# Balloon-assisted transcaval embolization of a type II endoleak associated with an aortocaval fistula after endovascular aortic repair

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## ABSTRACT

Endovascular aortic repair is an accepted treatment option for patients with infrarenal aortic aneurysm. Type II endoleak associated with persistent aneurysmal sac growth is considered an adverse event requiring endoleak occlusion. We describe the case of a patient with type II endoleak after endovascular aortic repair for infrarenal aortic aneurysm associated with aortocaval fistula and persistent aneurysm growth. Type II endoleak embolization was successfully performed with coils and Onyx through a transcaval approach using an occlusion balloon and co-axial microcatheter. (J Vasc Surg Cases and Innovative Techniques 2020;6:447-9.)

**Keywords:** Aortocaval fistula; Infrarenal; Endovascular aortic repair; Endoleak; Onyx

Endovascular aortic repair (EVAR) is the first choice treatment to repair infrarenal aortic aneurysms in selected patients. However, in 20% to 25% of cases, EVAR might be complicated by a type II endoleak. Although the large majority of type II endoleaks are not associated with persistent aneurysmal sac growth, where it does occur, embolization of the endoleak might be considered.[1,2] We describe the case of a patient presenting with clinical signs of right heart failure and a growing aneurysm sac after EVAR related to a persistent type II endoleak and aortocaval fistula and treated through a catheter-directed transcaval approach using an occlusion balloon, a coaxial microcatheter, coils, and Onyx.

## CASE REPORT

The patient provided informed consent for publication of the case report; the local ethics committee approved the publication of the case report. A 65-year-old man was evaluated for lower back surgery. Preoperative assessment revealed symptoms of right heart decompensation including dyspnea and bilateral lower limb edema. Coronary angiography demonstrated a significant circumflex artery stenosis which was managed using percutaneous revascularization and stenting. Additionally, a large infrarenal aortic aneurysm was suspected and confirmed using computed tomography (CT) angiography (Fig 1), revealing an 11-cm diameter infrarenal aortic aneurysm, associated with a 7-mm diameter aortocaval fistula and eligible for EVAR. The patient gave informed consent for further treatment. It was decided to exclude the aortic aneurysm with a modular stent-graft (Anaconda, Vascutek, Inchinnan, UK). After insertion of an additional proximal cuff (Anaconda, Vascutek) to manage a perioperative type I endoleak, the completion angiography showed correct positioning of the endograft and absence of type I or type III endoleaks.

Postoperative follow-up 3 months after EVAR was uneventful except for persistent right heart failure and growth of the aneurysmal sac to 11.8 cm and associated with a large endoleak (Fig 2), bilateral lower limb edema was markedly better after EVAR. Catheter angiography confirmed a type II endoleak with an inflow through the inferior mesenteric artery and outflow through the aortocaval fistula.

It was decided to embolize both the type II endoleak and the aortocaval fistula. Under local anesthesia and using a transcaval approach, a 6F occlusion balloon catheter (Berenstein, Boston Scientific, Natick, Mass) was navigated into the fistula and after inflation, completely occluding the fistula, a 2.7F microcatheter (Rebar-18, Medtronic, Minneapolis, Minn) was introduced coaxially into the aneurysmal sac, which was filled with microcoils (Concerto detachable coils; Medtronic) and Onyx (Medtronic) (Fig 3). However, it proved technically impossible to cannulate and coil-occlude the inferior mesenteric artery. Pulling back of the microcatheter and deflated occlusion balloon was complicated by intracaval backflow of minor fragments of Onyx; however, without clinical relevance, and in particular no signs of pulmonary embolism; the patient was also administered aspirin as an antiplatelet therapy after coronary intervention; however, no additional anticoagulant drug therapy was prescribed.

