

Endovascular treatment of abdominal aortic anastomotic pseudoaneurysm

The experience of two Centers



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Endovascular treatment of abdominal aortic anastomotic pseudoaneurysm. The experience of two Centers

INTRODUCTION: Abdominal aortic pseudoaneurysms are a rare but serious complication of aortic surgery. Treatment with traditional open surgery is associated with a high rate of perioperative mortality and morbidity. Endovascular treatment is less invasive and guarantees lower mortality and morbidity rates. The aim of this study was to evaluate the role of short-, medium- and long-term endovascular treatment of these pseudoaneurysms.

MATERIALS AND METHODS: Over the past 10 years, 14 patients with abdominal aortic aneurysms, which developed after prior aortic surgery, underwent endovascular treatment involving implantation of an endoprosthesis at our institutions. Exclusion criteria were emergency treatment and suspicion of an infected prosthesis. A Cheatham-platinum covered stent mounted on a balloon catheter was implanted in one patient and self-expandable stent-graft in the other 13. No fenestrated or custom-made prostheses were used.

RESULTS: The procedure had a 100% technical success rate. There was no postoperative mortality. Two type I endoleaks, observed at aortography at the end of the procedure, were not seen on the CT scan taken one month later. Three patients (21.4%) had major perioperative complications which consisted of early occlusion of a branch of the endoprosthesis, (treated with a femoro-femoral crossover bypass graft), a transient ischemic attack, and jaundice. The long-term mortality rate, at an average follow-up of 37.4 months, was 21.4%. None of the deaths was related to the procedure.

CONCLUSIONS: Endovascular treatment of patients who develop anastomotic pseudoaneurysm after surgery of the abdominal aorta is safe and effective both in the short and long term. In our opinion it is the treatment of choice for this category of patients.

KEY WORDS: Abdominal aortic surgery, Anastomotic pseudoaneurysm, Endovascular stent-grafting.

Introduction

Abdominal aortic anastomotic pseudoaneurysm (AAAP) is a rare but serious complication of aortic reconstructive surgery. The reported incidence rate of AAAP ranges from 0.2% to 15%^{1,2} and is rising because of the longer survival of patients who undergo surgery for aortic

obstruction or aneurysm and the increasing use of imaging during follow-up which facilitates diagnosis. Traditional open surgery for AAAP is associated with a high mortality rate that ranges from 8% to 28%³⁻⁵. Recently developed endovascular techniques for AAAP repair have been shown to be a valid alternative and to provide better results^{6,7}. The aim of this study was to evaluate the results of endovascular treatment of AAAP at two university hospitals.

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Materials and methods

From January 2000 to April 2010, 14 patients with AAAP underwent endovascular treatment with placement

of an endoprosthesis in the departments of vascular and endovascular surgery at the University of Palermo and the Federico II University in Naples. This case series included previously published cases⁸. Patient characteristics are listed in Table 1. The average age was 70.3 years and all patients were male. The average interval between the initial operation and the diagnosis of AAAP was 54.6 months (range: 7-24 months). Eight patients had undergone surgery for abdominal aortic aneurysm (AAA) and 6 had been operated on for obstructive/stenotic disease. Twelve patients were asymptomatic and two had abdominal pain and a pulsatile abdominal mass. Treatment was indicated in all cases because of the high risk of pseudoaneurysm rupture and enteric fistulization³⁻⁷. All patients underwent CT-angiography with 3D reconstruction preparatory to endovascular treatment. Patients with an infected aneurysm were not candidates for endovascular treatment. None of the patients had fever, leukocytosis (white blood cell count > 10,000), C-reactive protein levels >1mg/dl, or signs of periprosthetic infection on preoperative CT scan.

Follow-up protocol: All patients underwent Duplex scan examination right before being discharged. Patients with normal renal function were scheduled to have a CT-scan with contrast one month after endoprosthesis placement. Every 6 months the patients underwent clinical examination and Duplex scan. A follow-up CT scan was performed once a year.

