

Emergency endovascular repair of an acute aortocaval fistula with AAA: case report and review of the literature

U. M. BRACALE, L. DEL GUERCIO, M. PORCELLINI, G. BRACALE

Department of Vascular and Endovascular Surgery
Federico II University, Naples, Italy

A 72-year-old man with sudden abdominal pain and congestive cardiac failure presented a high-flow aortocaval fistula with a large abdominal aortic aneurysm as detected by Duplex ultrasonography and computed tomography angiography. As the patient's multiple comorbidities precluded open repair, an emergency left aortouniliac stent-graft deployment and femoro-femoral crossover bypass grafting were performed. Notwithstanding, incomplete exclusion of the fistula due to a small inflow from the contralateral iliac axis, the patient's cardiac overload decreased with a rapid resolution of cardiac failure, allowing for a staged ligation of the right iliac artery with a complete occlusion of the aortocaval fistula. At present there have been only 12 known cases, including our own, of patients treated with aortic stent-grafts; however, in consideration of the high mortality rate of open repair, endovascular repair is increasingly being recognized as a valuable treatment option.

KEY WORDS: Fistula - Stents - Aortic aneurysm, abdominal.

Aortocaval fistulas (ACF) are amongst the rarest life-threatening complications of infrarenal aortic aneurysms (AAA) with an incidence rate <2%.¹ Open repair is associated with a high mortality rate ranging from 20% to 60%.^{2,3} In the last decade,

Acknowledgements.—The authors would like to thank Gaetano Vitale, MD, for his technical assistance with illustrations, and Mrs Juliet Ippolito for reviewing the English text of this manuscript.

Received on March 13, 2009.
Accepted for publication on July 28, 2009.

Corresponding author: U. M. Bracale, MD, Department of Vascular and Endovascular Surgery, Federico II University, via S. Pansini 5, 80131 Naples, Italy. E-mail: palumbe@tin.it

endovascular repair of AAAs (EVAR) associated with ACF has emerged as a feasible alternative to standard surgical management, particularly in high-risk patients.

We describe herein the case of a 72 year-old male with a large AAA ruptured into the inferior vena cava (IVC) with high flow rates who underwent emergency aortouniliac stent-graft deployment and femoro-femoral crossover bypass grafting. A literature review is also included.

Case report

A 72-year-old man with a history of amyotrophic lateral sclerosis and a known aneurysm of the infrarenal aorta was referred to our hospital in November 2007 due to sudden abdominal pain and severe congestive cardiac failure. Type II diabetes mellitus and chronic obstructive pulmonary disease were also present. At admission, the patient had a blood pressure of 95/74 mmHg, and a tachycardia at 112 beats/min. His jugular veins were pulsatile and edema, cyanosis and coldness in both lower extremities was found. Bilateral pleural effusion and a large pulsatile abdominal mass with a machine-like murmur were also detected. His PO₂ measured in room air was 56.7 mmHg. Duplex ultrasonography (DUS) showed a 94-mm infrarenal aortic

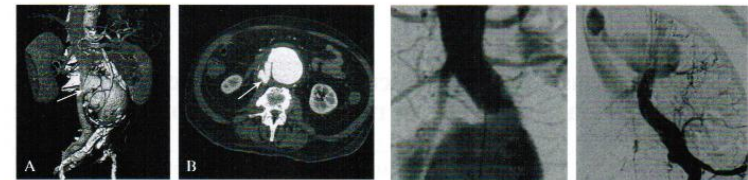


Figure 1.—A, B). Preoperative CT scan showing the aortocaval fistula (arrows).

aneurysm and a suspicious fistula track between the aneurysm and the IVC. A computed tomography angiography (CTA) revealed a simultaneous contrast enhancement of AAA and IVC, confirming the presence of a large aortocaval fistula. No retroperitoneal blood collection was observed (Figure 1). The patient's cardiac failure was non-responsive to medical therapy and, because of his poor general condition, he was considered unfit for open surgery and an emergency endovascular approach was preferred.

In the operating theatre systemic arterial and central venous pressure were continuously monitored. Under spinal anesthesia, both common femoral arteries were surgically exposed and a 11-Fr sheath was inserted into each. The periprocedural aortogram confirmed the presence of a fistula between the AAA and IVC. Because of an extremely calcified right iliac axis, we decided to implant a 28-mm Talent (Medtronic, Santa Rosa, CA, USA) aortouni-iliac endograft device via the left common femoral artery with a 16-mm stent-graft extension into the external iliac artery. The attempted introduction of a contralateral occluder device failed due to the existence of extensive heavily calcified lesions and a femoro-femoral bypass was implanted to restore arterial inflow in the right leg. The final angiogram showed a persistent fistula with a small inflow from the right iliac axis (Figure 2). The operation time was 147 minutes with a blood loss of 350 mL. In spite of the incomplete exclusion of the ACF, the patient's heart rate declined to 82 beats per minute and his central venous pressure dropped from 37 mmHg to 13 mmHg. In this state his cardiac condition improved within a few minutes and he was transferred, awake, to the Intensive Care Unit, where he remained stable for 24 hours. His PO₂ normalized to 83.7 mm Hg. One week later the DUS and CTA showed satisfactory deployment of the stent-graft at the level of the proximal aortic neck and distal left iliac artery although a residual ACF supplied by the retrograde blood flow via the patent right iliac axis was detected (Figure 3).

