

Case Report: Endovascular Repair of a Thoracic Aortic Aneurysm (Saccular Type) with a Stent-graft

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We describe the repair of a descending thoracic aortic aneurysm (saccular type, maximal size 85 mm) with an endovascular stent-graft in a 69-year-old man with chronic renal failure. The graft consisted of a self-expanding Z-stent covered with a woven polyester graft. An angiogram obtained intraoperatively showed complete thrombosis of the aneurysm. One month after the procedure, a contrast-enhanced computed tomographic (CT) scan showed thrombosis of the aneurysmal sac. A follow-up CT scan obtained 18 months after the operation confirmed that the aneurysm had disappeared. (Ann Thorac Cardiovasc Surg 2001; 7: 116-8)

Key words: endovascular repair, thoracic aortic aneurysm, saccular aneurysm, stent-graft

Introduction

The patient was a 69-year-old man (body weight, 57 kg; height, 166 cm) with sarcoidosis and hypertension, for which he was receiving medication. He had a history of surgery for rectal cancer. A chest roentgenogram showed an ectatic descending aorta. Enhanced computed tomography (CT) (Fig. a) and aortography demonstrated a saccular aneurysm (diameter, 85 mm) of the descending aorta at the level of T7. The diameter of the descending aorta proximal and distal to the saccular aneurysm was 26 mm. The blood urea nitrogen level was 45 mg/dl, and the creatinine level was 2.28 mg/dl owing to renal sarcoidosis. Because conventional surgery carried a high risk of exacerbating renal failure, endovascular stent-graft repair was scheduled.

Procedure: A stent-graft was constructed from a self-expanding Gianturco stainless-steel Z-stent (Cook, Inc., Bloomington, Ind.) covered by a woven polyester graft (UBE, thickness, 0.18 mm; porosity, 50 ml/cm²/min) after its crimps had been ironed out. The stent-graft was

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30 mm in diameter and 10 cm in length. The diameter of the stent-graft was approximately 120% of the diameter of the aneurysmal neck.

With the patient under general anesthesia, the left common iliac artery was surgically exposed to obtain vascular access. An incision was made in the left common iliac artery, and a 20-Fr Teflon delivery sheath (Cook, Inc.) with a tapered dilator was inserted under fluoroscopic guidance until the tip of the sheath was 1.5 cm proximal to the aortic aneurysm. Aortography was performed to verify the location of the sheath. Ventricular asystole was induced by an intravenous injection of 30 mg of adenosine triphosphate. The stent-graft was advanced into the sheath and placed in the descending aorta at the level of T6 to T8. The orifice of the saccular descending aortic aneurysm was closed. A second aortogram was obtained to confirm no leakage of blood into the aneurysm. Transesophageal echography showed a "hazy" echo in the aneurysm due to decreased blood flow.

One month after the procedure, a contrast-enhanced CT scan showed complete thrombosis of the aneurysmal sac (Fig. b). A contrast-enhanced CT scan obtained after 18 months confirmed that the aneurysm had disappeared (Fig. c).

Comment

A stent-graft was first used clinically to repair an ab-

dominal aortic aneurysm by Parodi et al. in 1991.¹⁾ Subsequently, among 110 patients with aortic aneurysms who underwent endovascular stent-graft repair, the initial success rate was 75%; the late success rate was 62% overall and 80% among patients in whom repair was initially successful.²⁾ Recently, endovascular stent-graft repair of abdominal aortic aneurysms is gaining increasing acceptance internationally.

In 1994, Dake et al.³⁾ reported on 13 patients who underwent endovascular stent-graft repair of descending thoracic aortic aneurysms. In 1998, Dake et al.⁴⁾ reported the outcome of endovascular stent-graft repair in a series of 103 patients with descending thoracic aortic aneurysms. Complete thrombosis of the aneurysm was achieved in 86 patients (83%). The operative mortality rate was 9%, and the rates of paraplegia and stroke were 3% and 7%, respectively. The most common complication was leakage into the aneurysmal sac, which required coil embolization in several patients. In one patient with a late leak, the aneurysm continued to enlarge and eventually ruptured into the esophagus. This patient suggests that complete blockage of blood flow to the aneurysm is very important.⁵⁾

In our patient, blood flow to the aneurysm was completely blocked, and there were no major complications, such as paraplegia and stroke. Two points merit further comment: (1) the location and shape of the aneurysm and (2) the material used for the stent-graft.

Location and shape of the aneurysm: The descending thoracic aortic aneurysm was a saccular type and had no branches. The aorta proximal and distal to the aneurysm was not dilated or tortuous, and there was no evidence of a thrombus. The proximal neck of the aorta was long enough to deploy the stent-graft. In our patient, the stent-graft was deployed at the level of the sixth to eighth thoracic vertebrae, at which there were no branches from the aneurysm and no large intercostal arteries. This was the main reason why the stent-graft caused complete thrombosis of the aneurysm. These factors prevented paraplegia and stroke in our patient.

Material of stent-graft: Direct leaks from the stent-graft and direct damage to the graft can cause leakage into the aneurysm. The stent-graft material should therefore have a low porosity and be strong enough to withstand systemic blood pressure. We used a woven polyester graft (UBE graft; thickness, 0.18 mm; porosity, 50 ml/cm²/min) to cover the stent-graft.

A contrast-enhanced CT scan obtained 18 months after the procedure showed that the aneurysm had disap-



Fig. Computed tomographic (CT) scans.

- a: A preoperative CT scan shows a saccular aneurysm of the descending aorta.
- b: An enhanced CT scan obtained 1 month after operation shows complete thrombosis of the aneurysmal sac.
- c: A CT scan obtained 18 months after operation shows that the aneurysm has disappeared.

peared. Dorros et al.⁶ used an endovascular covered stent-graft to repair a leaking intercostal artery patch, used to surgically correct a descending thoracic aortic aneurysm. A contrast-enhanced CT scan obtained 6 months after the operation showed resorption of the pseudoaneurysm. We could not find any other report documenting complete disappearance of an aneurysm after endovascular repair. The saccular aneurysm in our patient was suspected to be a pseudoaneurysm, because it initially measured 8 cm in diameter and disappeared only 18 months after endovascular repair.

Our preliminary results indicate that saccular thoracic aortic aneurysms can be successfully treated by endovascular stent-graft repair.

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