

Transvenous endovascular repair of symptomatic type II endoleak following endovascular repair of a ruptured common iliac aneurysm with arteriovenous fistula

Gerald Mak, BMed, MD,^a Craig Nesbitt, FRCS,^a Tim Shiraev, MBBS,^a Cindy Wang, BMed, MD,^a Matthew Doane, FANZCA,^b and Michael Neale, FRACS,^a Sydney, Australia

ABSTRACT

Arteriovenous fistula (AVF) is an uncommon presentation of ruptured aortoiliac aneurysm (rAIA). Symptomatic persistence of an AVF fed by a type II endoleak after endovascular aneurysm repair (EVAR) for rAIA is rare, with little in the literature to guide practice. We present a novel transvenous approach to treatment of symptomatic type II endoleak after EVAR for rAIA with AVF. A transvenous approach avoids complex arterial access and the need for stenting in the venous system. This technique should be considered in patients with persistent AVF after EVAR with ongoing symptomatic type II endoleak. (*J Vasc Surg Cases and Innovative Techniques* 2020;6:614-7.)

Keywords: Aortocaval fistula; Endovascular aneurysm repair (EVAR); Type II endoleak; Inferior vena cava (IVC); Transcaval access

Aortoiliac arteriovenous fistulae (AVF) in the context of abdominal iliac aneurysm (AIA) is rare, with an incidence of <1%.¹ Common causes of symptomatic presentation include lower back pain, abdominal tenderness, claudication, urinary symptoms, and lower limb oedema.¹

AIA with AVF may be repaired via open or endovascular approaches. Although endovascular intervention is associated with reduced morbidity and mortality, a risk of type II endoleak in the presence of AVF is a concern as there is an effective open flow system that can perpetuate the endoleak and associated complications.²

We report a case of successful endovascular coiling of symptomatic type II endoleak after endovascular aneurysm repair (EVAR) for AIA with AVF via a transvenous approach. Patient consent was obtained for publication of this case and associated imaging.

CASE REPORT

A 75-year-old man who had previously undergone emergency endovascular repair of a ruptured large right common iliac aneurysm with acute AVF in another hospital presented to our institution in November 2018 with worsening cardiac failure, significant shortness of breath, orthopnea, and bilateral

lower limb oedema. These symptoms were in association with persistent type II endoleak with AVF, known severe mitral incompetence along with associated tricuspid incompetence, pulmonary hypertension, and a dilated inferior vena cava (IVC). The patient had a background history of giant cell arteritis (on prednisone and methotrexate) with previous ascending aortic repair with biomechanical aortic valve replacement and coronary artery grafting. A computed tomography scan confirmed the arteriovenous communication with type II endoleak from large lumbar arteries in the distal aorta (Fig 1). It was felt that initial treatment of the AVF may help the symptomatic status of the patient before more complex treatment for the cardiac valve dysfunction. It was decided to treat the type II endoleak using a transvenous approach from the right common femoral vein through the AVF and into the aneurysm sac with coiling of the lumbar artery and distal aorta posteriorly to the previous endovascular graft (Fig 2). Detachable coils (Concerto coils, Medtronic, Dublin, Ireland) were used to ensure stable placement before detachment. After embolisation of the larger lumbar artery, access to the second lumbar artery was difficult and it was elected to pack the space between the previous endovascular graft and the second lumbar artery with coils, thereby occluding the origin of the second lumbar vessel. The transvenous approach allowed catheter assessment of the venous pressures within the aneurysm sac and the IVC before and after coiling with marked reduction in the measured venous pressure from a mean of 100 mm Hg down to 37 mm Hg, the measured pressures within the sac and the IVC being equal (Fig 3). The high residual pressure was felt to reflect the known cardiac issues with tricuspid and mitral valve incompetence.

Immediately after the procedure, the patient noticed significant improvement in his breathing, and was able to lie flat without shortness of breath and to walk with no obvious limitation. Over the following weeks, his fluid overload corrected with weight loss of 23 kg and complete resolution of the

From the Department of Vascular Surgery,^a and the Department of Anaesthesia,^b Royal North Shore Hospital.

Author conflict of interest: none.

Correspondence: Craig Nesbitt, FRCS, Northern Vascular Centre, The Freeman Hospital, Freeman Rd, High Heaton, Newcastle Upon Tyne NE7 7DN, UK (e-mail: craig.nesbitt@nhs.net).

The editors and reviewers of this article have no relevant financial relationships to disclose per the Journal policy that requires reviewers to decline review of any manuscript for which they may have a conflict of interest.