Two weeks following the original graft implantation, the patient's status significantly improved and he was readmitted to the operating theatre to ligate his right common iliac artery via an extraperitoneal route under spinal anaesthesia. Blood loss was approximately 100 mL. The patient was dis-

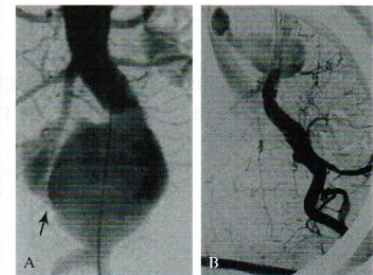


Figure 2.—Preoperative aortogram (A) demonstrating the fistula between the AAA and inferior vena cava (black arrow). Completion angiogram after stent-graft deployment (B) showing a persistent ACF supplied by the endoleak from right iliac axis.

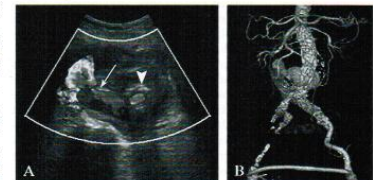


Figure 3.—One week DUS (A) and CTA (B) confirming patent stent-graft (arrow-head) and persistent ACF (arrow).

charged 10 days after this procedure which was performed without complications. At a 12-month review the patient was in good health status. His latest CTA showed a patent graft and the exclusion of the aneurysm with no evidence of ACF (Figure 4).

Discussion

Since the first report on endovascular repair of an AAA with ACF by Beveridge *et al.*⁴ was published in 1998, a total number of 11 cases have been described in medical literature with no reports of perioperative deaths.⁴⁻¹³ These 11 cases are included in this review (Table I). Contrarily, one out of three additional ACFs



Figure 4.—CTA at 12 months showing complete exclusion of the AAA without evidence of endoleak and ACF.

reported by Walker *et al.*¹⁴ had died perioperatively; however, because neither the clinical features of the patients nor details of the endovascular procedures were described in Walker's study, it has been excluded from further analysis in this paper. The average age of the 12 male patients (including our patient) treated was 70 years (ranging between 56 to 85) and the median aortic aneurysm diameter was 6.5 cm (ranging between 3-12.3). Atherosclerotic aneurysms measuring over 5.5 cm in size were recognized in 83.3% of ACFs. In contrast, Williamson *et al.*⁷ described the case of an invasion of a small, pre-existing AAA from a lymphoma which led to erosion of the aneurysm wall and development of an ACF. Both the aneurysm and the fistula were successfully treated by endovascular means.

Endoleaks occurred in 7 of the 12 cases (58.3%). Of these, two Type-II and one Type-III endoleak sealed spontaneously during the postoperative period.^{4, 9, 11} A secondary transcatheter embolization *via* the superior mesenteric artery was needed to treat persistent Type-II endoleaks from a patent inferior mesenteric artery

TABLE I.—Published cases of endovascular repair of ACF associated with AAA.

Author	Age sex	Stentgraft	Aneurysm size (cm)	Site of fistula	Complication	Secondary procedure	Outcome
Beveridge <i>et al.</i> 1998	71,M	Bifurcated Stentor (Mintec)	6	Ilio-caval	Type II EL	None	Alive 12 mo
Unscheid and Stelter 2000	74,M	Bifurcated Vanguard (Boston Scientific)	6	Aorto-caval	None	None	Alive 6 mo
Lau <i>et al.</i> 2001	61,M	AUI Talent (Medtronic)	5.5	Aorto-caval	EL from contralateral iliac	Ligation of contralateral iliac	Alive 12 mo
Williamson <i>et al.</i> 2002	85,M	Bifurcated Aneurx (Medtronic)	3	Aorto-caval	None	None	Alive 6 mo
Burke and Mauro 2003	66,M	Bifurcated Aneurx (Medtronic)	8	Aorto-caval	Type II EL, persistent ACF	Trans-catheter embolization, IVC	Not available
Vetrhus <i>et al.</i> 2005	66,M	Bifurcated Zenith (Cook)	8.6	Aorto-caval	Type II EL	None	Alive 12 mo
Vetrhus <i>et al.</i> 2005	80,M	Bifurcated Zenith (Cook)	12.3	Aorto-caval	None	None	Died 3 mo for perforated
Kopp <i>et al.</i> 2006	68,M	Bifurcated Zenith (Cook)	6.5	Aorto-caval	Type III EL (IMA)	Trans-catheter embolization	Not available
Clevert <i>et al.</i> 2007	64,M	AUI Zenith (Cook)	8	Aorto-caval	Type III EL	None	Alive 6 mo
Leon <i>et al.</i> 2007	80,M	Bifurcated Excluder (Gore)	6	Aorto-caval	None	None	Alive 5 wk
Kwon <i>et al.</i> 2008	56,M	Bifurcated Excluder (Gore)	5.1	Ilio-caval	None	None	Alive 5 mo
Bracale <i>et al.</i> 2009	72,M	AUI Talent (Medtronic)	9.4	Aorto-caval	EL from contralateral iliac	Ligation of contralateral iliac	Alive 12 mo

EL: endoleak; IVC: inferior vena cava; ACF: aortocaval fistula; IMA: inferior mesenteric artery.

