglobin level increased to an acceptable level (11 g/dl). The postoperative course of the patient was good. He continues in good health with a patent endograft 32 months after treatment.

**Conclusions:** This experience supports the efficacy of fenestrated endograft implantation for emergent repair of IVC injuries, with an experienced surgical and anesthesia team, in the availability of such synthetic devices.

### V14.5

#### SURGICAL MANAGEMENT OF GASTRODUODENAL ARTERY ANEURYSMS WITH CONCOMITANT CELIAC ARTERY STENOSIS

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**Objective:** True aneurysms of the gastroduodenal artery (GDA) are the rarest of all splanchnic artery aneurysms. They account for only 3,5% of the more than 3000 splanchnic aneurysms reported up to date.

**Methods:** From March 2002 to January 2005 4 patients (M/F - 2/2) were referred to our Department with concomitant occlusion of the celiac trunk and aneurysmal formations involving the gastroduodenal artery. All patients underwent spiral CT and angiographic reviews as a preliminary assessment for intervention. One patient underwent aneurysm embolization which was incomplete because of supplying collateral vasculature. A 9 month CT review showed confirmed incomplete thrombosis and he was scheduled for surgery. The remaining 3 patients were primarily qualified for surgery because of aneurysm anatomy. Surgery in all cases consisted of aneurysmectomy together with by-pass grafting using a harvested saphenous vein from the left renal artery to either the hepatic or gastroduodenal artery. In the patient with multiple GDA aneurysms a saphenous vein conduit was anastomosed between the proximal GDA stump and the distal GDA.

**Results:** All patients performed well after surgery. Control CT assessment revealed complete graft patency and no clinical manifestations of visceral ischemia were noted.

Conclusions: Although embolization is the method of choice in the treatment of visceral aneurysms, surgical treatment still remains a viable option when endovascular methods are not applicable.

#### V14.6

##### POSTTRAUMATIC HIGH FLOW PRIAPISM: DIAGNOSTIC APPROACH AND MANAGEMENT BY SUPERSELECTIVE MICROCOIL EMBOLIZATION

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Objective: To present image findings on ultrasound (US) and digital subtraction angiography (DSA) of posttraumatic high flow priapism and evaluate the safety and effectiveness of superselective embolization as a treatment choice. Methods: Two male patients who sustained straddle injuries and demonstrate painless partial erection are presented. On US a well circumscribed hypoechoic lesion with arterial Doppler waveforms at the left base of the penis was revealed in both patients. Traumatic pseudoaneurysm and arteriosinusoidal fistula was suspected. DSA demonstrated the presence of a pseudoaneurysm arising from the ruptured left cavernosal artery. Two helical 2-3 mm, 0,018 inch platinum microcoils were delivered to the origin of the ruptured artery via a microcatheter leading to total occlusion of the aneurysmal sac.

Results: The penis returned to flaccid condition within 24 h in both patients. Both patients refer normal erectile function since then having no additional treatment. On ultrasound follow-up at 3 and 6 months obliteration of the aneurysmal hypoechoic lesion was observed.

Conclusions: A well circumscribed hypoechoic lesion with arterial Doppler waveforms on US and the presence of a pseudoaneurysm on DSA are highly suggestive of high flow priapism. Superselective microcoil embolization of the ruptured cavernosal artery is an effective and safe therapeutic procedure.

#### V14.7

##### HYPOPLASIA OF COMMON AND INTERNAL CAROTID ARTERIES. A CASE REPORT

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Abstract not available

#### V14.8

##### EARLY AND LATE RESULTS OF ENDOVASCULAR THERAPY VS. ENDARTERECTOMY IN SYMPTOMATIC STENOSIS OF THE INTERNAL CAROTID ARTERY: A COMPARATIVE STUDY

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Abstract not available

#### V14.9

##### IATROGENIC FEMORAL ARTERIO-VEIN FISTULA AND PSEUDOANEURYSM FOLLOWING CATHETER INSERTION FOR HEMODIALYSIS

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Objective: Central venous catheterization saves lives but can cause undesirable complications. Very rare complications include the simultaneous formation of a pseudoaneurysm and arteriovenous fistula after catheterization. Methods: Insertion of a double-lumen catheter into the left femoral vein was planned for a 68-year-old female patient with renal disease who required emergency dialysis. A swelling on the left thigh appeared 3 days after the femoral artery had been mistakenly punctured during the procedure. A 4 cm diameter pseudoaneurysm, which is wide and restricted the left thigh, and an arteriovenous fistula between the femoral artery and vein, were detected by ultrasound and magnetic resonance angiography.

Results: The surgical hematoma was drained and the arteriovenous fistula and pseudoaneurysm were repaired.

Conclusions: Inadequate compression following arterial puncture may frequently result in a hematoma or the formation of a pseudoaneurysm. Simultaneous puncturing of artery and vein may cause an arteriovenous

fistula. In these conditions, magnetic resonance angiography has high diagnostic value. Traditional treatments of both complications are surgery, local compression with or without ultrasound, and injection of thrombin into the pseudoaneurysm. Stented graft insertion has been used to treat both sorts of lesions in recent years. However, because in our case the lesions formed simultaneously in the bifurcation of the common femoral artery, we could not perform a stented graft insertion.

