CASE REPORT

Rupture of the infrarenal abdominal aortic aneurysm (AAA) following an endovascular aneurysm repair (EVAR) due to an isolated type II endoleak

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SUMMARY

We present a case of an elderly man with the persisting type II endoleak following endovascular aneurysm repair. In a view of the multiple comorbidities, the patient was denied an open elective repair. However, when presented with a ruptured aneurismal sac, he underwent an emergency open abdominal aortic aneurysm repair. Overall, the patient has made a good postoperative recovery.

BACKGROUND

The aim of the endovascular aneurysm repair (EVAR) is to prevent an aneurysm rupture by exclusion from the systemic circulation. Despite encouraging, short-term results, such as decreased mortality, reduced blood loss and shorter hospital stay, the long-term durability of EVAR is still questioned.^{1–3} The reported incidence of the type II endoleak varies from 10% to even 44%.⁴ In addition, up to 20% of patients require an intervention within 5 years of EVAR and as presented in this case, sac expansion may occur even in the late follow-up.⁵ Aneurysm rupture post-EVAR due to an isolated type II endoleak is rare (<1% of all endoleaks).⁴ Furthermore, almost 30% of such ruptures occur with no sac expansion.^{4 5}

This case highlighted many challenges in the management of the type II endoleak. Furthermore, it revealed many deficiencies and limitations related to poor understanding of the pathophysiology of this post-EVAR complication and problems with a surveillance protocol.

CASE PRESENTATION

A 77-year-old man was referred to the vascular outpatient clinic with an incidental finding of the infrarenal abdominal aortic aneurysm (AAA, measuring 5.5 cm) discovered during the follow-up of his Hodgkin's lymphoma (figure 1).

His medical history included end-stage renal failure (baseline creatinine of 423 µmol/L), autoimmune haemolytic anaemia which required splenectomy, Hodgkin's lymphoma (in remission), transurethral resection of prostate, hypercholesterolaemia, hypertension, ischaemic heart disease, myocardial infarction, deep venous thrombosis, pulmonary embolism, total hip replacement, diverticular disease, gallstones and bilateral inguinal herniae repairs. He was a non-smoker with no alcohol consumption.

Figure 1 Incidentally found infrarenal 5.5 cm abdominal aortic aneurysm (AAA).

INVESTIGATIONS AND TREATMENT

Imaging evaluation of the AAA revealed an anatomical configuration amenable to an endovascular repair. Following the discussion at the vascular multidisciplinary meeting and given the patient's multiple comorbidities, it was decided that an endovascular repair is the most appropriate method of treatment.

The patient underwent an elective EVAR using a bifurcated stent graft—the Talent (Medtronic) modular system. An intraoperative completion angiography confirmed satisfactory deployment of the stent graft and exclusion of the aneurysm. The patient was discharged 48 h later and was followed up with a CT at 6 weeks time, which showed a satisfactory structural integrity/position of the patient's endograft and no evidence of an endoleak (aneurismal sac measuring 6.2 cm). At 3 months, a

Figure 2 An endoleak closely related to the right limb of the stent graft.

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repeated CT demonstrated an increase in the sac size (6.6 cm) with an endoleak closely related to the right limb of the stent graft (figure 2). Subsequently, a formal digital subtraction angiography (DSA) was arranged in order to ascertain the exact type of an endoleak. Unfortunately, the DSA was limited to the right limb of the stent graft only and did not show any evidence of an endoleak. Therefore, another follow-up CT was arranged 4 weeks later, which revealed type II endoleak from the lumbar arteries with the sac size of 6.4 cm. Subsequent CT scans were performed without contrast due to worsening of the patient's renal function, which showed a static sac size (6.6 cm). As a result, a series of aortic ultrasound scans were performed, which confirmed the presence of an endoleak. At 30 months from the initial surgery, surveillance CT found the aneurysm sac size of 7.4 cm with the persistent type II endoleak (figure 3). This has prompted an urgent DSA, which demonstrated a brisk type II endoleak into the sac from lumbar arteries. Embolisation with coils was attempted, but unfortunately was unsuccessful. A repeated CT at 35, 40 and 45 months showed a further increase in the sac size as 7.8 cm, 8 cm and 8.2 cm, respectively with an ongoing type II endoleak. Following a detailed discussion with the patient and his family regarding the high risks associated with an open repair, the patient opted to proceed with the treatment. However, during a cardiopulmonary exercise testing (CPEX), the patient developed ventricular tachycardia secondary to myocardial ischaemia. Subsequently, following a cardiology review and further discussion with the patient, the open repair was deemed to be associated with high mortality and the operation plans were abandoned.

