Embolization of a Recurrent Type 2 Endoleak Using the Liquid Embolic n-Butyl Cyanoacrylate

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ABSTRACT

Endovascular aneurysm repair (EVAR) has become an accepted alternative to open aortic aneurysm repair. Endoleaks are one of the most common complications of EVAR and can result in aneurysm enlargement and rupture. When embolization of type 2 endoleaks is needed, a transarterial or translumbar approach may be used. Metal coils are often utilized, but liquid agents have also been used for embolization. This case report involves endoleak embolization using metallic coils along with the liquid embolic agent n-butyl cyanoacrylate (n-BCA).

KEYWORDS: Aortic aneurysm, endovascular repair, endoleak, embolization

Objectives: Upon completion of this article, the reader should understand that endoleaks are a major complication of endovascular aneurysm repair and liquid embolic agents have the potential to be used for endoleak repair.

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CASE REPORT

A 77-year-old man with a past medical history significant for severe chronic obstructive pulmonary disease and coronary artery disease underwent endovascular repair of an incidentally discovered 9-cm abdominal aortic aneurysm (AAA). The AAA was treated using a bifurcated Zenith suprarenal device (Cook, Bloomington, IN) that extended into the distal common iliac arteries bilaterally. Following endovascular aneurysm repair (EVAR), a completion arteriogram revealed the stent graft to be in good position, with no evidence of an endoleak.

As per protocol at the author's institution, a three-phase computed tomographic angiogram (CTA) of the abdomen and pelvis was performed 1 month after EVAR and demonstrated a probable type 2 endoleak and an enlarging AAA that now measured 10.3 cm (Fig. 1). Because the aneurysm increased in size and an endoleak was present, it was decided to perform a diagnostic endoleak arteriogram with possible endoleak embolization. The diagnostic arteriogram confirmed the presence of a type 2 endoleak with no type 1 or type 3 endoleak. Selective injection of the superior mesenteric artery (SMA)

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Figure 1 CTA image of abdomen reveals 10.3-cm aneurysm with endoleak (arrowhead).

revealed filling of the endoleak from the inferior mesenteric artery (IMA) via the marginal artery.

A transarterial approach was chosen for treatment of this endoleak because it was inaccessible to translumbar access. The stent graft, left kidney, and bowel blocked any translumbar access to the endoleak (Fig. 1). In addition, a clear transarterial path could be seen from the SMA to the endoleak (Fig. 2). The middle colic artery was selected with a Renegade microcatheter (Boston Scientific, Natick, MA). This catheter was then used to select the marginal artery and IMA, and it was eventually advanced into the endoleak. The endoleak was embolized with microcoils, and the catheter was backed out and used to embolize the feeding IMA with microcoils. Postembolization arteriogram revealed no endoleak (Fig. 3).

Figure 2 Superior mesenteric angiogram demonstrates communication with endoleak (arrowhead).

Figure 3 Postembolization arteriogram showing microcoils deployed into endoleak and feeding IMA. No evidence of endoleak remains.

One month later, as per protocol, a CTA was again performed and showed the size of the AAA to be unchanged and demonstrated resolution at the site of the previous endoleak, but revealed a new small probable type 2 endoleak (Fig. 4). The new endoleak was inferior and posterior to the original endoleak, supplied in this case by the lumbar arteries. The decision was made not to intervene at this time because the endoleak was small and the AAA was stable. A 6-month follow-up CTA performed again showed the aneurysm to be unchanged in size but demonstrated the type 2 endoleak to be larger than on the prior study (Fig. 5). The decision to treat this endoleak was made at this time because of its persistence and increase in size on the 6-month CTA. A translumbar approach was selected for embolization because the new endoleak was posterior and accessible to translumbar access. The patient was given 500 mg cefazolin, and the right flank region was prepped in sterile fashion. Under fluoroscopic guidance, a 5F catheter (TLA access set; Boston Scientific, Natick, MA) was placed under fluoroscopic

Figure 4 CTA image of abdomen taken 1 month after transarterial embolization procedure. A new endoleak seen (arrowhead) inferior and posterior to previous endoleak.

Figure 5 Computed tomographic angiogram image taken 6 months after transarterial embolization. Size of the aneurysm is unchanged, but endoleak shown in Fig. 4 has expanded (arrowhead).

guidance into the endoleak via right translumbar approach. An angiogram revealed that the type 2 endoleak communicated with two lumbar arteries and the middle sacral artery (Fig. 6). Eight platinum coils were placed in the endoleak sac through the catheter. Following this, flow in the endoleak had slowed, but there was still significant persistent flow. N-butyl cyanoacrylate (n-BCA) Trufill “glue” (Cordis Endovascular, Miami Lakes, FL) was then used to completely embolize the endoleak (Fig. 7). The Trufill was mixed at a 2:1 ratio (ethiodized oil to n-BCA), and 4 mL of it was used to embolize the endoleak. The TLA access catheter was then removed. The patient tolerated the procedure well and was discharged the following day. Follow-up CTAs on this patient have revealed no recurrent endoleak.