#### V14.10

##### EXAMINATION OF ACUTE ARTERIAL THROMBOSIS

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Objective: The acute arterial occlusion is divided into thrombosis and embolism. Thrombosis gives a made poor limb salvage ratio and prognosis compared with embolism. Therefore, quick evaluation and medical treatment of thrombosis is required. Since we experienced two acute arterial thrombosis whose anti-thrombosis dissolution treatment by the arterial tube detention experienced in the past one year by the department of this was useful, we add and report some reference-consideration this time.

Methods: The thrombosis at leg artery which was experienced from April 2003 to March 2004. Carrying out an arterial tube in continuous Urokinase 60000 unit/day, Prostaglandin 20 µg/day on three days, enforcing the time from development of symptoms to blood circulation resumption, and before an operation postoperative complications, the degree classification of serious illness (SVS/ISCVS classification), a way type, and a leg of the existence of cutting, the hospitalization period, etc.

Results: Age is an average of 70.1 years old, one man, one woman, and before an operation one ASO and one Hypertension were recognized as complications. The time from development of symptoms to blood circulation resumption was an average of 12 h, and was one Class I and Class IIa in the SVS/ISCVS classification. Operation time is an average of 74 min, and the way type detained thrombectomy and the arterial tube in all examples. There was no case in which it resulted in cutting. The average hospitalization period was 10.5 days. To be useful was considered with the anti-thrombus dissolution treatment by arterial tube detention seeing the result of postoperative imaging by the side secondary blood circulation increase student, and it was thought that it also became improvement in limb salvage ratio.

Conclusions: Two leg acute arterial thrombosis experienced in the past one year was experienced, and some reference-consideration was added and reported. 2. By thrombosis, limb salvage ratio and the prognosis were considered that are poor and the thrombosis dissolution treatment by arterial tube detention is useful among acute arterial occlusion.

Examination of four acute arterial thrombosis whose thrombus dissolution treatment by arterial catheter was effective.

#### V14.11

##### SHOULD WE THINK ONCE AGAIN BEFORE DECIDING ON AMPUTATION IN PERIPHERAL ARTERY DISEASE?

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Objective: To emphasize the role and importance of distal bypass surgery in saving the extremity in patients with critical leg ischemia who are considered inoperable angiographically.

Methods: A total of 20 patients who had bypass surgery at infrapopliteal region in order to save the extremity at Department of Cardiovascular Surgery, GATA Haydarpaşa Research and Training Hospital between 2000 and 2005 were included in this study. Patients had stage IV disease according to Fontain classification and the run-off of distal arterial segments was less than 7 cm angiographically. Doppler ultrasonography and angiography were used to evaluate the long-term outcomes following surgery.

Results: Color Doppler ultrasonography, angiography and physical examination were used to assess the patency of the grafts and the status of the extremity. The patients were followed for an average of 27.3±14.7 months (1-60), and the cumulative percentages of graft patency and extremity salvage were 30% and 40%, respectively.

Conclusions: Although extremity salvage surgery is increasingly used, the number of patients who have Fontain 3-4 disease and therefore considered inoperable (i.e., presence of cut-off angiographically) is also increasing. In extremity

salvage surgery, time is a very crucial factor, and patient may lose his last chance in case of rapidly progressing necrobiosis, necrosis, and gangrene. We believe that a quickly performed distal arterial exploration will not only give no harm to the patient, but also provide an opportunity to save the limb.

#### V14.12

##### SEQUENTIAL PROFUNDA BYPASS: DIRECT REVASCLARIZATION OF PROFUNDA FEMORAL ARTERY AND EFFECTIVENESS IN LIMB SALVAGE IN SEVERE PERIPHERAL LIMB ISCHEMIA

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**Objective:** To assess the effectiveness and short-term results of aorto(ilio)-deep femoral-popliteal sequential revascularization in patients with severe lower limb ischemia.

**Methods:** Sequential revascularization procedure applied to 21 extremities in 15 patients with severe lower extremity ischemia who have occlusion in superficial femoral artery, unsuitable common femoral for revascularization or who are to be operated second time. Patients are investigated for diabetes mellitus, hypertension, coronary artery disease, atrial fibrillation, hypercholesterolemia and smoking risk factors. All patients evaluated with physical examination and flow pattern via hand Doppler. Color Doppler ultrasound or digital subtraction angiography is performed if necessary. Short and mid term results are evaluated by improvement in clinical symptoms and walking distance.

**Results:** Of 15 patients, 1 was female and 14 were male. Ages were between 41-71 and mean age was 58±7.5. In 9 patients single and in 6 patients bilateral revascularization performed. Follow up periods were between 9-76 weeks and mean period was 32±11 weeks. Three patients have had operation because of peripheral arterial disease. Three patients died because of non-operative causes in the early postoperative period. In the postoperative period in one patient single, in one patient bilateral amputation became obligatory because of distal emboli and insufficiency of the distal vascular bed. In the follow-up period all patients have significant improvement in clinical status and no reoperation is needed.

**Conclusions:** Sequential profunda-popliteal bypass is an alternative method in patients who had superficial femoral artery occlusion and unsuitable common femoral artery for revascularization procedure.

#### V14.13

##### RADIAL ARTERY TRANSPOSITION FOR DIFFICULT ARTERIOVENOUS ACCESS

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**Objective:** Chronic hemodialysis patients undergo multiple arteriovenous fistula attempts. We developed a new technique of radial artery transposition for hemodialysis access.

**Methods:** Six patients (4 female, 2 male), both forearm superficial veins are nonavailable due to previous arteriovenous fistula operations and with ulnar artery dominance and palmar arcus continuity, were operated. Radial artery was released in 2/3 distal to forearm. After venous exploration in antecubital region, radial artery was divided. Arteriovenous fistula anastomosis was done in elbow level with superficialization and looped transposition of radial artery.