At 52 months, while on dialysis, the patient developed a severe back ache.

On examination, the patient was tachycardic (heart rate of 105/min) with a systolic blood pressure of 111 mm Hg. The body temperature and oxygen saturation were normal. Examination of the respiratory system was unremarkable. Abdomen was soft and generally tender. A peripheral vascular examination demonstrated an expansile AAA. Pedal pulses were present bilaterally. An urgent CT revealed ruptured AAA sac with free intra-abdominal fluid and retroperitoneal haematoma (figures 4 and 5). The patient was taken immediately to theatre. At operation, type II endoleak and anterior rupture of sac were noted. The lumbar arteries were ligated, the stent graft was excised and the bifurcated Dacron graft was used to restore the arterial continuity.

OUTCOME AND FOLLOW-UP

Postoperative period was complicated by the hospital-acquired pneumonia. Overall, the patient has made a satisfactory recovery

Figure 3 Sac size of 7.4 cm with a persistent type II endoleak.

Figure 4 Type II endoleak with an anterior rupture of abdominal aortic aneurysm (AAA) sac.

and was discharged after a period of routine outpatient follow-up.

DISCUSSION

Endoleak is defined as an ongoing perfusion of the aneurysm sac, which is not excluded from the systemic arterial pressure.⁴ This may lead to endotension and sac rupture. Five different types of endoleak have been described. Type I results from an incomplete seal (proximally or distally), type III is caused by a structural endograft failure, type IV describes graft porosity and type V is consistent with sac expansion despite no evidence of endoleak.⁴ Finally, type II endoleak (branch leak) is the most common one and is caused by the retrograde flow from lumbar or inferior mesenteric arteries.⁶ Its pathophysiology remains unclear; hence the management of type II endoleak is still controversial. In the vast majority of cases, diagnosis is established during a routine post-EVAR surveillance with CT angiography and/or colour duplex ultrasound (CDUS).³ If these imaging modalities fail to detect a suspected endoleak, then formal angiography can be used.⁷ However, if an endoleak is not found, then invasive measurements of intra-aneurysm pressure can be obtained via direct translumbar puncture or indirectly through

Figure 5 Retroperitoneal haematoma.

the internal iliac arteries.⁷ If endotension is confirmed, then an intervention is advised.⁶

Several treatment options are available such as embolisation, percutaneous ultrasound-guided thrombin injection, conversion to open repair and laparoscopic clipping.^{4–8} Among these, trans-lumbar embolisation has reported the highest success rates with least complications.⁴ However, collateral leaks with complex anastomoses may prove embolisation to be impossible.⁹

In general, the type II endoleak is considered to be a benign one and once the pressure between the sac and the feeding branches equilibrates, the endoleak seals spontaneously in the majority of patients.⁶ Therefore, most of the cases with a stable sac size pose no urgency for an intervention, and a regular imaging surveillance is advocated.⁹ However, if a persistent endoleak is present, a more aggressive approach is favoured.^{4–9}

Few would argue with the fact that an ongoing sac expansion with or without endoleak warrants an intervention. The decision to continue conservative approach in this case was not an easy one, in a view of a predictable outcome (rupture) due to the continued sac expansion and persistent endoleak. There is substantial evidence that the majority of the deaths post-AAA open repair are related to the perioperative cardiac events and pre-existing renal disease.¹⁰ Therefore, we feel that the above decision was clinically justified given the patient's multiple comorbidities and failed CPEX during the preoperative assessment.

For that reason, it would be ideal to identify this high-risk group of patients with an 'impending rupture' during surveillance based on the morphological sac features. This, certainly, would help to provide more targeted treatment, but such investigations are not presently available.⁵ Although an invasive sac pressure monitoring has been reported, it has not been adopted in a routine practice.⁷ Instead, clinicians continue to assess the sac indirectly, by measuring its size during surveillance programme. Some authors propose an intervention when the sac size has increased by 5 mm, but at present, the sac size of 10 mm or more has been advocated as an indication for treatment.⁴

