Trans-stent Graft Embolization Using a Brockenbrough Needle for Delayed Rupture Due to Isolated Type II Endoleak after Endovascular Aortic Aneurysm Repair

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Abstract

Delayed rupture after endovascular aortic aneurysm repair (EVAR) secondary to an isolated type II endoleak is rare. A woman in her 90s developed an abdominal aortic aneurysm rupture 20 months following EVAR. A type II endoleak was revealed via digital subtraction angiography. The trans-stent graft approach using a Brockenbrough needle was immediately performed, and the endoleak cavity was occluded with n-octyl-2-cyanoacrylate. Trans-stent graft embolization can be adopted promptly following angiography without changing the body position or access site, even in cases of delayed rupture due to isolated type II endoleak.

Key words: delayed rupture, type II endoleak, endoleak embolization

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Introduction

Delayed rupture after endovascular aortic aneurysm repair (EVAR) is a potentially fatal complication that mainly occurs because of type I endoleak [1]. Delayed rupture caused by an isolated type II endoleak is rare [2], and its management has not yet been established. For elective type II endoleak embolization, access to the aneurysmal sac is most commonly attained via the transarterial or translumbar (direct sac puncture) approach. The transarterial approach requires more time and can be difficult or impossible to perform in cases of arterial feeders that are too tortuous or small to be catheterized [3, 4]. Translumbar approaches are mainly performed in the prone position, which is not preferable in patients with hemorrhagic shock. However, trans-stent graft approaches can be promptly used after angiography without the need to change body position or access site.

This case report describes a trans-stent graft embolization technique using a Brockenbrough needle via a femoral arterial approach for delayed rupture due to isolated type II endoleak after EVAR. Institutional review board approval was waived for this retrospective case report.

Case Report

A woman in her 90s was admitted to the emergency room with sudden lumbar pain lasting more than 12 hours. She had a past medical history of elective EVAR with an Endurant Stent Graft System (Medtronic Cardivascular, Santa Rosa, CA, USA) for a 56-mm infrarenal abdominal aortic aneurysm (AAA). Non-enhanced computed tomography (CT) performed at 1 year of follow-up showed no change in the aneurysmal sac diameter. On admission, the patient had a mild consciousness disturbance and hemorrhagic shock with a systolic blood pressure of 79 mm Hg, heart rate of 98 beats/min, and anemia (hemoglobin level, 7.8 g/dL). On CT angiography, the aneurysm sac was enlarged to 84 mm and rupture due to endoleak was confirmed. The endoleak cavity originated from close to the left iliac limb stent graft and the orifice of the left fourth lumbar artery, meandered within the aneurysmal sac, and then reached the bleeding...
Contrast-enhanced computed tomography images showing the presence of an endoleak cavity (arrow) and rupture point of the abdominal aortic aneurysmal sac (arrowhead). The endoleak cavity originates from close to the left iliac limb stent graft and the orifice of the left fourth lumbar artery (b), meanders within the aneurysmal sac (c, d, e), and then reaches the bleeding point of the right side of the aneurysm wall (f). However, differentiating the endoleak from type Ib, II, or III endoleaks is difficult.

Figure 2. Aortography showing a type II endoleak from the left fourth lumbar artery via a narrow iliolumbar artery (arrow head; iliolumbar artery, arrow; endoleak cavity).

point at the right side of the aneurysmal wall (Fig. 1). However, differentiating the endoleak from type Ib, II, or III was difficult. Endovascular therapy was used because of the patient’s older age and open surgical risk.

The procedure was started with the percutaneous insertion of a 5-Fr sheath via the bilateral femoral arteries under local anesthesia. Digital subtraction angiography confirmed the endoleak as being a type II from the left fourth lumbar artery via a narrow iliolumbar artery (Fig. 2). Despite blood transfusion, she was hemodynamically unstable and required immediate hemostasis by endoleak embolization. The transarterial approach via the iliolumbar artery appeared to take longer than usual and was unsuccessful because the vessel was too small and tortuous to catheterize. Direct puncture can normally be used to obtain immediate embolization; however, the translumbar approach requiring the prone posi-
tion might be unfavorable in a patient with hemorrhagic shock. Therefore, the trans-stent graft approach using a Brockenbrough needle via the femoral artery in the supine position was adopted.

