Staged Open and Endovascular Repair of Thoracoabdominal Aneurysms Using the Common Carotid Artery

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The purpose of this study was to demonstrate the feasibility of staged open and endoluminal repair of complex thoracoabdominal aneurysms. We report the management of two patients with a staged, open abdominal and endoluminal thoracic repair of Crawford extent II aneurysms, where iliofemoral access was impossible and thoracic repair effected by endograft deployment via a common carotid artery. From this experience we conclude that staged open and endovascular repair for both ruptured and elective Crawford extent II thoracoabdominal aneurysms can be performed using the common carotid artery, when anatomy is favorable.

INTRODUCTION

Conventional surgical repair of Crawford extent II thoracoabdominal aortic aneurysms (TAAA) remains a surgical challenge, especially so in the medically infirm and emergency patient presenting with rupture. Despite prudent case selection, associated morbidity for such cases approaches 50% and mortality rates of 17-20% are reported for specialist ceners.[1] More often these patients are considered unfit to withstand either staged or simultaneous laparotomy and thoracotomy.[1,2] It is well established that for patients with abdominal aortic aneurysm 5% will have concurrent thoracic segment disease and for patients presenting with descending thoracic aneurysms 13-29% will have abdominal involvement.[3,4] Tradition dictates that open thoracoabdominal repair is the treatment of choice for those who are medically fit.[5] However, some centers have adopted a staged open approach for complex thoracoabdominal aneurysms with favorable results.[6]

Therefore, if possible, a staged open and endovascular approach in such patients would appear rational, limiting morbidity and mortality associated with conventional repair.

Since the introduction of computed tomography we have noticed an increasing number of incidental cases, particularly so in the elderly. Inherent in this population is a higher incidence of comorbidity, including peripheral vascular disease, which can preclude suitable endovascular access.[7] We report the management of two patients with a staged, open abdominal and endoluminal thoracic repair of Crawford extent II aneurysms. In both cases iliofemoral access was impossible and the thoracic component was repaired with endografts deployed via a common carotid artery (CCA).

CASE REPORT

Case 1

A 61-year-old male presented with severe back pain and hemoptysis. Comorbidity included hypertension and type II diabetes mellitus, and in 1996 he had previously undergone left common iliac artery angioplasty. Principle findings on examination were a large thoracoabdominal aneurysm with stable hemodynamics and the presence of left lower lobe collapse with respiratory embarrassment. Neither common femoral pulse was palpable.

Preoperative evaluation. Spiral computed tomography revealed a Crawford extent II TAAA, with both a penetrating ulcer in a 7-cm thoracic segment and a contained posterior rupture of a 10-cm

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Ann Vasc Surg 2005; 19: 103-107
DOI: 10.1007/s10016-004-0049-y

