Aortic Therapy Using Iliac Limb Extensions Via Axillary Access

A novel technique for treating various aortic diseases and injury pathologies that may otherwise have been untreatable via an endovascular approach.

BY EDWARD WOO, MD

Endovascular aneurysm repair and thoracic endovascular aneurysm repair (TEVAR) were pioneered more than 10 years ago.[1,2] Both endovascular techniques have advanced significantly during the last decade. In March 2005, the TAG (Gore & Associates, Flagstaff, AZ) endoprosthesis was the first thoracic device to gain FDA approval. Furthermore, multiple other devices are in various stages of clinical trials. The results thus far have been excellent, showing clear benefits over open repair.[3-5] These devices, however, have been primarily developed to treat aneurysmal aortas. Insertion of these devices (the smallest TAG is 26 mm in diameter) into normal-sized aortas has led to complications.[6,7] We describe a technique of using iliac limb extensions delivered via the right axillary artery to treat pathology in the normal-sized aorta.

CASE 1

A 19-year-old woman presented to an outside institution with left lower-extremity ischemia and a type B aortic dissection. An emergent femorofemoral bypass was performed to revascularize the leg. Although her leg was revascularized, she developed mesenteric ischemia during the next 24 hours. She was emergently transferred to our hospital. The aorta at the takeoff of the left subclavian artery was approximately 17 mm. Given the size of the aorta, a commercial thoracic stent graft was not an option. As a result, we planned to use a Zenith (Cook Medical, Bloomington, IN) iliac limb extension introduced via the right axillary artery. The right axillary artery was exposed via an infraclavicular incision. Access was obtained, and a Lunderquist (Cook) wire was placed into the descending thoracic aorta. An 18-mm X 55-mm Zenith iliac limb was then placed just distal to the left subclavian artery covering the entry tear (Figure 1A). A 20-mm X 40-mm Wallstent (Boston Scientific Corporation, Natick, MA) was added distally to expand the true lumen more fully (Figure 1B). The patient did well after the operation, with resolution of her malperfusion. Her

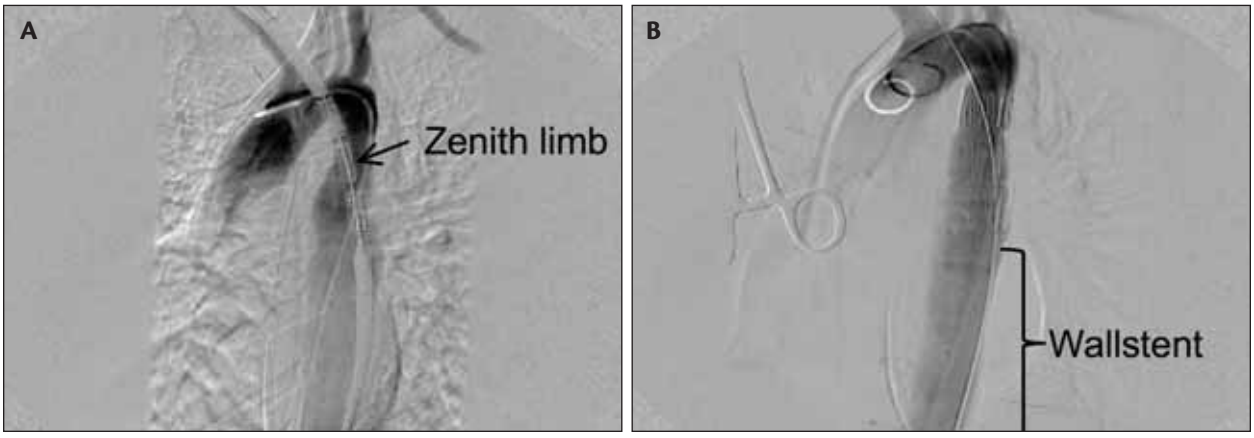

Figure 1. An 18-mm X 55-mm Zenith iliac limb just distal to the left subclavian artery covering the entry tear (A). A 20-mm X 40-mm Wallstent added distally to expand the true lumen more fully (B).

18-month follow-up CTA demonstrated good perfusion and no aneurysmal degeneration.

CASE 2

A 21-year-old woman had a concomitant subdural hematoma and intracranial brain injury, as well as an aortic transection after a motor vehicle accident. To optimize brain perfusion, elevation of mean arterial pressures was required. Although the transection did not demonstrate any extravasation, there was concern that blood pressure elevation would destabilize the aorta. As a result, she was transferred to our hospital to treat the aortic transection. Her aorta measured 20 mm at the left subclavian artery. An angiogram demonstrated a pseudoaneurysm approximately 2 cm distal to the origin of the left subclavian artery. The right axillary artery was exposed via an infraclavicular incision. Two 20-mm X 55-mm Zenith iliac limb extensions were subsequently delivered via this approach with successful coverage of the area of transection and exclusion of the pseudoaneurysm. The patient tolerated this procedure well, but unfortunately succumbed to her brain injuries approximately 1 week later.