**Results:** Anastomoses were done to basilic vein ( $n = 3$ ), and to concomitant vein of brachial artery ( $n = 3$ ). No hand ischemia was seen. Hemodialysis was able to apply after mean 73 days (range, 21-150 days). All fistula are patent in mean 10,5 months (range, 1,3 - 26,7 months).

**Conclusions:** Basilic vein transposition is the most common autogenous solution for hemodialysis access if the superficial veins of upper extremity are exhausted. Radial transposition in the forearm can be an autogenous fistula alternative easier to cannulate and more convenient for patients. Although fistula maturation period is longer, patency rate is high. The risk of hand ischemia is critical issue in patient selection.

#### V14.14

##### COMPARING THE SAPHENOUS VEIN LOOP FISTULA WITH THE GOR-TEX BRIDGE FISTULA IN THIGH FOR CHRONIC HEMODIALYSIS

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**Objective:** Performing chronic hemodialysis in patients suffering from end stage renal disease needs a suitable vascular access like A-V fistula in upper limbs, bridge fistula in upper or lower limbs, and use of permanent and temporary catheters.

The purpose of this study was to compare the saphenous vein loop fistula as a venous autograft versus using the synthetic GOR-TEX vascular graft for creating loop A-V fistula in the thigh for hemodialysis. Using an autologous vein instead of costly synthetic materials and technical feasibility because of one vascular anastomosis in lieu of two in the other method, are the features of our proposed method.

**Methods:** This was a single blind randomized matched controlled clinical trial. Sixty patients who needed a bridge fistula for dialysis access were randomly divided into two groups after making the two groups alike for the underlying diseases; diabetes mellitus and hypertension. We performed the loop saphenous A-V fistula in the test group and the GOR-TEX loop bridge fistula in the control group. Then we assessed the function criteria (fistula thrill and murmur) and complications in planned intervals. At the end of a year of follow up the flow rate of all fistula were assessed by means of Doppler sonography. These data were then compared with each other.

**Results:** The function criteria of the loop saphenous A-V fistula and the GOR-TEX method shows no significant differences ( $P < 0.8$ ). Also thrombosis of the fistula shows no significant difference between the two groups ( $P < 0.8$ ). The infection rate of the Gortex method was significantly high ( $P < 0.05$ ) but shows no significant difference with the saphenous method ( $P < 0.8$ ). The flow rate of the fistulae shows no significant difference in two groups ( $P < 0.8$ ).

**Conclusions:** High loop A-V fistula provides a satisfactory vascular access for hemodialysis with similar function criteria and lower infection rate in comparison with GOR-TEX loop A-V bridge fistula in thigh. Concerning the cost and facility of its use, thigh saphenous loop A-V fistula can be a good substitute for the routine use of synthetic grafts in dialysis access surgery.

#### V14.15

##### OUR SURGICAL TREATMENT RESULTS IN THE AORTOILIOFEMORAL OCCLUSIVE DISEASE: MIDDLE-TERM FOLLOWING AND EXAMINATION IN A SERIES OF 108 PATIENTS

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**Objective:** In this study, we aimed to evaluate our retrospective surgical treatment results in the aortoiliofemoral occlusive disease.

**Methods:** Between March 2001 and December 2004, 108 elective patients were operated in our clinic owing to aortoiliofemoral occlusive disease. There were 104 men and 4 women. The mean age of the patients was 60.4 years (range, 36 to 80 years). All patients were evaluated with history and physical examination of the patients, Doppler ultrasound examination of the carotid and lower extremity arteries, coronary angiography, and aortoiliac and lower extremity arteriography.

**Results:** The comorbid diseases and risk factors are smoking (88.8%), coronary artery disease (55.5%), hypertension (25%), hypertipidemia (12.9%), diabetes mellitus (11%), and chronic obstructive pulmonary disease (11%). A total of 26 patients (24%) underwent coronary artery bypass grafting (CABG) ( $n = 20$ ; 18.5%) or percutaneous transluminal coronary angioplasty (PTCA) ( $n = 6$ ; 5.5%) before surgical treatment of the aortoiliofemoral occlusive disease. Fifty-four (50%) patients underwent aortobifemoral bypass graft, 31 patients (28.7%) aortofemoral bypass graft, 14 patients (12.9%) iliofemoral bypass graft, 6 patients (5.5%) extraanatomic bypass graft, and 2 patients (1.8%) aortobiliac bypass graft. Seventeen (15.7%) patients also had simultaneous femoropopliteal bypass graft. Mean follow-up was 18.6 months (range, 1 to 45 months). In follow-up two patients developed graft thrombosis. One patient developed graft infection. One patient died peroperatively. Unless contraindicated after operation, all patients were given a warfarine sodium. The overall mortality rate was 2.7%. Overall patency and limb salvage rates were 98.2%.

Conclusions: Surgical reconstruction in the aortoiliac femoral occlusive disease is a safe method with good middle-term results in patency and limb salvage rates and has low risk in the good selected patients.

#### V14.16

##### RUPTURED BILATERAL ATHEROSCLEROTIC ANEURYSM OF THE AXILLARY ARTERY

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Objective: Axillary arterial aneurysms are so rare. Unless there are ischemic symptoms due to rupture or thromboembolic complications they are asymptomatic. We report a case of ruptured bilateral axillary artery aneurysm that we operated on in our clinic.

