

Endovascular Management of Juxtarenal Abdominal Aortic Aneurysm: A Case Report

Attapoom Susupaus, MD ; Piyapan Pamornsing, MD ; Komgrit Tanisaro, MD ; Siriwasan Akanithapichat, MD ; Jamorn Udomkusonsri, MD ; Praphat Pitayanon, MD



Attapoom Susupaus, MD

Cardiovascular Center, Bangkok Heart Hospital, Bangkok, Thailand

Abstract

Fenestrated endovascular aneurysm repair (FEVAR) is an option for management of a very complex abdominal aortic aneurysm (AAA). We are reporting on the case of a 74-year-old male with a 7.8×6.8 cm juxtarenal abdominal aortic aneurysm that arises at the level of the renal arteries and extends down to just above the iliac bifurcation and severe bilateral renal artery stenosis with caudally oriented left renal and cranially oriented right renal artery. This case shows that a strategy with fenestrated graft is feasible for aortic aneurysm repair and may offer a reasonable option for patients with very complex aortic anatomy. The patient was discharged home in 4 days without complications. The computed tomography angiography at 1 month showed a small type II endoleak at aortic bifurcation level. The patient remained well on follow up 4 months post-surgery.

Keywords: juxtarenal aortic aneurysms,

Juxtarenal aortic aneurysms (JRA) account for approximately 15% of abdominal aortic aneurysms.¹ By definition, suprarenal aortic cross-clamping is required for surgical repair, causing temporary renal artery occlusion that may lead to postoperative renal dysfunction, in some cases requiring (temporary) hemodialysis.

Standard endovascular aneurysm repair (EVAR) is not an option due to inadequate landing zone for the graft below the renal vessels. Hence fenestrated and branched aortic endografts have been developed to treat high risk patients unfit for open surgery and anatomically unsuitable for standard EVAR. However, procedures are complex, technically challenging, and time consuming.^{2,3}

Case Report

A 74-year-old man with a past medical history of hypertension, dyslipidemia, ischemic heart disease, chronic renal insufficiency and peripheral vascular disease, underwent right total knee replacement in March 2018. Postoperative kidney ultrasonography was performed due to renal insufficiency which revealed an abdominal aortic aneurysm. His computed tomography (CT) scan of the thorax, abdomen, and pelvis showed a large pararenal abdominal aortic aneurysm (7.8×6.8 cm) (Figure 1).



Figure 1: Three-dimensional reconstruction of computed tomography angiography (CTA) demonstrates a juxtarenal abdominal aortic aneurysm (AAA).

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Owing to the significant risk for open surgery, FEVAR was planned. The anatomy was suitable for FEVAR but the right common iliac artery (CIA) was dilated, necessitating the extension of the right iliac limb into the external iliac artery (EIA). The decision was made to proceed with coiling of the right internal iliac artery (IIA) one week prior to FEVAR. FEVAR was performed in July 2018, 3 months after CTA diagnosis as obtaining a factory customized aortic stent can take 2-3 months. FEVAR is performed in the hybrid or equipped with a flexible C-arm (Philips Allura Xper FD20, WA, USA). The operation was performed under general anesthesia via bilateral open common femoral artery (CFA) access with the patient under general anesthesia and on heparin therapy (1 bolus dose of 70

IU/kg). With the angiographic aid of a descending thoracic aortic pigtail catheter introduced via left femoral artery access, the fenestrated graft was introduced through the right CFA. The vertical position and rotational anatomy of the fenestrations were confirmed on angiography. The graft was then partially deployed. Using a larger 14F sheath via the left CFA which was free, right renal artery, left renal artery and SMA were sequentially cannulated with Terumo 0.035-inch wires over Cobra C2 catheters (Cook, Bloomington, IN, USA), which were then exchanged for Amplatz stiff wires followed by 7F Flexor® Ansel guiding sheaths (Cook). BeGraft 6 mm × 22 mm, 6 mm × 22 mm and 8 mm × 37 mm covered stents were then deployed through the sheaths and respectively flared out (Figure 2).

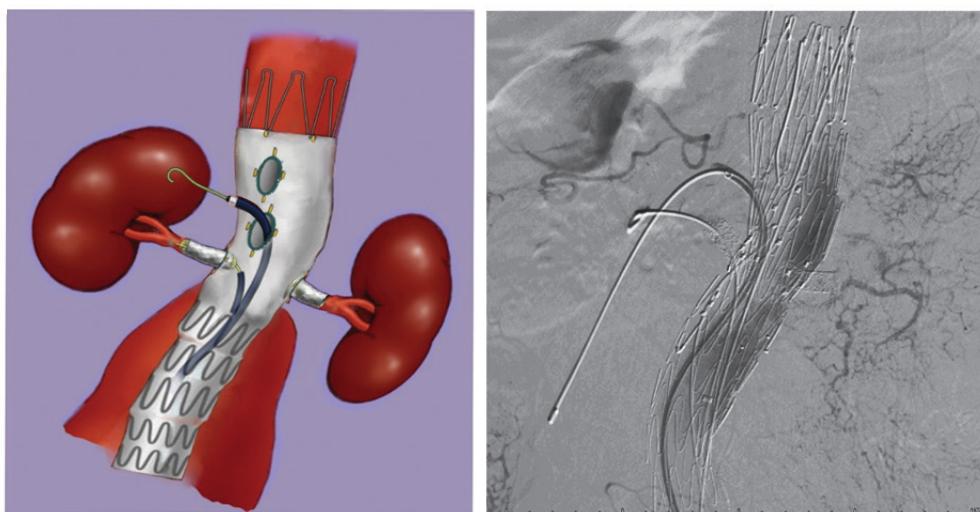


Figure 2: After right renal artery, left renal artery and SMA were sequentially cannulated with Terumo 0.035-inch wires over Cobra C2 catheters (Cook, Bloomington, IN, USA), which were then exchanged to Amplatz stiff wires followed by 7F Flexor® Ansel guiding sheaths (Cook). BeGraft 6 mm × 22 mm, 6 mm × 22 mm and 8 mm × 37 mm covered stents were then deployed through the sheaths and respectively flared out.