CASE 3

A 64-year-old man experienced concomitant orthopedic injuries and an aortic transection just distal to the left subclavian artery subsequent to a motor vehicle accident. He underwent open repair of the aortic transection and repair of his orthopedic injuries at an outside institution. Approximately 4 weeks after the aortic repair, he developed a distal suture line dehiscence. He developed a large hemothorax, hemodynamic instability, and respiratory compromise. The patient was emergently transferred to our institution for further care. He was not a candidate for reoperative open surgery, and his aorta was approximately 20 mm in diameter. As a result, we accessed the right axillary artery via an infraclavicular approach. Subsequently, three 22-mm X 55-mm Zenith iliac extensions were used to cover the entire graft extending into normal aorta proximally and distally. This successfully treated the suture line breakdown and established hemostasis. At 1-year follow-up, the patient was fully recovered from his injuries and did not require any subsequent aortic interventions.

DISCUSSION

TEVAR has clearly demonstrated benefits over open repair.[3-5] Although the devices and trials have been designed around treating aneurysmal aortas, the applicability of TEVAR has broadened significantly. Treatment of complicated type B aortic dissections and traumatic aortic transections has been facilitated with thoracic endografting.[3,5,6,8] One major limitation, however, is the normal-sized aorta. Currently, the smallest TAG device is 26 mm in diameter. This would create a significant oversize in an 18-mm to 20-mm aorta; one clearly described complication is graft collapse.[6,7]

To circumvent this, we have used Zenith iliac limb extensions. Although any graft would suffice, the Zenith ESLE offers a variety of diameters corresponding to a 55-mm length. When treating complicated type B dissections or traumatic transections, often less than 10 cm of length is needed to treat the entry tear or transection, respectively. In the case of dissections, if more length is needed to expand the true lumen, an uncovered Wallstent can be added as described in case 1.

We have approached graft delivery and access through the right axillary artery. The iliac devices are not long enough to reach the distal arch from the femoral artery and unlikely to reach from the common iliac artery in an average-sized person. The right axillary artery is easy to expose and offers almost a direct line to the distal arch. The device is subsequently easily delivered to this location. Furthermore, because these are iliac devices, the axillary artery can accommodate the sheath diameter.

A clear limitation of this approach is the graft length. This would not offer an ideal treatment for pavement of a long segment of aorta. Multiple pieces would be necessary, increasing the risk of access-related complications as well as endoleaks.[9,10] Nevertheless, until a thoracic device becomes available for treatment of the normal-sized aorta, our approach does offer one option for treatment of the pathologic states described in this article. ■

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1. Dake MD, Miller DC, Semba CP, et al. Transluminal placement of endovascular stent-grafts for the treatment of descending thoracic aortic aneurysms. N Engl J Med. 1994;331:1729-1734.
2. Parodi JC, Palmaz JC, Barone HD. Transfemoral intraluminal graft implantation for abdominal aortic aneurysms. Ann Vasc Surg. 1991;5:491-499.
3. Stone DH, Brewster DC, Kwolek CJ, et al. Stent-graft versus open-surgical repair of the thoracic aorta: mid-term results. J Vasc Surg. 2006;44:1188-1197.
4. Makaroun MS, Dillavou ED, Kee ST, et al. Endovascular treatment of thoracic aortic aneurysms: results of the phase II multicenter trial of the Gore TAG thoracic endoprosthesis. J Vasc Surg. 2005;41:1-9.
5. Greenberg RK, O'Neill S, Walker E, et al. Endovascular repair of thoracic aortic lesions with the Zenith TX1 and TX2 thoracic grafts: intermediate-term results. J Vasc Surg. 2005;41:589-596.
6. Neschis DG, Moaine S, Gutta R, et al. Twenty consecutive cases of endograft repair of traumatic aortic disruption: lessons learned. J Vasc Surg. 2007;45:487-492.
7. Tehrani HY, Peterson BG, Katariya K, et al. Endovascular repair of thoracic aortic tears. Ann Thorac Surg. 2006;82:873-877; discussion 877-878.
8. Xu SD, Huang FJ, Yang JF, et al. Endovascular repair of acute type B aortic dissection: early and mid-term results. J Vasc Surg. 2006;43:1090-1095.
9. Czerny M, Grimm M, Zimpfer D, et al. Results after endovascular stent graft placement in atherosclerotic aneurysms involving the descending aorta. Ann Thorac Surg. 2007;83:450-455.
10. Parmer SS, Carpenter JP, Stavropoulos SW, et al. Endoleaks after endovascular repair of thoracic aortic aneurysms. J Vasc Surg. 2006;44:447-452.