Preprocedural CT showed that the endoleak cavity was located within a 1-cm radius just cephalad to the middle of the left iliac limb stent graft (Fig. 1). An 8-Fr, 67-cm, braided, transseptal guiding introducer (Swartz; St. Jude Medical, Minneapolis, MN, USA) was advanced to the left iliac limb stent graft via the left femoral artery. A Brockenbrough needle (BRK XS Series transseptal needle; St. Jude Medical) was then introduced under fluoroscopic guidance into the endoleak cavity using anatomical markers (Fig. 3A). Successful access to the endoleak cavity was confirmed by blood return and a sac angiogram (Fig. 3B). After the infusion of 5% dextrose through the needle, a 1 : 4 mixture of n-butyl-2-cyanoacrylate (NBCA, histoacryl; Aesculap, Tuttingen, Germany) and iodized oil (lipiodol; Guerbet Japan, Tokyo, Japan) was infused. After the endoleak cavity was filled with 2.5 mL of the mixture, the Brokenbrough needle was removed. The NBCA was retained in the proximal part of the endoleak cavity, and no reflux was observed. On the final angiogram, the type II endoleak had disappeared and no type III endoleak from the puncture hole was observed (Fig. 4). The procedure time between insertion of the transseptal guiding introducer and the final angiography was less than 30 min.

The patient transiently recovered with hemodynamic sta-
bility, and the hemoglobin level was maintained at 9.5 g/dL for 2 hours after admission to the intensive care unit. How-
ever, she then developed abdominal distension and nausea as well as elevated intra-abdominal pressure. She died 5.5 hours later, presumably of abdominal compartment syn-
drome (ACS).

Discussion

Recent studies have shown that the incidence of delayed rupture is 0.9% and that it occurs mainly because of type I endoleak [1]. For EVAR-suitable patients with rupture due to type I or III endoleaks, endovascular procedures are con-
sidered a superior treatment option compared with surgical conversion [5].

However, differentiating endoleak type on CT angiogra-
phy is often difficult. Digital subtraction angiography is ef-
fective for diagnosing and appropriately managing endoleak [6]. In the present case, angiography showed rupture due to an isolated type II endoleak via the left fourth lumbar artery.

A systematic review article reported a low incidence of delayed rupture in patients with isolated type II endoleaks (<1%) [3]. The management of rupture due to isolated type II endoleak, including endovascular procedures, has not been established. In elective type II endoleak embolization, access to the aneurysmal sac is most commonly attained via trans-
sartorial or translumbar (direct sac puncture) approaches [3]. A previous series demonstrated no significant difference in durability between the two techniques with failures rates of 28% and 22% for the translumbar and transarterial appro-
aches, respectively [4, 7]. Direct sac puncture is preferred to the transarterial approach because of its significantly shorter fluoroscopic and procedural times [4]. However, the translumbar approach can only be performed in the prone position, which might be unfavorable in a patient with hem-
orrhagic shock. Other direct sac puncture techniques include transabdominal, transcaval, and trans-stent graft approaches [8]. To the best of our knowledge, there are no reports on the use of trans-stent graft embolization in patients with de-
layed rupture due to isolated type II endoleak. However, there was a case report of transabdominal embolization for a type II endoleak rupture [9]. Embolization can be a treat-
ment option for delayed rupture due to isolated type II en-
doleak. Moreover, the trans-stent graft approach has the ad-
vantage of allowing for prompt endoleak embolization fol-
lowing diagnostic angiography without changing the body position or femoral access site.

The Brockenbrough needle was introduced under fluoro-
oscopic guidance into the endoleak cavity up to the bleed-
ing endoleak cavity to be embolized, other options are fill-
ing the endoleak cavity up to the bleeding point or filling the entire aneurysmal sac. Care must be taken to minimize the risk of non-target embolization due to NBCA reflux. The advancement of a microcatheter via a hole in the trans-
stant graft approach can minimize the risk if time permits.

Unfortunately, the patient died, presumably of ACS, as a result of continuous hemorrhage over half a day. ACS may have been present at the time of admission and/or worsened during the procedure. Endoleak embolization is effective for reaching hemostasis, but other hemorrhage-associated com-
plications require simultaneous assessment. Therefore, surgical conversion should be considered when ACS is suspected, even after embolization. In conclusion, trans-stent graft em-
bolization is a prompt alternative to the standard transarterial and translumbar approaches in patients with delayed rupture due to isolated type II endoleak after EVAR.

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Conflict of interest: The authors declare that they have no con-
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