Perioperative and mid-term results of trans-graft embolization of the hypogastric artery for treatment of type II endoleaks after endovascular aortic repair with off-label use of re-entry catheters

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ABSTRACT

Type II endoleaks after endovascular aortic repair are a common scenario that, although infrequently, may sometimes require secondary interventions when leading to significant enlargement of the aneurysm sac. Herein, we present the perioperative and mid-term results of one of our endovascular aortic repair cases with type II endoleak from the hypogastric artery, whose ostium was covered by the prior stent graft limbs and that were successfully treated with a novel technique employing re-entry catheters in an off-label fashion. This technique may represent a valid alternative solution when conventional access between artery and prosthesis is laborious or impossible to achieve. (J Vasc Surg Cases Innov Tech 2025;11:101674.)

Keywords: Type 2 endoleak; Embolization; Re-entry catheter

Type II endoleaks (T2ELs) after endovascular aortic repair (EVAR) are a common scenario that may sometimes require secondary interventions when leading to significant enlargement of the aneurysm sac.[1,2] When they arise from the hypogastric artery (HA), whose ostium is covered by the stent graft, the approach to embolization can be technically challenging, and conventional approaches may not be feasible.[3]

Recently, re-entry catheters have been widely employed in peripheral arteries to gain access to the true lumen after sub-intimal recanalization of chronic total occlusions.[4] However, they may be potentially used to puncture stent grafts and gain controlled access to T2EL nidus in selected circumstances. Herein, we present the perioperative and mid-term results of one of our EVAR cases with T2EL from the HA, whose ostium was covered by the prior stent graft limbs, and that was successfully treated with a novel technique employing re-entry catheters in an off-label fashion.

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The patient provided written informed consent for publication of the case report and related anonymized images.

CASE REPORT

A 78-year-old male with type 2 diabetes mellitus on insulin therapy, medically treated hyperlipidemia and hypertension, coronary artery disease (prior coronary artery bypass grafting), a former smoker, and with a previous left hemicolectomy, was also diagnosed with infrarenal abdominal aortic aneurysm. In 2008, he underwent EVAR with a Medronic Endurant II stent graft at an outside institution, which was reported to be technically successful. He then underwent normal yearly follow-up with his primary care physician until 2019, when owing to health care disruption because of the Sars-CoV-2 pandemic, he did not perform any other outpatient follow-up until 2022. At this point, after undergoing a computed tomography angiography (CTA) for other medical reasons, that showed a bilateral type 1B endoleak (Fig 1) with 12-mm increase of the abdominal aortic aneurysm diameter. An elective intervention was undertaken at the same facility where the patient had originally received EVAR, with embolization of the right HA (maximal diameter 11 mm) with a 16 mm Amplatzer Plug (Abbott Cardiovascular) and relining of the right iliac limb landing on the external iliac artery with an Endurant 16-13-120 endoprosthesis. The 16 mm Amplatzer Plug was placed in the distal portion of the right HA; however, its most proximal portion was dilated and gave origin to a collateral vessel. At time of intervention, it was felt that this vessel, having a small diameter, would not be able to produce a meaningful endoleak, and for that reason, its selective embolization was not performed. Then, to preserve HA patency on the left side, an iliac branch device was placed (using the Cook endoprosthesis) and placing a VBX 8L-79 stent graft (Gore & Associates) as bridging stent in the HA, which was post-dilated to ensure good apposition at the proximal and distal landing sites.

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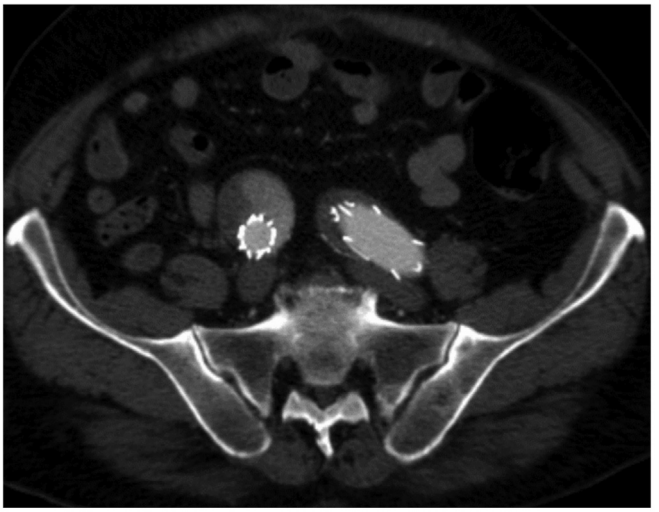

Fig 1. Computed tomography angiography (*CTA*) at time of referral showing bilateral type 1B endoleak after prior endovascular aortic repair (*EVAR*).

