EVAR of a Large AAA With a Pelvic Kidney

Mating an off-the-shelf helical limb with a custom, fenestrated device offered AAA repair without compromising renal function in a patient with multiple comorbidities.

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Custom-made endovascular branched and fenestrated grafts have expanded the capability of endovascular repair to regions beyond the infrarenal aorta.[1-3] Different configurations of branches have been reported and used,[1,2,4,5] but the basic principle of bridging the aneurysmal segment of the aorta to maintain perfusion of critical end organs while excluding the aneurysm from circulatory flow is the same. We prefer using helical limbs because of the ability to conform to complex anatomic morphology without bending or kinking the involved stents, offering improved flow dynamics that have been tested with computation fluid dynamic models. As well, the broader applicability of helical limbs to anatomic variations makes the potential for "off-the-shelf" graft development a closer reality. In this case report, we describe an unconventional use of a visceral helical branched graft.

PRESENTATION

A 73-year-old man presented to our outpatient clinic with a 7.2-cm abdominal aortic aneurysm (AAA), which was found during a workup for back pain. His medical and surgical history included coronary artery disease and myocardial infarction, chronic obstructive pulmonary disease, gastroesophageal reflux disease and remote bleeding peptic ulcers, chronic back pain, and a previous cholecystectomy and appendectomy. He used continuous positive airway pressure at night for obstructive sleep apnea. He also had a history of chronic mesenteric ischemia and superior mesenteric artery stenosis, which had been recently stented during the course of referral to our center. He was a current smoker and reported that his father had also had an AAA.

When seen in the office, the patient was a moderately obese man with no evidence of peripheral occlusive disease. His aneurysm could not be palpated on examination due to truncal obesity. His baseline creatinine level was 1.2 mg/dL, and his blood urea nitrogen was 17 mg/dL. A recent cardiac stress test revealed a dilated left ventricle with a large akinetic area of inferior wall reflective of previous myocardial infarction. He was not considered to be fit for surgery due to his pulmonary and cardiac issues, as well as his obesity.

A preoperative CT scan revealed a 7.2-cm infrarenal AAA, and there was evidence of a superior mesenteric artery stent *in situ*. Using the center lumen of flow and three-dimensional reconstruction functions of our post-

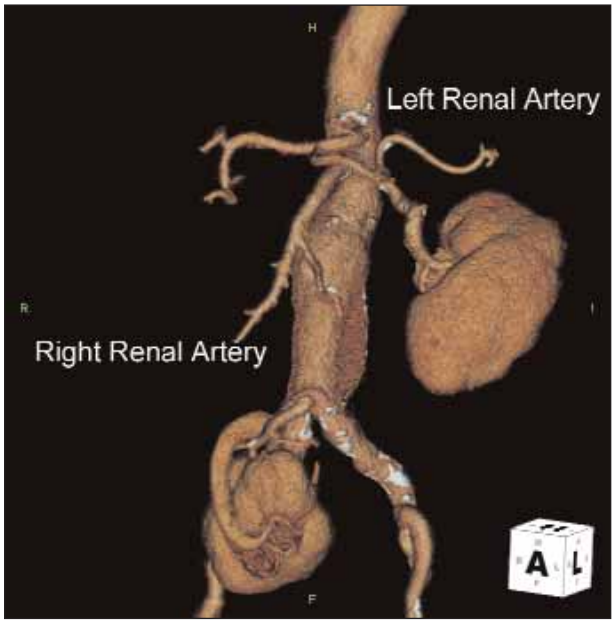

Figure 1. A preoperative CT scan revealed a right pelvic kidney and considerable iliac calcification. Three-dimensional images were constructed using TeraRecon software.

