Stent-Grafting of the Thoracic Aorta by the Cardiothoracic Surgeon

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Background. **We evaluated endovascular stent-grafting as a new technique in aortic surgery.**

Methods. **One hundred ninety-six stent-grafts were implanted in the thoracic aorta in 172 patients. All procedures but one were performed in the operating room by a team of cardiothoracic surgeons; 112 operations (57%) were emergency procedures. Twenty-four procedures (12%) were reoperations for endoleaks. The left subclavian artery origin was covered in 46 cases and the left common carotid artery in 2 cases. Access was by femoral cut-down in 174 procedures, percutaneous femoral approach in 1, and by conduit to the iliac arteries or infrarenal aorta in 17. Surgical reconstruction of damaged access vessels became necessary in 10 cases.**

Results. **Thirty-day mortality was 9.7% (19 patients). Paraplegia occurred in 1.0% (2 patients). Primary technical success was 85.2%, secondary 91.8%. Six conversions to open repair were necessary, 3 during the procedures and 3 secondarily before discharge. Actuarial survival was 79% at 1 year, 67% at 3 years, and 55% at 5 years.**

Conclusions. **The results are excellent, taking into account the high incidence of emergency procedures and that open surgery is not promising in many patients. The cardiothoracic surgeon can perform the procedure after adequate training in endovascular techniques. Surgical skills are mandatory because of the potential need for extended surgical approach to the access vessels or immediate conversion to open surgery. Therefore, the operating room is the preferred site for this procedure.**

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Since Parodi and colleagues [1] implanted their first homemade endovascular stent-graft, endovascular repair has evolved into a routine procedure for abdominal aortic aneurysms. In thoracic aortic lesions, the potential benefit for the patient is more evident than in abdominal aortic aneurysms because of the more significant mortality and morbidity associated with the conventional procedure. Dake and associates [2] implanted the first stent-graft in the thoracic aorta in 1992, and that series was the stimulus to develop commercial stent-grafts.

As they possessed endovascular skills, vascular surgeons, cardiologists, and radiologists started to treat the thoracic aorta as well as the cardiothoracic surgeons, to whom traditionally patients with thoracic aortic disease were referred. There is growing interest in the whole cardiothoracic community [3] in this new minimally invasive modality. Since we started our endovascular program very early with abdominal aortic aneurysms, experience has accumulated [4], and the technique is now fully integrated into our operative spectrum.

Patients and Methods

Between September 1999 and the end of 2005, we performed 196 thoracic aortic stent-graft procedures in 172 patients (119 male and 53 female), aged 15 to 87 years (mean, 60). Twenty-four implantations were redo operations for secondary graft extension; 22 of these secondary procedures were performed in patients from our own series, 2 were referred from other institutions. Data were collected in a Microsoft Access database from the hospital and office charts, the operative reports, and the preoperative and postoperative measurements. Only stent-grafts approved in the European Community were implanted. Written informed consent for the operation was obtained in all cases according to the rules of regular elective or emergency surgery. This retrospective study was approved by

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Table 1. Patients' Demographics and Aortic Diseases as Indications for Stent Grafting

Aortic Pathology	n	Male	Age (Years)	Age (Mean)
Traumatic rupture	31	28 (90%)	15–81	37
Posttraumatic aneurysm	4	3 (75%)	37–65	52
Penetrating atherosclerotic ulcer	43	23 (54%)	55–87	70
True aneurysm	26	14 (54%)	57–85	72
Type-B dissection	57	43 (75%)	36–87	62
Suture aneurysm	8	6 (75%)	33–66	54
Others	3	1 (33%)	46–61	55
Total	172	119 (69%)	15–87	60

the Institutional Ethics Committee, which waived the need for additional patient consent to the study.

The indications for primary stent-graft implantation and patient demographics are summarized in Table 1.

One hundred twelve operations (57%) were emergency procedures with these preoperative conditions: active bleeding in 23, contained rupture in 55, malperfusion in type B dissections in 17, symptomatic aneurysm in 12, and 5 urgent procedures because of impending complications.

Diagnostic Evaluation

The elective cases were seen as outpatients, and optimal diagnostic evaluation was performed to plan the procedures and optimize risk factors. That included high-quality spiral computed tomography (CT) and coronarography combined with aortography. In 11 cases of impaired renal function, magnetic resonance imaging replaced CT. The appropriate stent-grafts were chosen in cooperation with the manufacturers; custom-made grafts were ordered if necessary. If coronary artery disease was detected, this was treated by percutaneous intervention or coronary bypass grafting some weeks before the procedure.

Fig 2. Hybrid procedure for a thoracoabdominal aneurysm in a 72-year-old woman. The celiac axis ostium was covered by the stent-graft (E-vita). The 10-mm Dacron access graft to the distal abdominal aorta was used as a bypass for iliac artery reconstruction after deployment of the endograft. A second bypass (6-mm expanded polytetrafluoroethylene) to the common hepatic artery was anastomosed on top.

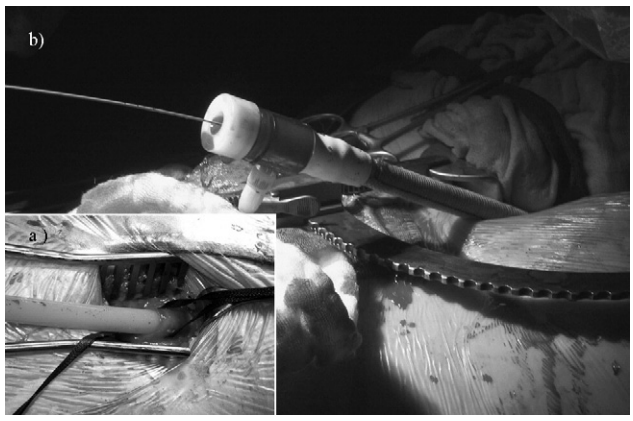

Fig 1. Endovascular access. a) Routine angioaccess consists of exposure of the common femoral artery with a small oblique incision. The delivery system of the stent-graft is advanced directly over the puncture site without arteriotomy guided by the ultrastiff guidewire. b) For the access conduit, a 10-mm Dacron graft has been sutured end to side to the distal abdominal aorta (Fig 3). A 24F sheath is passed through this graft into the suprarenal aorta.

In most of the emergency procedures, however, measurements had to rely on the plain axial CT scans performed by the referring hospitals and simple graphical methods. These CT scans were often of inferior quality, with 5- to 10-mm slices. Usually no information concerning the iliac vessels was available from these external emergency evaluations. When in doubt, the correct diameters of the aorta were determined with intraoperative transesophageal echocardiography or intravascular ultrasonography. Stent-grafts were chosen from the in-hospital stock of Talent and, since 2004, E-vita grafts.

Devices and Implantation Technique

We used Talent (Medtronic Vascular, Santa Rosa, California) stent-grafts in 123 procedures, E-vita (Jotec, Hechingen, Germany) in 60, Zenith TX1 (William Cook Europe,