Methods: 74-year old male patient was admitted to our clinic for enlarging left axillary mass. Ruptured axillary artery aneurysm was determined with emergent upper extremity selective arteriography. The patient had been operated on 3 years ago due to ruptured axillary artery aneurysm located in other extremity. The patient was operated emergently. Infraclavicular and deltopectoral incision was used for aneurysm resection. We performed aneurysmectomy and polytetrafluoroethylene graft interpositioning.

Results: We did not observe any vascular problems. In follow-up period, the graft patency was 100%. Bilateral upper extremity paralysis due to brachial plexus pressure before the surgery did not resolve in the postoperative period. He was referred to a physical rehabilitation program. The histopathologic examination of the resected aneurysms section revealed atherosclerotic and degenerative changes.

Conclusions: Axillary artery aneurysms can lead to losses of extremities and thromboembolic complications. For this reason, their operative treatments should not be further delayed.

#### V14.17

##### AESTHETIC ASPECTS OF THE SURGICAL TREATMENT OF THE VARICOSE SYNDROME - OUR EXPERIENCES AND GUIDE

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Objective: The authors emphasize the importance of some technical details during the preoperative and postoperative periods as well as surgical techniques which may improve the aesthetic and functional results of the operation.

Methods: Over a period of 25 years, 2014 patients (1312 women and 702 men) at the Clinic for vascular and transplant surgery in Novi Sad have been operated for varicose syndrome. During a 5 year observation period the recurrency rate was 2.5%.

Results: During a 5 year observation period the recurrency rate was 2.5%. Aesthetic and functional results of the operation are excellent.

Conclusions: The importance of an early diagnosis and adequate diagnostic methods, indications for surgery and the techniques of some surgical operations have been studied. A combination of medicamentous, surgical treatments and sclerotherapy yield the best results. Stripping is the method of choice as it provides the best long-term results with minimum of recurrences. Partial extirpation did not yield good results. Recurrency of varicosities of the leg after surgical treatment still poses a serious aesthetic problem. Through radical surgery the number of recurrences is reduced to acceptable proportions. Sclerosing therapy is indicated only as an addition to the surgical treatment, as complement therapy.

#### V14.18

##### DOES RADIO-CEPHALIC ARTERIO-VEIN FISTULA EVOKE ASYMPTOMATIC STEAL SYNDROME? LASER DOPPLER FLOWMETRY STUDY

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Objective: The aim of this study was to assess the skin microcirculation in the aspect of steal syndrome, in patients with radio-cephalic arterio-venous fistula for hemodialysis.

Methods: The subjects were 25 patients with chronic renal insufficiency, hemodialysed via radio-cephalic arterio-venous fistula. None of the patients revealed any clinical symptoms of steal syndrome. Fistulas were performed in end to side fashion. Laser Doppler flowmetry was applied to monitor skin resting perfusion, vasomotion and temperature. Skin blood flow, skin temperature and vasomotion were recorded in four sites: proximally to the fistula—on the medial side of the arm and distally—on the dorsal surface of the hand. The same sites on the contralateral extremity served as the control. Obtained results were converted to the percentage format and evaluated for statistical significance with *t*-paired Student test ( $P < 0,05$ ). The amplitude of vasomotion was established by means of spectral analysis of recorded signal.

Results: Skin blood flow, skin temperature, and vasomotion amplitude were statistically higher on the extremity with arterio-venous fistula in comparison to the control one. The highest values were observed on the dorsal surface of the hand, below the fistula. Observed in the study side to side differences can be explained by the hemodynamic influence of the fistula on the limb's microcirculation. It is suggested that the arterio-venous fistula may evoke the steal syndrome, clinically asymptomatic at onset, however present on the level of microcirculation. Increased skin blood flow, presumably in the mechanism of maximal vasodilatation, seems to be an adaptive reaction preventing peripheral ischaemia. Intensification of the amplitude of vasomotion is often a reported reaction of microcirculation to ischaemic conditions. Formation of collateral circulation-phenomenon well known in the symptomatic steal syndrome, could also contribute to higher perfusion.

Conclusions: The results of the study show that even radio-cephalic arterio-venous fistula significantly influences blood flow in peripheral microcirculation and the pathomechanism of steal syndrome should be investigated also in the aspect of microcirculation. Routine administration of vasodilators might be considered to prevent the occurrence of symptomatic steal syndrome especially in case of upper arm fistulas where the frequency of this complication is definitely higher.

#### V14.19

##### BILATERAL VENOUS THROMBOSIS AND LYMPHEDEMA IN UPPER EXTREMITIES OF THE PATIENT WITH LUNG CANCER

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Objective: Although upper limb lymphedema or deep vein thrombosis after chemotherapy or radiotherapy is seen frequently in patients with lung cancer, they are rarely seen together.

Methods: We examined the 58-year-old male patient with lung cancer suffering from swelling of neck, chest and upper extremity after chemotherapy and radiotherapy. In examination, the increasing edema in both arms and venous collaterals on the chest and shoulders were found. Deep vein thrombosis in both subclavian veins is determined in venous Doppler ultrasound. No involvement of radiopharmaceutical agent shown at proximal to wrists in lymphoscintigram of bilateral upper limbs. This image is harmonious to bilateral upper extremities lymphedema.

Results: The patient was conservatively treated and supported.

