



Fig 1. (A) Postoperative computed tomographic (CT) scan demonstrated that both stent grafts were fitted in semicircular shape within the patient's abdominal aorta. (B) A reconstructed CT scan disclosed that the two stent-grafts paralleled each other and then separated into each iliac artery.

#### References

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### Early Diagnosis of Perioperative Myocardial Infarction After Coronary Bypass Grafting: Why Is the Incidence so High?

To the Editor:

We read with interest the article by Lim and colleagues [1], who evaluated the possibility of the early diagnosis of perioperative acute myocardial infarction (PAMI) after coronary artery bypass grafting (CABG) using Troponin I (TnI) and cardiac magnetic resonance imaging. In our opinion, a few remarks with respect to the definitions and, therefore, to the results ought to be addressed.

In their series of 28 patients, the authors reported that 9 patients had a TnI value  $\geq 7.5$  ng/L early after on-pump CABG and emphasized that it is 95% specific for detecting a PAMI. As a consequence, CABG-related PAMI occurred in approximately 33% (9/28) of patients, which is an extremely high rate of events. Moreover, it is noteworthy that all patients had an uneventful recovery, did not require inotropic support or use of intraaortic balloon pump, and did not have new Q waves or left bundle branch block documented. Hence, it is our opinion that the definition of PAMI may have been too extensive, and the difference between PAMI and postoperative myocardial injury (or myocardial damage) was not clearly defined.

In 2008 my colleagues and I [2], while evaluating the occurrence of postoperative release of biomarkers in a large series of patients underwent on-pump CABG, showed that biomarker levels were increased in 35% to 65% of patients in the first hours after coronary surgery. However, according to current literature,

less than 2% of patients developed clinical or hemodynamic evidence of PAMI or fulfilled the criteria for postoperative diagnosis of PAMI [3]. As previously reported, high serum levels of cardiac enzymes are common in more than 60% of patients after on-pump coronary surgery, even in the absence of clinical, electrocardiographic, and hemodynamic evidence of PAMI. This myocardial damage can be caused by different mechanisms, including direct trauma by sewing needles; focal trauma from surgical manipulation of the heart; global ischemia from inadequate perfusion, myocardial cell protection, or anoxia; coronary artery or venous graft embolism; and other complications of the procedure. Having said that, we continue to believe that a number of different criteria must be met for a PAMI to be diagnosed: (1) indicative electrocardiographic changes (ST-T changes, new Q-wave appearance, and reduction of R waves greater than 25% in at least 2 contiguous leads); (2) echocardiographic evidence of new akinetic or dyskinetic ventricular wall segments; and (3) biochemical indicators (maximal concentration of TnI and maximal value of CK-MB mass exceeding twofold the upper reference limits on two subsequent samples or maximal value exceeding fivefold the normal reference limits on one occasion). Upper reference limits for TnI have been established at  $\leq 0.08$  ng/mL (the 99th percentile of referenced controlled group with a total imprecision of  $<10\%$ ). Therefore, the sole laboratory evidence of increased biomarker serum level without evidence of the other two criteria is a soft outcome to justify any aggressive treatment as necessary in case of PAMI.

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#### Reply

To the Editor:

I am grateful to Mannacio and colleagues [1] for their interest in the findings of our study. As they know, identifying myocardial infarction (MI) related to coronary artery bypass grafting (CABG) using conventional electrocardiography and biochemical methods is difficult. In our investigation we used late gadolinium enhancement (LGE) cardiovascular magnetic resonance imaging (CMR) and biomarkers of injury and inflammation to investigate the incidence and early predictors of MI type 5 in patients undergoing CABG [2].

Troponin is a particularly sensitive biomarker, and as they and other investigators have demonstrated, troponin elevation is common and could almost be regarded as normal early after on-pump cardiac surgical procedures. Consequently, the diagnosis of CABG-related MI type 5 established by the joint task force of the American College of Cardiology Foundation, the American Heart Association, the European Society of Cardiology, and the World Heart Federation requires biomarker values more than five times the 99th percentile during the first 72 hours after CABG, together with either the appearance of new pathologic Q-waves or new left bundle branch block, or angiographically documented new graft or native coronary artery occlusion, or imaging evidence of new loss of viable myocardium [3].

In our study, the protocol involved routine imaging after the procedure, and this imaging fundamentally changed the categorization of our patients. To put in an alternative way, if we had not performed magnetic resonance imaging, the patient would not have been categorized as having MI type 5 despite the same clinical course and level of biomarker release! Highlighting this anachronism was one of the purposes of the article, along with a suggestion that initial biomarker release profiles may be different in patients with evidence of necrosis on MRI postoperatively. Whether those patients should be categorized as having CABG-related MI or CABG-related myocardial necrosis can be debated. In my opinion, the latter is probably more clinically appropriate, whereas the emotive term of CABG-related MI is reserved for patients with clinically relevant complications.

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#### OPCAB Technique for High-Risk Patients

To the Editor:

I read with interest the article by Singh and colleagues [1]. They describe a novel technique for performing off-pump coronary artery bypass (OPCAB) in a patient with left main stem coronary disease.

I have been doing OPCAB for the last 15 years and like most of the other surgical groups, left main coronary artery disease has never been considered a contraindication for OPCAB grafting [2].

I have routinely used the glove technique in most of my patients with very low ejection fraction and in unstable patients with or without left main coronary artery disease. Instead of air, I have used lukewarm saline, which provides an excellent cushion and hemodynamic stability and keeps the heart warm.

In my series of almost 1200 cases, I have had two conversions to on-pump bypass grafting using combined glove and deep pericardial sling. The technique of using glove is well established and is not a new, novel technique as described by the authors [1].

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#### Reply

To the Editor:

We read with interest the letter from Dr Sharma [1] regarding our technique published in the previous issue of this journal as "How to Do It" [2]. We thank the author for these interesting comments and remarks.

However, I beg to differ from Dr Sharma's statement that left main disease (LMD) has never been considered a contraindica-