Open repair of a type II endoleak facilitated by temporary disconnection of graft components

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ABSTRACT

Endoleaks are a frequent indication for reintervention after endovascular repair of an abdominal aortic aneurysm. Here we present a method of open repair of a persistent type II endoleak involving graft component separation and reconstruction, in a patient with symptomatic interval aneurysmal sac enlargement despite endovascular coiling and embolization. This case report demonstrates an alternative open technique of endograft component separation and reconstruction that may be required in cases where open repair with sac exploration and vessel oversewing is hindered by the graft position. (J Vasc Surg Cases and Innovative Techniques 2021;7:26-9.)

Keywords: Vascular surgery; Endovascular; Endoleak; Aneurysm; Open repair

Endoleaks (EL) are a common complication of endovascular aortic aneurysm repair (EVAR) and a frequent indication for reintervention. Although the majority of type II ELs follow a benign natural history, they can lead to sac expansion and rupture.[1,2] Sac expansion of more than 5 mm is used as a surrogate marker for rupture risk and prompts reintervention.[3,4] Although many ELs can be managed by percutaneous interventional procedures, open conversion can be considered in the presence of a persistent type II EL with sac expansion and no remaining options for embolization.[5] Graft explantation is required in a significant proportion of patients undergoing open conversion for late complications of EVAR.[6] Here we discuss an alternative technique of open type II EL repair with graft component separation and reconstruction, resulting in successful control of the contributing lumbar vessel and avoidance of endograft explantation. The patient gave written consent for publication of their case details and the relevant images.

CASE REPORT

A 66-year-old woman underwent EVAR of a 9.7-cm infrarenal abdominal aortic aneurysm with a standard EVAR stent graft (Endurant, Medtronic, Dublin, Ireland) in June 2013 in another institution. She was not an ideal open surgery candidate given her multiple comorbidities which included obesity, hypertension, and chronic obstructive pulmonary disease. A type II EL was noted on completion angiogram. Postoperatively, she suffered ischemic colitis, which was managed conservatively. Follow-up imaging showed EL persistence without sac expansion in January 2015. Ten months later, computed tomography (CT) imaging performed for abdominal pain, distension and constipation after repair of a neck of femur fracture, incidentally showed an interval increase in aneurysmal sac size from 8.0 cm to 8.7 cm over 5 months with an associated type II EL.

One month later (3 years after EVAR), she underwent CT-guided translumbar embolization of a type II EL secondary to an identified contributing lumbar artery, using coils (Nester, Cook Medical, Bloomington, Ind) and Onyx liquid embolic agent. The postprocedural CT showed no residual EL. Ten months after embolization (October 2016), the patient was admitted to hospital owing to the presence of aneurysmal tenderness and the visualization of EL on routine surveillance ultrasound examination. A CT EVAR showed sac expansion to 9.6 cm and confirmed a residual type II EL (Fig 1). Fig 2 shows a CT reconstruction of the EVAR stent graft in situ. The presence of tenderness, normal inflammatory markers, and evidence of increasing sac size were concerning for symptomatic aneurysmal disease related to enlargement.

The next day, the patient underwent diagnostic angiography followed by an open repair. Aortography was performed via right femoral percutaneous access. This procedure demonstrated a large posterior type II EL; however, in conjunction with the CT scan, it was not clear exactly where the origin was and the decision was made to proceed with open sac exploration. A midline laparotomy was performed with supraceliac control owing to suprarenal fixation of the in situ device and in preparation for the potential need for graft explantation. The retroperitoneum was explored and the infrarenal neck of the aneurysm dissected. Heparin was given, the sac opened, and the thrombus evacuated. High-pressure bleeding was noted from a large lumbar artery located posterior to the right limb of the graft, making it difficult to reach.

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Fig 1. Axial computed tomography (CT) sequence showing a type II endoleak from the posterior lumbar artery.

Fig 2. Preoperative computed tomography (CT) reconstruction showing the stent graft in situ.