There is no doubt that a lifelong follow-up is mandatory post-EVAR, but the optimal imaging modality still poses many deliberations among vascular surgeons.¹¹ In particular, even CT can miss serious complications requiring treatment.⁵ Recent evidence demonstrated that CDUS is safe and sensitive in detecting endoleaks.¹² This is an important finding, which significantly reduces patients' exposure to ionising radiation. On the other hand, CDUS is not sufficiently robust to be the primary surveillance tool.³ Therefore, it is likely that CT will continue to be a valuable adjunct during the follow-up. But the harmful consequences of ionising radiation and nephrotoxicity cannot be ignored. The natural annual background exposure in the UK is around 2.4 milliSiverts (mSv),¹³ whereas one CT of the abdomen/pelvis delivers up to 8–10 mSv.¹³ Although there is no radiation dose limit for the patient, repeated imaging has to be carefully balanced against the aforementioned risks.¹³ In the present case, the patient has received 14 CT scans during 52 months of follow-up. Some of the scans were uncontrasted; hence no endoleak assessment was performed. This raises many questions regarding the surveillance protocol and lack of

uniform guidelines on the management of 'impending' stent graft failures.

Type II endoleak continues to be an 'Achilles heel' of the EVAR. Although, a lifelong follow-up is mandatory, current protocols lack uniformity regarding the optimal timing and imaging modality.^{5–12} Until robust and long-term data on the natural history of the type II endoleak is available, how one makes the decision of whether to intervene or not remains debatable and should be based on an individual case basis.

Learning points

- ▶ A conservative approach for the type II endoleak is appropriate if there is no sac expansion.
- ▶ Intervention is recommended if progressive sac expansion with or without demonstrable endoleak is present.
- ▶ If endovascular approach fails, an open surgery is advised.
- ▶ The clinicians must remain vigilant as late sac ruptures, although rare, are possible.

Competing interests None.

Patient consent Obtained.

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REFERENCES

- 1 Rosen NA, Cayne NS, Macari M, *et al.* "Unpredictable" late rupture of an abdominal aortic aneurysm after bifurcated aneurysm repair. *Vasc Endovascular Surg* 2008;42:69–73.
- 2 Torsello GB, Klenk E, Kasprzak B, *et al.* Rupture of abdominal aortic aneurysm previously treated by endovascular stentgraft. *J Vasc Surg* 1998;28:184–7.
- 3 Gray C, Goodman P, Herron C, *et al.* Use of colour duplex ultrasound as a first line surveillance tool following EVAR is associated with a reduction in cost without compromising accuracy. *Eur J Vasc Endovasc Surg* 2012;44:145–50.
- 4 Sidloff D, Stather P, Choke E, *et al.* Type II endoleak after endovascular aneurysm repair. *Br J Surg* 2013;100:1262–70.
- 5 Karthikesalingam A, Holt P, Vidal-Diez A, *et al.* Predicting aortic complications after endovascular aneurysm repair. *Br J Surg* 2013;100:1302–11.
- 6 Imamura A, Koike Y, Iwaki R, *et al.* Infra-renal abdominal aortic aneurysm complicated by persistent endotension after endovascular repair: report of a case. *Surg Today* 2005;35:879–82.
- 7 Kougias P, Bismuth J, Huynh TT, *et al.* Symptomatic aneurysm rupture without bleeding secondary to endotension 4 years after endovascular repair of an abdominal aortic aneurysm. *J Endovasc Ther* 2008;15:702–5.
- 8 Kasthuri RS, Stivaros SM, Gavan D. Percutaneous ultrasound guided thrombin injection for endoleaks: an alternative. *Cardiovasc Intervent Radiol* 2005;28:110–12.
- 9 Chan KKL, Fung KH, Wong SKH, *et al.* Acute symptomatic abdominal aortic aneurysm secondary to endovascular stent graft associated type II endoleak. *Asian J Surg* 2006;29:157–60.
- 10 Beard JD, Gaines PA. *Vascular and endovascular surgery*. Saunders Limited, 2006.
- 11 Karthikesalingam A, Page A, Pettengell C, *et al.* Heterogeneity in surveillance after endovascular aneurysm repair in the UK. *Eur J Vasc Endovasc Surg* 2011;42:585–90.
- 12 Karthikesalingam A, Al-Jundi W, Jackson D, *et al.* Systematic review and meta-analysis of duplex ultrasonography, contrast-enhanced ultrasonography or computed tomography for surveillance after endovascular aneurysm repair. *Br J Surg* 2012;99:1514–23.
- 13 Farr RF, Allisy-Roberts PJ. *Physics for medical imaging*. Oxford: Bailliere Tindall, 1996.

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