2468-4287

© 2020 The Authors. Published by Elsevier Inc. on behalf of Society for Vascular Surgery. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

<https://doi.org/10.1016/j.jvscit.2020.09.008>

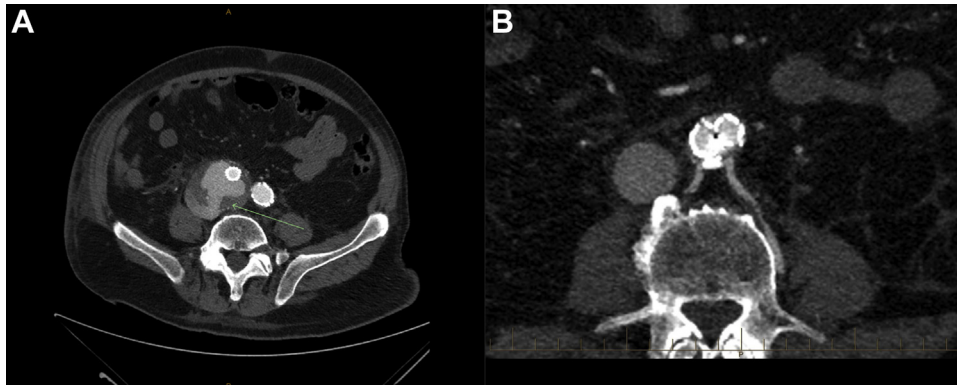


Fig 1. Preoperative computed tomography scan demonstrating large arteriovenous fistula (AVF) (A) and large lumbar vessels (B).

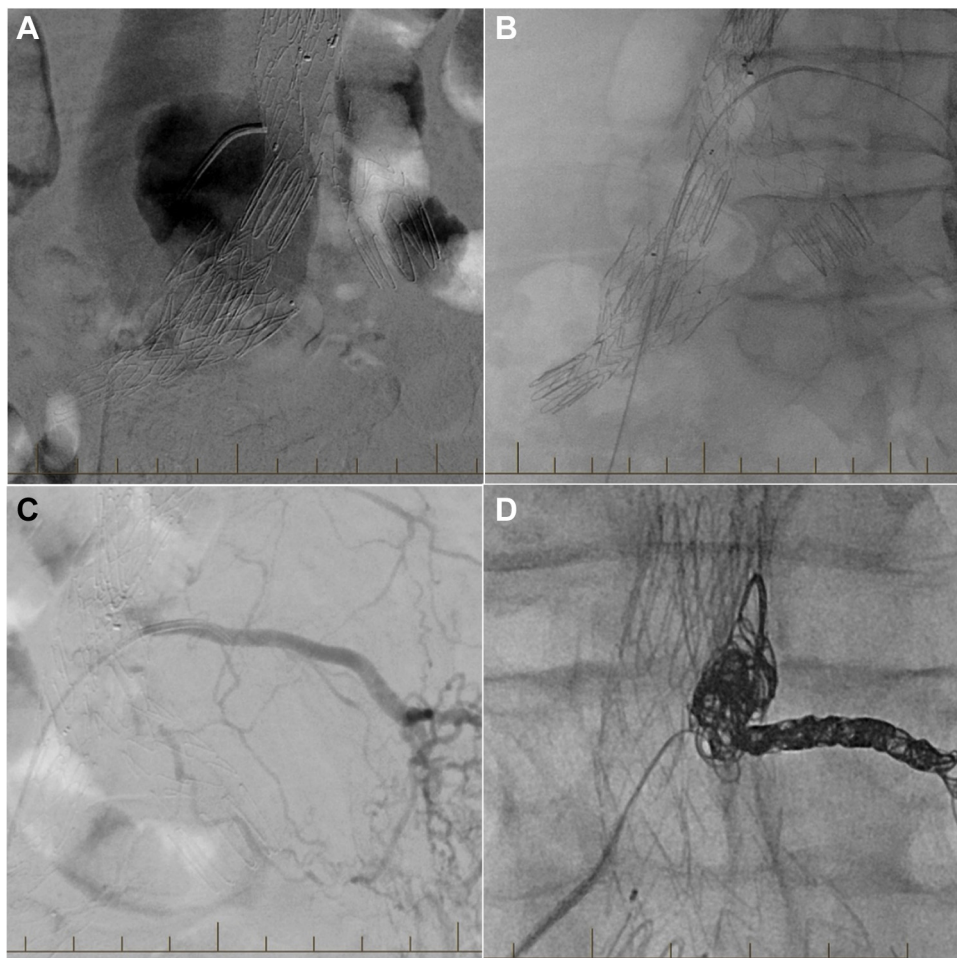


Fig 2. Intraoperative Images. A, Transcaval access of aortic sac via arteriovenous fistula (AVF). B, Transvenous access to lumbar artery. C, Transcaval access of lumbar feeding artery. D, Transcaval coiling of lumbar vessel feeding type II endoleak.

severe bilateral lower limb oedema. He remains asymptomatic at 18 months of follow-up without shortness of breath, orthopnea, or lower limb oedema and has not required any intervention for cardiac valve disease. Follow-up cardiac echocardiography has shown a decrease in the size of the

IVC, a decrease in pulmonary pressures, a decrease severity of both mitral and tricuspid incompetence, improved left ventricular ejection fraction, and a decrease size of the cardiac chambers. He has also had a significant decrease in medication requirement for his cardiac failure.