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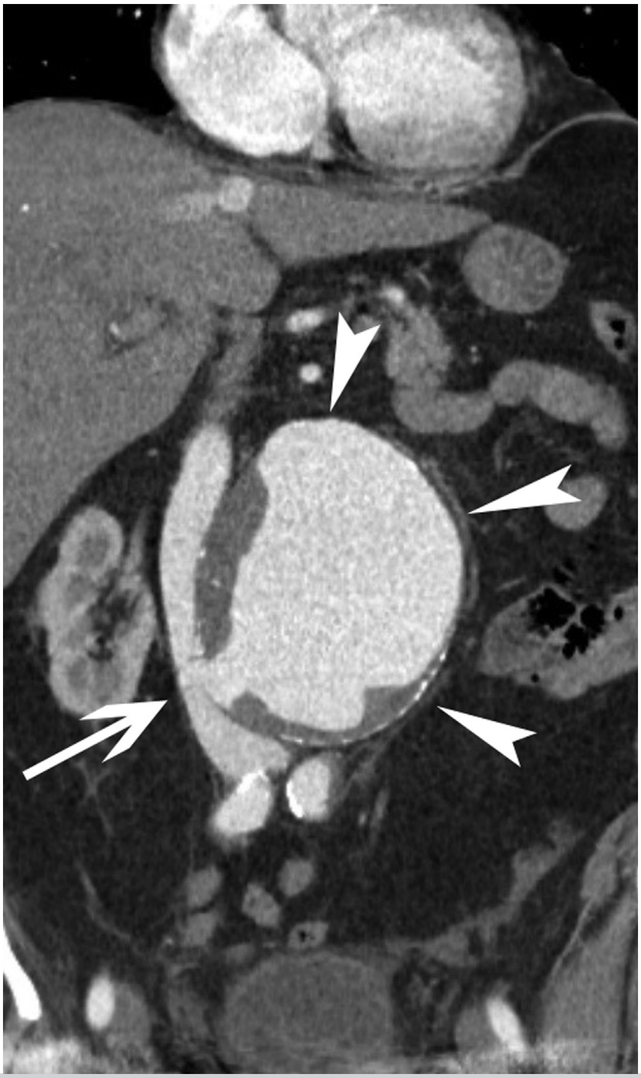

**Fig 1.** Coronal reconstructed contrast-enhanced computed tomography (CT) shows the large abdominal aortic aneurysm sac with maximal diameter of 11 cm (*white arrowheads*) and the 7-mm diameter aortocaval fistula (*white arrow*) with early drainage into the inferior vena cava.

**Fig 2.** Coronal recontructed contrast-enhanced computed tomography (CT) of the abdominal aorta after endovascular aneurysm repair (EVAR) shows the endoleak (*white arrowheads*) and the persistent aortocaval fistula (*white arrow*).

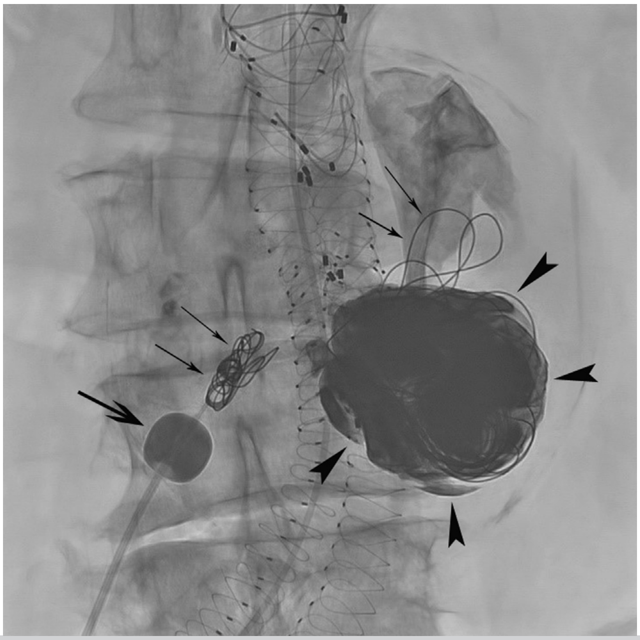

**Fig 3.** Transcaval embolization procedure through a guiding occlusion balloon (*arrow*) with deposition of coils (*small arrows*) and Onyx (*arrowheads*).

Clinical follow-up after EVAR and embolization are uneventful, including well-controlled right heart function.

Follow-up CT imaging 1 year after EVAR demonstrated persistent occlusion of the type II endoleak and aortocaval fistula, however, a persistent, small type II endoleak can be missed on CT imaging owing to metallic coil and Onyx artefacts. However, the aneurysmal sac diameter remained stable with no radiological signs of further growth, which was regarded as favorable sac remodeling (Fig 4).