Results

Endovascular treatment was performed in operating rooms furnished with specialized angiographic equip-

ment. Ten patients were given loco-regional anesthesia and the other 4 were given local anesthesia. The endoprosthesis was successfully implanted in each patient. There were no cases of conversion to open surgery. None of the patients died in the immediate postoperative period (30 days). There were 3 cases (3/14: 21.4%) of major postoperative complications: one case of early occlusion of a branch of the endoprosthesis, one case of transient ischemic attack and one case of jaundice in a patient with hepatic cirrhosis. Type I endoleak found in 2 patients on aortography at the end of the procedure was not observed on the CT scan performed one month after surgery. There were no cases of type II endoleak. Average hospital stay was 8.2 days (range: 3-16 days). During an average follow-up of 37.4 months (range 6-105 months) reintervention using traditional surgery was required in 2 cases (14.3%): the case of early occlusion of a branch of the endoprosthesis mentioned above, which was treated with a suprapubic femoro-femoral crossover bypass graft, and one case of endoprosthesis migration. The long-term mortality rate was 21.4%, 2 patients died of acute myocardial infarction and one died of stroke. Patients' characteristics and type of procedures are summarized in Table I.

Representative Case

An 83-year-old man who had undergone aorto-bifemoral bypass grafting for aorto-iliac disease 17 years previously, underwent aortography in addition to coronary angiography performed to evaluate stable angina. Aortography revealed an infrarenal anastomotic pseudoa-

TABLE I. Patients' characteristics and type of procedures

Pt	Age (y) /sex	Prosthesis (Dacron)	AAAP DT (mm)	ASA	Delay (m)	Initial disease	Stentgraft	AAAP Location	LOS (d)	Postoperative complication	FU (m)	Outcomes
1	83/M	Bifurcated	42	3	204	PAD	CP stent 18 mm	Proximal	3	-	12	Alive
2	79/M	Tube	44	3	72	AAA	Talent AUI 24 mm	Proximal	4	-	16	Alive
3	73/M	Bifurcated	54	4	24	AAA	Endurant 28 mm	Proximal	5	-	19	Alive
4	80/M	Tube	75	3	38	AAA	Zenith 28 mm	Distal	7	-	6	Died: MI
5	67/M	Bifurcated	58	3	7	PAD	Zenith AUI 28 mm	Proximal	10	-	25	Alive
6	60/M	Bifurcated	63	4	50	PAD	Talent 34 mm	Distal	7	-	29	Alive
7	47/M	Bifurcated	55	3	55	PAD	Zenith 28 mm	Distal	5	-	31	Alive
8	63/M	Tube	59	3	44	AAA	AneuRx 26 mm	Distal	16	Limb occlusion: Fem-Fem crossover	37	Alive
9	76/M	Bifurcated	38	3	18	PAD	Talent 30 mm	Proximal	12	TIA	14	Died: Stroke
10	69/M	Tube	47	3	16	AAA	Talent 28 mm	Proximal	8	-	49	Alive
11	70/M	Tube	59	3	122	AAA	AneuRx 28 mm	Proximal	9	-	171	Alive
12	59/M	Bifurcated	40	3	45	PAD	Talent 30 mm	Proximal	6	-	81	Alive
13	83/M	Tube	52	4	58	AAA	Zenith 32 mm	Proximal	11	-	26	Died: MI
14	76/M	Bifurcated	39	3	12	AAA	Talent 26 mm	Distal	12	Jaundice	105	Alive

Pt: patient; AAAP: abdominal aortic anastomotic pseudoaneurysm; ASA: American Society of Anesthesiologist; DT: diameter transverse; FU: followup; M: masculine; PAD: peripheral arterial disease; AAA: abdominal aortic aneurysm; LOS: length of stay; CP: cheatam platinum stentgraft; AUI: aorto-uni-iliac; TIA: transient ischemic attack; MI: myocardial infarction.



