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Case Report

Embolization of a type 2 endoleak using a micropuncture introducer set and a triple-coaxial system through the deep iliac circumflex artery via the ipsilateral femoral artery ☆,☆☆

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ABSTRACT

An 83-year-old man underwent embolization for a type 2 endoleak following endovascular aortic repair for an abdominal aortic aneurysm. The type 2 endoleak originated from the left iliac circumflex artery, which was located very close to the puncture site in the left femoral artery. This proximity made the embolization procedure challenging; however, by employing a combination of a micropuncture introducer set and a triple-coaxial system, embolization with N-butyl-2-cyanoacrylate was successfully achieved.

Introduction

The endoleak are a unique complication of endovascular aortic repair (EVAR) for abdominal aortic aneurysms (AAA). Type 2 endoleak (T2E) are the most common type, comprising 10%-25% of all endoleaks [1] and occurring in approximately 10% of patients after EVAR [2]. T2E are a risk factor for aneurysmal sac enlargement, with rupture occurring in about 1% of patients with T2E after EVAR [2]. While T2E typically do not require immediate reintervention, post-EVAR aneurysm dilation greater than 5 mm is associated with increased late mortality and may necessitate reintervention [3]. Transcatheter arterial embolization is a common treatment for T2E [4]. On the other hand, performing a procedure on a vessel that arises very close to the puncture site is quite challenging. This is be-

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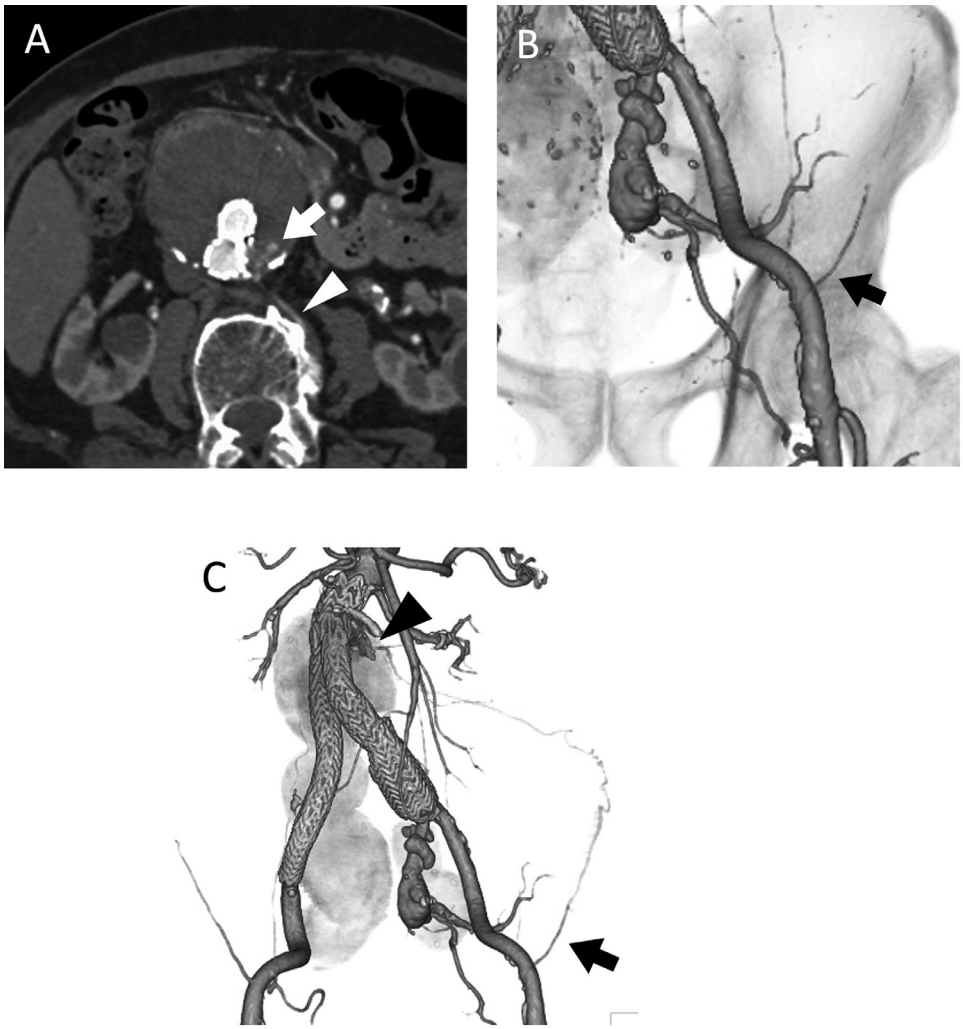

