Repair of coexistent infrarenal and thoracoabdominal aortic aneurysm: Combined endovascular and open surgical procedure with visceral vessel relocation

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Patients with aneurysmal disease involving both the thoracoabdominal and the infrarenal aortic segments require high-risk surgical treatment, either simultaneously or sequentially. Endovascular treatment is not feasible when important collaterals are involved. We report here a case of simultaneous endovascular and surgical treatments for repair of thoracoabdominal and infrarenal aneurysms with celiac trunk relocation.

Clinical Summary

A 72-year-old man with a history of myocardial infarction (since 1995) was referred to our department for evaluation of concomitant thoracoabdominal and infrarenal aneurysms. The patient underwent contrast-enhanced thoracoabdominal computed tomographic scan, which revealed the presence of a thoracoabdominal aneurysm arising from the middle portion of thoracic descending aorta and involving the origin of the celiac trunk. The maximum diameter was 7.5 cm. Also found was a large, inferior, infrarenal aneurysm with a maximum transverse diameter of 10.1 cm (Figure 1). Considering previous cardiac events, transthoracic echocardi-

ography was performed and showed reduced posterior wall motion, lateral apical wall akinesia, and conserved global left ventricular function. Coronary arteriography showed severe multiple stenoses of the circumflex artery. Digital angiography was also performed and revealed severe bilateral obstructive disease and kinking of the iliac-femoral axis. The patient was selected for a combined endovascular and surgical procedure. Open surgical repair of the abdominal aneurysm was undertaken, with implantation of a 20 × 11-mm aortobifemoral Dacron polyester fabric graft. The celiac trunk was dissected and reimplanted on the superior mesenteric artery with an end-to-side anastomosis to create a distal landing zone for the endovascular graft. A 10-mm Dacron polyester fabric sleeve was then sewn to the aortic graft as an access port for endovascular stenting of thoracoabdominal aneurysm. This procedure was performed in the operating room, monitored with a portable Philips BV 300 C-arm image intensifier with digital subtraction (Philips Medical Systems, Eindhoven, The Netherlands). Because of the length of the aneurysm, two endografts (40 × 36 × 120 mm and 38 × 36 × 15 mm; Talent World Medical Manufacturing Corporation, Sunrise, Fla) were required to exclude it. After the endovascular procedure, the Dacron polyester fabric side arm was amputated and closed. Complete exclusion of the thoracoabdominal aorta with excellent perfusion of the visceral vessels and without evidence of endovascular or anastomotic leak was shown on completion arteriography (Figure 2). The patient was extubated 6 hours after the operation. No major complications occurred, and the patient was discharged on postoperative day 7. At 6 months' follow-up, the patient was free of symptoms, and computed tomographic scan revealed complete thrombosis of thoracoabdominal aneurysm and absence of stent-graft endoleaks.

Discussion

Thoracic and thoracoabdominal aneurysms have always represented a dramatic treatment challenge in the history of aortic

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Figure 1. Preoperative computed tomographic scan showing presence of thoracoabdominal aneurysm, originating from middle portion of descending thoracic aorta and involving origin of celiac trunk, and of voluminous infrarenal aortic aneurysm.

Figure 2. Completion arteriogram after procedure showing exclusion of thoracic aneurysm, excellent perfusion of visceral vessels, and no endovascular or anastomotic leak. Arrow indicates celiac trunk anastomosed on superior mesenteric artery (circled area).

surgery. The traditional surgical approach is still associated with significant mortality and morbidity.¹ In 1994, Dake and colleagues² reported their experience with endovascular treatment of

thoracic aneurysms and opened a new era in the history of this pathologic entity. Since then, technologic research has led to the production of progressively better devices that make the procedure far safer, more feasible, and more effective. Nevertheless, severe peripheral arterial obstructive disease, aneurysms involving important collaterals, and a landing zone proximal to visceral vessels each represent a contraindication to this treatment.

In our case the extension of thoracoabdominal aneurysm and the coexistence of a voluminous infrarenal aneurysm required extended aortic replacement; furthermore, the presence of concomitant pathologic conditions, such as severe chronic obstructive pulmonary disease and coronary artery disease, made surgical risk untenable. Sequential surgical repair of the two aneurysms could be performed, but this approach would have required two major surgical interventions, with additional risks. According to some authors, rupture of the residual aneurysm can occur during the wait for the second operation.³ At the same time, endoluminal stent graft placement was not feasible because of the presence of severe bilateral iliac-femoral obstructive disease. Furthermore, the extension of thoracoabdominal aneurysm would have required occlusion of the celiac axis with endograft to exclude the aneurysm itself.

The combined approach allowed us to avoid these difficulties. Introducing an endograft through a previously constructed side branch of abdominal prosthesis allowed us to avoid the iliac femoral axis. Surgical reimplantation of the celiac trunk on the superior mesenteric artery allowed complete exclusion of the thoracoabdominal aneurysm, with low risk of visceral ischemia. Although some authors have reported a considerable risk of paraplegia with a combined approach,^{4,5} this risk was considered acceptable in such a high-risk setting with a patient who was not a candidate for either staged or simultaneous operations. This combination of the finest modern endovascular and experienced standard surgical techniques is an important development, because it allows treatment of patients with complex aortic disease who are at high surgical risk for concomitant diseases and could not benefit from either surgical or endovascular treatment in isolation. What is more, concomitant surgical relocation of visceral vessels opens a new era in the treatment of thoracoabdominal aneurysms, allowing for the first time application of endovascular techniques even in patients that until now have been subjected to laborious and high-risk interventions.

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