Fig. 1: (A) Aortography showing an infrarenal anastomotic pseudoaneurysm. (B) Preoperative enhanced computed tomography VR reconstruction showing proximal anastomotic pseudoaneurysm (white arrow).

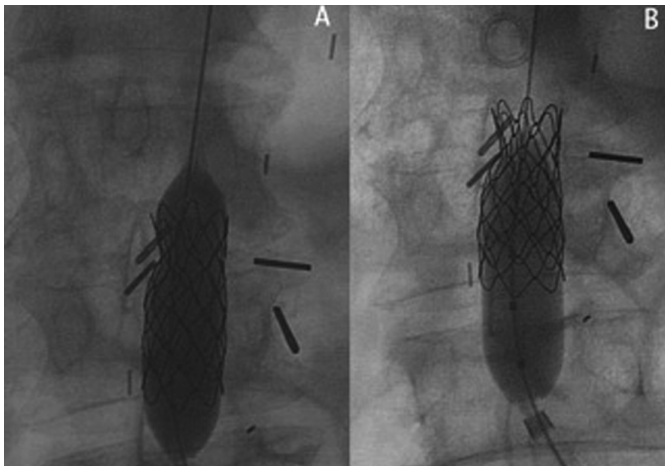


Fig. 2: (A) Inflation of the inner balloon with partial expansion of the stent-graft. (B) Distal stent-graft dilation with 20 mm balloon.

neurysm (Fig. 1 A). CT- angiography confirmed the presence of a pseudoaneurysm and showed that endovascular treatment using a standard endoprosthesis was impossible due to the difference in caliber of the native aorta (diameter 14 mm) and the termino-lateral prosthesis (diameter:20 mm) (Fig. 1 B). The patient was not a candidate for traditional surgery, but instead underwent an endovascular procedure. With the patient under local anesthesia, the right branch of the aorto-bifemoral bypass was isolated at the level of the groin. After a 14 French vascular introducer was positioned, a Cheatham-Platinum covered stent (NuMED Inc, Hopkinton NY, USA) mounted on a 14 mm balloon catheter was placed just below the origin of the lowest renal artery. The distal part of the stent-graft was then adjusted with a 20 mm BIB balloon catheter (NuMED Inc, Hopkinton NY, USA) (Fig. 2 A, B). Completion aortography and CT angiography at 1 month (Fig. 3 A, B) showed the stent-graft well positioned and the pseudoaneurysm completely excluded.



Fig. 3: (A) Final result at completion aortography. (B) Postoperative enhanced computed tomography VR reconstruction showing the covered stent excluding the aneurysm with no residual endoleak.

Discussion

Abdominal aortic anastomotic pseudoaneurysm is a serious late complication of aortic reconstruction and is difficult to evaluate due to the absence of early signs and symptoms and retroperitoneal location of the lesion. Treatment of AAAP with traditional surgery is associated with a mortality rate ranging from 24% to 100% in symptomatic patients undergoing emergency surgery and 4.5% to 17% in asymptomatic patients undergoing elective surgery^{3, 9-13}. During the past 10 years it has been shown that endovascular surgery is a valid alternative to open surgery and is associated with less short- and long-term mortality and morbidity. In the most recent clinical series mortality and morbidity rates range from 0% to 4% and 12.5% to 25% respectively¹⁴⁻¹⁶. In the present study, based on the 10-year experience of 2 university hospitals, the mortality rate at 30 days was 0% and the survival rate, at an average follow-up of 37.4 months, was 78.4%.

