

A Novel Aortic Wrap Technique

Reinforcing the aorta with an external aortic band can prevent type I endoleak after EVAR.

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Endovascular aneurysm repair (EVAR) is an attractive alternative to surgical repair of abdominal aortic aneurysms (AAAs).¹ Many patients, however, are poor or ineligible candidates for EVAR because of unsuitable anatomy.¹⁻³ In addition, some investigators have reported that proximal attachment failure is a long-term complication after EVAR.^{4,5} When left untreated, type IA endoleak after EVAR is associated with a high risk of AAA expansion and rupture.^{2,3} Unfortunately, none of the endovascular strategies of reinforcing the neck from the inside have achieved complete success.^{4,5} Failure of endovascular intervention, therefore, might require surgical repair and removal of the endograft, which increases morbidity and mortality rates of the procedure.²⁻⁵ To overcome these problems, reinforcing the outside of the aorta with an external aortic band has shown promising experimental and preliminary clinical results.^{6,7} This report describes a novel technique of aortic banding in a 72-year-old woman who developed type I endoleak 5 years after EVAR.

CASE REPORT

A 72-year-old woman with an AAA underwent EVAR with placement of an aortoaortic stent graft 5 years earlier. She was admitted to our hospital after a computed tomography (CT) scan of her abdomen revealed a new type I endoleak. The maximal diameter of her AAA had increased from 4.5 mm to 5.2 cm 6 months earlier. Her medical history included coronary artery disease, chronic obstructive pulmonary disease, chronic renal insufficiency, and previous bilateral renal artery stenting. An abdominal aor-

togram revealed a type IA endoleak and a large saccular aneurysm just below the renal arteries (Figure 1). Because of the endoleak's location and its proximity to previously stented renal arteries, additional stent graft or stenting procedures were not considered good options. Due to her comorbid conditions, open surgical repair was also not considered a reasonable option. Alternatively, a hybrid approach using a polyester tube graft to reinforce the proximal aortic neck was performed (Table 1).

SURGICAL TECHNIQUE

The procedure was performed in the surgical endovascular suite with the use of general anesthesia. After preparing and draping the patient in the sterile routine fashion, an 8-cm-long upper-midline laparotomy incision was performed. The infrarenal retroperitoneum was opened through a small 5-cm incision, and the aneurysmal aorta was exposed. Both renal arteries

were visualized and exposed, and the aorta was dissected circumferentially free from the surrounding tissues below the renal arteries for approximately 5 cm in length. A graft "passer" was carefully placed around the aorta, and a 12-mm Hemashield (Boston Scientific Corporation, Natick, MA) graft was pulled around the aortic aneurysm neck, encircling it just below both renal arteries. The graft was measured, tightened, and then secured with 2-0 Ticron sutures (Tyco Healthcare, Waltham, MA). A second 12-mm Hemashield graft was then placed 5 mm below the first graft. It was tightened and secured in a similar fashion. Both grafts were then sutured together with heavy #2 Ethibond (Ethicon, a Johnson & Johnson compa-



Figure 1. Abdominal aortogram reveals a large type IA proximal endoleak (white arrow) and distal type I endoleak (black arrow).

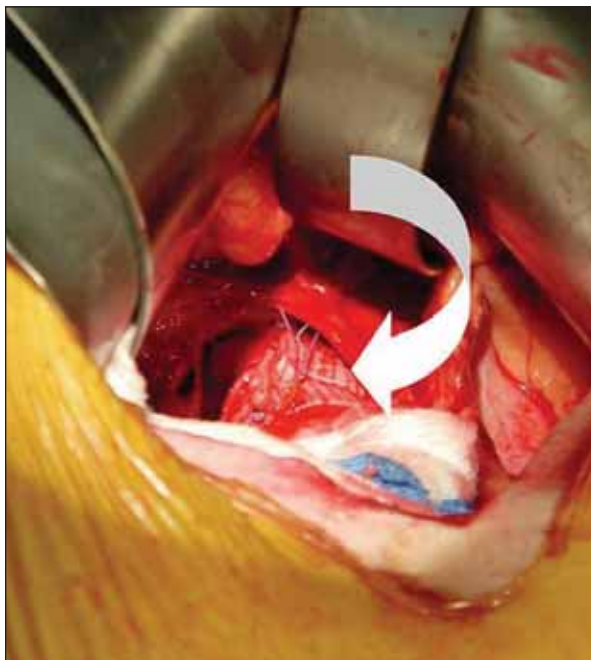


Figure 2. The operative field reveals the location of the polyester graft (aortic band) 12 mm in diameter positioned just distal to the renal arteries (curved arrow).

ny, Warren, NJ) sutures (Figures 2 and 3). The omentum was then placed between the duodenum and aortic grafts to prevent graft erosion into the intestine. After the abdominal cavity was irrigated with an antibiotic solution, the incision was closed in the usual fashion. There was less than 50 mL of blood loss during the entire procedure.

ENDOVASCULAR PROCEDURE

Left and right common femoral arteries were accessed percutaneously using a modified Seldinger technique with front-wall puncture. The 6-F sheaths were then inserted in the left and right common femoral arteries. An abdominal aortogram was performed to assess the proximal aortic neck and to execute quantitative aortic measurements (Figure 4). One 10-F Prostar XL device (Abbott Vascular, Santa Clara, CA) was used in the left and right femoral arteries for percutaneous femoral artery repair, employing the pre-close technique that has been previously described.^{8,9} Heparin anticoagulation was administered intravenously to maintain an activated clotting time of 200 to 225 seconds.

