The Safety of Using Large Amount (30 cc) of Onyx (Ethylene-vinyl Alcohol Copolymer) for the Treatment of Large Type II Endoleak after Endovascular Repair of Abdominal Aortic Aneurysm

Mohammad Hasan Namazi, MD¹ Isa Khaheshi, MD¹ Ali Reza Serati, MD¹
 Mohammad Reza Movahed, MD^{2,3}

¹ Cardiovascular Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran

² CareMore, Tucson, Arizona

³ Department of Medicine, University of Arizona College of Medicine, Tucson, Arizona

Address for correspondence M. Reza Movahed, MD, PhD, FACP, FACC, FSCAI, Arizona CareMore Regional Cardiology, 7091 E. Speedway Blvd., Tucson, AZ 85710 (e-mail: rmova@aol.com).

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Abstract

Keywords

- endoleak
- transcatheter intervention
- aortic aneurysm
- complications
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- aneurysmal abdominal aorta

Endovascular aneurysm repair (EVAR) is associated with late complications including the development of endoleaks as major complications. Type II endoleak is the consequence of collateral retrograde flow from the aortic branches; generally from the lumbar arteries, inferior mesenteric artery, or middle sacral artery. The method and the ideal timing for the treatment of endoleaks remain controversial. We are presenting a case of successful treatment of a large type II endoleak using embolization with large amount of Onyx copolymer via a percutaneous transfemoral route without any adverse outcome. A significant advantage of Onyx as opposed to glue is that it may be injected for a long period of time (20–60 minutes) with a lower risk for microcatheter entrapment. This case report suggests that much higher amount of Onyx can safely be used if needed to seal large endoleaks without adverse event.

Type II endoleak is the consequence of collateral retrograde flow from the aortic branches—generally from the lumbar arteries, inferior mesenteric artery, or middle sacral artery. We present a case of successful treatment of type II endoleak using embolization with large amount of Onyx copolymer via a percutaneous transfemoral route.

Case Presentation

A 57-year-old man with a 7-year medical history of coronary artery bypass graft (CABG) presented with intermittent

claudication and dyspnea on exertion (New York Heart Association [NYHA] class III) that he had been experiencing for the last 6 months. His coronary risk factors included hypertension, smoking, and hypercholesterolemia.

Coronary angiography showed patent grafts and an aneurysmal abdominal aorta (AAA). Computed tomographic angiography (CTA) revealed a large abdominal aortic aneurysm (AAA, transverse dimension = 6.9 cm, length = 8.1 cm) and an aneurysm of the right common iliac artery (transverse dimension = 4.4 cm, length = 5.2 cm). The patient underwent successful endovascular aneurysm repair (EVAR) at that time. Based on our surveillance protocol for these patients,

Fig. 1 (A) Selective angiography with microcatheter in aneurysmal sac after wiring from superior mesenteric artery (SMA) through middle colic artery (MCA) to inferior mesenteric artery (IMA). (B) Approaching SMA through MCA. (C) Wire in MCA and Riolan arch. (D) Wire in aneurysmal sac through IMA. (E) Final result after Onyx injection showed no opacification in aneurysmal sac. ICA, inferior colic artery. (F) Schematic image for clarifying the intervention: A indicates to IMA, B indicates to SMA, C indicates to Riolan arch, D indicates to aneurysmal sac, and line indicates to the wire.

we would perform CT with delayed imaging (CTA) and plain abdominal radiographs 30 days postprocedure. If no endoleak is present, CTA will be repeated again at 6 and 12 months. Ultrasound (US) and CTA are both viable options as surveillance tools. In our center, CTA is mostly used for follow-up surveillance.

During routine 12 months follow-up after the procedure, the patient's CTA revealed the presence of relatively large

(size 22 mm × 5 mm) type II endoleak at the right antero-lateral and posterior aspects of the aneurysmal sac arising from the inferior mesenteric and lumbar arteries. Multiplanar reconstructions showed small branches connecting the superior mesenteric artery (SMA) to the inferior mesenteric artery (IMA) through a marginal artery.

