Case Report

Endovascular management of the patent inferior mesenteric artery in two cases of uncontrolled type II endoleak after endovascular aneurysm repair

Iswanto Sucandy[1], M.D., Hans Kim[2], M.D., Theodore R Sullivan[1], M.D., F.A.C.S.

[1]Department of Surgery, Abington Memorial Hospital, Abington, Pennsylvania, USA.
[2]Department of Interventional Radiology, Abington Memorial Hospital, Abington, Pennsylvania, USA.

Citation: Sucandy I, Kim H, Sullivan TR. Endovascular management of the patent inferior mesenteric artery in two cases of uncontrolled type II endoleak after endovascular aneurysm repair. **North Am J Med Sci** 2011; 3: 387-390.
doi: 10.4297/najms.2011.3387

Abstract

Context: Endovascular aneurysm repair (EVAR) has well documented advantages over traditional open repair and has been widely adopted as the alternative treatment modality for abdominal aortic aneurysm. However, endoleaks specifically type II can be a significant problem with this technique leading to aortic sac expansion and potential rupture. A large number of type II endoleaks are caused by persistent inferior mesenteric artery (IMA) retrograde bleeding. Various methods to try to manage this complication have been previously described. IMA embolization via the marginal artery of Drummond, however, has not been adequately popularized as an alternative less invasive approach to the treatment of type II endoleak. **Case Report**: Two men, ages 77 and 81, underwent uneventful EVAR for 5.5 and 5.0 cm infrarenal abdominal aortic aneurysms, respectively, using Zenith Cook® bifurcated stent grafts. Computed tomography angiography at 1 and 6 months postoperatively demonstrated small type II endoleaks in both cases which were followed clinically. Subsequent follow-up tomography scan at 12 months revealed persistent type II endoleaks related to retrograde filling from the IMA with significant enlargement of the aneurysm sacs. Both patients underwent successful IMA coil embolization via the marginal artery of Drummond. **Conclusions**: Percutaneous IMA embolization using standard endovascular techniques to access the marginal artery of Drummond is an alternative, and in our opinion, preferred technique for controlling type II endoleaks caused by a persistently patent IMA.

Keywords: Endoleak, marginal artery, drummond, coil embolization

Correspondence to: Iswanto Sucandy, MD., Department of Surgery, Abington Memorial Hospital, 1200 Old York Road, Abington, Pennsylvania 19001, USA. Tel.**:** 215-4817460, Fax: 215-481-2159, Email: isucandy@amh.org

Introduction

A potential complication caused by persistent or recurrent flow into the aneurysm sac is known as endoleak which can be classified as one of four types. Type I endoleaks involve mechanical separation of the device from the native vascular system. Blood flows around the stent graft at the attachment sites resulting in filling of the aneurysm sac. Type II endoleaks are more complex and occur due to persistent reverse flow through the branch vessels (i.e., inferior mesenteric, lumbar, hypogastric, sacral, gonadal and accessory renal arteries). As in type I, the arterial pressure in type II endoleaks is transmitted into the aneurysm sac causing sac expansion. In this situation, the patients remain at risk for aneurysm rupture. The treatment of type II endoleaks requires elimination of flow through the branch vessels, excluding the aneurysm sac from the systemic pressure. Type III endoleaks are caused by fabric tears, graft disconnection or disintegration, while flow through the graft wall porosity is categorized as a type IV endoleak.

Various methods such as a direct translumbar embolization, preoperative IMA coil embolization, intraoperative aneurysm sac thrombin injection, laparoscopic IMA clipping, combined laparoscopic IMA stapling and sclerosant injection have previously been reported. In this

study, we describe the feasibility and efficacy of managing type-II endoleak caused by IMA retrograde bleeding using IMA embolization technique via the marginal artery of drummond.

Fig. 1 CT scan showing type-II endoleak.