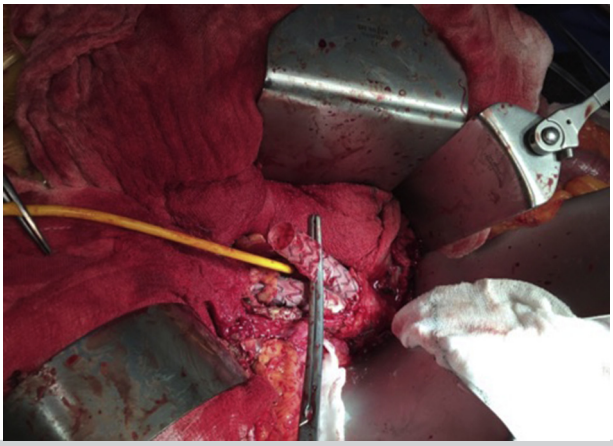

Fig 3. Stent graft component separation of the right limb reveals large, high-pressure back-bleeding from a posterior lumbar artery responsible for the persistent type II endoleak. A Foley catheter can be seen inserted into the vessel and inflated to obtain temporary hemostasis. Definitive hemostasis was obtained with a hemostatic Prolene suture. Orientation: Caudal aspect to left of image.

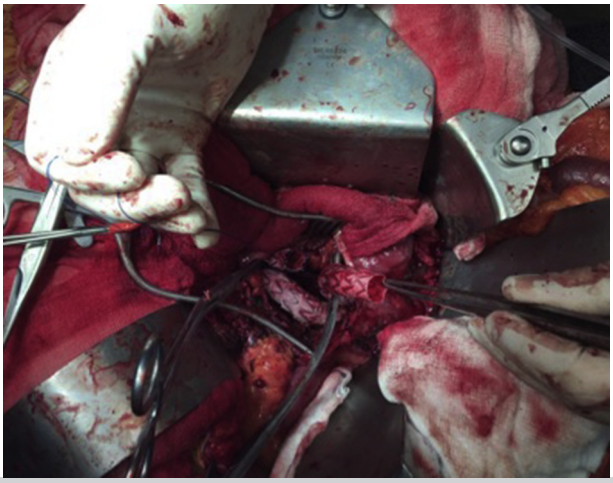

Fig 4. Purse string suture on right distal component placed to assist with reconstruction. Orientation: Caudal aspect to left of image.

While retracting the right limb of the stent graft in attempting to gain access to the lumbar vessel, the stent components inadvertently disconnected, prompting the following alternative surgical technique. The right proximal and distal limbs were clamped with DeBakey clamps, and a Foley catheter was inserted into the lumbar vessel and inflated to achieve temporary haemostasias (Fig 3). Back bleeding was definitively controlled using 2/0 polypropylene suture. Nitinol Z-rings left little room for end-to-end anastomosis, thus to reconnect the right limb of the endograft, a 3/0 purse string suture was placed around the proximal lumen of the distal component to allow for temporary compression of the limb (Figs 4 and 5). This maneuver was to facilitate smoother passage of the distal component proximally back into the ipsilateral limb. The double ended suture needles were then brought through the ipsilateral (16 mm) limb of the main body ensuring three-stent overlap and the distal component "pulled through." The pursestring was then released and the overlap was sutured with interrupted 4/0 polypropylene and pledgets to achieve

