Effective treatment of type IIb endoleak via targeted translumbar embolization

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ABSTRACT

After endovascular aneurysm repair, type II endoleaks are encountered frequently, and warrant intervention when associated with aneurysmal sac expansion. Thus, the contemporary vascular surgeon must be able to manage them. The presented case illustrates our approach to percutaneous translumbar selective coil embolization of individual lumbar arteries feeding the type IIb endoleak. The use of specific imaging systems allows for needle track guidance to access the endoleak pocket. Treatment of the feeding vessels with detachable coils can be achieved with a direct route via the translumbar sheath. The benefits of this approach include avoidance of graft puncture, targeted therapy, and low puncture-related complications. (J Vasc Surg Cases Innov Tech 2022;8:232-6.)

Keywords: Abdominal aortic aneurysm; Endoleak; EVAR

Endoleaks, or continued perfusion of an excluded aneurysm sac, are commonly encountered after endovascular aneurysm repair (EVAR) underpinning the Society of Vascular Surgery recommendation for serial imaging postoperatively to monitor for their development and subsequent risk of aneurysm expansion.[1,2]

Type II endoleaks (T2EL) are caused by the reversal of flow through collateral arteries into the aneurysm sac, most commonly from a patent inferior mesenteric artery (IIa) or lumbar arteries (IIb). Reported T2EL incidence varies considerably owing in part to variable follow-up imaging and the low-flow nature of most T2EL, which can be missed with poorly timed computed tomography angiography (CTA). The majority of T2EL resolve spontaneously within 6 months of the index surgery[3-5]; 10% persist and may contribute to continued aneurysm sac expansion.[4,5] The repair of such endoleaks in the setting of significant aneurysm expansion is recommended, while continued surveillance is preferred in cases without sac growth.[1,6] Interventions for T2EL have involved endovascular transfemoral and translumbar arterial coil embolization,[7] perigraft arterial sac embolization,[8,9] and transcaval catherization.[10] Surgical approaches include ligation of feeding vessels[11] and conversion to open aneurysm repair.[12]

We present our technique for percutaneous translumbar coil embolization of individual lumbar arteries feeding a type IIb endoleak. Patient approval for publication was obtained.

CASE DESCRIPTION

A sixty-year-old male former smoker presented with a 55-mm infrarenal abdominal aortic aneurysm (AAA), with a 30-mm right common iliac and a 25-mm left common iliac artery aneurysms. EVAR was performed with Gore Excluder device (W.L. Gore & Associates, Newark, DE) with two docking limbs with additional endovascular repair of the bilateral iliac artery aneurysms using bilateral Gore Excluder iliac branch endoprosthesis extending to the bilateral internal and external iliac arteries. Completion angiography revealed widely patent renal arteries, main body iliac limbs, and internal iliac branches with no endoleak. The patient was initiated on aspirin and clopidogrel due to bilateral iliac branch endoprosthesis repair and discharged on postoperative day 1.

The first follow-up CTA, obtained 5 months postoperatively, demonstrated a type IIb endoleak originating from patent lumbar arteries and a stable aneurysm sac size of 55 mm (Fig 1, *A*). In addition, there was incidental identification of occlusion of the left internal iliac branched device which was managed nonoperatively. Given no aneurysm sac expansion, the endoleak was monitored with yearly serial imaging.

Three years postoperatively, aneurysm growth was present with more than 1-cm sac of enlargement (Fig 1, *B*), with the AAA measuring 67 mm and a persistent type IIb endoleak originating from two lumbar arteries. Findings were confirmed by contrast-enhanced ultrasound (CEUS) examination (Fig 2), and no other endoleaks were identified. The patient was recommended for type IIb endoleak treatment.

