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Clinical Research

Thoracic Endovascular Aortic Repair for Treatment of Late Complications After Aortic Coarctation Repair

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Background: To report our experience with thoracic endovascular aortic repair (TEVAR) for treatment of postcoarctation repair aortic aneurysms.
Methods: Between November 2000 and December 2008, 13 patients were treated with TEVAR and rerouting of the supra-aortic vessels for aortic aneurysm ($n = 10$) and pseudoaneurysm ($n = 3$).
Results: One patient (7.7%) died due to peroperative perforation of the aorta. For the other patients, the median hospital stay was 9 days. One patient needed an additional stent because of a type I endoleak. Two patients (15.4%) developed a small type II endoleak for which no additional intervention was needed. One patient developed hemothorax, four patients (30.8%) had a Horner syndrome, one patient had a phrenic nerve paresis, and another patient developed hemiplegia. The mean follow-up of the survivors was 35 months (range, 2-72) with a median of 30 months. Most patients (84.6%) showed a decrease or stabilization of the size of the aneurysm sac. One patient had recurrent pneumonia with increase of the size aneurysm after 3 years.
Conclusions: TEVAR is appealing for patients with late complications after aortic coarctation repair, but necessitates long-term follow-up.

INTRODUCTION

Long-term complications after surgical coarctation repair are not uncommon. Aortic aneurysm formation, either at the site of coarctation repair or proximal to the site, and pseudoaneurysm formation are the most frequent ones. Moreover, aneurysm is a life-threatening condition. Untreated, it has a 100% rupture rate within 15 years.[1] Local aneurysms at the site of the coarctation repair mainly localize opposite to the patch and represent two-thirds of postsurgical aortic aneurysms.[2] Pseudoaneurysms develop from suture lines or at the site of isthmic restenosis.

The incidence varies from 3% to 28% and is increasing with time. One of the risk factors for late postoperative aneurysm formation is the type of initial surgical repair, the highest risk being associated with Dacron patch aortoplasty.[1] Another risk factor is the type of graft. Troost et al. showed a significantly higher incidence with knitted Dacron interposition grafts (Gelseal, Gelsoft grafts) than with woven Dacron interposition grafts (Gelweave).[3] Besides surgical technique, other risk factors for late postoperative aneurysm formation are bicuspid aortic valve, advanced age at primary coarctation repair, hypoplastic transverse aortic arch, and high preoperative systolic peak pressure gradients.[2-4]

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Conventional open surgical repair is associated with a high mortality and morbidity.[5,6] Therefore, endovascular repair by thoracic endovascular aneurysm repair (TEVAR) is appealing.

MATERIALS AND METHODS

Between November 2000 and December 2008, 13 patients (median age, 32 years; range, 28-46) with late (pseudo)aneurysm formation postcoarctation repair were treated with TEVAR at our institution and followed prospectively. A retrospective analysis of this prospectively maintained database was performed. Table I lists the preoperative demographic data of these patients.

In 11 patients (84.6%), the aortic coarctation was initially treated by a Dacron patch aortoplasty. In one patient, a subclavian flap aortoplasty was performed, and for one patient, the primary procedure was unknown. The median age at the primary coarctation repair was 6 years (range, 3-20).

Four patients (30.8%) received a secondary intervention before the TEVAR procedure. In eight patients (61.5%), associated cardiac disorders were found. More details are summarized in Table I. The median time between primary coarctation repair and TEVAR was 24 years (range, 22-29 years).

Table II summarizes the characteristics of the postcoarctation repair aneurysms. In 11 patients, the postcoarctation repair aneurysm was an asymptomatic finding on routine follow-up CT scan, MRI, or echocardiography. In two patients, the CT scan was performed for acute thoracic pain. Ten patients (76.9%) suffered from a true aortic aneurysm; three (23.1%), from a pseudoaneurysm. The maximal diameter ranged from 46 to 72 mm (median, 52 mm). In all patients, the aneurysm developed at the site of the coarctation repair. In two of them, aneurismal degeneration was present in the more proximal aorta (one in the ascending aorta and one in the transverse aortic arch). In eight cases, the aneurysm included the left subclavian artery. The aneurysm was fusiform in eight cases and saccular in five cases. Nine patients (69.2%) had a hypoplastic aortic arch, hypoplastic aortic arch being defined as an aortic arch for which ratio of the diameter of the aortic arch to that of the distal thoracic aorta is smaller than 0.9.

Diagnostic imaging of the vertebrobasilar vessels was performed routinely, and all cases were discussed interdisciplinary by the cardiologist, the interventional radiologist, and the vascular surgeon. All TEVAR procedures were performed under general anesthesia. All devices were delivered using

Table I. Patient history

Patient number	Gender	Age/year at primary repair	Type of primary repair	Secondary intervention before TEVAR	Age/year TEVAR	Comorbidities	ASA score
1	Male	17 years/1971	Unknown		46 years/2000	Hypertension	2
2	Male	6 years/1980	DPA		28 years/2002		3
3	Male	6 years/1981	SFA		28 years/2003		2
4	Male	15 years/1979	DPA		39 years/2003	Nicotine abuses, obesity	2
5	Male	6 years/1981	DPA		29 years/2004	Bicuspid aortic valve	2
6	Male	8 years/1980	DPA	Valvulotomy; subvalvular membrane resection (1987)	32 years/2004	Nicotine abuses, obesity, bicuspid aortic valve	3
7	Male	6 years/1982	DPA		28 years/2004	Bicuspid aortic valve, aortic valve stenosis	2
8	Male	6 years/1981	DPA		30 years/2005	Nicotine abuses	2
9	Male	4 years/1979	DPA	DPA (1983)	33 years/2008	Bicuspid aortic valve, aortic valve stenosis, mitral valve regurgitation	2
10	Male	12 years/1980	DPA	Dacron Interposition Graft (1992)	40 years/2008	Obesity, hypertension	3
11	Male	20 years/1985	DPA	Dacron Interposition Graft (1993)	43 years/2008	Aortic descending dilatation + aortic valve regurgitation + local dissection	2
12	Male	6 years/1982	DPA		32 years/2008	Bicuspid aortic valve	2
13	Male	6 years/1981	DPA		33 years/2008	Hypertension	2

DPA, dacron patch aortoplasty; SFA, subclavian flap aortoplasty; ASA, American Society of Anesthesiologists.