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Case report

Aneurysmal degeneration and type Ib endoleak with proximal aneurysm rupture: A case report, review of literature and technical suggestions

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ABSTRACT

Introduction: Despite the reduction in mortality incidences of AAA in proportion to increased use of EVAR, the natural history of aneurysms with the presence of an endoleak post EVAR remains unclear. With a cumulative AAA rupture incidence of 2% at six years post EVAR, the lack of an immediate endoleak is not an indicator of success.

Case report: We present a case of an 80-year-old man who presented to the emergency department with generalised abdominal pain and hypotension. Four years earlier he had underwent an EVAR for a 6 cm infra-renal AAA. The computed tomography angiogram (CTA) illustrated aneurysmal dilatation of the left common iliac artery with extensive retroperitoneal haemorrhage. The patient was transferred to the operating room for an endovascular repair but due to significant episodes of haemodynamic instability, an emergency exploratory laparotomy was performed. To our surprise, there was a left-sided infra-renal anterolateral rupture of the aneurysm sac. The stent was explanted with difficulty from its fixed proximal aortic section down to left-sided common iliac artery. The fixed bare portion of the stent in the proximal aorta and in the right common iliac artery was left in-situ and the rest was integrated to a trouser graft with an end-to-end technique.

Discussion: On detection of an endoleak, the aim should focus on their endovascular management, as open conversions are associated with high mortality and morbidity. Conclusion: If open conversion is indicated, all technical aspects of the repair including partial stent extraction should be considered for best outcome.

1. Introduction

Endovascular repair of abdominal aortic aneurysms (AAA) has become a widespread and accepted approach in most vascular units across the world. Currently, various follow-up protocols aiming to optimise and identify possible complications are subject to debate [1]. The EUROSTAR registry data showed a cumulative post EVAR (Endovascular Aneurysm Repair) AAA rupture prevalence of 2% at six years, with a peak incidence at 36 months [2]. Endoleak is a well-known and common complication following EVAR. It occurs in approximately in 15%–52% of all EVAR patients [3–5]. Type I and III endoleaks are uncommon and they mostly present early. The incidences of type I endoleak, defined as blood flow into the aneurysm sac due to an incomplete seal between the graft and vessel is reported to be between 1% and 3% at 36 months [6]. Delayed type I endoleak is therefore a rare complication of EVAR with few reported cases in the literature. We present a case of delayed type Ib endoleak with proximal rupture of the aneurysm sac four years post EVAR with review of the literature and technical suggestions.

2. Presentation of case

An 80-year-old man with past medical history of hypertension hypercholesterolaemia and ischaemic heart disease presented to the emergency department with generalised abdominal pain and hypotension. Four years earlier he had underwent an EVAR (Main body B25 Anaconda stent, Vascutek, Renfrewshire, Scotland) for a 6 cm infra-renal AAA in another hospital. The computed tomography angiogram (CTA) illustrated aneurysmal dilatation of the left

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common iliac artery with extensive retroperitoneal haemorrhage and a left-sided iliac stent that did not extend into the bifurcation point of the left common iliac artery (Fig. 1). The patient was transferred to the operating room within 3 h of arrival for an endovascular repair but due to sudden and significant episode of haemodynamic instability (sudden drop of blood pressure 70/50 mmHg from 100/70 mmHg), agitation and confusion a decision for an emergency exploratory laparotomy was made. Midline incision was given, bowel was moved laterally and infrarenal clamp was applied. On inspection of the abdominal aorta and to our surprise, there was a left-sided infra-renal anterolateral rupture of the aneurysm sac (Fig. 2).

The stent was explanted with difficulty from its fixed proximal aortic section down to left-sided common iliac artery. The fixed bare portion of the stent in the proximal aorta and the remaining stent in the right common iliac artery was left in-situ. A trouser graft (Hemashield Gold knitted, Boston Scientific, Natick, MA, USA) was then anastomosed with end-to-end technique to the proximal aorta, to the remaining stent on the right and to the native bifurcation of common iliac artery on the left (Fig. 3). The sac was eventually closed. The estimated cross clamp time was 28 min with total 2.7 litters of blood loss. The abdomen was closed in layers. Histology of the sac demonstrated no infection. In view of the CTA and the operative findings, it is our opinion that the aneurysm rupture was secondary to a delayed type Ib endoleak. This resulted in retrograde arterial flow into the sac and subsequent rupture of the proximal infra-renal aorta. It was postulated that aneurysmal degeneration and late migration of the left iliac limb was the primary reason for this presentation. The patient recovered well without any further vascular complications and a surveillance CTA four weeks later showed complete repair of the aneurysm with no leak (Fig. 3). On later inspection of the original EVAR notes (4 years ago) from another hospital, it was apparent that the original operation had been complicated by a repeated detachment of the left iliac limb. In addition, a type II endoleak (2 years after the initial EVAR) secondary to the inferior mesenteric artery and a lumbar

Fig. 1. CT Image demonstrating the pre-operative iliac aneurysm and type Ib Endoleak on 3D image reconstruction.