Under general endotracheal anesthesia, the patient was placed in the right lateral decubitus position. A hybrid operating suite with needle-track and fusion technology was used (GE IGS

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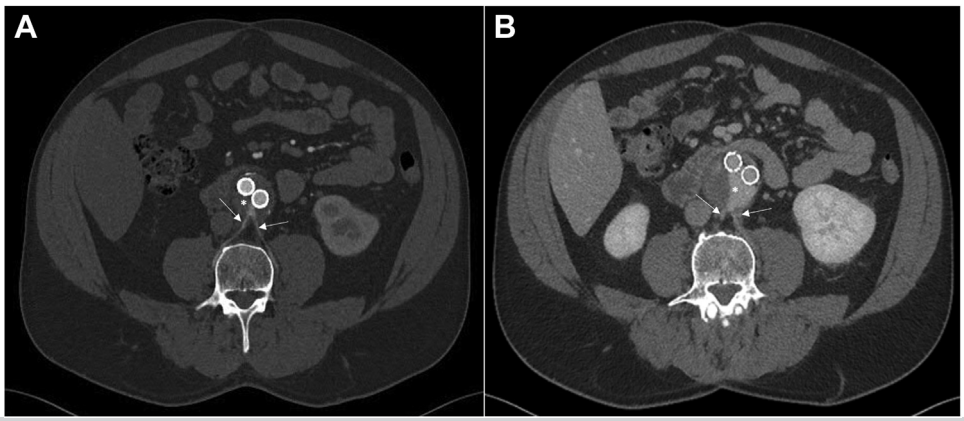

Fig 1. Imaging before type IIb endoleak intervention. **(A)** CTA at 5 months after endovascular aneurysm repair (EVAR) demonstrating a type IIb endoleak. **(B)** Delayed phase computed tomography angiography (CTA) demonstrating continued type IIb endoleak 3 years after EVAR. Note aneurysm sac enlargement. *Endoleak. White arrows indicate feeding lumbar arteries.

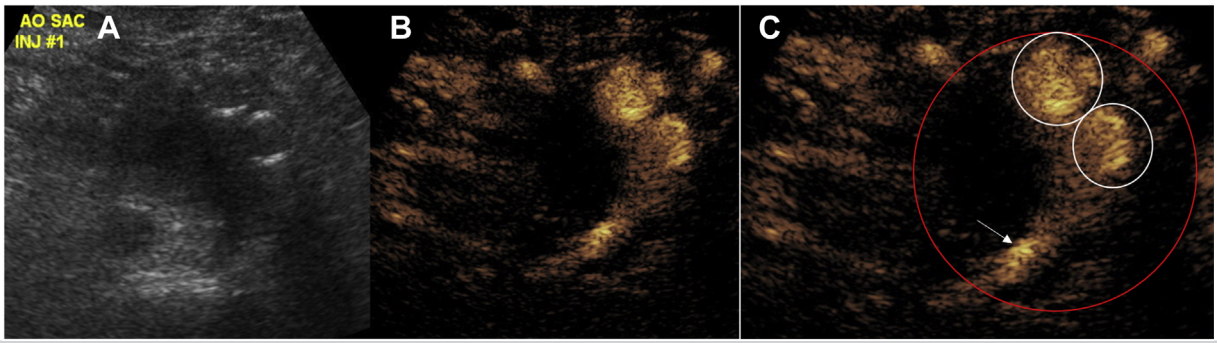

Fig 2. Preoperative contrast-enhanced ultrasound (CEUS) examination demonstrating type IIb endoleak originating from lumbar arteries. **(A)** Precontrast. **(B)** Postcontrast. **(C)** Postcontrast, annotated: white circles denote endograft iliac artery limbs and white arrow indicates the right lumbar endoleak.

Discovery, GE Healthcare, Chicago, IL). A registration spin is performed and the imaging is fused with the preoperative CTA to determine the safest needle track, which is then processed in the imaging software to be used as the needle track in two dimensions (bull's eye and needle track). This procedure allows for needle track planning for translumbar sac puncture (Fig 3). The procedure is then performed with the same resolution and fluoroscopic quality as when not using needle track images.