An 18-F sheath was then introduced into the right femoral artery and a 12-F sheath into the left femoral artery. A 23-mm Excluder (Gore & Associates, Flagstaff, AZ) trunk-ipsilateral stent graft (16-cm-long, 14.5-mm

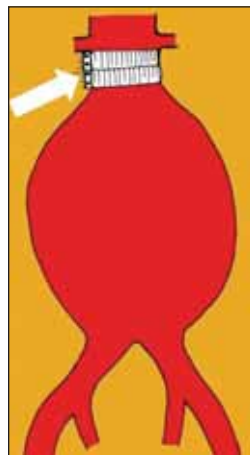


Figure 3. The aortic banding procedure shows a polyester graft 12 mm in diameter wrapped around the exterior surface of the infrarenal aorta and sutured to the aortic adventitia (arrow).



Figure 4. Abdominal aortogram after surgical placement of the external aortic band reveals resolution of a proximal type I endoleak (arrow).

iliac diameter limb) was inserted into the 18-F sheath and deployed in the infrarenal abdominal aorta. The 14.5-mm diameter and 14-cm-long contralateral Excluder limb was then deployed through the 12-F sheath via the right femoral artery. Final angiography was performed and revealed satisfactory results with no evidence of endoleak (Figure 5). The sheaths were removed from the femoral arteries, and the Prostar XL sutures were advanced to the arteriotomy site using a sliding knot technique.^{8,9} Sterile dressings were applied to the femoral access sites and to the abdominal incision.

The patient was then sent to a surgical recovery room for 24 hours. The remainder of her hospital stay was uncomplicated, and she was discharged on the fourth postoperative day. At 6-month follow-up, a CT

TABLE 1. TECHNIQUE

- 10-cm upper midline abdominal incision
- Aorta exposed just below the renal arteries
- 12-mm polyester graft is placed around the aortic neck, below both renal arteries, using a graft passer
- The graft is measured to the desired length, tightened, and secured with sutures to the aortic adventitia

scan of the abdominal aorta revealed a reduction of the AAA maximal diameter to 4.8 cm. There was no evidence of endoleak (Figure 6).

CONCLUSION

To be able to perform EVAR for AAA without a suitable landing zone for stent deployment, the appropriate diameter and length of the aneurysm neck are essential.¹⁻³ Previous reports have revealed that patients with short, funnel-shaped, reversed-taper, severely calcified, or thrombus-laden infrarenal necks are not good candidates for EVAR.¹⁻⁵ Surgical treatment, therefore, remained the only option until recently. Many patients, however, are poor or ineligible candidates for surgical AAA repair because of their comorbid conditions.¹⁰⁻¹² The aortic banding technique, used to treat this patient, offers a less-invasive treatment of this complex problem (Table 2). The aortic banding is performed through a small laparotomy and retroperitoneal incision and offers direct exposure to the infrarenal aorta. The dissection around the aorta is relatively simple, with minimal blood loss. After the dissection is accomplished, the 12-mm Hemoshield graft can be easily placed around the aorta and secured at the desired diameter. The length of the graft can be calculated from the formula: $L=2\pi R$, where L represents the length of the graft and 2R equals the desired diameter of the aortic neck. This approximation gives the surgeon an estimated length of the graft that can be marked before encircling the aorta. Once the graft is secured and hemostasis is achieved, the surgical portion of the procedure is completed. This can all be accomplished in a relatively short (20 to 30 minutes) operative time.

There are many advantages of this procedure. First, in patients with comorbidities, the length of surgical procedure is significantly shorter.^{8,9} For the aortic banding technique, the aorta does not have to be



Figure 5. Final abdominal aortic angiogram reveals resolution of type I proximal (straight white arrow) and distal endoleak after placement of an Excluder bifurcated endograft (curved white arrow).



Figure 6. A CT scan obtained 6 months after the aortic banding and stent graft procedure did not reveal endoleak (white arrow). The aneurysm maximal diameter decreased from 4.9 cm before the banding to 4.4 cm at 6-month follow-up.

clamped, thus preventing prolonged ischemia of the visceral organs.^{10,11} In patients with a AAA that originates immediately below or at the origin of the renal arteries, the aorta is frequently clamped in the supraceliac region to allow the surgical repair. This contributes to intestinal ischemia in addition to renal ischemia.^{10,11} Also, in this instance, the renal arteries are frequently bypassed or reimplemented, thus further pro-

TABLE 2. BENEFITS AND INDICATIONS FOR AORTIC BANDING

- Short abdominal incision
- Minimizes visceral organ manipulation
- Significantly shorter surgical procedure time
- The aorta does not have to be clamped, which prevents ischemia of the visceral organs
- Minimal blood loss
- Our preliminary observations reveal that aortic banding is a safe and effective hybrid procedure to facilitate EVAR in patients with AAA that were previously amenable only to a surgical repair
- A useful surgical technique for treatment of refractory type I endoleak after EVAR
- Could improve eligibility for EVAR
- Could prevent type I endoleak and endograft migration in patients with unfavorable anatomy

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longing renal ischemia. All of these maneuvers significantly increase the operative time and contribute to patient morbidity and mortality. The aortic banding in our patient circumvented aortic clamping and provided an appropriate landing zone for EVAR.

Our preliminary observations reveal that aortic banding is a safe and effective hybrid procedure to facilitate EVAR in patients with AAAs that were previously amenable only to a surgical repair. However, further studies in a larger number of patients are needed to determine the safety and efficacy of this technique. Furthermore, a laparoscopic retroperitoneal aortic neck banding may represent an even less-invasive approach for patients with unfavorable aortic anatomy and/or persistent type I endoleak. ■

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