Conclusions: The existence of the lymphedema in the progression of lung cancer is rare. After the chemotherapy, lymphedema is generally not encountered. However, lymphedema is frequently seen in the portion of body exposed to the radiotherapy. Due to the tumoral compression, large catheters for chemotherapy, and radiotherapy cures or combination of each ones, venous thrombosis and lymphedema was developed in upper extremities of our patient. Both of the pathologies at the same time is rarely seen in lung cancer progression. In diagnosis or differential diagnosis of lymphedema, lymphoscintigram is an easy, rapid and cost-effective method to use.

#### V14.20

##### BRACHIO-BRACHIALIS ARTERIO-VEIN FISTULA FOR HEMODIALYSIS. REPORT OF 2 CASES

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Objective: Anterotransposition of basilic vein and formation of brachio-basilic arterio-venous fistula is usually considered as the last option for the native vascular access for hemodialysis on the upper extremity. We present 2 cases of anterotransposition of brachial vein and creation of brachio-

brachial arterio-venous fistula as the last option before forearm/upper arm graft placement.

**Methods:** Two patients with chronic renal insufficiency were admitted for the creation of vascular access for hemodialysis. Patients were temporarily dialysed via subclavian catheters. In both cases physical examination, confirmed by ultrasonography, revealed the lack of suitable cephalic and basilic veins on the forearms and upper arms. Precise color Doppler ultrasound examination showed brachial artery with appropriate diameter and wide 2 brachial veins running parallel and joining into one axillary vein in the axillary fossa. Due to the presence of the right subclavian catheters an attempt was made to utilize one of left brachial veins for the vascular access. Surgery was performed in 2 stages. Brachial artery and 2 brachial veins were exposed in the area of cubital fossa. One of the brachial veins was dissected and mobilized. Distal part of the vein was ligated and transected and proximal part of the vein was anastomosed to brachial artery end to side with continuous Prolene 6/0 suture. The fistulas were left for 4 weeks to mature with the brachial vein in its anatomical location. Then, the second stage of operation was performed. The entire length of brachial vein was exposed and mobilized via one longitudinal incision from cubital fossa up to armpit. The vein was transposed anteriorly under the skin and secured in its new location by a few subcutaneous stiches. Palapable thrill and the presence of good bruit confirmed the functionality of vascular access.

**Results:** The fistulas were started to be needled in 10 days after the removal of stiches and resolution of local oedema and subtle subcutaneous haematoma. Control ultrasound performed in first patient 5 months after surgery showed good flow (800 ml/min) and good arterialization of the anterotransposed brachial vein. At present, 12 months after procedure, venous pressures are within accepted ranges and dialysis parameters are adequate. In the second patient only early results are available, which are satisfactory too.

**Conclusions:** Our case reports show that brachial vein can be considered as the last option for creation of native vascular access on the upper arm before synthetic graft placement.

#### V14.21

##### ACUTE ILIAC ARTERY RUPTURE—ENDOVASCULAR TREATMENT

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**Objective:** To evaluate the efficacy and safety of endovascular stent grafting for emergency treatment of acute rupture of iliac arteries.

**Methods:** We present six patients who were administered to our department for iliac artery rupture over a 2-year period. In five patients the rupture was iatrogenic. Four were secondary to balloon angioplasty of iliac artery stenosis and one occurred during coronary angioplasty. In the last patient the rupture was secondary to iliac artery mycotic aneurysm.

Direct placement of a stent-graft was performed in all cases, which was dilated until extravasation was controlled. Four balloon expandable stent grafts (Jomed) and two self expandable (Gore-Hemobahn) were used.

**Results:** Placement of stent graft was successful in all the cases without any complications. Immediately following administration, control Digital Subtraction Angiography (DSA) was performed which confirmed the absence of leakage from the ruptured artery and the obliteration of the aneurysm. Patient recovery was uneventful. The patients had no complaints and during follow up with ultrasound and DSA at 1, 6 and 12 months stent grafts were patent and no extravasation or significant restenosis of the affected vessel was shown.

**Conclusions:** Endovascular placement of stent-graft is a quick, less invasive, efficient and safe method for emergency treatment of acute iliac artery rupture, with satisfactory short and mid term results.

#### V14.22

##### ENDOVASCULAR APPROACH AS A SAFE SECONDARY AORTIC PROCEDURE FOR PARAASTOMOTIC ANEURYSM

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**Objective:** Conventional open surgery of abdominal aortic aneurysm remains the gold standard. Failure of standard repair occurs most commonly as a result of paraanastomotic aneurysm formation. The occurrence rate lies between 3% early after the operation and 13.3% in series with longer follow-up. Open surgery of this complication is still associated with increased morbidity and mortality rates. After encouraging results with endovascular aortic repair (EVAR) for abdominal aortic aneurysm we extended this treatment to the high-risk patients with paraanastomotic aneurysm.

**Methods:** From January 2000 to December 2004, 6 pts with a history of previous conventional aortic surgery, developed a new paraanastomotic aneurysm (pseudoaneurysm): at the proximal site of an infrarenal aorto-aortic graft in four and at the distal site in two. The stent-graft was delivered in the catheterization laboratory under epidural anesthesia with induced hypotension and heparinization through the femoral or iliac artery. Subsequent aortography confirmed the adequacy of treatment. For all pts the endovascular device was a self expandable endoprosthesis consisting of circumferential nitinol stent springs covered with a Dacron fabric (Talent - Medtronic AVE, Santa Rosa, CA).

