Endovascular rescue of long-term vascular graft implants and need for continuous surveillance

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ABSTRACT

We present two cases of vascular graft degradation after long-term implantation. In both patients, endovascular techniques were employed to effect continued graft patency and function. Furthermore, these cases lend further credence to the doctrine of lifelong surveillance of all vascular interventions regardless of graft material. Postoperative surveillance of vascular interventions is generally recommended to avoid failures by identifying "the failing graft"[1] at the earliest possible time to facilitate corrective procedures. There is a tendency that with continued function, over time, surveillance methods are spread farther apart and in fact often discontinued. Recent experiences with two cases illustrate the vital importance of lifelong continuous surveillance regardless of the site, graft material, or absence of symptoms. Clearly, the patient's compliance is essential. Both patients consented to the publication of their cases. (J Vasc Surg Cases and Innovative Techniques 2018;4:12-4.)

CASE 1

A 75-year-old woman had undergone an end-to-side aortobifemoral (Dacron) bypass in 1990 for "small aortic syndrome"[2] complicated by severe stenosis and calcification. Routine computed tomography (CT) angiography surveillance was performed at 4- to 6-year intervals on the basis of the patient's availability. Duplex ultrasound studies were performed episodically at another institution. A proximal anastomotic pseudoaneurysm as well as degradation of the distal body and left limb of the Dacron bifurcated graft was seen but not deemed worthy of repair until 26 years after primary intervention, when the largest aneurysmal diameter measured 5.1 cm (Fig 1, *A*). The patient underwent successful endovascular repair using an AFX (Endologix, Irvine, Calif) aortoiliac bifurcated stent graft with left iliac extension, relining the original Dacron graft (Fig 1, *B* and *C*). The patient continues to do well at 18-month follow-up with CT angiography confirmation.

CASE 2

An 80-year-old man, suffering rest and night pain, underwent a left femoral-popliteal below-knee bypass in 1992 using an umbilical vein graft for a superficial femoral artery occlusion. A localized area of graft biodegradation was first noted on routine duplex ultrasound surveillance after 12 years of continuous graft function. Because the patient was asymptomatic, we elected to continue surveillance, and by postintervention year 20, the aneurysmal bulges became painful and extended along the entire length of the graft, now measuring 3 to 8 cm in diameter (Fig 2, *A*). Endovascular salvage was successfully performed with the placement of seven overlapping Viabahn (W. L. Gore & Associates, Flagstaff, Ariz) 10-cm stent grafts within the original umbilical vein bypass (Fig 2, *B* and *C*). An additional stent graft was placed 4 years later in 2016 to manage a single distal endoleak that was causing lower thigh pain (Fig 3). The patient continues to do well at 2 years with 6-month duplex ultrasound follow-up.

DISCUSSION

Detection of potential lesions leading to graft failure in aneurysmal and occlusive disease has been well documented as vital in the quest to achieve high patency rates.[3,4] For the lower extremities, the finding of intimal hyperplasia associated with altered velocities has proved to be an important mode to maintain primary graft patency and, as a consequence, long-term limb salvage. In addition to ultrasound, CT angiography and magnetic resonance angiography are important adjuncts. What is equally clear, there cannot be a single set of guidelines for all—rather discriminate selection of the optimal diagnostic modality. This also holds true for the time intervals between studies. What we now advocate is to never stop surveillance because as our cases demonstrate, they were successfully rescued by minimal intervention for lesions requiring repair at 20 and 26 years after the original surgery.

Biodegradation of umbilical vein grafts was first described by us in 1984,[5] but the total analysis[6] confirmed higher patency rates than those associated with prosthetics.[7-10] At 5 years, however, aneurysmal degradation was found in 27% and dilation in an additional 20%. It was from this early production line that the graft for case 2 was derived. From that experience, we also learned that even Dacron fibers suffer "fatigue"

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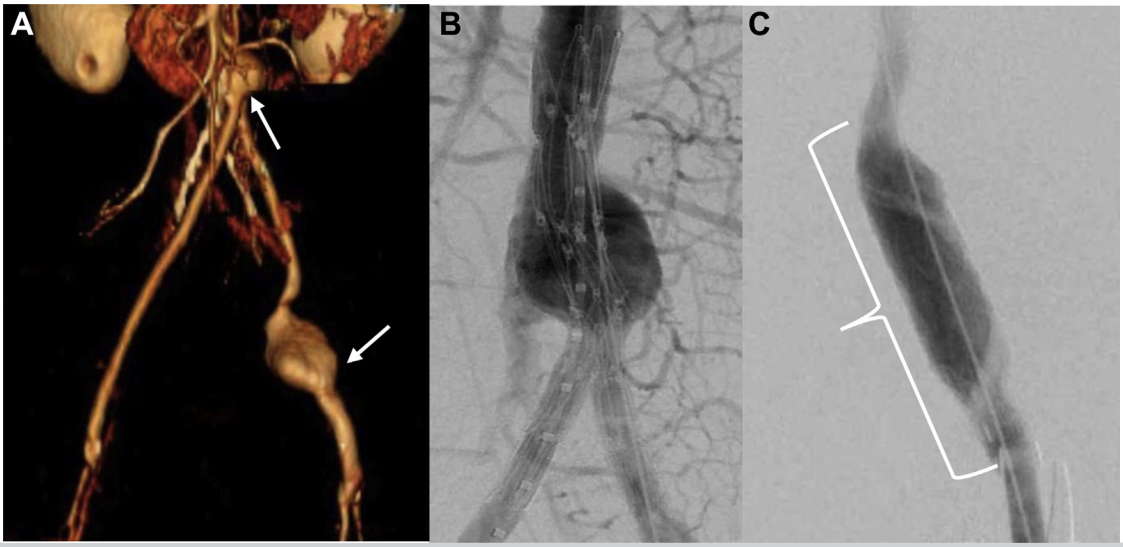