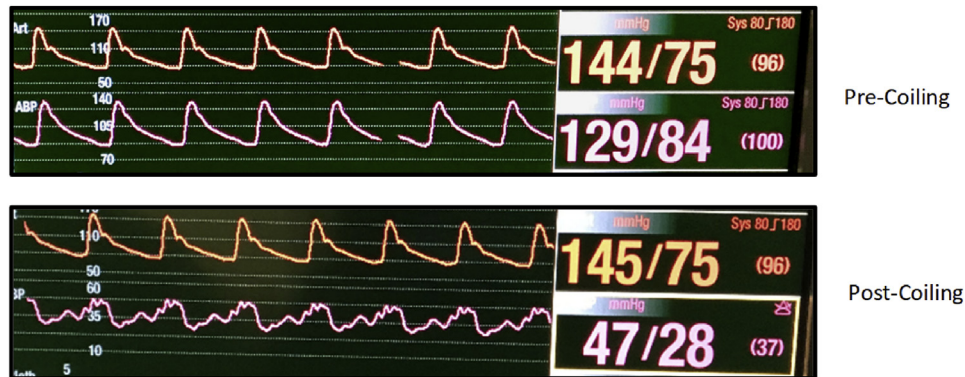


Fig 3. Pressure trace from the radial artery (red) and inferior vena cava (IVC) (pink) before and after coiling.

DISCUSSION

A type II endoleak after EVAR for AIA with AVF may be classified into symptomatic and asymptomatic. Symptomatic type II endoleak is one in which detrimental clinical sequelae or AIA sac expansion related to the endoleak occurs. We propose a management algorithm in Fig 4.

In standard infrarenal EVAR, an asymptomatic type II endoleak can be managed conservatively and is often the policy adopted in EVAR for AIA with aortocaval/venous fistula. The largest review of management of aortocaval fistula (ACF) analyzed 67 AIA with ACF comparing endovascular ($n = 26$) and open repair.³ Through a subanalysis of these case reports, we identified nine type II endoleaks after endovascular repair, of which eight were asymptomatic. Spontaneous resolution of these asymptomatic endoleaks occurred in 75% of patients ($n = 6$). Two patients underwent intervention despite their asymptomatic status. Kopp et al described endovascular coiling of an asymptomatic type II endoleak supplied by the inferior mesenteric artery⁴; LaBarbera et al⁵ performed transarterial coil embolisation of the aneurysmal sac and used a muscular ventricular septal defect occluder device to close the ACF, requiring concomitant femoral arterial and venous access. Sveinson et al⁶ reported ongoing abdominal aortic aneurysm (AAA) shrinkage over 8 years after EVAR despite a massive ACF and type II endoleak; they postulated a therapeutic role for persistent ACF in the context of type II endoleak.

Overall, it seems to be safe to manage an asymptomatic type II endoleak conservatively, even in the context of persisting ACF after EVAR for AAA.

We identified three cases of symptomatic type II endoleak after EVAR for AIA with AVF. Jeuriëns-van de Ven et al⁷ described open repair with good recovery for persistent type II endoleak with an ilio caval AVF after EVAR for bilateral common iliac aneurysms. The patient presented with dyspnea and weight gain, and initial treatment with inferior mesenteric artery embolisation failed to resolve the fistula owing to lumbar collaterals.

Sfyroeras et al⁸ described an open management of symptomatic type II endoleak presenting as persistent derangement of renal function after EVAR for AAA with ACF, thought to be due to increased IVC and renal vein pressure from the fistula after 6 months of conservative management. After open surgical ligation of the fistula, the authors reported improved renal function.

Melas et al⁹ reported endovascular repair of type II endoleak from a lumbar artery 1 month after emergency EVAR for ruptured AIA, with no evidence of AVF or endoleak at the time of repair. The patient developed signs of heart failure and follow-up imaging at 6 months revealed an AVF and a persistent endoleak. An IVC stent graft (LeMaitre Vascular, Burlington, Mass; Tubular Unifit) was inserted via the femoral vein. Concomitant femoral artery access was used for diagnostic angiography which confirmed resolution of the endoleak intraoperatively. Both the endoleak and the ACF remained closed with decrease in aneurysm sac size and patent IVC at the 36-month follow-up computed tomography scan.

