EJVES Short Reports (2016) 33, 24–26

CASE REPORT

Atypical Presentation of a Type 2 Endoleak following Emergency Open Repair of a Ruptured Abdominal Aortic Aneurysm

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Background: An endoleak is a common complication following EVAR. Specifically, a Type 2 endoleak occurs because of retrograde flow from lumbar vessels outside the endograft within the aneurysm sac. Even though it is common following EVAR, it has not been identified as a complication following open ruptured abdominal aortic aneurysm (AAA) repair.
Report: A 73-year-old male underwent open repair of a ruptured AAA. Five months later, computed tomography revealed filling from a lumbar vessel mimicking a Type 2 "endoleak." The initial ultrasound showed a single pair of lumbar vessels with aneurysm sac expansion 8 weeks later. The "endoleak" and expanding sac were treated, and the 2-year surveillance demonstrated sac shrinkage.
Discussion: Because endoleak is a complication after EVAR, this case provides a unique presentation of Type 2 "endoleak" physiology following open repair of a ruptured AAA. It is believed that it is necessary to expand the list of possible complications after open ruptured AAA repair to include "endoleaks."

Article history: Received 28 July 2016, Revised 5 September 2016, Accepted 7 September 2016,
Keywords: Endoleak: EVAR, Ruptured aneurysm, Open abdominal aortic aneurysm

INTRODUCTION

An endoleak presents as blood flow outside an endograft and within the aneurysm sac. It has been documented as the most common complication following endovascular aneurysm repair (EVAR). Type 2 endoleak occurs because of retrograde flow from the aortic branches, generally from the lumbar arteries, inferior mesenteric artery, or middle sacral artery.[1] With this endoleak type, persistent flow occurs and prevention of thrombosis of the aneurysm sac has been indicated. In some cases, this has resulted in continued aneurysm expansion and offers the risk of rupture.[2]

Many early Type 2 endoleaks are transient and resolve spontaneously but a small minority of patients with untreated Type 2 endoleaks may suffer from aneurysm rupture. If Type 2 endoleaks do not resolve spontaneously, the preferred method of dealing with persistent Type 2 endoleaks is via translumbar or transarterial embolization using a combination of glue and coils. Approaching the aneurysm sac directly by puncturing via fluoroscopic or computed tomography (CT) guidance for translumbar embolization has shown to be the most appropriate for long-term repair.[1] Even though endoleak is a well-documented complication of EVAR, this is virtually unheard of after open surgical repair of ruptured abdominal aortic aneurysm (AAA) and therefore no specific guidelines for management are in place.

A unique case is presented of a patient who underwent emergent, open repair of a ruptured AAA and developed an atypical postoperative course characterized as physiology that would mimic a Type 2 "endoleak". Consent for publication of this case report has been obtained from the patient.

CASE REPORT

A 73-year-old male presented to an outside institution with a chief complaint of backache for which he received a magnetic resonance imaging displaying a ruptured aneurysm. Emergency open repair was needed for his ruptured AAA and his postoperative course was complicated. He developed pneumonia and subsequently cardiopulmonary arrest after, developed a massive intraperitoneal bleed from a PEG tube placement, and had acute renal insufficiency requiring dialysis for 6 weeks.

He presented to our institution after the open ruptured AAA repair with significant improvement in his overall status and resolution of his renal failure. During the course of

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http://dx.doi.org/10.1016/j.ejvssr.2016.09.002