The sac was punctured with a 20G, 20-cm needle; selective contrast injection demonstrated a high-flow endoleak cavity with two feeding lumbar arteries (Fig 4, *A*). A V18 wire was advanced and access was upsized to a 5F Ansel 0 sheath (Cook Medical, Bloomington, IN), which was sutured to the skin, securing aneurysm sac access. Using a combination of an Omniflush catheter (Angiographics, New York, NY) and a microcatheter/wire (Renegade, Boston Scientific Corporation, Marlborough, MA/Glidewire Gold, Terumo, Tokyo Japan), both lumbar arteries were selectively catheterized and coil embolized with multiple 0.018 Interlock coils (Fig 4, *B*) successfully obliterating flow through both arteries. The endoleak pocket was then filled with additional coils, 14 and 22 mm, packed tightly adjacent to the origin of the lumbar arteries. Additional Onyx (Medtronic, Minneapolis, MN) was injected in the coil nest to secure endoleak treatment. Angiogram demonstrated stagnant contrast with absent flow to the lumbar arteries (Fig 4, *C*). Completion intraoperative CEUS examination confirmed resolution of the endoleak (Fig 5). The patient was discharged home on postoperative day 1 with resumption of aspirin and clopidogrel.

The follow-up CTA and CEUS examination at 9 months postoperatively were negative for endoleak with no evidence of new contributing vessels to the aneurysmal sac. The sac diameter stabilized; the maximum diameter was 66 mm versus 67 mm before the procedure.

DISCUSSION

Significant debate remains regarding the correct approach to T2ELs. Although the treatment of asymptomatic T2EL without aneurysm sac enlargement has largely been excluded, controversy exists when sac enlargement is present. T2EL are associated with

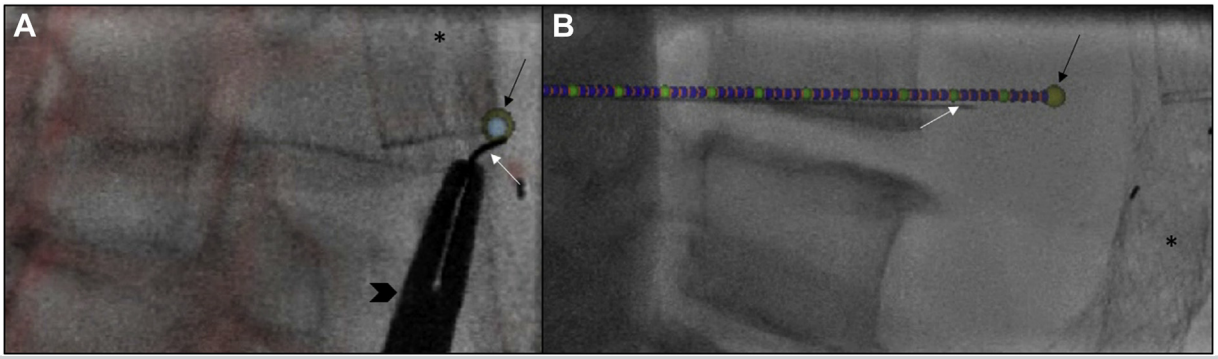

Fig 3. Fluoroscopy imaging was used and fused with preoperative computed tomography angiography (CTA) allowing needle track planning for translumbar sac puncture. **(A)** Needle driver (arrowhead) guiding 20G, 20-cm needle (white arrow) along planned needle track (black arrow). Endograft seen posteriorly (*). **(B)** Sagittal view with needle (white arrow) seen alongside needle-track (black arrow). Endograft noted anterior to the needle tract (*).