In our case, it was not technically feasible to use a covered IVC stent owing to its proximity to the IVC confluence and a ventricular septal defect device was not considered owing to the large size of the arteriovenous communication (Fig 1). However, the location of the AVF allowed the transvenous approach for coil embolisation, being easier and more direct than complex microcatheter approaches through the arterial system to the lumbar arteries and allowing direct measurement of the pressure within the sac and IVC. This approach negates concern about long-term patency of the IVC with use of a covered stent and avoids potential complications related to arterial puncture.

CONCLUSIONS

We describe a case of transvenous access for the arterial embolisation of symptomatic type II endoleak after EVAR for AIA with AVF, negating the requirement of arterial puncture and the often-challenging access to the lumbar arteries via an arterial approach. The procedure

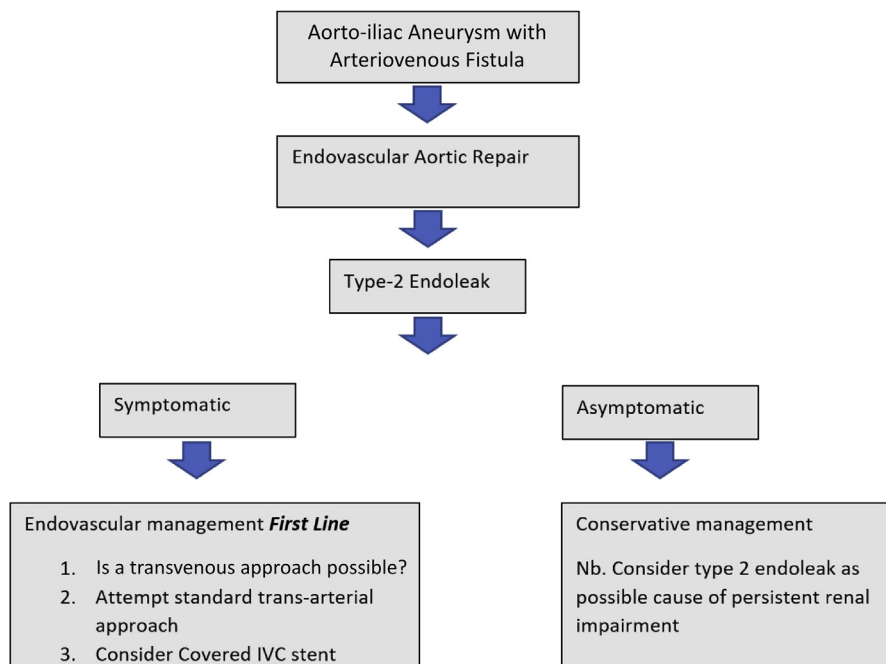


Fig 4. Treatment algorithm for the management of a type II endoleak after endovascular repair of aortoiliac aneurysm with an arteriovenous fistula (AVF). IVC, inferior vena cava.

was quick, safe, and led to symptomatic improvement. This treatment also allowed IVC pressure assessment during the procedure as a guide to successful treatment. This technique could be considered either as a stand-alone procedure or in conjunction with other endovascular treatments in cases of symptomatic type II endoleak with persistent AVF after EVAR.

REFERENCES

- Huang Y, Gloviczki P, Duncan AA, Kalra M, Hoskin TL, Oderich GS, et al. Common iliac artery aneurysm: expansion rate and results of open surgical and endovascular repair. *J Vasc Surg* 2008;47:1203-12011.e2.
- van de Luijtgaarden KM, Gonçalves FB, Rouwet EV, Hendriks JM, ten Raa S, Verhagen HJM. Conservative management of persistent aortocaval fistula after endovascular aortic repair. *J Vasc Surg* 2013;58:1080-3.
- Orion KC, Beaulieu RJ, Black JH III. Aortocaval fistula: is endovascular repair the preferred solution? *Ann Vasc Surg* 2016;31:221-8.
- Kopp R, Weidenhagen R, Hoffmann R, Waggershauer T, Meimarakis G, Andrassy J, et al. Immediate endovascular treatment of an aortoiliac aneurysm ruptured into the inferior vena cava. *Ann Vasc Surg* 2006;20:525-8.
- LaBarbera M, Nathanson D, Hui P. Percutaneous closure of aortocaval fistula using the Amplatzer muscular VSD occlude. *J Invasive Cardiol* 2011;23:343-4.
- Sveinsson M, Sonesson B, Resch TA, 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.
- Jeuriëns-van de Ven SA, van der Velden APS, Kool LJS, van der Vliet JA, Berger P. Persisting iliaco-caval fistula after EVAR maintained by a type II endoleak. *Ann Vasc Surg* 2011;25: 1142.e7-9.
- Sfyroeras G, Moulakakis K, Bessias N, Maras D, Tsanis A, Georgakis P, et al. Persistent endoleak after endovascular exclusion of an aortocaval fistula, producing renal insufficiency. *Vasa Suppl* 2010;39:98.
- 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.

Submitted May 2, 2020; accepted Sep 11, 2020.