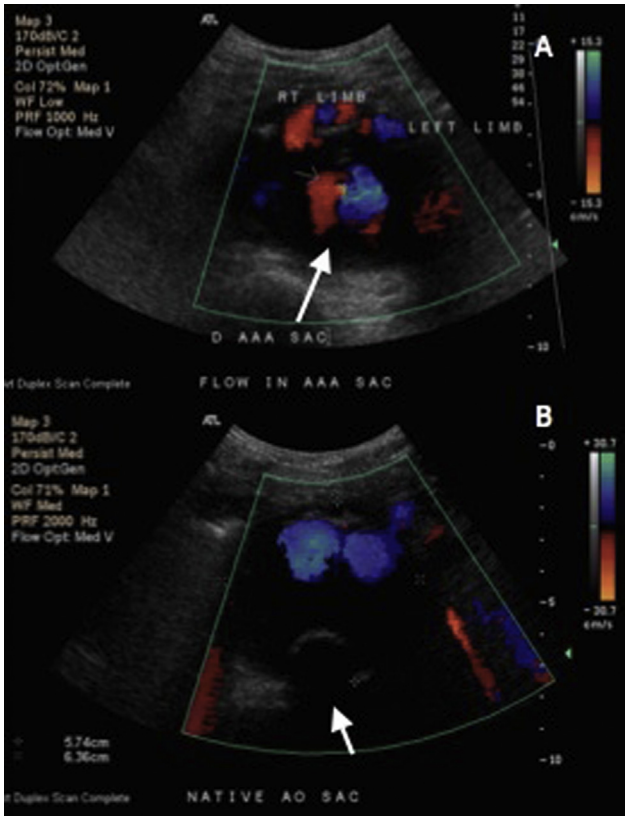

Figure 1. Preoperative ultrasound of patient with flow seen into the abdominal aortic aneurysm sac as well as within the right and left limbs of the bifurcated Dacron graft. The arrow points to the area of endoleak (A). Postoperative image indicating Type 2 endoleak repair with no flow from the lumbar vessels into the aneurysm sac, with flow seen in both limbs. The arrow points to location of the Onyx injection (B).

his hospitalization for a gastrointestinal bleed, CT angiography (CTA) was completed that revealed persistent flow into the surgically closed aneurysm sac from a pair of lumbar arteries. An aorto-iliac duplex scan showed a maximum aortic diameter of 5.8 cm and evidence of a Type 2 endoleak in the distal aneurysm sac that appeared to fill via a single lumbar vessel. Both CTA and the initial aorto-iliac duplex scan were completed 5 months after the original ruptured AAA repair. A decision was made was to monitor and assess for continued sac growth before proceeding to any intervention. A follow-up aorto-iliac ultrasound 8 weeks later was significant for an increasing aneurysm sac size measuring 6.2 cm $\times$ 6.3 cm, which represented a growth of almost 5 mm in 2 months.

A decision for an intervention was made because of the expanding sac size. The patient underwent a translumbar aortogram. An 18-gauge needle was used to cannulate the aneurysm sac. A wire was placed and transition was made to a 6F Pinnacle destination sheath (Terumo Medical Corporation, Somerset, NJ 08873, USA). An obvious cavity in the aneurysm sac was detected with filling from a pair of lumbar vessels. A glide wire and quick cross catheter were used to select the lumbar arteries. At this point, Onyx embolization material (2 vials) was injected through the quick cross catheter and no bleeding was detected

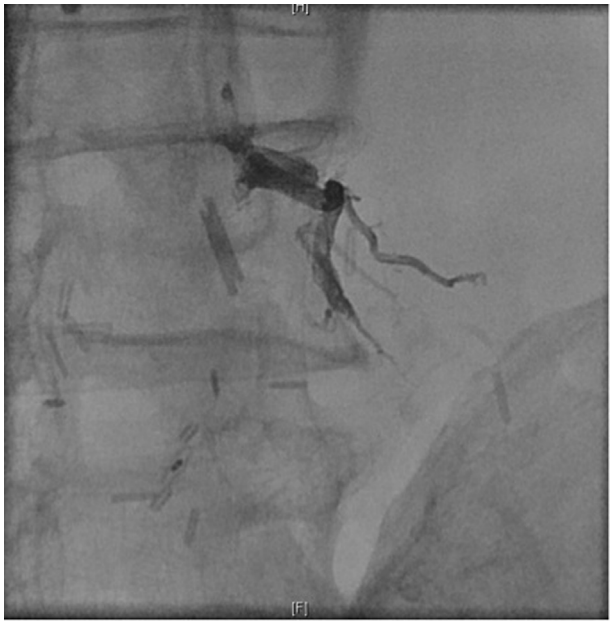

Figure 2. The Onyx cast present in the paired lumbar vessels causing the Type 2 endoleak.

thereafter (the first developer of Onyx in 2010 was ev3 Inc. and this product is now formed by Medtronic). Postoperative evaluation of the aneurysm via ultrasound initially showed resolution of the endoleak. One month later, a repeat aorto-iliac duplex scan was significant for return of the Type 2 endoleak in direct proximity to the area where Onyx embolization material was placed (Fig. 1A). A repeat procedure was planned.