Fig. 1 – (A). Contrast-enhanced CT reveals a T2E (arrow) originating from the left third lumbar artery (arrowhead). (B). A 3D angiography image shows the left deep iliac circumflex artery (arrow), which is very close to the puncture site in the left femoral artery. (C). Another 3D image demonstrates that the T2E (arrowhead) is emanating from the left third lumbar artery via the left deep iliac circumflex artery (arrow).

cause only the tip of the sheath can be introduced, which increases the risk of sheath dislodgement during the procedure. To address this issue, we considered a combination method using a micropuncture introducer set and a triple-coaxial system, which comprises a small microcatheter, a large microcatheter, and a 4-Fr catheter. We report here a case of a patient with a T2E who was successfully treated using this new approach.

Case report

An 83-year-old man had an AAA measuring 42 mm, a right common iliac artery aneurysm measuring 44 mm, and a right internal iliac artery aneurysm measuring 49 mm. The patient underwent EVAR using the Excluder (W.L. Gore and Associates, Flagstaff, AZ) with coil embolization of the distal right internal iliac artery. Four years after EVAR, the AAA had enlarged from 42 mm to 60 mm. A contrast-enhanced CT scan revealed T2E from the left and right 4th lumbar arteries and the inferior mesenteric artery. Coil embolization was performed on these arteries. However, a year after the embolization, a contrast-enhanced CT scan revealed that the AAA remained dilated at 64 mm, and T2E had developed from the left 3rd lumbar artery via the left deep iliac circumflex artery (Fig. 1). Subsequently, repeat embolization was considered. However, it was deemed difficult to perform this procedure from the right femoral artery due to the increased length from the right femoral artery to the left deep iliac circumflex artery following EVAR. The manipulation of the microcatheter would be challenging. Therefore, a left femoral artery approach was necessary. However, the orifice of the left deep iliac circumflex artery was close to the puncture site of the left femoral artery, with only 25 mm separating the orifice from the center of the left femoral head. We determined that us-

Fig. 2 – Angiography of the left external iliac artery using the outer catheter of a 4-Fr micropuncture introducer set revealed the left deep iliac circumflex artery (arrow).

ing a conventional 4-Fr sheath would be challenging, as only the tip of the sheath could be inserted, which posed a risk of sheath dislodgement during the procedure. Consequently, we decided to use a 4-Fr micropuncture introducer set (Merit Medical, South Jordan, UT). The micropuncture introducer set is composed of an inner catheter matched with the 0.018-inch guidewire and an outer 4-Fr 10-cm-long catheter. We believed the outer catheter would allow direct introduction to the left deep iliac circumflex artery and provide stability during the procedure. The left common femoral artery was punctured with a 21-G needle under ultrasound guidance. A 0.018-inch guidewire was advanced to the left external iliac artery, and a 4-Fr micropuncture introducer set was introduced along the guidewire. After removing the inner catheter, angiography of the left external iliac artery through the outer catheter revealed the left deep iliac circumflex artery (Fig. 2). A large microcatheter (2.6-Fr Masters HF; ASAHI INTECC, Aichi, Japan) was then advanced to the left deep iliac circumflex artery via the outer catheter using a 0.025-inch guidewire. Subsequently, the outer catheter was advanced to the left deep iliac circumflex artery along the large microcatheter (Fig. 3). Angiography of the left deep iliac circumflex artery through the outer catheter revealed T2E originating from the long and tortuous artery (Fig. 4). A small microcatheter (1.9-Fr Carnelian MARVEL; Tokai Medical Products, Aichi, Japan) was then advanced into the AAA through the left 3rd lumbar artery using a 0.014-inch microwire (ASAHI Meister; ASAHI INTECC) and a 0.010-inch microwire (ASAHI CHIKAI X; ASAHI INTECC) (Fig. 5). Embolization was successfully performed using a mixture of N-butyl-2-cyanoacrylate (NBCA) and iodized oil (ratio 1:4) (Fig. 6).

The patient did well without any complications and was discharged from the hospital 1 day after the embolization. At the 5-month follow-up, imaging demonstrated no enlargement of the AAA.