**Results:** Four patients received a bifurcated endoprosthesis, and the other two had an aorto-uniliac stent graft followed by a femoro-femoral crossover prosthetic bypass. There were no major complications or death or surgical conversion. ICU stay and LOS were 14.0±3.0 h and 5.0±0.9 days, respectively.

**Conclusions:** Surgical treatment requires re-laparotomy, dissection of the abdominal aorta in the scarred retroperitoneum and suprarenal aortic clamping. Mortality rates for elective surgical treatment of paraanastomotic aneurysm are relatively high also in asymptomatic patients ranging from 3% to 17%, while mortality rates for ruptured is very high ranging from 24% to 70% with a morbidity ranging from 70% to 83%. Our experience confirms that EVAR is less-invasive and safer alternative technique aimed at excluding from blood flow perianastomotic pseudoaneurysms of the abdominal aorta, making possible to treat patients considered unsuitable for conventional surgery.

#### V14.23

##### MAY TUNNELED HEMODIALYSIS CATHETERS BE INSERTED UTILIZING EXISTING SUBCUTANEOUS TRACTS AFTER INADVERTENT ACCESS LOSS?

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**Objective:** To assess the efficacy and safety of insertion of a tunneled hemodialysis catheter using a previously used puncture site and an existing subcutaneous tract after inadvertent catheter removal.

**Methods:** Study on 11 patients that presented for long-term tunneled catheter for hemodialysis insertion during a 2-year period. The time from catheter removal to catheter reinsertion varied from 18 h to 7 days. All catheters were in jugular position and were surgically placed. The new catheter was reinserted using a hydrophilic guidewire.

**Results:** Successful reinsertion was achieved in 9 cases (81.82%). All nine catheters had normal function and no catheter related infections occurred. In the two cases where success was not obtained the venous puncture site could not be crossed. These cases occurred at 5 and 7 days after initial catheter removal.

**Conclusions:** 1. The same venous puncture site may be used for tunneled hemodialysis catheter insertion after inadvertent loss of such a catheter.

2. Time from catheter removal to reinsertion is critical for success.

#### V14.24

##### TRAUMATIC RUPTURE OF FEMORAL VEIN

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**Objective:** Traumatic vascular injury is rare. Only one case of traumatic rupture of external iliac vein has been reported. We report a case of traumatic rupture of femoral vein without any injury to femoral artery or nerve.

**Methods:** 8 year old boy presented to Accident and Emergency following a fall from his bike during which he sustained injury to his left groin from the handle bar of his bike. He was tachycardic, pale, blood pressure was unrecordable and GCS was 6/15. He was intubated and ventilated and on examination had a palpable swelling in his left groin with a 2 cm/2 cm wound. He was resuscitated with 8.4 l of crystalloid fluid and 4 units of blood. He was rushed to theatre. On exploration of his groin wound the femoral vein was found to be totally severed below the saphenofemoral junction without

any injury to femoral artery and nerve. We ligated the proximal and distal ends of the femoral vein, debridement and closure of the wound and the patient was transferred to a Paediatrics Intensive Care Unit for further care. He was managed conservatively and follow-up Doppler was satisfactory. He had developed pre renal failure which was managed successfully with fluid resuscitation and dialysis.

**Results:** Traumatic injury of femoral vein without any other injury is rare. Ram SP and co workers had reported a case of traumatic rupture of left iliac vein following insertion of central line through the femoral vein which was managed conservatively. Gad D and colleagues reported a case of spontaneous rupture of left iliac vein which was repaired. If the femoral vein is ligated below the saphenofemoral junction venous blood can be drained via the long and short saphenous vein and the profunda femoris vein.

**Conclusions:** Rupture of femoral vein should be considered when any person has trauma to groin and if the injury is below the saphenofemoral junction it can be safely managed by ligating the ends of the vein.

#### V14.25

##### THE CONCOMITANCE OF VARICOCELE AND VENOUS INSUFFICIENCY IN YOUNG MALES

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**Objective:** Venous disorders such as varicose veins and venous insufficiency (VI) are of the most commonly reported chronic diseases and a significant source of morbidity in the world. Although the incidence of varicocele in the general male population is about 15%, it is implicated as a factor responsible for infertility in about one third of infertile males. The aim of this article is to evaluate the concomitance of varicose veins and varicocele in male patient group.

**Methods:** This study was conducted as multi centered in cardiovascular outpatient clinics of two major military hospitals. The data of 1500 young male patients with venous insufficiency were recorded and questioned for varicocele. Doppler ultrasonography for venous insufficiency and varicocele was performed.

**Results:** The mean age of the patients enrolled in this study was 21.15±1.3. Varicocele was a concomitant finding in 46% of the patients. Left total trunk, bilateral total trunk, higher BMI, package year, life style as standing occupation, family history, longer duration of symptoms and constipation were found as potential factors for concomitant varicocele in both univariate and adjusted multivariate analysis. A statistically significant moderately positive correlation was found between grades of junction reflux and varicocele (Spearman's rho correlation  $r = 0.637$ ,  $P < 0.001$ ).

**Conclusions:** With the evaluation that varicocele may be concomitant in half of the young male patients with venous insufficiency, just a simple question in history taking may help these patients to be diagnosed and get treated for this potential cause of infertility. We think that, as venous insufficiency is one of the forecoming diseases among the cardiovascular outpatient clinics, especially young male patients with venous insufficiency should be questioned and if necessary consulted for varicocele.