Recurrent intervention of the aneurysm sac was accomplished with a 6F sheath via a translumbar approach placed into the aneurysm sac. Furthermore, a micro-catheter was placed in the aneurysm sac with selective catheterization of the paired lumbar arteries. At this point, 0.5 mL of Onyx was injected and demonstrated complete closure of both

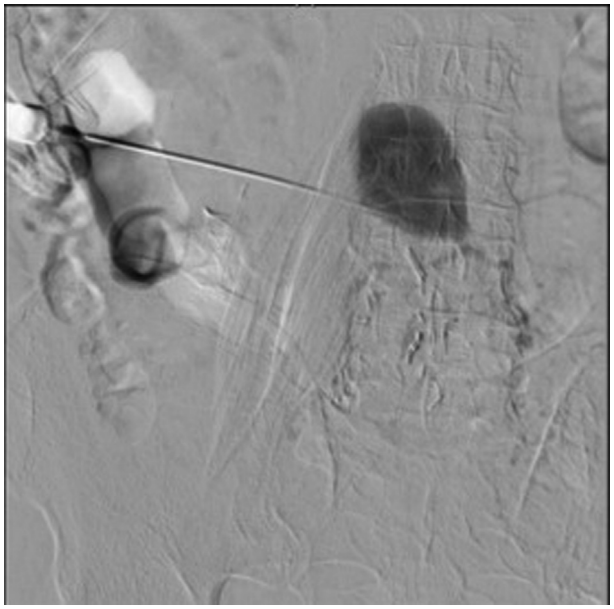

Figure 3. Successful translumbar embolization after the second attempt with a 22 chiba needle into the aneurysm sac.

lumbar vessels along with the absence of flow into the aneurysm sac (Figs. 2 and 3). Surveillance via aorto-iliac artery duplex ultrasound post embolization of the patent lumbar arteries has been performed for more than 2 years. Ultrasound determined that there was no evidence of persistent filling of the aortic aneurysm sac (Fig. 1B). Additionally, the aorto-iliac artery duplex scan showed that the aortic sac size had decreased to 5.0 cm from the pre-treatment size of almost 6.3 cm.

DISCUSSION

Even though Type 2 endoleak phenomenon has been described in popliteal artery aneurysm from geniculate vessels, this is, to our knowledge, the first reported case of a Type 2 endoleak phenomenon following open repair of a ruptured AAA.[3] Because of this unique presentation of a complication post open ruptured AAA repair, it is worthwhile discussing the decision-making for treatment of this patient. Generally, freedom from secondary interventions after open repair (81.9%) have shown to be low compared with freedom from endovascular repair interventions (70.4%).[4] Additionally, graft-related complications following open AAA repair include anastomotic aneurysm, graft occlusion, graft infection, and aortoenteric fistula, while non-graft-related complications include small bowel obstruction, incisional hernia, sexual dysfunction, buttock claudication, and infection.[5]

When considering the common complications seen after open AAA repair, a Type 2 endoleak-like phenomenon offers a new complication that is not seen in this setting. Because this is typically seen after EVAR, a similar endoleak protocol for management was followed for this patient. The first-line treatment after assessing the endoleak was surveillance for any aneurysm sac expansion via ultrasound to avoid intervention if there was no aneurysmal growth.[6] With no significant difference in benefit seen between the transarterial and translumbar embolization of the aneurysm sac, a translumbar approach was selected to treat this endoleak. The unique aspect of the translumbar embolization in this case was that no endograft was present for landmarks during the procedure because of the nature of an open ruptured AAA repair. This meant that a non-traditional approach was required before injecting the Onyx embolization material in the aneurysm sac.

This case is unique because the patient presented with imaging revealing patent lumbar vessels draining into the aneurysm sac that would by definition be known as a Type 2 endoleak. With this case, it is believed to be necessary to consider within the list of possible complications a patient may encounter after open ruptured AAA repair to include "endoleaks." And, this unusual complication and treatment continue to demonstrate the value of treating patent branch vessels when they lead to aneurysm sac expansion, even after open ruptured AAA repair.

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