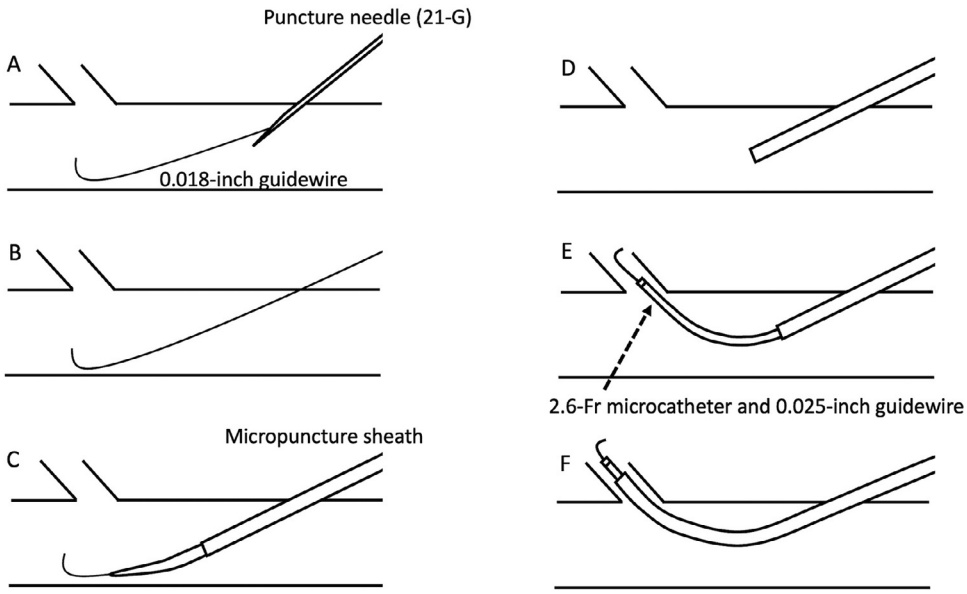

Fig. 3 – A sketch showing the insertion of a 4-Fr micropuncture outer catheter into the left deep iliac circumflex artery (A). The left femoral artery was punctured with a 21-G needle under ultrasound guidance, and a 0.018-inch guidewire was advanced into the left external iliac artery (B). A 21-gauge needle was removed, leaving the 0.018-inch guidewire (C). A 4-Fr micropuncture introducer set was then introduced over the guidewire (D). The inner catheter was subsequently removed. (E). A large microcatheter was advanced into the left deep iliac circumflex artery through the outer catheter using a 0.025-inch guidewire. (F) Finally, the outer catheter was advanced into the left deep iliac circumflex artery along the large microcatheter.

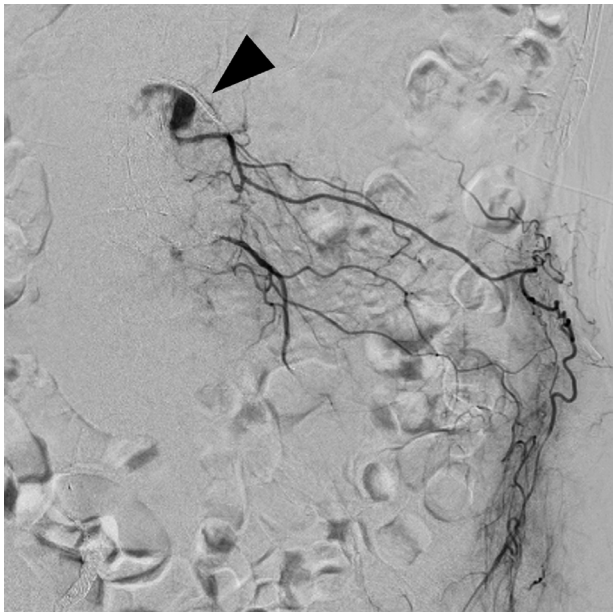

Fig. 4 – Angiography of the left deep iliac circumflex artery through the outer catheter revealed T2E (arrow) fed by the long and tortuous artery.

Discussion

In this case, we successfully performed embolization of the T2E through the deep iliac circumflex artery via the ipsilateral femoral artery using a micropuncture introducer set and a triple-coaxial system.

The micropuncture introducer set offers several advantages. The use of a thin needle for initial access to blood vessels reduces the risk of bleeding and organ damage, and the narrow diameter of the outer catheter allows for direct insertion into even small arteries [5]. In contrast, a conventional sheath is relatively rigid and may be difficult to advance into small arteries. The 4-Fr micropuncture introducer set's outer catheter advanced easily into the left deep iliac circumflex artery and provided excellent support for the microcatheters, facilitating the successful catheterization of the AAA from the long and tortuous artery.

Additionally, a large microcatheter can be inserted into the outer catheter of the 4-Fr micropuncture introducer set, enabling the use of a triple-coaxial system consisting of a small microcatheter, a large microcatheter, and a 4-Fr outer catheter. The triple-coaxial system offers several advantages in embolization for T2E. In this system, a large microcatheter helps prevent the small microcatheter from sagging or jumping as it enters a narrow artery, facilitating advancement through tortuous and constricted vessels. Additionally, it simplifies catheter exchange when using NBCA for embolization. If the initial attempt is unsuccessful, the small microcatheter can be replaced while the large microcatheter remains in place. This allows for the easy insertion of a new small microcatheter without the need for additional selective catheter placement. This method is especially beneficial for T2E cases, where the access route is often very long and tortuous [6].