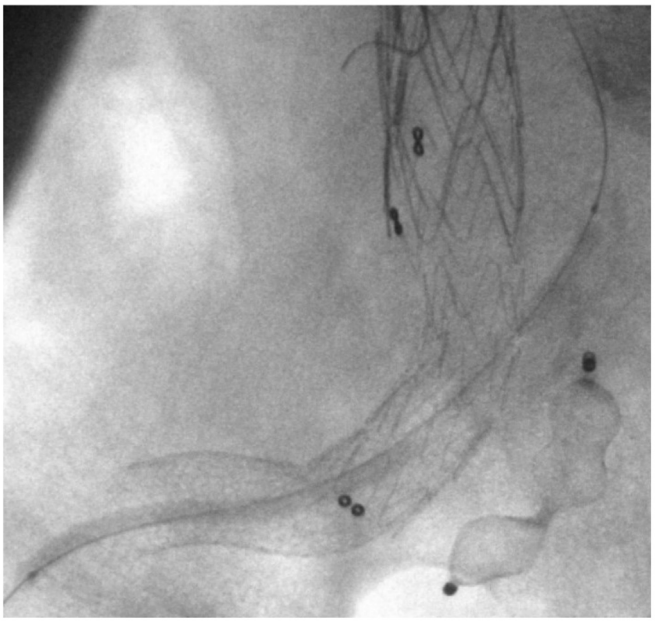

Fig 2. Intraoperative details showing the transgraft access with balloon dilation of the fabric hole.

The procedure had no perioperative complications, and the 1-month CTA was regular; however, after 1 year, a new CTA showed a T2EL from the right HA, with iliac growth (maximal AP × LL diameters of 40 × 51 vs 35 × 46 mm for the common iliac artery).

The patient was referred to our division, and considering the scenario, we decided to attempt an embolization of the T2EL. Under local anesthesia and 5Fr percutaneous right femoral access, multiple attempts at passing between the external iliac artery and the prosthesis were made without success; therefore, we decided to proceed with a transgraft route to the HA using the

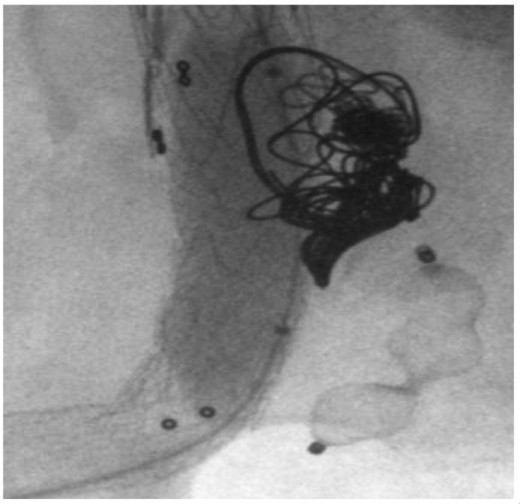

Fig 3. Intraoperative details showing embolization of the endoelak nidus with coils.

Be-Back (Bentley GmBH) 2.9 Fr re-entry catheter. This device is a crossing catheter with a 360° rotational retrievable Nitinol needle at its tip, full steerable control, and comes with four different configurations (2.9 and 4Fr, 80 and 120 cm). We first placed a 5Fr-45 cm Flexor Ansel sheath (Cook Medical) with the tip toward the iliac limb; then, we punctured the graft limb with the catheter needle and inserted an .014 wire into the HA. In fact, because we knew that the source of T2EL was in the most proximal portion of the right HA and above the Amplatzer Plug, we assumed that we would only need to direct the needle above the cranial marker of the embolization device to assess the endoleak nidus. Subsequently, we dilated the trans-prosthetic access with a non-compliant 2.5-mm balloon and then placed a 4Fr Ber2 angiographic catheter through the graft hole after removing the guiding sheath. We performed a selective angiography through the catheter to confirm effective access to the endoleak nidus; then, we placed in telescopic fashion a 2.7 Progreat microcather (Terumo Inc) (Fig 2). Embolization was performed through the microcatheter with detachable coils and Onyx glue until the complete filling of the endoleak nidus. Sealing of the trans-limb hole was attained with a VBX 11-59 stent graft with technical success at final angiogram (Fig 3). The 1-month and 6-month CTAs both showed the correct outcome of the procedure with complete T2EL exclusion and no evidence of other endoleaks, as well as stability of the aneurysmal sac diameter (Fig 4).