The fenestrated stent graft was then fully unsheathed. Then celiac artery was cannulated with a Terumo 0.035-inch wire over a Simonon1 catheter, which was then exchanged to Amplatz stiff wire followed by a 7F Flexor® Ansel guiding sheath (Cook). BeGraft 8 mm × 27 mm covered stent was then deployed through the sheath and flared out. Another endograft (Cook® Aortic 28 mm × 80 mm) introduced via the left CFA was deployed inferiorly as far as the aortic bifurcation and unsheathed. CIA endograft (Cook® iliac limb 13 mm × 107 mm) was deployed (Figure 3). The aortic body was balloon molded after each deployment. Final check angiography revealed stent in proper position without any endoleak. All devices and guide wires were removed. Both CFAs were closed primarily using 6/0 polypropylene sutures. The patient was extubated and transferred to the CCU in satisfactory condition. The patient received 48 hours of intravenous cefazolin post-operatively and was monitored clinically for any infection. He was discharged well on the fourth post-operative day. The computed tomography angiography at 1 month showed small type II endoleak at right posterolateral aspect of aortic bifurcation (Figure 4).

Discussion

Open surgery for juxtarenal aortic aneurysm, if compared with infrarenal aortic aneurysm, is characterized by more extensive mobilization of viscera to achieve adequate exposure of the abdominal aorta and by a period of renal ischemia, potentially increasing operative risk, especially the risk of postoperative renal dysfunction. This complex aortic pathology remains a challenge for suitable endovascular repair without compromising visceral perfusion. Even though the advances in stent-graft technology now permit aneurysm necks \leq 10 mm to be treated by classical EVAR. However, in standard EVAR the complication rates climb rapidly with increasing numbers of adverse features in the proximal neck.

Fenestrated endovascular aneurysm repair (FEVAR) was first reported in 1999 for the treatment of a juxtarenal aortic aneurysm. The technique was initially developed to treat high risk patients unfit for open surgery and anatomically unsuitable for standard EVAR. Not all JRAs are suitable for FEVAR.



Figure 3: Completion angiography demonstrates widely patent fenestrated stent graft with no endoleak.

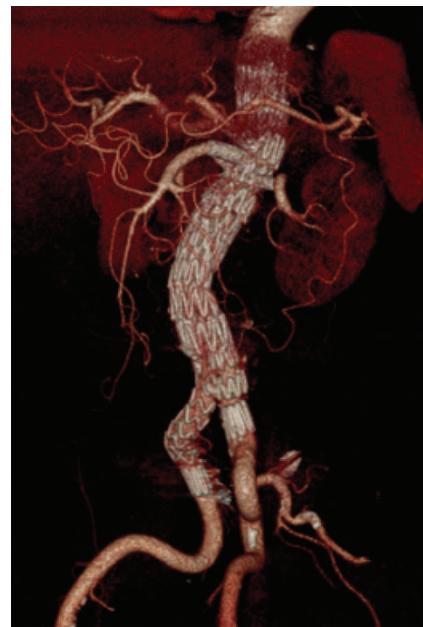


Figure 4: follow-up CTA at 1 months shows a widely patent fenestrated stent graft with small type II endoleak at aortic bifurcation level.

It is clear that a large number of patients are excluded from EVAR due to inadequate aneurysm neck length.⁴ There are as yet no data extrapolating this to identify the proportion of patients eligible for FEVAR.

Custom design and manufacture of these grafts excludes their utility in the acute setting. Current time to manufacture is 6-8 weeks. “Off-label” surgeon-modified devices have been described, on-site modifications of commercially available aortic endografts.⁵ More complex procedures may increase operating time and rates of graft-related endoleak. Until an “off-the-shelf” device is created this remains the only option in emergencies where open repair is prohibited.

A recent study reported outcomes of FEVAR as a first line strategy for short neck, juxtarenal, and suprarenal aortic aneurysms in a large volume center. Technical success is

96.8%, thirty day mortality is 0.7% and freedom from re-intervention rate for FEVAR at one and 3 years are 96.1% \pm 1.4% and 90% \pm 2.7% respectively.⁶ This is a consistent finding in EVAR. Interventions appear to occur within the first postoperative year and subsequently plateau. Close surveillance is essential to identify visceral vessel stenosis or pre-occlusion. Robust statistical comparison of FEVAR versus traditional open surgery would only be possible in a prospective randomized controlled trial. No such trial has been devised in the 10 years of evolution of FEVAR and it may never happen.

Conclusion

Fenestrated endovascular stent grafting is a feasible alternative for treatment of complex abdominal aortic aneurysms in high risk patients with a high technical success and low operative mortality and morbidity rates.

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