## DISCUSSION

Persistent arteriovenous (AV) fistula after EVAR for infrarenal aortic aneurysm associated with aortocaval fistula has been reported previously, with various follow-up and treatment options. If clinical and radiologic follow-up cannot clearly identify clinical signs of venous hypertension and heart failure or a progressive increase in aneurysmal sac diameter, conservative management might be acceptable resulting in a stable clinical condition and favorable aneurysm sac remodeling.[3,4]

**Fig 4.** Coronal recontructed contrast-enhanced computed tomography (CT) of the abdominal aorta after endovascular aneurysm repair (EVAR) and embolization of the type II endoleak and aortocaval fistula shows confirms the Onyx-cast (*white small arrows*) in the aneurysm sac; the aortocaval fistula is closed and no early drainage of contrast material into the inferior vena cava is depicted.

However, in the event of clinical deterioration and/or progressive aneurysm sac enlargement, treatment of the AV fistula and associated endoleak seems mandatory. Occlusion of the aortocaval fistula can be performed by insertion of a tube[5] or modular stent graft[6] into the inferior vena cava during[6] or in late follow-up after[5] the EVAR procedure. However, after caval vein endografting, a type II endoleak associated with progressive aneurysm sac growth might persist. A combination of caval vein stent graft and additional glue embolization of the nidus of the endoleak, as proposed by Burke et al,[7] can be an alternative option. However, endografting of the inferior vena cava is rarely performed and little is known about potential complications, including late thromboembolic or infectious events. To avoid these potential venous complications and to treat the patient under local anesthesia with minimally invasive transcatheter techniques, it was decided to temporarily occlude the aortocaval fistula with an occlusion balloon in a transvenous approach. This allowed safe and complete occlusion of the nidus of the type II endoleak and the AV fistula during the same session as transcatheter or direct translumbar embolization of the nidus of the type II endoleak, without temporary occlusion of the fistula that could be associated with a high risk of nontarget embolization and pulmonary embolism. Combination of coils and liquid embolic agents like Onyx or a mixture of enbucrylate and iodized oil might be better than coils only, owing to the risk of late coil recanalization.[8] Potentially, additional antegrade coil or plug occlusion of the inferior mesenteric main branch, if technically feasible, might result in better aneurysmal sac diameter control.

## CONCLUSIONS

This report demonstrates that a persistent aortocaval fistula after EVAR and associated with progressive right heart failure and progressive aneurysm sac enlargement can be managed with transvenous catheter-directed techniques using a combination of coils and Onyx as embolic agents, occluding both the AV-fistula and the nidus of the type II endoleak and resulting in disappearance of the endoleak with stable aneurysm sac diameter.

## REFERENCES

1. Patatas K, Ling L, Dunning J, Shrivastana V. Static sac size with type II endoleak post-endovascular abdominal aortic aneurysm repair: surveillance or embolization? Interact Cardiovasc Thor Surg 2012;15:462-6.
2. Jones J, Atkins M, Brewster D, Chung T, Kwolek C, LaMuraglia G, et al. Persistent type 2 endoleak after endovascular repair of abdominal aortic aneurysm is associated with adverse late outcomes. J Vasc Surg 2007;46:1-8.
3. Sveinsson M, Sonesson B, Resch T, Dias N, Holst J, Malina M. Aneurysm shrinkage is compatible with massive endoleak in the presence of an aortocaval fistula: potential therapeutic implications for endoleaks and spinal cord ischemia. J Endovasc Ther 2016;23:529-32.
4. Van de Luijtgarden K, Gonçalves F, Rouwet E, Hendriks J, ten Raa S, Verhagen H. Conservative management of persistent aortocaval fistula after endovascular aortic repair. J Vasc Surg 2013;58:1080-3.
5. Melas N, Saratzis A, Saratzis N, Lazaridis I, Kiskinis D. Inferior vena cava stent-graft placement to treat endoleak associated with an aortocaval fistula. J Endovasc Ther 2011;18:250-4.
6. ElKassaby M, Alawy M, Zaki M, Hynes N, Tawfick W, Sultan S. Total endovascular management of ruptured aortocaval fistula: technical challenges and case report. Vascular 2014;22:306-9.
7. Burke C, Mauro M. SIR 2003 film panel case 8: aortocaval fistula supplied by a type II endoleak. J Vasc Intervent Radiol 2003;14:813-7.
8. Abularrage C, Patel V, Conrad M, Schneider E, Cambria R, Kwolek C. Improved results using Onyx glue for the treatment of persistent type 2 endoleak after endovascular aneurysm repair. J Vasc Surg 2012;56:630-6.

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