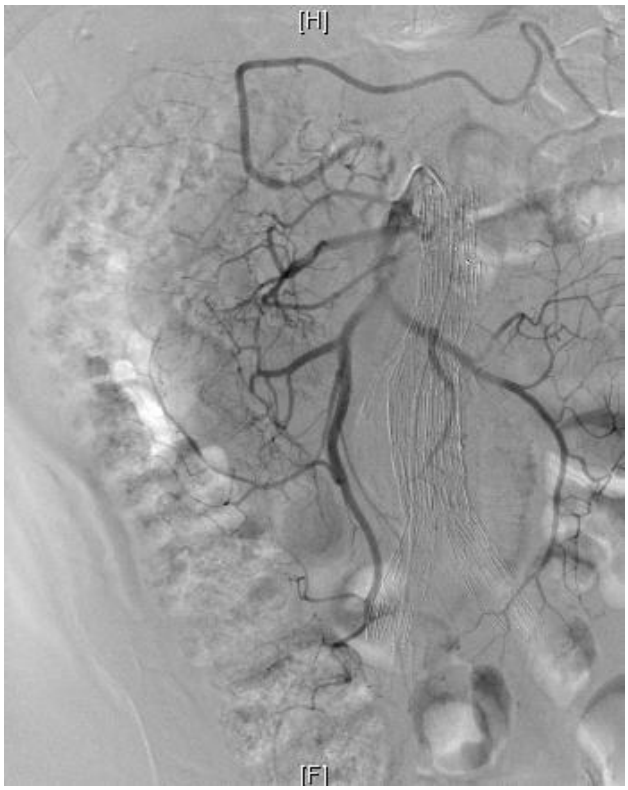

Fig. 2 Superior mesenteric artery angiography showing the presence of marginal artery of Drummond.

Fig. 3 Cannulation of the marginal artery of drummond with a hydrophilic guidewire towards the origin of the IMA.

Fig. 4 Selective angiography showing a type-II endoleak due to retrograde filling from the IMA.

Case Report

Two men, ages 77 and 81 underwent uneventful EVAR for 5.5 cm and 5.0 cm infrarenal AAAs respectively, using

Cook Zenith® (Cook Inc. Bloomington, IN) bifurcated stent grafts. Completion angiography showed successful exclusion of the aneurysm without evidence of endoleaks. Postoperative recoveries were uncomplicated in both cases. Computer tomography (CT) angiography at 1 and 6 months postoperatively demonstrated small type II endoleaks, which were followed clinically. Subsequent follow-up CT scan at 12 months revealed persistent type-II endoleaks related to retrograde filling from the IMA with significant enlargement of the aneurysm sacs (Figure 1).

Both patients then underwent selective superior mesenteric artery (SMA) angiography to define the arterial anatomy and gain access to the IMA via the middle colic artery for embolization (Figure 2). Through a 5-Fr. sheath, a 3-Fr. microcatheter was passed over a 0.18 hydrophilic wire into the marginal artery of Drummond leading to the origin of the IMA (Figures 3, 4). Coil embolization with 3-mm stainless steel microcoils was successfully performed in both cases (Figure 5). Postembolization angiography demonstrated complete resolution of the endoleaks with preservation of the major colonic and rectal branches of the IMA. Both patients were asymptomatic following the procedure and able to resume normal activities in 2 days. Follow up CT angiography at 1, 6, 12, and 18 months durably demonstrated sac thrombosis.

Fig. 5 Embolization was performed using 3-mm stainless steel microcoils at the origin of the IMA.

Discussion

18.9% of patients undergoing EVAR develop type-II endoleak, mostly due to patent inferior mesenteric or lumbar arteries. Among those with endoleak, 79.9% experience complete and permanent resolution in ≤ 6 months, while 20.1% have persistent endoleaks [1]. Leaks that occur along the ventral aspect of the aneurysm sac are usually caused by retrograde flow from a patent IMA, while those that occur along the dorsal aspect of the sac are usually caused by a patent lumbar artery [2]. It has been shown with use of microcatheters that the pressure within the sac related to a type-II endoleak is at or near peak systole. Tolia et al reported that a persistent type-II endoleak is associated with an increased incidence of aneurysm sac growth, reintervention rate, the need for conversion to open repair, and the risk of sac rupture [3]. Therefore a more aggressive approach to management of persistent type-II endoleak has been advocated by many authors [4-5]. Lack of patient compliance with close follow-up as well as the potential negative renal effects of repeated intravenous contrast CT scan surveillance also favors early intervention.

Although a significant number of patients experience IMA endoleak, the majority of the cases ultimately result in spontaneous resolution yielding a small role for routine preoperative embolization [6]. Characteristics of the flow seen on color Doppler studies are often used to predict outcomes. Rapid flow represents a bad prognosis, whereas low velocity with a to-and-fro movement of blood predicts spontaneous thrombosis and endoleak resolution [7]. The other prognostic factor influencing the outcomes and clinical significance of type-II endoleaks is the size of the nidus of flowing blood. If the diameter of the nidus exceeds 1.5 cm, aneurysm enlargement will most likely occur [8].

To our knowledge, there has been no consensus on how to best treat type-II endoleaks. When reperfusion of the aneurismal sac via the SMA occurs through the IMA, the IMA origin can be accessed and coil embolization performed via the marginal artery of Drummond or the arch of Riolan. This transarterial technique is safe and highly effective with up to 100% success rate at 2-year follow-up [4]. In the translumbar approach, the aorta is punctured under CT or fluoroscopic guidance. Left sided access is typically used to avoid the inferior vena cava. The access needle is angled at about 45-60 degree antero-medially, aimed so as to pass just anterior to the vertebral body, avoiding the adjacent transverse process. Once in the sac, proper arteriography is performed followed by coil embolization. Compared to the translumbar approach, the transarterial technique avoids substantial complications related to access-tract soft tissue infection and retroperitoneal hematoma.

