



Stent Graft Implantation and Superselective Embolization with Liquid Embolic Agent, Onyx for Iatrogenic Common Iliac Artery Pseudoaneurysm and Persistent Endoleak

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A 68-year-old male patient with a history of femoro-femoral bypass following unsuccessful intervention for chronic total iliac occlusion was found to have a saccular pseudoaneurysm of the right common iliac artery (CIA) due to interventional device-related injuries associated with the past endovascular intervention. An iatrogenic pseudoaneurysm in the CIA is generally asymptomatic, but it has a high risk of rupture, regardless of its size or symptoms. Endovascular therapy may be the best treatment option; however, ineffective sealing with a stent graft may lead to a type I endoleak. Under such conditions, use of the liquid embolic agent, Onyx, as a bailout solution for the type I endoleak is promising.

Key Words: Iliac artery, Aneurysm, Endoleak, Iatrogenic injury, Embolization

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INTRODUCTION

Common iliac artery (CIA) pseudoaneurysm can result from inflammation, infection, vasculitis, or iatrogenic trauma secondary to interventional procedures. This report details the endovascular treatment of an iatrogenic CIA pseudoaneurysm complicated by type I endoleak (T1E) using an ethylene-vinyl-alcohol-copolymer liquid embolic agent (Onyx Liquid Embolic System; EV3, Irvine, CA, USA).

CASE

A 68-year-old male patient with a history of hypertension and diabetes mellitus presented with bilateral intermittent claudication 3 years ago. Computed tomography angiography (CTA) revealed chronic total occlusion (CTO) of

the right CIA and diffuse stenosis of the left iliac segments (Fig. 1A). Two self-expandable stents were implanted across the left iliac system. To address the right CTO lesion, we advanced a guidewire in an antegrade manner through the left brachial artery (BA) after a failed retrograde approach. This approach was somewhat successful, but the guidewire did not cross the hard cap of the occlusion. Thus, the patient underwent femorofemoral bypass surgery for the right CTO lesion (Fig. 1B).

Two years later, a 2.5-cm saccular pseudoaneurysm of the right CIA was incidentally found during a lumbar spine evaluation (Fig. 1C). Early intervention reduces the risk of rupture and its related complications. Since the patient did not consent to undergo any open surgical interventions, the decision was made to treat the lesion endovascularly.

The left femoral artery was exposed surgically, and a 6

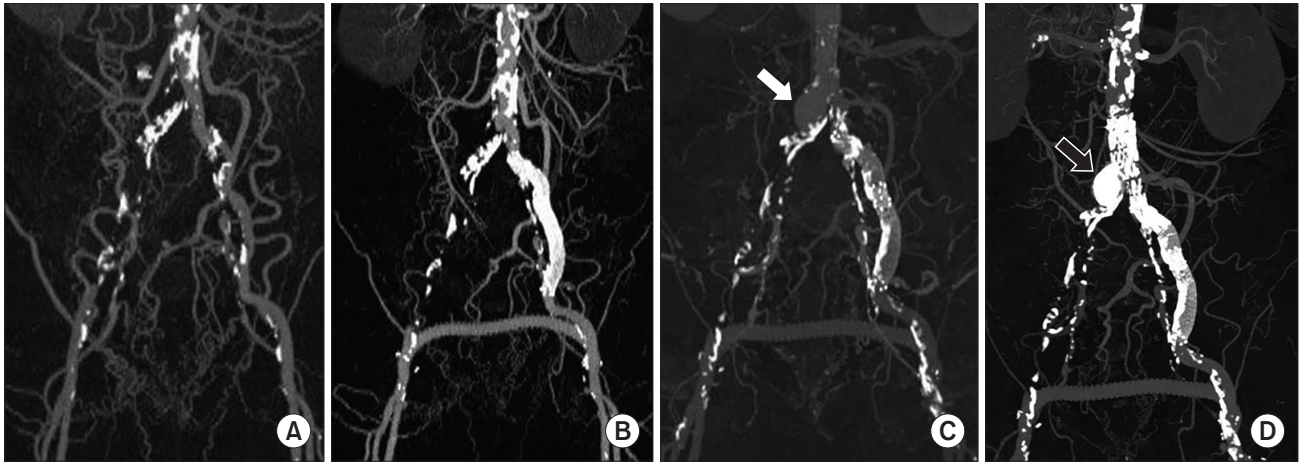


Fig. 1. (A) Preoperative computed tomography angiography (CTA) showing long segment occlusion of the right iliac artery and focal severe stenosis of the left iliac arteries. (B) Postoperative CTA showing patent left-to-right femorofemoral bypass. (C) Two years later, CTA revealed a 2.5-cm saccular pseudoaneurysm of the right common iliac artery (white arrow). (D) Follow-up CTA showing the strong X-ray opacity of the tantalum powder of the Onyx (black arrow) that is responsible for the imaging artifact.