#### V14.26

##### PHLEGMASIA CERULEA DOLENS CASES WITH FATAL RESULTS

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**Objective:** Phlegmasia cerulea dolens (PCD) is a rare occurrence. It is characterized with complete or almost complete obstruction of the venous flow of the extremities. Arterial circulation may be disturbed as well. Two PCD cases resulting in death after insufficient deep vein thrombosis (DVT) treatment despite all the interventions have been presented.

**Methods:** A 78-year-old female patient had been diagnosed as DVT on the left leg 3 days after total right hip prosthesis operation and 15 days before her presentation. Due to insufficient medical treatment, she applied to our clinic after one week with increased pain in the left leg and cyanosis. The other patient, a 36-year-old male, was diagnosed as DVT of the lower extremity but refused the treatment.

**Results:** The patients were diagnosed as PCD at our clinic and 80 U/kg followed by 18 U/kg/h heparin infusion was started. When no clinical response was received, both patients were performed venous embolectomy. While

heparin infusion was sustained, ischemia in the legs increased and metabolic acidosis developed in both patients. The patients were amputated above the knee. The first patient whose acidosis advanced died on the 3rd day after amputation, and the other patient died 12 h later.

**Conclusions:** PCD is usually encountered in the postpartum period, in those with DVT history, following the surgery, and the patients with malignancies. The clinical prognosis may be extremely rapid as well as gradual following a DVT. Treatment involves classical DVT treatment in addition to thrombolytic and surgical treatment. The mortality and morbidity rates of PCD are usually high. To reduce such complications, DVT treatment and follow-up should be well-planned on an individual patient basis.

#### V14.27

##### VERTEBRAL ARTERY STENTING IN PATIENT WITH TAKAYASU DISEASE

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**Objective:** A 24-year-old man without cardiovascular risk factors in September 2000 had a syncope with subsequent hospitalization. Pulse was not found both in the left and right arm. For this the patient underwent diagnostic tests including angiography. Angiographic results: occlusion of left and right common carotid artery (the left and right internal carotids were patent); occlusion of left and right subclavian arteries. Diagnosis of Takajasu disease was done. The patient underwent surgical intervention with graft (Ao-right and left carotid-right and left subclavian arteries). In October 2000 the angiographic control documented the occlusion of the right graft branch in absence of symptoms. New surgical intervention was performed: graft lumen was reopened and new distal anastomosis was done. In November 2001 occlusion of left branch of the graft was documented. New surgical intervention was performed. In 2004 the patient was hospitalised for a syncope.

**Methods:** The patient underwent angiography study that documented occlusion of the previous graft, of both the subclavian and carotid arteries. Critical stenosis of the origin of right vertebral artery was found. This vessel was the last opened vessel for the right and left cerebral circulation perfusion. The patient underwent vertebral stenting soon after the diagnostic angiography. Via right femoral artery an 8F multipurpose catheter engaged the right vertebral artery ostium and after the placement of filter wire a balloon premounted stent was implanted. Immediate angiographic result was good without complications.

**Results:** The patient did not suffer neurological symptoms both during the procedure and soon after. He returned in the intensive room without symptoms. The haemodynamic parameters were monitored every hour, they remained stable and the patient remained asymptomatic. The medical therapy after stenting included: tirofiban for 18 h after the procedure, ticlopidin 250 mg twice daily, Betaistina 8 mg twice daily, atenolol 50 mg, Prednisone 5 mg, Amlodipin 10 mg. After the procedure the patient underwent neurological evaluation. CT of brain documented no ischemic lesions.

**Conclusions:** In patient with Takajasu disease and occlusion of left and right common carotid artery and left and right subclavian arteries the right vertebral artery was the last opened vessel for right and left cerebral circulation perfusion. A critical stenosis of proximal segment of the right vertebral artery was successfully treated with primary stenting after placement of filter wire system. Immediate angiographic result was good without complications.

#### V14.28

##### SYMPTOMATIC DISSECTION OF THE CAROTID ARTERY AFTER AORTA ASCENDING REPLACEMENT DUE TO TYPE A DISSECTION: TREATMENT WITH ENDOVASCULAR STENT

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**Objective:** Symptomatic dissection of the common carotid artery is a rare complication after an aorta ascending replacement due to an acute type A dissection. Adverse complications are the formation of a haemodynamically relevant stenosis, vascular occlusion, pseudoaneurysm and the possible resulting embolic or haemodynamic stroke. We report two such cases were managed with endovascular stent-grafting.



**Methods:** There were two patients, 48 and 59 years of age with a prior replacement of the ascending aorta due to type A dissection after an event-free period of 18 months and 3 years, respectively. The first case (48-year-old male) developed a transient, right-sided weakness. The duplex ultrasound of the supra aortic vessels showed a dissection membrane in both common carotid arteries. In view of the localisation and the fact that both sides of the carotid arteries were involved, the treatment consisted of endovascular stent-grafting (Wallstent) of the brachiocephalic trunk of the right subclavian artery and the left common carotid artery. The second case (59-year-old female) developed also a transient, right-sided weakness. The duplex ultrasound of the supra aortic vessels showed a dissection membrane only in the left common carotid artery.

**Results:** The post intervention angiography showed that in both cases a complete elimination of the false lumen and the resurrection of the original lumen had been achieved. The regular duplex follow up of the asymptomatic patients showed no evidence of new stenosis or dissections.

**Conclusions:** The presented cases show a successful endovascular stent-grafting in one-sided or in double-sided carotid dissection as an alternative to surgical treatment.