Fig 1. A, Three-dimensional reconstructed computed tomography (CT) scan depicting both the proximal anastomotic and the left limb aneurysmal degeneration of the Dacron graft (*arrows*) at 26 years after implantation. **B,** Proximal anastomotic aneurysmal degeneration of Dacron graft treated by endovascular aneurysm repair as demonstrated in this intraoperative study before endograft completion with subsequent nonvisualization of graft aneurysms. **C,** Intraoperative study of Dacron graft left iliac limb aneurysmal degeneration successfully treated with a covered stent graft (*bracket*).

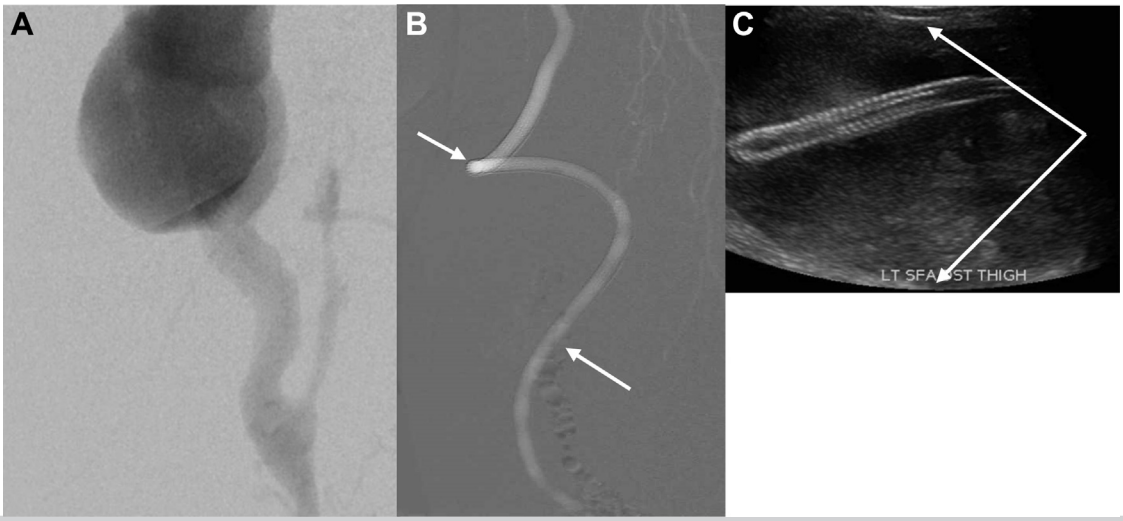

Fig 2. A, Segment of umbilical vein graft aneurysmal degeneration. **B,** Endovascular salvage of the umbilical vein bypass with overlapping stent grafts (*arrows*). **C,** Ultrasound depicting overlapping stent grafts in distal superficial femoral artery (*SFA*) and proximal popliteal artery. The *arrows* depict the opposite walls of the aneurysm sac (6-8 cm).

and can dilate or aneurysmally degrade, which was erroneously thought to be protective. Not so. Subsequent modifications in the manufacture of the umbilical graft showed a dramatic reduction of this problem.[11] Furthermore, case 1 demonstrated Dacron fatigue in an aortobifemoral graft, separate from the proximal anastomotic aneurysm. Neither of these cases demonstrated infectious etiology.

Concerns about surveillance costs are justified. Although costs are variable across the country, our costs for duplex ultrasound, CT, and magnetic resonance imaging (MRI) are similar to those of recent reports.[12,13] Duplex ultrasound for a single yearly study ranges from $177 to $350[12]; CT and MRI charges average $2028[12] and $2380,[13] respectively. Although endovascular approaches are high cost, their value must be based on comparisons to alternative procedures. Open bypass surgery using autologous tissue is least expensive, but with failure and attempts at revascularization, costs for bypass material and possible amputation and rehabilitation will surpass those of endovascular interventions. For example, in case 2, the total cost of the stents alone

Fig 3. Angiogram depicting previously implanted Viabahn stent grafts (*arrows*). Distal endoleak visualized, located 6 cm above the original distal umbilical vein bypass anastomosis (*circle*).

exceeded $30,000, whereas contemporary longer covered stents would cost around $17,000. Costs for open femoral-distal bypass range from $12,000 to $26,000, and in the case of failure leading to amputation, costs escalate and can exceed $60,000.[14] Timely surveillance studies documenting potential limb-threatening disease can lower costs by enabling deployment of endovascular techniques.

CONCLUSIONS

Regardless of the type of intervention or graft employed, a lifelong postoperative surveillance routine should be the rule. Ultrasound and, if needed, CT or MRI should be individualized and spaced relative to each patient's needs.

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