As the treatment of this delayed complication is controversial, different options were discussed with final decision to

proceed with intervention due to relatively large size of the endoleak. Based on the operator discretion, the decision was made to use Onyx instead of coil for treatment. Under general anesthesia, a 6F arterial sheath was inserted into the right femoral artery. After placement of renal double curve (RDC) guiding catheter, a workhorse long guide wire (BMW 300 mm) was selected for crossing into the endoleak via retrograde collaterals. Selective angiogram identified filling of the aneurysm sac via the IMA (►Fig. 1A). Wiring started from the proximal part of the SMA, through the middle colic artery (►Fig. 1B), into the Riolan arch (►Fig. 1C), advanced into the IMA, and finally into the site of the endoleak adjacent to the posterolateral part of the aorta, beneath the placed aortic stent (►Fig. 1D). Then an over-the-wire microcatheter (Fine-Cross MG Terumo, Leuven, Belgium) advanced through the wire into the IMA. Embolization was performed into the microcatheter nonadhesive liquid embolic agent, Onyx (ethylene-vinyl alcohol copolymer).

Because of a large leak, much larger amount of Onyx (30 cm³) was used successfully without any adverse event. Once it was delivered outside of the microcatheter, it tended to precipitate (not to polymerize like glue), occupying the target area space slowly (►Fig. 1E). A slow solidification process started from the “outside-in.” We did not allow the backward movement of more than 10 to 15 mm of Onyx along the tract. To have full control and visualization during the Onyx delivery, road-mapping capability was used. Angiography at the end of the procedure showed acceptable results without complications. The 6-month follow-up CTA revealed no aneurismal leakage.

Discussion

EVAR is now a common practice for AAA treatment. Although AAA repair by means of EVAR has more late complications in comparison to surgical repair, it seems that endovascular treatments nowadays are becoming more favorable because of less invasiveness and more convenient for patients. The use of EVAR has enhanced the knowledge of late complications, including the development of endoleaks as major complications.^{1–3} Type II endoleak results from collateral retrograde flow from the aortic branches, generally from the lumbar arteries, inferior mesenteric artery, or middle sacral artery.⁴

Type II endoleaks occur at a rate of 5 to 25% after the endovascular repair of AAA. The method and the ideal timing for the treatment of endoleaks remain controversial.^{5,6}

A variety of treatment options are available for type II endoleak repair, including coil embolization, endovascular extension grafts, and open surgical repair. Transcatheter embolization of endoleaks is a less invasive option with better tolerability than open surgical repair.^{7,8} Embolization can be performed through the transarterial approach or direct percutaneous puncture of the aneurysm sac via the translumbar or transcaval approaches.^{9–11}

In this report, we presented a unique case of a large endoleak requiring much larger amount of Onyx (30 cm³) that was injected during 15 minutes right after dimethyl sulfoxide (DMSO) for successful sealing without any adverse

event. Bosiers et al reported the amount of Onyx between 1.1 and 11 mL (mean 4.6 mL)¹² much lower amount than our case of using 30 cm³. Like our study Abularrage et al found Onyx to be safe in large aneurysm sacs of type II endoleaks in comparison to coil embolization.¹³ We found no recommended dose for Onyx for sealing the sac. The dosing clearly depends on the sac geometry. Our case is the first demonstrating the safety of using large amount of Onyx without any adverse event.

Using embolization procedure with Onyx copolymer via a percutaneous transfemoral approach for the treatment of type II endoleak is safe. Onyx is a good embolic agent that has been used for occluding cerebral arteriovenous malformations (AVMs), filling endoleaks, and more recently in peripheral AVMs. Onyx is an agent with controllable endovascular behavior. It allows more precise nidus penetration for creating a solid cast. It has also shown acceptable results for Onyx usage in extracranial and peripheral AVMs. A significant advantage of Onyx as opposed to glue is that it may be injected for a long period (20–60 minutes). In addition, there is a lower risk of having the microcatheter trapped in the target area, as long as the recommended technique is followed. Type II endoleaks can be related to aneurysmal enlargement and rupture; however, this risk is far less than the types I and III endoleaks (0.5 vs. 3.4%).^{14,15} In conclusion, endoleak is an ongoing challenge associated with EVAR. The management of type II endoleaks remains greatly controversial issue in endovascular treatment of aneurysms of abdominal aorta because of various personal experiences concerning the long-standing outcomes of the diverse approaches.

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