Translumbar Embolization of a Type 2 Endoleak after Endovascular Aneurysm Repair Involving Five Communicating Arteries and the Endoleak Sac: A Case Report

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Abstract

A 46-year-old woman underwent emergent endovascular aneurysm repair for impending rupture of an abdominal aortic aneurysm. Contrast enhanced computed tomography (CT) 10 months after the procedure revealed a type 2 endoleak and enlargement of the aneurysm. Since the transarterial approach to the sac was technically difficult, direct translumbar embolization was performed. An elaster needle was inserted directly into the sac via a translumbar approach. Angiography revealed five arteries communicating with the endoleak sac. The inferior mesenteric artery and bilateral third lumbar arteries were selectively catheterized and embolized with coils. The sac and fourth lumbar arteries were embolized using an n-butyl-2-cyanoacrylate-lipiodol mixture. All of the communicating arteries and the sac were successfully embolized without severe complications. Follow-up CT images showed a reduction in the size of the aneurysm.

Key words: endovascular aneurysm repair, type 2 endoleak, embolization, translumbar

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Introduction

Endovascular aneurysm repair (EVAR) is the preferred treatment for abdominal aortic aneurysms (AAA), but it is not without its complications. Endoleaks are a frequent complication after EVAR; type 2 endoleaks in particular are the most common type with an incidence of 10.2%-18.9%[1-3]. Although conservative management of type 2 endoleaks is recommended in suitable candidates, endovascular treatments are indicated in cases of persistent endoleaks or expansion of the aneurysm[1, 4]. However, even with this technique, it is often difficult to completely embolize the endoleak [3-5]. Here we report a case of type 2 endoleak with three feeding and two draining arteries that was successfully embolized using the direct translumbar approach.
vent rupture 16 months after EVAR. The diameter of the aneurysm was 56 mm. Transarterial embolization was considered comparatively difficult and thought to require more contrast medium than the translumbar approach because the collateral pathways to the endoleak sac were tortuous and long (Fig. 2). Therefore, the direct translumbar approach under CT (Aquilion 64; Toshiba Medical Systems, Otawara, Japan) fluoroscopic guidance was employed to access the sac. Informed consent was obtained from the patient before the procedure.

The procedure was performed in a prone position under local anesthesia using the interventional radiology-CT system. A 20-gauge 20-cm elaster needle (Happycath PTCD needle; Medikit, Tokyo, Japan) was inserted through the left major psoas muscle at the level of fourth lumbar vertebra and advanced directly into the sac under CT fluoroscopic guidance (Fig. 3). Angiography via the outer sheath of the coaxial needle revealed inflow from the inferior mesenteric artery (IMA) and outflow to the bilateral fourth lumbar arteries (Fig. 4a). A micro-catheter (Tellus; Asahi Intecc, Tokyo, Japan) was introduced via the outer sheath and advanced into the sac. The IMA was catheterized by a micro-catheter and embolized with two bare platinum detachable coils (CASHMERE; Codman, Raynham, MA, USA). The proximal portion of the IMA and the endoleak sac around the IMA orifice were embolized with 0.2 mL of 33% n-butyl-2-cyanoacrylate (NBCA) diluted with lipiodol (NBCA-lipiodol; Guerbet, Tokyo, Japan) (Fig. 4b). A subsequent angiography with the micro-catheter placed at the upper portion of the sac revealed that the bilateral third lumbar arteries were also feeders (Fig. 4c). The left and right third lumbar arteries were catheterized and embolized, respectively, with 10 pushable microcoils (Tornado and Hilal, Cook Japan, Tokyo, Japan; and C-Stopper, Piolax, Kanagawa, Japan). The upper portion of the sac was filled with 0.6 mL of the NBCA-lipiodol mixture (1:2). Finally, 2.5 mL of the NBCA-lipiodol mixture (1:2) was injected to fill the remnant sac and bilateral fourth lumbar arteries. Consecutively, the outer sheath was removed slowly and a small amount of NBCA-lipiodol mixture (1:2) was infused into the puncture root to prevent bleeding from the aneurysm (Fig. 4d). CT images obtained immediately after the procedure indicated complete embolization of the four lumbar arteries and the IMA. The injected lipiodol and contrast materials filled the sac completely.