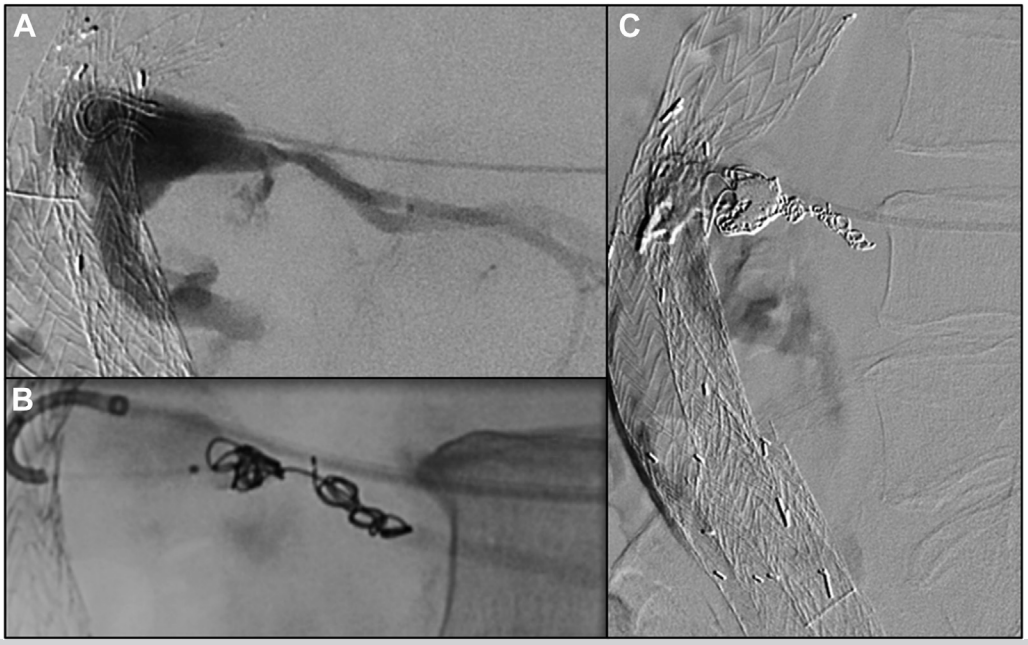

Fig 4. Intraoperative angiographic images. **(A)** Selective contrast injection demonstrating two lumbar arteries feeding the aneurysm sac. **(B)** Selective coil embolization of small feeding lumbar arteries. **(C)** Completion angiogram demonstrating no flow into aneurysm sac.

increased risk of aneurysm growth in up to 60% of patients, and higher incidence of secondary interventions.[4,13,14] This is particularly true for T2EL that persist beyond 6 to 12 months after initial EVAR, with intervention rates of more than 50% compared with early T2EL that resolve spontaneously in 75% of cases.[3,5] However, an increased risk of aneurysm rupture has not been demonstrated consistently and, even in cases of secondary rupture, rates remain low (approximately 2%), similar to that seen more generally after EVAR.[4,15-17]

There is great heterogeneity in the technical approach for T2EL repair, ranging from endovascular isolated artery embolization, to conversion to open repair. Overall technical success, which is usually defined as successful access, accurate deployment, and complete exclusion of the endoleak,[18] in one systematic review was found to be 87.9% with the best results being with translumbar (98.7%) and transcaval embolization (93.3%).[13] However, resolution on follow-up imaging is only apparent in two-thirds of patients, despite technical success.[13] Continued monitoring after intervention is recommended owing to the documented recurrence risk.[19] Given the unpredictable natural course, we favor the least invasive approach balanced with the highest likelihood of technical success. The presented case demonstrates that type IIb endoleaks can be safely treated via a