Published online: January 11, 2005

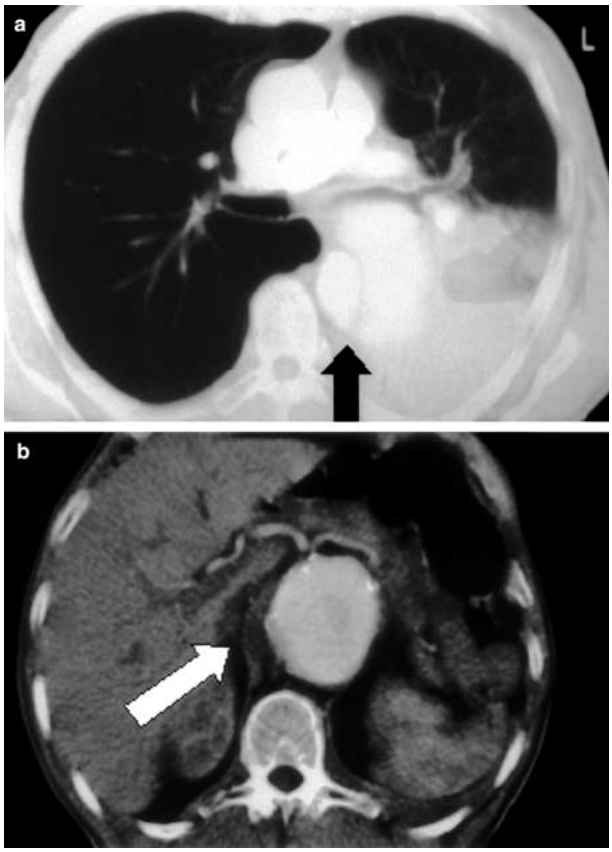

Fig. 1. Crawford extent II thoracoabdominal aneurysm. There is a penetrating ulcer in the thoracic segment (**a**, *black arrow*) and contained rupture of the abdominal aneurysm (**b**, *white arrow*).

abdominal component (Fig. 1). The aneurysm had an hourglass configuration with a 32-mm anatomical waist just proximal to the celiac trunk. Graduated aortography was performed, confirming that the thoracic component was suitable for endovascular repair. However, the common iliac arteries were noted to be heavily calcified and of small diameter with an occluded right side. Conventional iliofemoral access was considered too hostile for endovascular device delivery.

In view of these findings, digital subtraction aortography and duplex scanning were performed to assess both carotid artery caliber and architecture. Both CCA measured 9 mm in maximal transverse diameter with absence of internal carotid artery disease. A left common carotid approach appeared to provide the more expedient angle of entry to the aortic arch.

Operative detail. Staged thoracoabdominal repair was undertaken, with conventional suprarenal repair being performed in the first instance. Following intravenous heparinization (80 IU/kg) and supraceliac cross-clamping, endoaneurysmorraphy was performed using a 20-mm straight Dacron tube graft incorporating the celiac, superior mesenteric, and renal arteries in a Carrel patch. Aortic segment rupture was confirmed at laparotomy. The patient was transferred to intensive care postoperatively, requiring ventilation for refractory left lobar collapse.

Endoluminal thoracic stenting was performed 2 weeks following open abdominal repair. The left CCA was used for endovascular access. Having been displayed via a low transverse neck incision, a 0.035-inch Meier guide wire was introduced via a 6F sheath under fluoroscopic guidance. Intraoperative angiography was used to accurately identify proximal neck and distal device landing sites, by means of a portable C-arm image intensifier with digital subtraction. The distal end of the Meier wire was snared and retrieved through a percutaneous left femoral puncture, providing "body-floss" control. Via the carotid arteriotomy, two 38 × 98 mm Talent™ stent grafts (Medtronic AVE, Sunrise, FL) were deployed in an overlapping distal-to-proximal fashion under relative hypotension, minimizing the risk of stent migration or deformation (Fig. 2). Completion angiography was performed to ensure aneurysmal exclusion and absence of endoleak. Inspection of the CCA revealed no intimal damage and primary closure of the arteriotomy was effected.

The patient was transferred to intensive care postoperatively where rapid resolution of respiratory embarrassment occurred within 24 hr due to release of compression on the left main bronchus. There were no neuroischemic events, and the patient remains well with no evidence of endoleak or stent migration at 6 months.

Case 2

A 76-year-old male presented electively with an asymptomatic Crawford extent II TAAA diagnosed incidentally. Comorbidity included chronic respiratory disease with bilateral bullae.

Preoperative evaluation. Spiral computed tomography and graduated aortography revealed an 8.5-cm thoracic aneurysm originating 3 cm distal to the origin of the left subclavian artery. A 30-mm waist presented just proximal to the celiac axis, below which a 10-cm juxtarenal aneurysmal extended to the aortic bifurcation. The right and left common iliac artery diameters were too small and excessively tortuous, precluding endograft delivery (Fig. 3).

Carotid architecture was assessed as previously detailed. Both CCA measured 8.5 mm in maximal transverse diameter with absence of internal car-