Moreover, when removing the microcatheter, the cast of NBCA may adhere to its tip. In a conventional catheter system, this cast could be scraped off at the tip of the 4-Fr catheter, potentially leading to nontarget embolization of other organs. However, with the triple-coaxial system, the large microcatheter can dislodge the cast in a deeper position, allowing it to be carried away to a distal site. Thus, using NBCA with the triple-coaxial system is considered a safer procedure [7].

In conclusion, the combination of a micropuncture introducer set and a triple-coaxial system is effective for embolizing T2E through the deep iliac circumflex artery via the ipsilateral femoral artery.

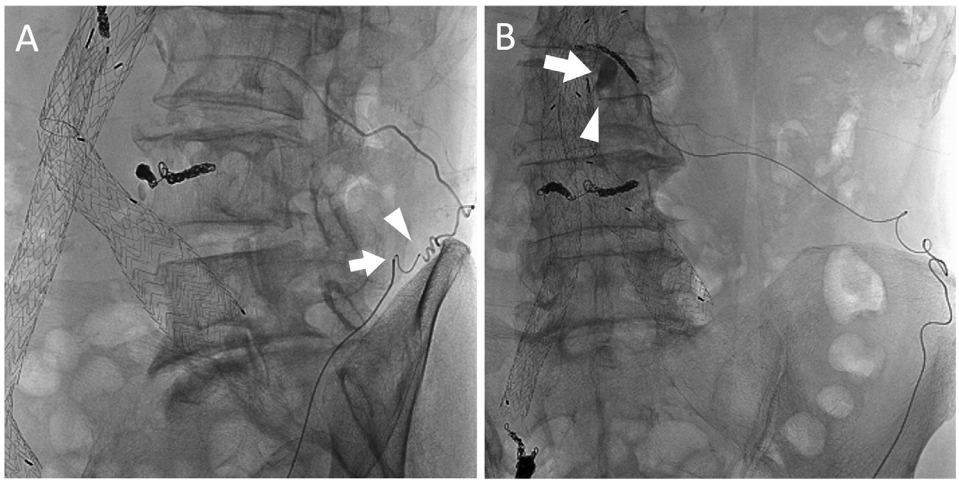

Fig. 5 – (A). The small microcatheter (arrowhead) was advanced to the left deep iliac circumflex artery with good support from the large microcatheter (arrow). Eventually, the small microcatheter was placed within the aneurysm. (B) Angiography from the small microcatheter (arrowhead) revealed the T2E (arrow).

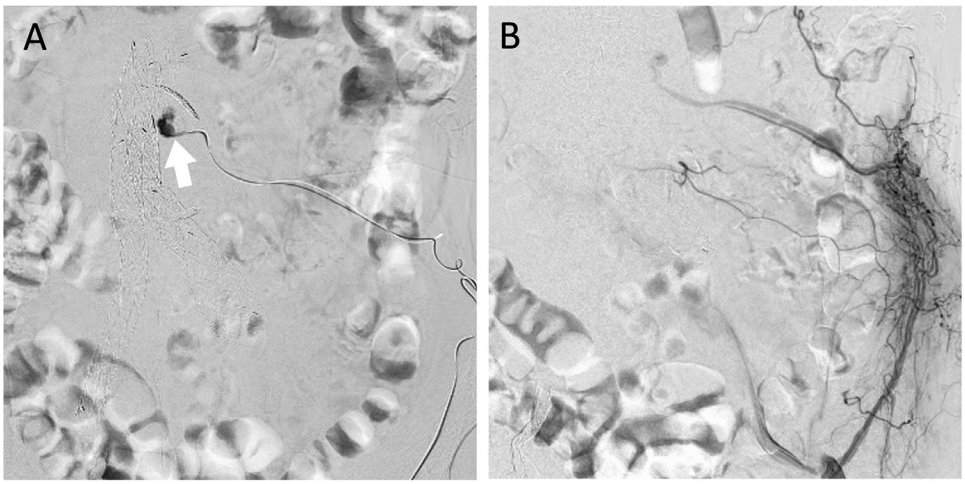

Fig. 6 – (A) Embolization was performed using a mixture of NBCA and iodized oil (ratio 1:4) (arrow) via the small microcatheter. (B) Postembolization angiography showed the disappearance of the T2E.

Patient consent

Written informed consent was obtained for the publication of this article.

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