(IMA) in two of the patients.^{8, 10} In one of the patients a combined IVC endografting provided a complete exclusion of ACF.⁵ In our patient, who was treated by aortoumbilic stent-grafting, we tried to occlude the contralateral iliac axis by the intraluminal placement of a plug. However, this attempt failed, owing to the highly calcified arterial lesions, so we then opted for a delayed ligation of the right common iliac artery *via* an extraperitoneal miniminvasive approach, in consideration of the significant improvement of the patient's cardiopulmonary status. The case described by Lau *et al.*⁸ also reports that a staged open treatment was chosen after hemodynamic stabilization.

Conclusions

Despite the fact that no specific guidelines are available, our review indicates that endovascular management is feasible for acute ACFs complicating AAAs without the occurrence of perioperative deaths. Even in cases of incomplete exclusion of the ACF, endovascular repair can be considered beneficial for an immediate resolution of high output cardiac failure, although for some patients, including our own, who require an aortoumbilic stent-grafting and a staged ligation of the contralateral iliac artery in order to obtain a complete occlusion of the ACF, additional endovascular procedures or surgical retroperitoneal interventions may be necessary.

References

- Davis PM, Gloviczki P, Cherry KJ Jr, Toomey BJ, Stanson AW, Bower TC *et al.* Aorto-caval and ilio-iliac arteriovenous fistulae. *Am J Surg* 1998;176:115-8.

- Schmidt R, Bruns C, Walter M, Erasmi H. Aorto-caval fistula: an uncommon complication of infrarenal aortic aneurysms. *Thorac Cardiovasc Surg* 1994;42:208-11.
- Cinara IS, Davidovic LB, Kostic DM, Cvetkovic SD, Jakoljevic NS, Koncar IB. Aorto-caval fistula: a review of eighteen years experience. *Acta Chir Belg* 2005;105:616-20.
- Beveridge CJ, Plessas HCC, Chamberlain J, Wyatt MG, Rose JDG. Aortiliac aneurysm with aortocaval fistula treated by a bifurcated endovascular stent-graft. *Cardiovasc Intervent Radiol* 1998;21:244-53.
- Unscheid T, Stelter WJ. Endovascular treatment of an aortic aneurysm ruptured into the inferior vena cava. *J Endovasc Ther* 2000;7:31-5.
- Lau LL, O'Reilly MJG, Johnston LC, Lee B. Endovascular stent-graft repair of primary aortocaval fistula with abdominal aortic aneurysm. *J Vasc Surg* 2001;33:425-8.
- Williamson AF, Amuruzia G, Cone LA, Smith J. Endovascular repair of a ruptured abdominal aortic and iliac artery aneurysm with an acute ilio-caval fistula secondary to lymphoma. *Ann Vasc Surg* 2002;16:145-9.
- Burke C, Mauro MA. SIR 2003 film panel case 8: aortocaval fistula supplied by a type II endoleak. *J Vasc Interv Radiol* 2003;14:813-7.
- Vetrhus M, McWilliams R, Tan CK, Brennan J, Gilling-Smith G, Harris PL. Endovascular repair of abdominal aortic aneurysms with aortocaval fistula. *Eur J Vasc Endovasc Surg* 2005;30:640-2.
- Kopp R, Weidenhagen R, Hoffmann R, Waggerhauer T, Meirakis G, Andrassy J *et al.* Immediate endovascular treatment of an aortiliac aneurysm ruptured into the inferior vena cava. *Ann Vasc Surg* 2006;20:525-8.
- Clevert DA, Stiekel M, Flach P, Strautz T, Hoeng A, Jauch KW *et al.* Contrast-enhanced ultrasound in detection and follow-up of an infrarenal abdominal aortic aneurysm with aorto-caval fistula and endovascular treatment. *Cardiovasc Intervent Radiol* 2007;30:480-4.
- Leon LR Jr, Arslan B, Ley E, Labropoulos N. Endovascular therapy of spontaneous aortocaval fistulae associated with abdominal aortic aneurysms. *Vascular* 2007;15:35-40.
- Kwon SH, Oh JH, Park SJ, Park HC. Endovascular repair of a spontaneous right common iliac artery-inferior vena cava fistula due to infrarenal aortiliac aneurysm. *Vasc Endovasc Surg* 2008;42:279-83.
- Walker SR, Macierewicz J, MacSweeney ST, Gregson RSH, Whitaker SC, Wenham PW *et al.* Mortality rates following endovascular repair of abdominal aortic aneurysms. *J Endovasc Ther* 1999;7:233-8.