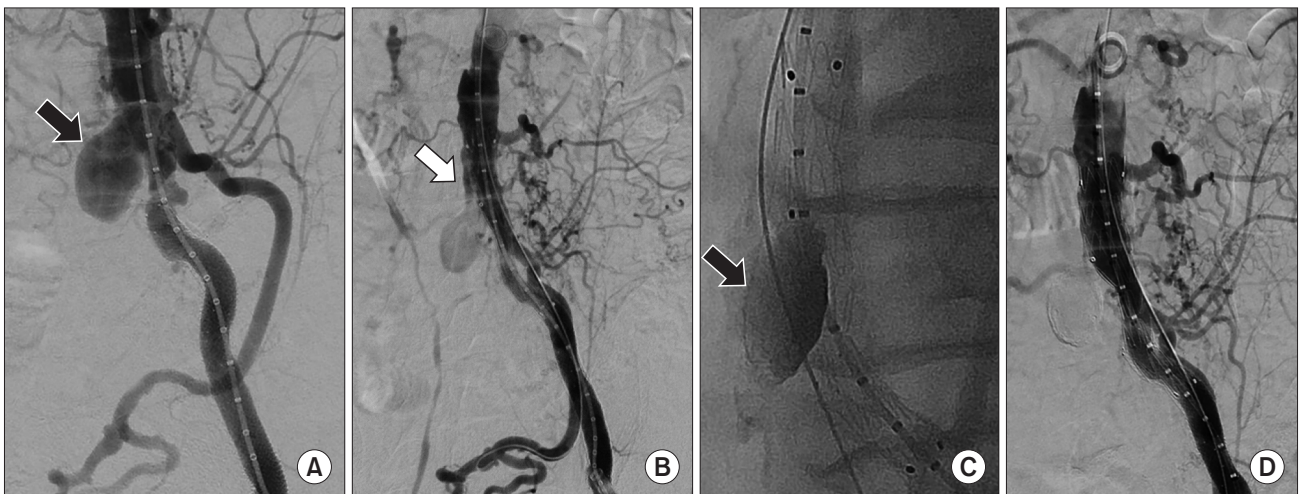


Fig. 2. (A) Aortography confirming a saccular pseudoaneurysm of right common iliac artery (black arrow). (B) Repeated balloon angioplasty after stent graft implantation could not eliminate the T1E. Prior catheterization into the IMA allows visualization of the IMA opening (white arrow). On the other hand, a microcatheter was cannulated into the pseudoaneurysmal sac in advance with the use of Onyx in the case of T1E. (C) Delivery of Onyx into the nidus (black arrow). (D) Resolution of a type I endoleak after Onyx application. T1E, type 1 endoleak; IMA, inferior mesenteric artery.

F sheath was inserted via the left BA, while a microcatheter (Renegade STC; Boston Scientific, Natick, MA, USA) was cannulated into the pseudoaneurysm with the planned use of Onyx in the case of T1E despite post-adjunct balloon dilation. Next, an iliac limb stent graft (Endurant IIs; Medtronic Vascular, Santa Rosa, CA, USA) was deployed to the infrarenal segment of the aorta. The patient had a large inferior mesenteric artery (IMA) of least 3 mm in diameter (Fig. 2A). To decrease the potential risk of bowel ischemia, we intentionally placed the proximal edge of the stent graft

just below the IMA opening, which was not covered by the stent graft. Follow-up angiography showed the presence of a persistent T1E originating from the right aspect of the proximal landing zone into the pseudoaneurysm. Attempts to exclude the T1E using repeated balloon dilation of the stent graft were unsuccessful (Fig. 2B). Since the endoleak channel was engaged endoluminally with the microcatheter, the T1E and pseudoaneurysm were embolized using 3.6 mL of Onyx (Fig. 2C). Completion angiography confirmed successful embolization of the T1E and preservation of the

IMA (Fig. 2D). CTA at 1 year demonstrated the absence of endoleak or pseudoaneurysm recurrence (Fig. 1D).

DISCUSSION

The occurrence of CIA pseudoaneurysm in the transatlantic inter society consensus (TASC)-D group could be attributed to excessive manipulation of a large-bore catheter, sheath, or stiff guidewire [1]. The pathologic feature of the pseudoaneurysm is deficient arterial media with loss and/or fragmentation of the connective tissue and smooth muscle, leading to continued enlargement and subsequent rupture [2]. Therefore, it is recommended that pseudoaneurysm be promptly repaired when identified regardless of size or symptoms. Particularly in this type of a case, since the pseudoaneurysm was close to the aortoiliac bifurcation, a minimally invasive repair is required.

Onyx is a non-adhesive liquid embolic agent consisting of ethylene vinyl alcohol copolymer dissolved in dimethyl sulfoxide (DMSO) and suspended micronized tantalum powder to provide contrast for visualization under fluoroscopy. Onyx 18 is generally preferred because its lower viscosity permits superior penetration into the aneurysm. We selected Onyx 34, which has greater viscosity than Onyx 18, to minimize the risk of reflux into the aorta while the endoleak channel is filled [3,4]. We followed the recommended technique, priming the microcatheter with DMSO, to prevent the Onyx from hardening within the catheter. Onyx was slowly injected and began to harden within a few minutes. A slow injection with several pauses was performed to fill the leakage space in the neck. Onyx spreads out in different directions, filling the endoleak channel and pseudoaneurysm.