Figure 6 Translumbar angiogram demonstrates translumbar catheter (arrowhead) accessing endoleak (arrow). Communication of endoleak with two lumbar arteries and middle sacral artery can also be seen.

DISCUSSION

Endovascular abdominal aneurysm repair was first performed ~15 years ago, and it is now considered a viable alternative to open aneurysm repair.¹ Although systemic complications appear to be less frequent with EVAR than with open repair, there are some unique complications from EVAR that are not seen after open AAA repair.¹⁻³ The most common complication associated with EVAR is endoleak, with reported prevalence varying from 15 to 50%.⁴

Although there is consensus that endoleaks classified as type 1 and type 3 should be repaired immediately upon discovery because of their risk of aneurysm enlargement and rupture, there is no such consensus regarding treatment of type 2 endoleaks.⁵⁻⁷ Currently at

Figure 7 (A) Anteroposterior image taken following translumbar embolization shows platinum coils and glue injected into endoleak. Fluoroscopic appearance of n-butyl cyanoacrylate Trufill “glue” is demonstrated (arrowhead). (B) Lateral image shows embolized endoleak (arrowhead) as well as coils from translumbar embolization of original endoleak and inferior mesenteric artery (arrow).

our institution, type 2 endoleaks are repaired if the aneurysm enlarges or if the endoleak persists for > 6 months. In addition, delayed endoleaks, which occur after an endoleak-free CTA has been obtained, are repaired. This approach is based on the fact that some type 2 endoleaks seen on the initial post-EVAR CTA spontaneously resolve, whereas endoleaks that are persistent or causing AAA enlargement are more dangerous and can lead to aneurysm rupture.^{8–11}

One unique aspect of this case study is that it involves a patient on whom transarterial endoleak embolization was performed with resolution of the endoleak on angiography, but with occurrence of a second type 2 endoleak at a new location that was being supplied by different arteries. The initial embolization was performed using a transarterial route because a clearly negotiable path from the SMA to the IMA could be identified. This is not always the case. As was done in this case, when a transarterial endoleak embolization is performed it is important to embolize not just the feeding artery but also the endoleak itself. Baum et al demonstrated a very high endoleak recurrence rate when only the feeding artery was embolized using a transarterial approach.¹² Translumbal embolization allows for embolization of the endoleak itself. This is thought to be the reason for the lower recurrence rate among translumbal embolizations in Baum's study.¹² In the case presented here, the endoleak recurred despite transarterial embolization of the endoleak and the feeding vessel.

Metal coils have been the embolization material of choice for endoleaks, but liquid embolic agents like n-BCA do offer some unique advantages.^{13,14} In one study, n-BCA approved for presurgical embolization of cerebral arteriovenous malformations was used in the embolization of 11 type 2 endoleaks.¹⁴ In 9 of the cases it was used in conjunction with coils; in 2 cases it was used alone. One concern regarding the use of liquid embolic agents for embolization is the possibility that it might reach distal portions of the IMA, lumbar artery, or other vessel communicating with the type 2 endoleak, thereby causing ischemia to structures supplied by these vessels.¹⁵ Two safeguards for preventing this complication are (1) to ensure slow flow in the endoleak before depositing liquid embolic agent, and (2) to mix the n-BCA with an appropriate amount of ethiodized oil to adjust its thickness and hardening time. In the study involving n-BCA for type 2 endoleak embolization, flow in the endoleak was decreased by first depositing metal coils in the endoleak and then using the n-BCA.¹⁴ The n-BCA was mixed in a 2:1 ratio of ethiodized oil to n-BCA. This is a lower ratio than the Trufill typically used in neurovascular applications, allowing for decreased viscosity and shorter hardening time. In this case, the large endoleak with high flow prompted the initial use of coils. Once enough coils had been placed to decrease the

flow rate, n-BCA was then used successfully to complete embolization.

CONCLUSION

Although EVAR has advantages over open aneurysm repair, it also can result in complications such as endoleaks. Embolization of type 2 endoleaks has emerged as a useful treatment option using both a transarterial and translumbal method. Liquid embolic agents such as Trufill have some potential advantages over coils in endoleak embolization. Knowing when and how to use these liquid embolics is important for any interventional radiologist treating type 2 endoleaks. Liquid embolic agents are useful in repair of endoleaks, but more investigation is warranted into their short- and long-term consequences.

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