There were no major complications associated with this procedure. The procedure time was approximately 2.5 hours.
Fig. 4. Angiography via the outer sheath revealing inflow from the inferior mesenteric artery (IMA) (arrow) and outflow to the bilateral fourth lumbar arteries (short arrows) (a). The IMA is catheterized by a micro-catheter via the outer sheath and embolized with two coils and the n-butyl-2-cyanoacrylate (NBCA)-lipiodol mixture (1:2) (arrow) (b). Follow-up angiography revealing that the bilateral third lumbar arteries are also feeders (arrowheads) (c). Thereafter, the bilateral third lumbar arteries (arrowheads) are embolized respectively with 10 coils, while the sac and bilateral fourth lumbar arteries (short arrows) are embolized with the NBCA-lipiodol mixture (1:2) (d).

The total amount of contrast agent used during the procedure was 65 mL and no impaired renal function was observed. Follow-up CT images 8 months after treatment showed a reduction in the size of the aneurysm to 49 mm in diameter (Fig. 5). No re-expansion was observed for 1 year after the treatment.

Discussion

Transarterial embolization and direct translumbar embolization were the main treatment methods for type 2 endoleaks. The sac was usually fed by the IMA or lumbar arteries via the long tortuous collateral pathways. However, accessing the sac is often difficult, and these techniques sometimes fail to embolize the sac[3-5].

Sidlof et al[3] reported a systemic review including 57 cases of direct translumbar embolization and 120 cases of transarterial embolization from 32 non-randomized retrospective studies. They demonstrated that direct translumbar embolization had a higher clinical success rate than transarterial embolization (81.0% vs. 62.5%, respectively; P = 0.024) and a lower recurrence rate (19.0% vs. 35.8%, respectively; P = 0.036). In addition, direct translumbar embolization had a lower rate of complications (0.0% vs. 9.2%; P = 0.043). In other studies, translumbar embolization reportedly had significantly shorter fluoroscopy and procedure times than transarterial embolization[6]. On the other hand, Stavropoulos et al[7] showed that the effectiveness of transarterial embolization, which involved embolization of the sac and the feeding artery, was similar to that of direct translumbar embolization for type 2 endoleaks. Both methods are utilized to embolize type 2 endoleaks.

In the translumbar approach, the endoleak sac was mostly embolized with coils, NBCA, an ethylene vinyl alcohol copolymer, or a combination of coils and glue[5-7]. In a few reports, the communicating arteries were selectively embolized in addition to the sac[8, 9]. Yu et al[9] demonstrated that embolization of the sac and communicating arteries was not superior to embolization of the sac only. In the present case, both the sac and five communicating arteries were suc-
Fig. 5. Computed tomography (CT) images before the procedure show the enlarged aneurysm 56 mm in diameter (a). CT images 8 months after the treatment demonstrate a reduction in the size of the aneurysm to 49 mm in diameter (b).

cessfully embolized by the translumbar approach. This approach made it easier to access the sac than the transarterial approach. Moreover, embolization of the IMA was thought to decrease the risks of non-target embolization of the IMA when the NBCA-lipiodol mixture was injected into the sac and residual flow from the communicating arteries. We believe that the direct translumbar approach had the potential to embolize the communicating arteries and the sac. Another advantage might be shortened fluoroscopy and procedure times and a reduced amount of contrast agent used because it was not necessary to advance a catheter through complicated pathways. In most reports of translumbar embolization, a 4-, 5-, or 6-Fr sheath was placed directly into the sac[5-9]. In the present report, however, the outer sheath of the 20-gauge 20-cm elaster needle was used to access the sac to prevent major bleeding.

Several complications associated with direct translumbar embolization have been reported, including non-target embolization of the IMA, large retroperitoneal bleeding, asymptomatic extravasation of glue into the inferior vena cava, and transient type 3 endoleak caused by stent puncture[7, 8]. Stavropoulos et al[7] reported non-target embolization of the IMA and large retroperitoneal bleeding as severe complications of this procedure. In the former case, non-target embolization of the branches of the IMA with NBCA resulted in bowel ischemia and an eventual partial colectomy. In the latter case, large retroperitoneal bleeding occurred and the patient required blood transfusion. The authors suspected that the cause of bleeding was injury of a vessel during the placement of a catheter within the sac or incomplete embolization of the endoleak, but this was not confirmed.

The translumbar approach has several limitations. First, the anatomical setting around the endoleak sac, such as the vertebral body, inferior vena cava, and stent graft, can restrict translumbar access to the sac. Second, it may not be easy to advance a micro-catheter into the communicating arteries. Previous reports indicate that the most effective treatment method for type 2 endoleaks remains to be established. However, embolizing all communicating arteries as well as the sac may achieve better sac stability than embolizing the sac only. Further investigations such as a randomized prospective study are needed to confirm the optimal treatment method for type 2 endoleaks.

Ethical statement: Our study did not require ethical board approval.

Conflict of interest: The authors declare no conflicts of interest.

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