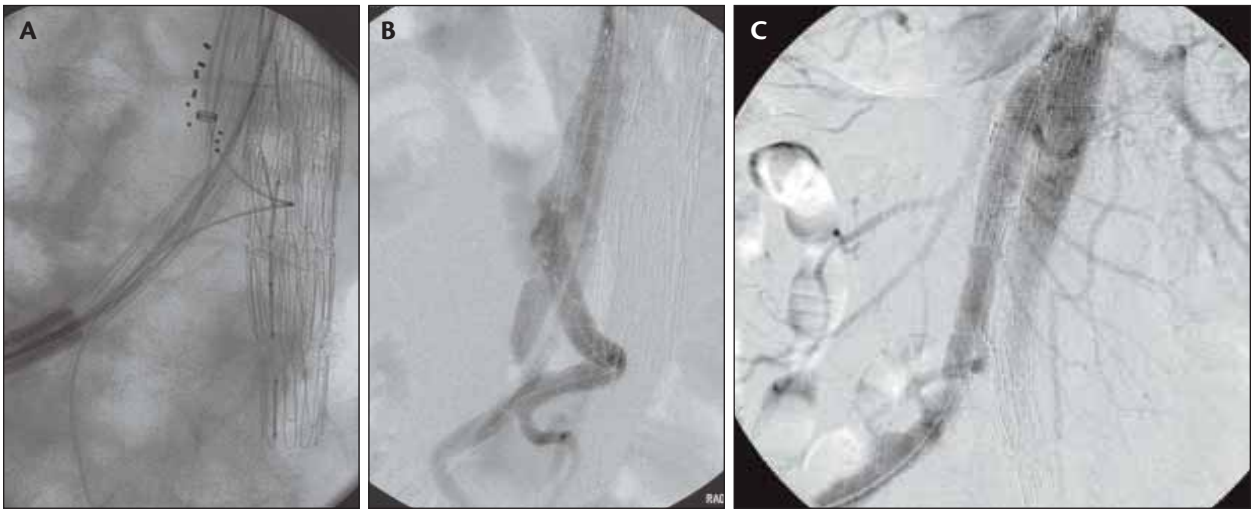

Figure 2. An intraoperative angiogram revealed cannulation of the helical limb of the branched device and selective cannulation of the pelvic kidney artery (A). After stent placement, the helical limb is patent (B). Completion angiogram (C).

processing software (TeraRecon, Inc., San Mateo, CA), we were able to measure the critical aortic dimensions. The left renal artery and vein were in the normal position, but his right kidney was located within the pelvis. The right renal artery originated from 1 cm above the aortic bifurcation and was the sole arterial source for the pelvic kidney (Figure 1). The iliac arteries had a considerable amount of calcification.

COURSE OF ACTION

We planned an endovascular intervention and designed a custom, multicomponent aortic endograft composed of both an off-the-shelf helical limb and a Zenith endovascular graft (Cook Medical, Bloomington, IN). We elected to incorporate the arterial supply to the pelvic kidney in a manner similar to what we typically use to preserve antegrade flow into the internal iliac arteries in the setting of a common iliac aneurysm.[2] Proximally, we utilized a scallop fenestration to allow for the treatment of the short proximal neck, preserving the left renal artery.

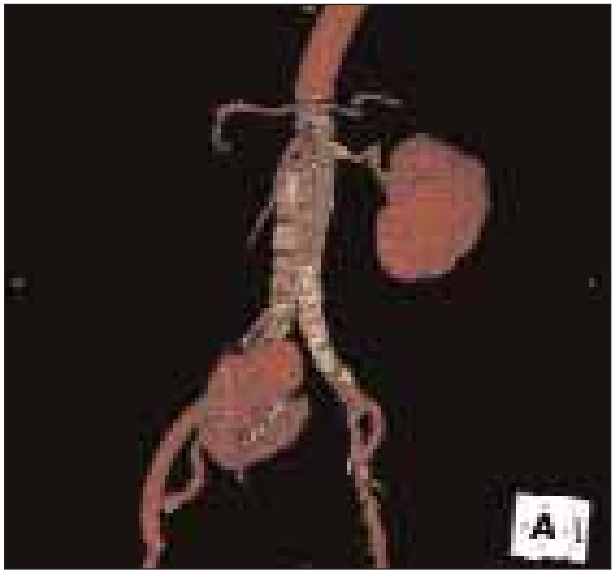

Figure 3. A postoperative CT scan of patient after aneurysmal exclusion with custom, branched graft.

PROCEDURE

Before establishing wire access to the aneurysm and proximal aorta, a 10-mm Dacron iliac conduit was anastomosed in an end-to-side fashion to the right common iliac artery to provide adequate access. The main fenestrated device (Zenith) was then introduced through the left side, and access through the fenestration to the left renal artery was gained using a VS1 catheter (Cook Medical). A 7-mm X 2-cm covered, balloon-expandable stent (Jostent, Abbott Vascular, Santa Clara, CA) was used to bridge the fenestration and the left renal artery and then postdilated using a 10-mm X 2-cm OptiPro balloon (Cordis Corporation, Warren, NJ). The internal limb was cannulated with a VCF catheter (Cook Medical), and the branched renal device was inserted through the right iliac conduit over a through-and-through wire (260-cm Glidewire, Terumo Interventional Systems, Somerset, NJ). Access of a floppy Glidewire and MPA catheter (Cook Medical) into the helical branch was achieved by snaring the preloaded wire. A sheath was then advanced through the exposed left brachial artery into the helical limb, which was positioned superior and posterior to the pelvic renal artery. Access into the artery was established

(Continued on page 42)

(Continued from page 41)
through that sheath, and renal angiography was performed (Figure 2). Covered, balloon-expandable stents (Jostent) were used to bridge the helical limb to the renal artery, and completion angiography confirmed patency (Figure 2). A 59-mm mating limb was then deployed to join the helical limb to the aortic bifurcated graft. Completion angiography revealed good flow to both renal and iliac arteries (Figure 2).

FOLLOW-UP

The patient tolerated the procedure well. His hospital course was complicated by a postoperative ileus, which resolved without intervention, and he was discharged home on postoperative day 10 with a creatinine level of 1 mg/dL. His 1-month postoperative CT scan revealed no endoleak and good perfusion of the graft (Figure 3).

CONCLUSION

We presented a case of a 73-year-old man with a pelvic kidney arising from a large AAA treated using an off-the-shelf helical limb that was mated with a custom fenestrated device. Although helical branch technology is still evolving, cases such as this are encouraging for future widespread use. This approach allowed us to offer AAA repair without compromising renal function in a patient with multiple comorbidities who may not have withstood conventional open treatment. ■

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