#### V14.29

##### LOCAL THROMBOLYSIS OF FEMORODISTAL ARTERIAL RECONSTRUCTIONS

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**Objective:** Acute limb ischaemia resulting from sudden occlusion of the previous arterial reconstructive operation is usually subject to some sort of redo surgery. However, in selected cases local thrombolytic therapy (TT) offers a valid alternative to surgical desobliteration.

**Methods:** A cohort of 30 patients (average age 61 years) with multiple previous infrainguinal arterial reconstructions is presented. In these, 42 sessions of TT were performed. Prior to TT, 22 patients have already had 63 operations. In all, serious but reversible limb ischaemia has occurred with the longest graft occlusion time not exceeding 2 weeks' duration.

**Results:** TT was successful in 34 (81%), unsuccessful in 8 (19%) patients. In 7 of these 11 reoperations then followed. Single TT was sufficient in nine and in another nine patients the therapeutic session was completed with PTA. After successful TT residual lesions were revealed in 15 patients and these were eventually also reoperated. Of these, 4 distal bypasses remained patent and four other limbs required amputation (median follow-up 30 months). Out of 15 occlusions treated exclusively by TT and/or PTA 10 reconstructions remained patent and two limbs were amputated (median follow-up 16 months). During or following TT once a benign episode of GIT hemorrhage and once a catheter-related sepsis has occurred.

**Conclusions:** Successful TT depicts local situation prior to graft failure and demasks anatomical lesion that had caused the occlusion. Therefore its diagnostic potential is important, too. Restored capacity of the distal outflow tract is mandatory for future success of following new surgical or interventional (PTA) steps. Had hypercoagulation state or ineffective anticoagulation therapy caused the occlusion, TT is a method of choice. Combined with PTA it reduces the need for further redo operations.

#### V14.30

##### CASE REPORT: THE SUCCESSFUL GRAFTING DURING THE REOPERATION OF THE MESENTERIAL ARTERIES USING HUMAN SAPHENOUS VEIN ALLOGRAFT

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**Objective:** Human saphenous vein allografts are used frequently in our Department of Vascular and Thoracic surgery as good alternative material

for autologous vein graft or prosthesis graft in bypass surgery. We present the case report of the patient with the thrombosed aorto-mesenterial autologous vein graft, which was repaired with the vein allograft.

**Methods:** The 38-year-old male patient was admitted to our University Clinic with diagnosis of acute mesenterial ischemia. Six months earlier the patient had an operation with aorto-mesenterial autologous vein graft (aorto to the superior mesenterial artery). The autologous vein graft diameter was less than 5 mm. During admission the patient suffered with severe abdominal pain. Doppler-sonography of the mesenterial arteries and of the autovein graft showed thrombosis of the aorto-mesenterial bypass and occlusion of the inferior mesenterial artery. The patient was taken immediately to the operation theatre for emergency operation. The thrombosed autologous vein graft was removed and replaced with the human saphenous vein allograft. Furthermore, another bypass was performed with the vein allograft between the abdominal aorta and the inferior mesenterial artery. The usage of prosthesis graft was discarded because of the possible occurrence of infection after acute mesenterial ischemia. In our University Clinic human saphenous vein allografts are stored in saline solution containing heparin and antibiotics at 4°C for up to 30 days.

**Results:** We present satisfactory results at 5 years follow-up by angiography. Now the patient has significantly increased body mass and no complaints of mesenterial ischemia.

**Conclusions:** We believe that the human saphenous vein allograft is a good alternative material for bypass surgery in cases, where other materials are not suitable to use and the prosthesis grafts are contraindicated.

#### V14.31

##### ENDOVASCULAR REPAIR OF ABDOMINAL AORTIC ANEURYSM ASSOCIATED WITH PROXIMAL THORACIC AORTIC DISSECTION

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**Objective:** The natural history of thoracic aortic dissections related to later aneurysm formation in the abdominal aorta continues to be examined. This is a case report of a synchronous endovascular management of a chronic type III aortic dissection together with an infrarenal abdominal aortic aneurysm.

**Methods:** A 49-year-old patient presented with pain in the left hemithorax radiating to the back. He had a history of an acute type I aortic dissection that was treated with replacement of the ascending aorta with a composite valve graft. Two years later he presented with type III aortic dissection from the level of the left subclavian artery to the aortic bifurcation together with an infrarenal abdominal aortic aneurysm of maximum diameter 65 mm. He had no clinical signs of distal organ malperfusion. Preoperative digital angiography revealed that the splachnic vessels were originating from the true lumen.

**Results:** Endovascular repair was performed with implantation of a self-expandable stent graft at the level of the entry site in the thoracic aorta (Endofit, Endomed) without occluding the left subclavian and the lower intercostal arteries. During the same procedure an aortomonoiliac stent graft (Endofit, Endomed) was implanted in the abdominal aorta for exclusion of the abdominal aortic aneurysm with endoluminal occlusion of the contralateral iliac artery with a stent graft. An extraanatomic femoro-femoral bypass was performed for restoration of contralateral limb blood flow. The patient recovered without serious complications. Follow-up consists of contrast-enhanced CT scan of the chest and abdomen every 3 months for the first year and annually thereafter.

**Conclusions:** Endovascular repair is feasible in the setting of an abdominal aortic aneurysm with proximal thoracic aortic dissection. Attention to sealing possible entry and reentry sites with implantation of a stent graft is imperative to ensure complete aneurysm exclusion without endoleak that can predispose to subsequent increase in intrasac pressure and rupture.