Among the many choices regarding embolic agents, permanent material such as coils is preferred. Some authors support use of either gelfoam slurry or thrombin in addition to coils. Baum et al pointed out that secondary recanalization can occur after these procedures. Therefore, to obtain an effective and durable result, dense packing of microcoils seems to be necessary [9]. The use of other agents, including Vinyl alcohol copolymer, Ethibloc, and

Cyano-acrylate has also been successfully reported [10-13].

Laparoscopic or open surgical ligation of all relevant branches is a possible solution for the type-2 endoleaks. However experience has shown that there are often more vessels involved in these lesions than is initially suspected, and unless they are all clipped, the surgical route invariably results in failure or recurrence. The commonly encountered dense adhesion and fibrotic tissues around the aneurysmal sac also lower the chance of success with the operative methods [14].

Conclusions

In summary, we have found that retrograde flow from the IMA contributes to many type-2 endoleaks. Access to the aneurysm sac is possible with subselective catheterization of the SMA and the middle colic artery to enter the IMA via the marginal artery of Drummond or arch of Riolan. Percutaneous IMA embolization using endovascular techniques is an alternative, and in our opinion, the preferred technique for controlling type-2 endoleaks caused by a persistently patent IMA.

References

1. Jones JE, Atkins MD, Brewster DC, et al. Persistent type 2 endoleak after endovascular repair of abdominal aortic aneurysm is associated with adverse late outcomes. J Vasc Surg 2007; 46(1):1-8.
2. Gorich J, Rilinger N, Sokiranski R, et al. Leakages after endovascular repair of aortic aneurysm: classification based Radiology. 1999; 213 (3): 767-772.
3. Tolia AJ, Landis R, Lamparello P, et al. Type II endoleaks after endovascular repair of abdominal aortic aneurysms: Natural history. Radiology 2005; 235(2):683-686.
4. Baum RA, Carpenter JP, Tuite CM, et al. Diagnosis and treatment of inferior mesenteric arterial endoleaks after endovascular repair of abdominal aortic aneurysms. Radiology 2000; 215(2): 409-413.
5. Mita T, Arita T, Matsunaga N, et al. Complications of endovascular repair for thoracic and abdominal aortic aneurysms: an imaging spectrum. Radio Graphics 2000; 20:1263-1278.
6. Fan CM, Rafferty EA, Geller SC, et al. Endovascular stent graft in abdominal aortic aneurysms: the relationship between patent vessels that arise from the aneurismal sac and early endoleak. Radiology 2001; 218 (1): 176-182.
7. Arko FR, Filis KA, Siedel SA, et al. Intrasac flow velocities predict sealing of type II endoleaks after endovascular abdominal aortic aneurysm repair. J Vasc Surg 2003; 37 (1): 8-15.
8. Timaran CH, Ohki T, Rhee SJ, et al. Predicting aneurysm enlargement in patients with persistent type II endoleaks. J Vasc Surg 2004; 39 (6): 1157-1162.
9. Baum RA, Carpenter JP, Golden MA, et al. Treatment of type 2 endoleaks after endovascular repair of abdominal aortic aneurysm: comparison of transarterial and translumbar techniques. J Vasc Surg 2002; 35(1):23-29.
10. Golzarian J, Valenti D. Endoleakage after endovascular treatment of abdominal aortic aneurysms: Diagnosis, significance and treatment. Eur Radiol 2006; 16 (12):2849-2857.
11. Martin ML, Dolmatch BL, Fry PD, Machan LS. Treatment of type II endoleaks with Onyx. J Vasc Interv Radiol 2001; 2:729-732.
12. Van den berg JC, Nolthenius RP, Casparie JW, et al. CT-Guided thrombin injection into aneurysm sac in a patient with endoleak after endovascular abdominal aortic aneurysm repair. Am J Roentgenol 2000; 175 (6): 1649-1651.
13. Ellis PK, Kennedy PT, Collins AJ, Blair PH. The use of direct thrombin injection to treat a Type II endoleak following endovascular repair of abdominal aortic aneurysm. Cardiovasc Interven Radiol 2003; 26 (25):482-484.
14. Richardson WS, Sternbergh WC 3rd, Money SR. Laparoscopic inferior mesenteric artery ligation: an alternative for the treatment of type II endoleaks. J Laparoendosc Adv Surg Tech A 2003; 13 (6): 355-358.