THE HYBRID PROCEDURE FOR SURGICAL REPAIR OF THORACOABDOMINAL ANEURYSMS

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INTRODUCTION

Cardiovascular surgeons at the Methodist DeBakey Heart Center have a long history of leadership in the treatment of aortic pathology, and nowhere is this leadership more apparent than with thoracoabdominal aneurysms (TAAs). The Methodist DeBakey Heart Center has more experience in treating TAAs than any other institution in the world. Yet despite our expertise and concentration of surgical experts, TAA repair remains complex and carries significant morbidity and mortality. The center's success with endograft repair of infrarenal abdominal aortic aneurysm has led our team to extend these techniques to thoracoabdominal aneurysm repair in an effort to decrease the magnitude of this surgery.

DISCUSSION

Thoracoabdominal aneurysms involve both the descending thoracic aona and some portion of the abdominal aorta. These aneurysms were classified into four categories by Dr. E. Stanley Crawford at The Methodist Hospital. Crawford type I extends from the left subclavian to the abdominal visceral vessels distally, usually ending at the level of the renal arteries. Crawford type II extends from the left subclavian to the aortic bifurcation. Crawford type Ill extends from the level of about T6 to the aortic bifurcation. Finally, Crawford type IV extends from the diaphragm co the aortic bifurcation. This universally used classification allows one to scudy aneurysms of comparable risk, as the more extensive aneurysms (type I and II) carry the greatest risk.

The classic open surgical repair of TAAs pioneered at The Methodist Hospital involved a long thoracoabdominal incision from the umbilicus across the coscal margin and extending into a full posterolateral left thoracocomy. The left chest was directly entered, and a retroperitoneal dissection was used to expose the aorta. Surgical planning required identification of appropriate areas for proximal and distal control, graft placement and reattachment of necessary vessels. The renal arteries, the superior mesenteric artery and celiac axis are always rear-

Figure 1. Arteriogram showing debranching of left carotid and left subclavian arteries.

Figure 2. Intraoperative picture of graft placement.

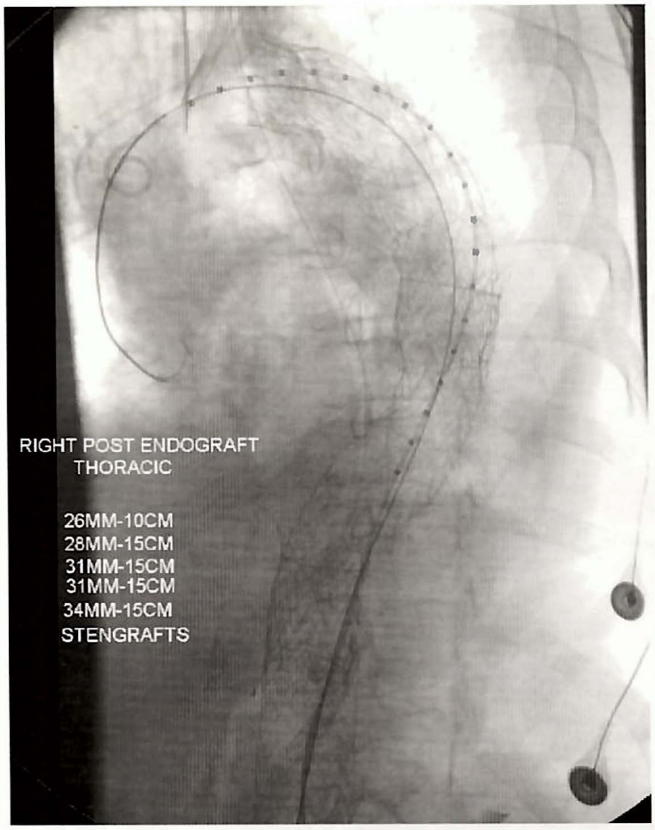

Figure 3. Fluoroscopy picture of stents in place.

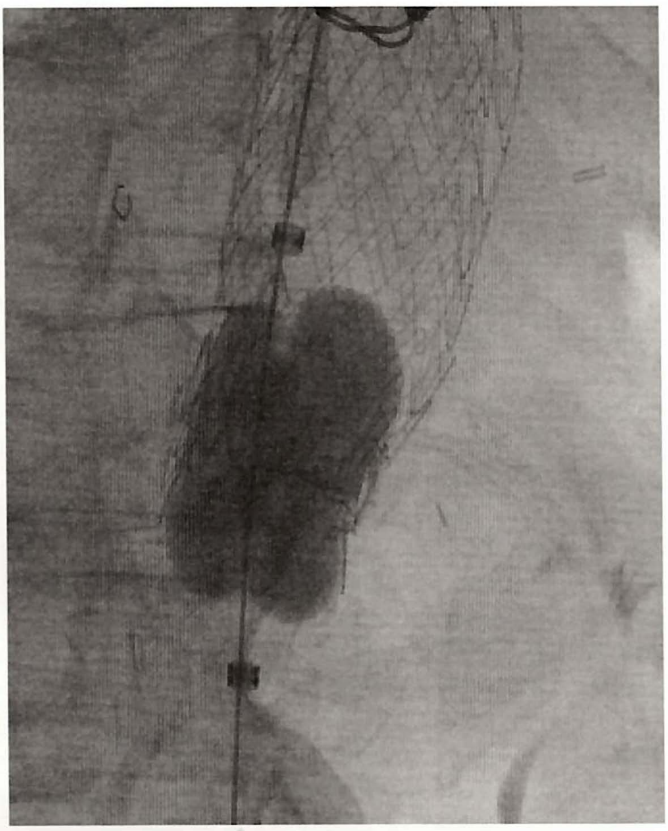

Figure 4. Balloon dilatation of the distal stent graft.

tached, and large incercostal arteries between T9 and L2 that may represent the spinal artery of Adamkiewicz are attached when present. Cerebral spinal fluid drainage and left heart bypass are also used in extent I and II TAAs.