DISCUSSION

Although a frequent occurrence following EVAR procedures, T2ELs require secondary procedures only on rare instances. Although a variety of technical approaches have been described to access T2ELs and perform embolization, only the transarterial route allows for direct occlusion of the feeding arteries. In contrast, all other approaches (eg, translumbar, peri-graft, or transcaval) may only allow for indirect filling of the T2EL nidus with possible backflow

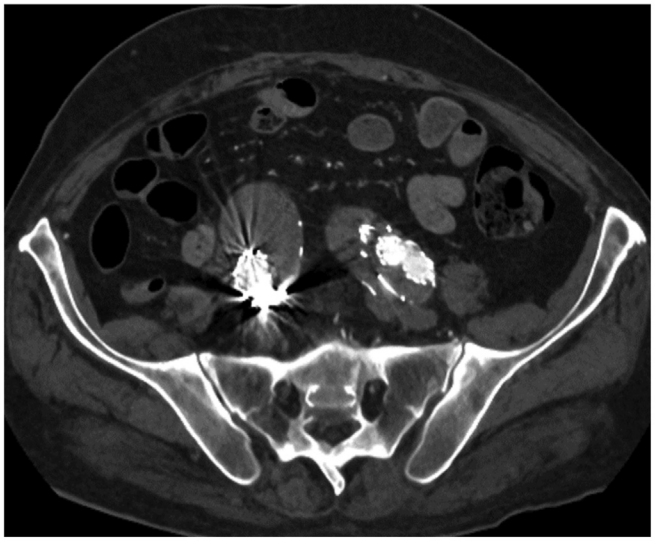

Fig 4. Postoperative computed tomography angiography (*CTA*) with complete resolution of the endoleak and stability of the iliac diameter.

of liquid agents into feeding vessels.[5,6] Notably, T2ELs from the HA or its first-order branches may be notoriously difficult to treat. This is the reason why most operators agree that when using iliac branch devices in the setting of HA aneurysms, collateral vessels ≥2 mm should be embolized prior to deployment of the bridging stent graft(s).[7,8] This is as much important in cases where iliac branch devices are placed for correction of a type 1B endoleak[9]; in the presented case, it was felt that embolization of the HA main trunk would have obliterated its first-order derivatives while posing fewer risks for distal pelvic ischemia. However, it is likely that, due to misalignment of the plug, a T2EL developed proximally to the site of HA embolization.

In our case, conventional approaches were unsuccessful at attaining embolization of the T2EL, and we therefore decided for a direct transprosthetic catheterization of the HA residual aneurysmal sac with a re-entry catheter. After proper stabilization with an introducer sheath, we were able to easily and effectively direct the needle of the catheter towards the side of the endograft's limb that laid more closely to the T2EL nidus (as assessed from preoperative CTA images). In contrast to prior attempts at using conventional needles,[10] this procedure employs (although in off-label fashion) a properly designed endovascular device that is easy to visualize, track, and manipulate. Alternative approaches might as well be sought, such as using steerable sheaths with electrically powered wire, to puncture the fabric of stent grafts. Although all these techniques remain strictly off-label and should only be used in a judicious way after more conventional approaches have failed, it is important that operators have familiarity with such advanced applications from other fields before attempting to use them in a non-conventional fashion.

Although the embolization itself only requires the use of microcatheter and microcoils (with or without additional liquid embolic agents), we used a telescopic approach using a conventional angiographic catheter to provide additional support and trackability during the endovascular procedure (as the microcatheter only might have been compressed by the stent graft fabric and nonetheless was difficult to maneuver). Given the relatively large size of the trans-limb hole, this was sealed with a balloon-expandable covered stent to prevent a type 3 endoleak, with durable results up to 6 months.

CONCLUSION

This preliminary report shows the safety, feasibility, and short-term effectiveness of a novel trans-limb approach using re-entry catheters for embolization of T2ELs after EVAR. This technique may represent a valid alternative solution when conventional access between artery and prosthesis is laborious or impossible to achieve. Further experience and longer follow-up are needed to validate the results of the technique, although we believe this should be considered in the armamentarium of endovascular physicians.

DISCLOSURES

None.

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