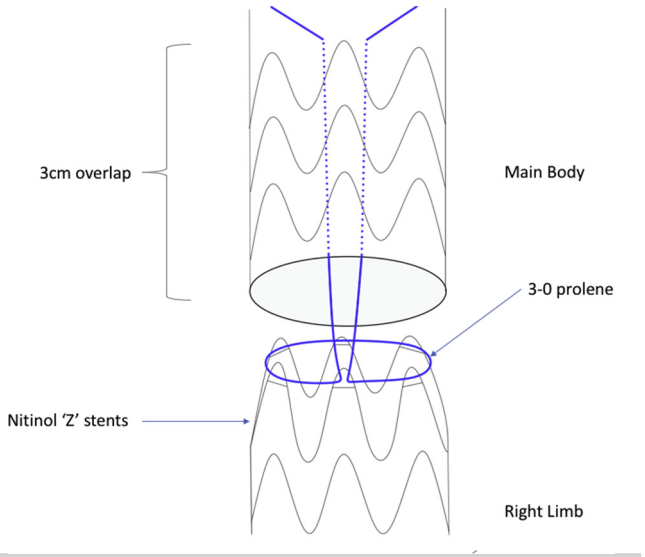

Fig 5. Illustration demonstrating purse string technique to temporarily compress distal limb to allow reinsertion into the main body. Sutures brought out through stent graft wall at a point 3 cm proximal to the distal main body lumen to allow for a 3-stent overlap.

hemostasis. Completion angiogram showed no EL, but evidence of thrombus in the distal right limb within the common iliac artery. The aneurysm sac was trimmed and imbricated with a 2/0 running suture to decrease the size to approximately a 4-cm diameter. A right groin incision was made and a 14F sheath was placed to perform a thromboembolectomy of the right limb of the graft. Resolution was confirmed with completion angiogram. Retroperitoneal packing was performed for coagulopathic bleeding and the abdomen was left open as a laparostomy using an ABThera dressing (KCI, Inc, San Antonio, Tex) to facilitate relook to ensure hemostasis, once the patient had stabilized. Coagulopathic bleeding was due to significant blood loss with large volume transfusion of the following blood products intraoperatively: Cell saver, 1200 mL, 4 units of red blood cells, 8 units of fresh frozen plasma, 2 pools of platelets, 2 g fibrinogen, and 2 g tranexamic acid.

The operative time was 5 hours from the commencement of aortography. All lower limb pulses were present postoperatively.

At relook laparotomy on the first postoperative day, ischemic sigmoid colon was evident, which was thought to be a watershed infarction owing to poor collateralization (considering the history of ischemic colitis and despite celiac, superior mesenteric, and both internal iliac arteries remaining patent). She underwent a Hartmann's procedure, was extubated the following day, and moved from critical care 6 days later with return to full independence.

Local policy follow-up surveillance involves biannual duplex ultrasound examination, regardless of sac size and selected CT scans to follow known EL or sac expansion or failure of regression. Both CT scans (which were performed for other reasons in April 2020) and duplex ultrasound examination show consistent sac regression and no EL at 4 years postoperatively.

RESULTS

i. Primary EVAR June 2013 completion angiogram — type II EL
ii. CT EVAR November 30, 2015 — type II EL, sac expansion from 8.0 to 8.7 cm over 5 months
iii. CT-guided translumbar embolization December 17, 2015
iv. Postembolization CT EVAR December 21, 2015 — no EL
v. CT May 9, 2016 - sac stability, no EL
vi. CT October 25, 2016 - sac expansion, type II EL
vii. CT scan (April 22, 2020) and duplex ultrasound examination (October 7, 2020) - no EL, sac stability

DISCUSSION

This case demonstrates the long-term difficulties that may be encountered in patients who undergo EVAR. A study published in 2012 found that embolization techniques for type II EL did not alter the rate of sac growth, with the majority of patients showing a persistent EL.[7] Graft-preserving interventions have been shown to be reasonably safe, with good durability in the medium term.[8] This technique of temporary disconnection has resulted in a good outcome for this patient, obviating the need for graft explantation. We believe this technique would be widely applicable across graft types because most iliac limb overlap occurs in a similar configuration within the aortic sac. This patient has not required further intervention over the subsequent 4-year period. It may be replicated in patients for whom the position of the endovascular graft or the anatomy of the contributing lumbar vessel prevents simple oversewing, and for patients who would otherwise require graft explantation.

CONCLUSIONS

This alternative open approach for treating a persistent type II EL postembolization has allowed for successful repair without the need for explantation of graft components.

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