The traditional method for managing endoleak involves the use of coils or glue (*N*-butyl cyanoacrylate); thus, one might wonder why Onyx was used in this case. Although coil embolization is an easy technique, the coil may migrate out of the desired level. Some experts favor glue to enhance the seal. It should be noted that glue must be injected rapidly and the catheter immediately removed to prevent it from adhering to the cast. Hence, a sufficient learning period is required to master safely handling the glue. Onyx, on the contrary, resists adhering to its delivery catheter. This allows for slow and precise delivery without concern regarding injury to the target lesion upon catheter removal, minimizing the possibility of misapplication or distal embolization [5]. In addition, its texture is well suited for occupying spaces and conforming to irregular surfaces. The main disadvantage of Onyx is imaging artifacts on the CT image due to the tantalum powder. This limitation on follow-up CTA can be overcome when combined with du-

plex ultrasonography scan.

There is limited evidence of the efficacy of embolization of T1E using Onyx. Nevertheless, some authors showed favorable results using Onyx embolization for the treatment of T1E after endovascular abdominal aortic repair (EVAR). One study showed a promising early experience of Onyx embolization as a bailout solution of T1E [6]. Another study reported the use of T1E embolization with Onyx in 25 patients. At 1 year, the overall freedom from T1E recurrence was 80%, while freedom from sac growth was 85% [7]. Although long-term data are not available, clinical success rates are high in most case reports, and the mid-term results are acceptable.

Another aspect highlighted through this case is IMA preservation. During EVAR, IMA sacrifice is universal [8]. However, some investigators showed that IMA interruption might be a major factor in the development of bowel ischemia after EVAR [9,10]. The incidence of bowel ischemia after EVAR is reportedly 1% to 5%, but the mortality rates are high [11]. The need to preserve the IMA must be assessed on a case by case basis. Our patient had a hypertrophic IMA, which supplies blood to a relatively large mesenteric circulation. In addition, as he had bilateral hypogastric arterial occlusion, IMA preservation was very important to preventing potentially lethal bowel ischemia.

In conclusion, CIA pseudoaneurysm should be completely excluded. Embolization of T1E using Onyx appears acceptable. However, the long-term data are lacking. Therefore, patient follow-up remains mandatory in such cases.

CONFLICTS OF INTEREST

The authors have nothing to disclose.

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REFERENCES

- 1) Suzuki K, Mizutani Y, Soga Y, Iida O, Kawasaki D, Yamauchi Y, et al. Efficacy and safety of endovascular therapy for aortoiliac TASC D lesions. *Angiology* 2017;68:67-73.
- 2) Baltacıoğlu F, Cimşit NC, Cil B, Cekirge S, Ispir S. Endovascular stent-graft applications in iatrogenic vascular injuries. *Cardiovasc Intervent Radiol* 2003;26:434-439.
- 3) Grisafi JL, Boiteau G, Detschelt E, Potts J, Kiproff P, Muluk SC. Endoluminal treatment of type IA endoleak with Onyx. *J Vasc Surg* 2010;52:1346-1349.
- 4) Weber W, Kis B, Siekmann R, Kuehne D. Endovascular treatment of intracranial arteriovenous malformations with onyx: technical aspects. *AJNR Am J Neuroradiol* 2007;28:371-377.
- 5) Ayad M, Eskioglu E, Mericle RA. Onyx: a unique neuroembolic agent. *Expert Rev Med Devices* 2006;3:705-715.
- 6) Henrikson O, Roos H, Falkenberg M. Ethylene vinyl alcohol copolymer (Onyx) to seal type 1 endoleak. A new technique. *Vascular* 2011;19:77-81.
- 7) Ameli-Renani S, Pavlidis V, Morgan RA. Early and midterm outcomes after transcatheter embolization of type I endoleaks in 25 patients. *J Vasc Surg* 2017;65:346-355.
- 8) Ward TJ, Cohen S, Fischman AM, Kim E, Nowakowski FS, Ellozy SH, et al. Preoperative inferior mesenteric artery embolization before endovascular aneurysm repair: decreased incidence of type II endoleak and aneurysm sac enlargement with 24-month follow-up. *J Vasc Interv Radiol* 2013;24:49-55.
- 9) Criado FJ, Wilson EP, Velazquez OC, Carpenter JP, Barker C, Wellons E, et al. Safety of coil embolization of the internal iliac artery in endovascular grafting of abdominal aortic aneurysms. *J Vasc Surg* 2000;32:684-688.
- 10) Ahn SS, Rutherford RB, Johnston KW, May J, Veith FJ, Baker JD, et al. Reporting standards for infrarenal endovascular abdominal aortic aneurysm repair. *J Vasc Surg* 1997;25:405-410.
- 11) Becquemin JP, Majewski M, Fermani N, Marzelle J, Desgrandes P, Allaire E, et al. Colon ischemia following abdominal aortic aneurysm repair in the era of endovascular abdominal aortic repair. *J Vasc Surg* 2008;47:258-263.