This classic approach has been reported from our institution in separace studies involving 1,509, 1,773, and 1,004 different paciencs.[1,2,3] Morcalicy for TAA remains high, however, averaging 13% for elective procedures and 47% for emergency procedures.[1],4 Morbidity even in contemporary expert hands also remains high, with a 6% renal failure race and 4.5% paraplegia rate.[2] In cencers without extensive experience, mortality and morbidity are even higher and are related to the extensive nature of the surgery and the common preexisting comorbidicies in this patient population. Since the latter is not within our control as surgeons, our efforts have focused on minimizing the surgical intervention by developing a hybrid surgical approach utilizing a smaller, open surgical component combined wich endografr repair techniques.

Planning for a hybrid procedure requires similar considerations to the classic open approach. Instead ofareas co place a vascular clamp for proximal and distal control, we must achieve a proximal and distal landing zone co sear the stent graft without leak. This requires at least 2 cm of aorta less than 40 mm in diameter as a landing zone. Additional proximal landing zone can be obtained into the aortic arch by debranching rhe left carotid and left subclavian artery (Figure 1). Distal additional landing zone may be obtained by extending che scent grafts into rhe iliac arteries bur is usually within an infrarenal aortic graft. In the hybrid procedures, chis is achieved via standard laparotomy with rhe infrarenal aorta being replaced by an aortoiliac or aortobilaceral femoral bypass graft. The TAA usually narrows slighcly just below che renals, allowing placement of a large, usually 20 x 10 mm or 22 x 11 mm graft with a long waist segment to serve as the distal landing zone. Use of a large graft allows a better transition co the usually larger landing zone proximally.

The next consideracion is maintaining perfusion to the necessary vessels. Bypass grafts are brought from the iliac limbs up co both renals, the superior mesemeric artery and the celiac axis and then ligated at the aorca (Figure 2). Access for stent graft placement may be achieved via the native femoral or iliac artery if large enough or via the femoral extension of the previously placed graft. Multiple graft components are necessary in these long aneurysms and each need a 5 cm overlap segment. After the stent grafc has been placed (Figure 3), each end and all overlaps are balloon dilated (Figure 4) and arteriograms are performed (Figure 5). Cerebral spinal fluid drainage is routinely used, although the lefc heart bypass is not necessary.

Our early experience with hybrid

techniques is encouraging and reflects our continued efforts to lead the field of thoracic aortic surgery and improve the standard of patient care.

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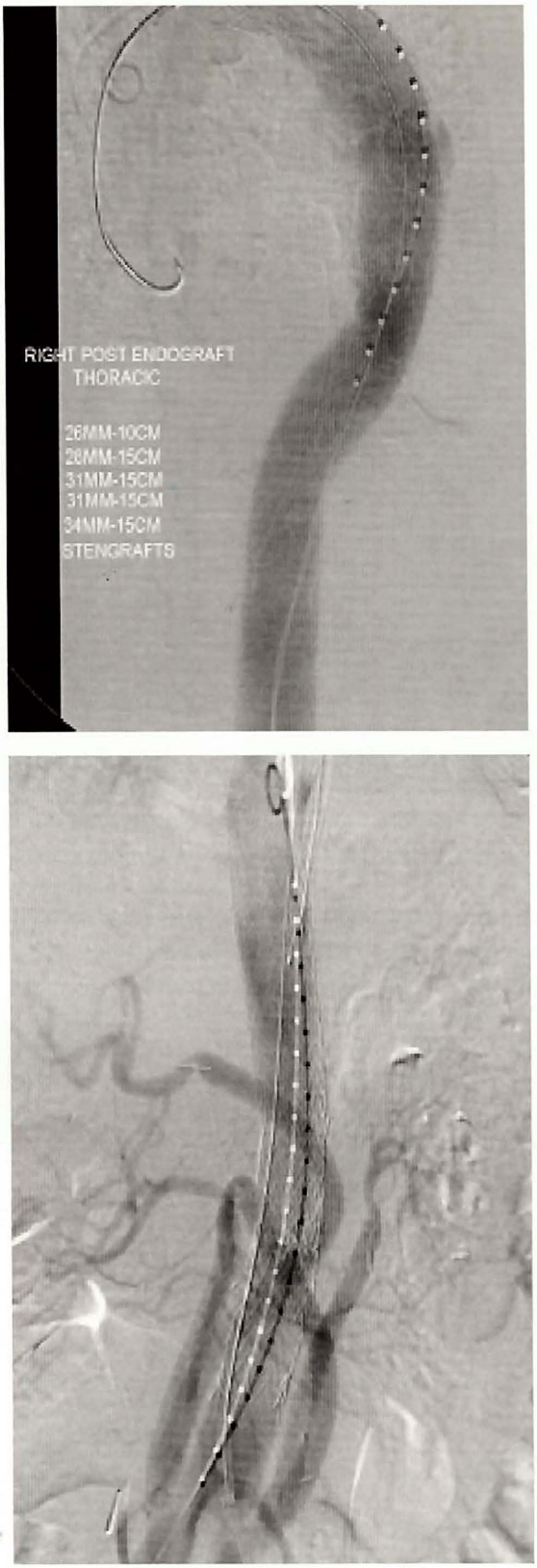

Figure 5. Completion arteriogram.