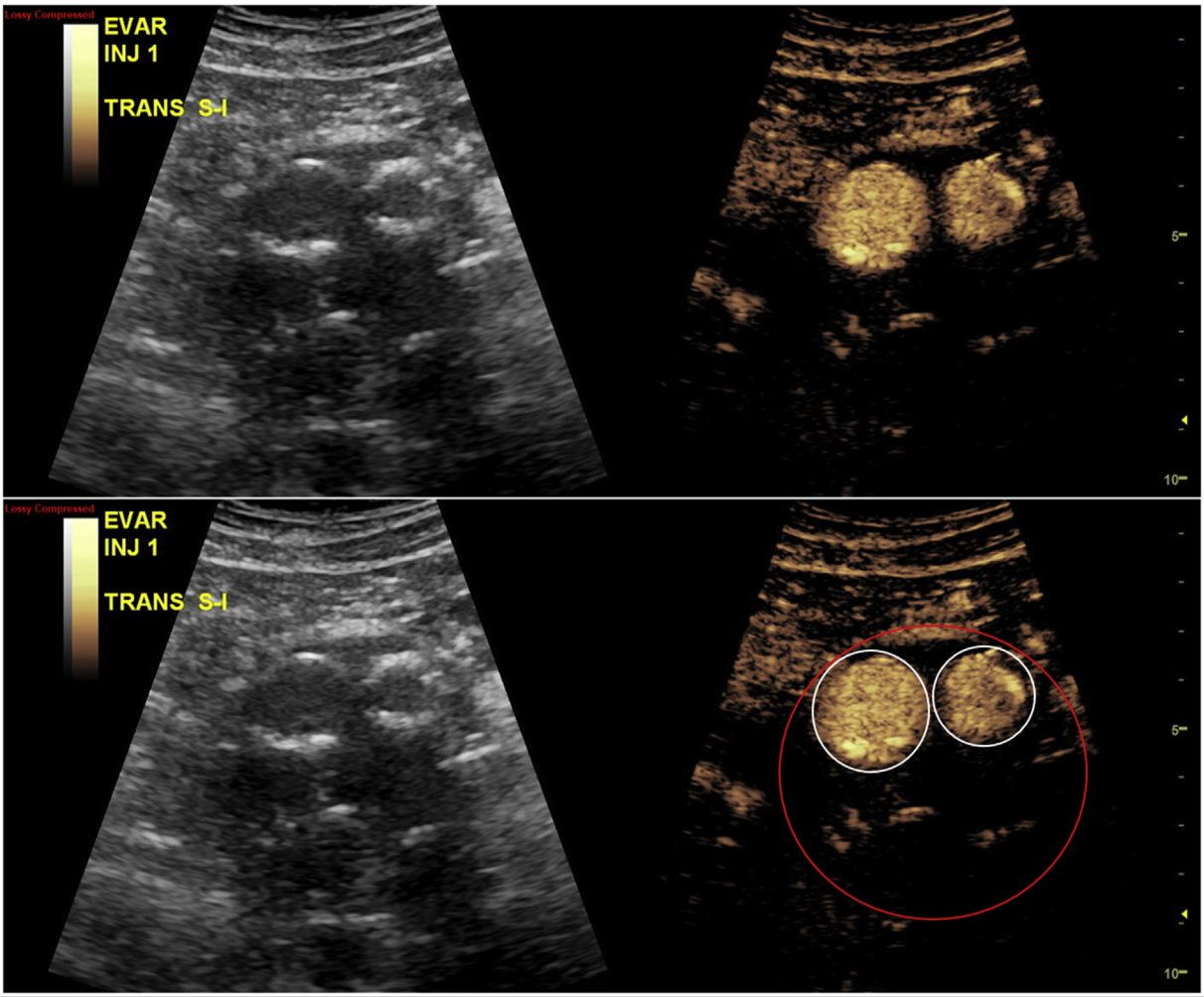

Fig 5. Intraoperative contrast-enhanced ultrasound post-translumbar embolization of a type II endoleak (T2EL). White circles around iliac graft branches, white arrow pointing to echogenic foci in the aneurysm sac representing embolic material. Note the complete resolution of the endoleak. *EVAR,* Endovascular aneurysm repair.

translumbar approach with technical success lasting over 12 months. The benefits of this approach include avoiding puncture of the graft, targeted therapy, and a low risk of puncture-related complications. Moreover, use of intraoperative CEUS examination allows for the identification of any persistent endoleak that can be addressed during the same anesthetic, thus potentially decreasing the number of reinterventions required.

Additional technical aspects deserve mention. The ability to perform a needle track real-time guidance to the specific target in the endoleak pocket is available in a few imaging systems. This tool can potentially decrease radiation compared with traditional multiplanar fluoroscopic or tomographic guidance, in addition to increasing precision. In our experience, upsizing the access with a sheath has not been associated with retroperitoneal bleeding and enables the introduction of different shaped catheters before microcatheters to target feeding lumbar arteries. Although cannulation of lumbar arteries is challenging using the translumbar approach owing to its opposite direction, it is feasible, particularly when these arteries are large. Finally, the treatment of the feeding vessels with small detachable coils can be followed by larger coils filling the aneurysm sac gap with a direct route via the translumbar sheath.

With the rapid increase in use of EVAR and fenestrated-branched EVAR for repair of complex AAAs, the frequency of T2EL is likely to increase.[20] The contemporary vascular surgeon must have several tools in their armamentarium to deal with this anatomically diverse type of endoleak: the technique presented above is one such tool, which should be used in a complementary fashion to previously described approaches.

CONCLUSIONS

The treatment of type IIb endoleaks associated with aneurysm sac expansion was safely achieved with a translumbar approach and target lumbar artery coil

embolization with excellent results and negligeable patient morbidity.

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