Complex reconstruction of the thoracic aorta using a novel stent graft/graft prosthesis

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We present a case of successful treatment of a complex thoracic aortic aneurysm using a stent graft/graft prosthesis. This novel system allows us to stent the descending aorta and to replace the aortic arch and ascending aorta with its attached vascular graft in a single-stage procedure.

Clinical Summary

A 65-year-old man was admitted to our department with intermittent pain between his scapulae. A computed tomographic scan of the aorta showed a complex aneurysm of the thoracic aorta. The craniocaudal extension of the descending aorta was 64 mm with a parietal thrombus, leaving a perfused lumen of 49 mm (Figure 1). A dissection was excluded, and coronary angiography and echocardiography did not reveal any relevant additional heart disease.

The patient was operated on by using deep hypothermic circulatory arrest with antegrade intermittent blood cardioplegia and antegrade selective cerebral perfusion. The thoracic aorta was replaced with a stent graft/graft prosthesis. During cooling, the ascending aorta was initially replaced supracommissurally with a 28-mm Dacron prosthesis (Hemashield Platinum; Boston Scientific Inc, Wayne, NJ). At 18°C, the aortic arch was opened, and cerebral perfusion was initialized. A thoracic stent graft system (E-vita open; Jotec Inc, Hechingen, Germany) with a diameter of 30 mm was inserted into the descending aorta over a guide wire. The vascular stent with a length of 150 mm was released, leaving its proximal end about 5 mm distal to the left subclavian artery. A nonpreclotted Dacron graft was pulled out of the stent about 5 mm and sewn to the proximal descending aorta. The graft was further pulled out of the stent and sealed with glue (CoSeal Surgical Sealant; Baxter Healthcare Corp, Deerfield, Ill). Supra-aortic vessels were attached to the trimmed graft in an island fashion. The graft was finally trimmed and sewn to the 28-mm supracommissural prosthesis. After rewarming, the patient was weaned from cardiopulmonary bypass, and the chest was closed.

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Postoperative computed tomographic scanning showed no residual leakage of the stent graft and a satisfactory postoperative result of the reconstructed thoracic aorta (Figure 2).

Discussion

The present case describes the use of a novel stent graft/graft prosthesis for replacement of a complex aneurysm of the thoracic aorta.

Various techniques to treat these kinds of complex thoracic aneurysms have been reported. In general, single-stage and 2-stage approaches can be distinguished. A 2-stage technique with an elephant trunk (ET) has been initially described by Borst and colleagues.[1] In a second-stage operation, this ET can be used for the proximal attachment of another graft or as a landing zone for a stent graft prosthesis. The latter procedure can be performed after a time interval or in the same operative setting. In single-stage procedures a transmediastinal approach with or without additional left anterolateral thoracotomy,[2] as well as bilateral anterior thoracotomy and transverse sternotomy, have been described.[3]

The stent graft system used here combines the therapeutic principle of a 2-stage approach with the advantage of performance in a single operation. It has similarities to the so-called frozen ET. Here the proximal landing zone of the stent graft is replaced by the custom-made connection of the stent graft/graft, which is sutured to the distal descending aorta. The vascular stent itself consists of a polyester fabric with a flexible nitinol wire skeleton without open bar ends or reinforced circular springs distally. It can be delivered in 2 lengths (150 and 160 mm) with appropriate diameters (24-40 mm). The nonpreclotted, double-woven, crimped Dacron prosthesis of 70 mm in length is also delivered in various diameters (24-38 mm).

There are certain important aspects when applying this system. The extension of the descending aneurysm has to be shorter than the stent to enable a sufficient distal landing zone. The length of the stent of 150 mm is in the recommended range to minimize the risk of paraplegia. The aortic diameter has to be adequate to anchor the graft distal to the left subclavian artery. In some cases the aorta might need to be tailored. Because the graft is delivered inserted into the stent, a preclotted graft surface might be harmed. Therefore the prosthesis is not preclotted and needs to be sealed.

Indications for this system are complex thoracic aneurysms involving the ascending aorta, aortic arch, or both in combination with the proximal descending aorta. A similar system has been described by Kato and associates[4] in the treatment of type A aortic dissection. This patient group might also benefit from this single-

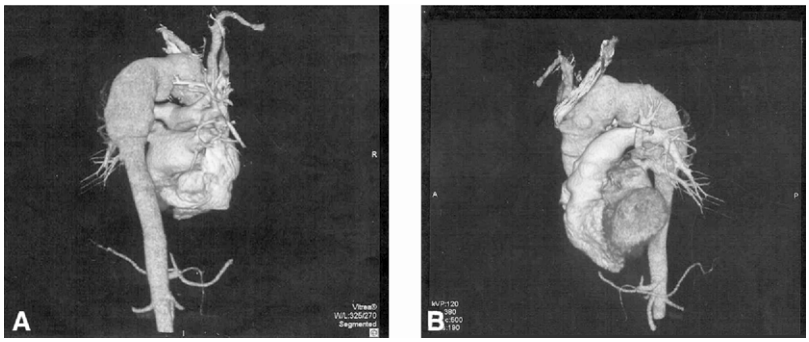

Figure 1. Three-dimensional preoperative computed tomographic scan of the thoracic aorta showing the complex aortic aneurysm. A, posterior view; B, left lateral view.

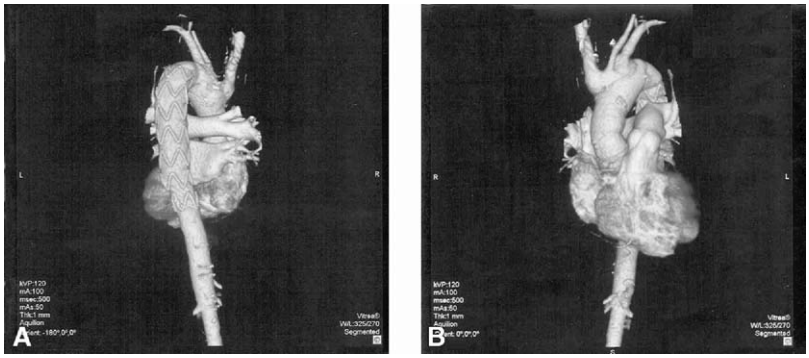

Figure 2. Three-dimensional postoperative computed tomographic scan of the thoracic aorta showing the stent graft/graft system. A, Anterior view; B, posterior view.

stage procedure because it has been shown that residual dissection of the aortic arch and descending aorta after replacement of the ascending aorta might lead to further dilatation of the residual aorta. Additional stenting of the descending aorta might improve long-term results in these patients.[5]

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