It is often difficult to diagnose AAAP with Duplex scan and the specificity and sensitivity of the examination are lower than those of CT scanning or MRI¹⁷. In a series of over 1000 patients followed up for 6 to 12 years after surgery for aortic disease, only 6 anastomotic pseudoaneurysms were observed¹¹, while in an even larger series¹⁸, of 6090 patients, the incidence rate of AAAP was 0.4%. However, follow-up with Doppler ultrasound every 6 months, or at least once a year, is recommended¹², especially in patients who have developed postoperative complications. In the present series, the accuracy

rate of Duplex scan was 58.3%: 12 patients underwent ultrasound and 7 cases of AAAP were identified. In a study conducted by Kalman et al., CT scanning, although more expensive than ultrasound, had greater accuracy: 64.9% of AAAP over 3 cm in diameter were identified and in 13.8% of these cases there were indications for surgery¹⁹. Whatever the methods used to diagnose AAAP, it is important to make a careful search for associated anastomotic aneurysms. In 25% of patients with a bifurcated prosthesis, a distal anastomotic aneurysm is present as well, and 15% of femoral artery aneurysms are associated with an aortic aneurysm²⁰. Small anastomotic aneurysms may remain stable over time or increase in size until they rupture. At diagnosis a significant percentage of them (8%-40%) are ruptured and are associated with a mortality rate ranging from 67% to 100%²¹. Technically there can be a difference in the treatment of AAAP and aneurysms of the abdominal aorta. The aortic neck may be short due to juxtarenal anastomosis, or the patient may have a bifurcated endoprosthesis and there may not be space for the standard endoprosthesis between the renal arteries and the new bifurcation. It has recently been reported that encouraging results have been obtained with the use of stent-grafts that are fenestrated²² or custom-made²³, even though a rather long time is required to produce these endoprostheses. In our series no fenestrated or custom-made endoprostheses were used.

One limit of endovascular treatment of AAAP is the impossibility of determining, from intraoperative samples, whether the prosthesis is infected or not.

Conclusions

The results reported in the literature and the results of this study show that, in the treatment of AAAP, endovascular stentgrafting is a valid alternative to traditional surgery and is the treatment of choice for high-risk patients. Although our case series was small, the short- and medium-term results were satisfactory. Positive long-term results would suggest that endovascular surgery could become the treatment of choice for all patients with AAAP.

Riassunto

INTRODUZIONE: Gli pseudoaneurismi anastomotici dell'aorta addominale sottorenale sono una rara ma seria complicanza della chirurgia aortica. Il trattamento chirurgico "open" convenzionale è gravato da un considerevole tasso di mortalità e morbidità peri-operatoria. Il trattamento endovascolare è un trattamento meno invasivo che garantisce tassi di morbi-mortalità più contenuti. Scopo di tale studio è di valutare il ruolo del trattamento endovascolare a breve e lungo termine.

MATERIALI AND METODI: Negli ultimi dieci anni, 14 pazienti affetti da pseudoaneurisma aortico dopo chirurgia sono stati sottoposti a trattamento endovascolare con impianto di endoprotesi. In questo studio sono stati esclusi pazienti trattati in urgenza e pazienti con sospetta infezione protesica. Sono state impiantate endoprotesi auto-espandibili (self-expandable) in 13 pazienti; in un caso è stato impiantato un CP-stent graft montato su pallone (balloon-expandable). Non sono state impiegate protesi custom-made o fenestrate.

RISULTATI: Il successo tecnico è stato del 100% con mortalità post-operatoria nulla. Due endoleak di Tipo I visibili all'aortografia finale della procedura non sono stati riscontrati alla successiva TC a un mese. Vi sono state 3 complicanze maggiori nel periodo peri-operatorio (21,4%): una occlusione di branca protesica trattata con bypass femoro-femorale crossover, un TIA ed un ittero. La mortalità a distanza è stata del 21,4% ad un follow-up medio di 37,4 mesi, nessuna correlata alla procedura.

CONCLUSIONI: Il trattamento endovascolare in pazienti con pseudoaneurisma anastomotico dopo chirurgia dell'aorta addominale è sicuro ed efficace a breve e lungo termine. Laddove si riscontrino le condizioni di applicazione rappresenta, a nostro avviso, la procedura di scelta.

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