Fig. 2. Intra-operative image of EVAR (in-situ) & rupture point (black arrow) at left sided infra-renal proximal aorta.

branch, demonstrated no sac expansion and was left unintervened. The patient had an uneventful recovery and was discharged 7 days later with follow up CTA in 6 months demonstrating no flow disturbances or associated complications. He has been allocated to surveillance follow up according to the departmental follow up protocol.

3. Discussion

The primary aim of EVAR is to exclude the aneurysm sac and prevent death from aneurysm rupture. The prognosis of aneurysms with endoleak after EVAR remains poorly understood. In one study, sac expansion was reported in 20% of patients with type I or III endoleak, compared to 10% with type II endoleak or 5% where no endoleak was detected [7]. In addition, aneurysm enlargement after EVAR may not necessarily result in a higher risk of rupture, as different reports documented ruptures in shrinking aneurysms with no endoleak [8]. Type Ib endoleak appears more likely if the common iliac artery diameter is more than 18 mm or has a continuous length of less than 15 mm [9]. Other factors that require attention are shaggy aorta, mural thrombus, transmural calcification and vessel tortuousity [10,11]. Failure in preoperative evaluation of such factors may result in acute type Ia/Ib endoleak.

According to the EUROSTAR study ($n = 2862$) the risk ratio for late rupture secondary to type Ia endoleak was 7.59 ($p = 0.001$). This value was less significant in type Ib endoleaks ($p = 0.8$) [12]. This might be due to late changes in anatomical configuration of the aorta. In addition, achieving complete seal between the stent and the native aorta that might be short, trapezoidal, ulcerated, angulated or thrombotic may also contribute to delayed endoleak [13]. Likewise, dilated, irregular and tortuous iliac arteries that may pose problematic distal attachments could result in the late presentation of endoleaks (type 1b) [13]. Despite various recommendations for proximal fixation of the stents, the type of fixation (Transrenal Vs Infrarenal) showed no difference in late formation of the endoleaks [14].

The basic principle in the treatment of either acute or late type of endoleak is based on minimising the increasing risk of rupture. Treatment should be an urgent priority to avoid death or severe complications, but such approach should not exceed the risk of endoleak itself. Unfortunately, such planning is not easy as no clear consensus exists and risk prediction vary for individual patients [15]. So far, various late type I (proximal and distal) endoleaks have

Fig. 3. Postoperative image exhibiting the infra-renal bare stent, right sided stent and graft-to-stent incorporation on 3d image reconstruction.

been treated with a variety of methods: additional stents, peri-aortic ligature, glue or coil embolisation or even embolisation of the peri-graft space, all with good results. However, complications such as rupture, colonic ischaemia or even transmission of the systemic pressure through the peri-graft thombus have been reported [16,17].

Despite all the available endovascular treatment modalities, rupture and severe haemorrhage at presentation necessitate open repair [18]. The open conversion rates following delayed endoleak have been reported to range between 0.6% and 4.5%. Open conversion for acute type I endoleak are associated with a 20% mortality and for delayed up to 60%. Open conversion and repair in delayed rupture post EVAR are very complex and differ from primary open repair. There are multiple factors that make such an operation technically challenging. The first issue is the proximal control of the native aorta. In cases where infra-renal clamping of the native aorta is not possible due to suprarenal fixation of the stent, the use of a suprarenal clamp and intra-aortic balloon occlusion is applicable but prolonged suprarenal cross clamping is associated with high peri-operative mortality [19]. Phades et al. review of sixteen patients, requiring open conversion for late failure of EVAR demonstrated 75% supraceliac clamping with 13% mortality. This was associated with prolonged hospitalisation at 18 days (range, 6–78 days) with six patients requiring extra anatomical bypass [20]. Furthermore, Forbes et al. experience with late EVAR rupture also showed 67% supraceliac clamping with complete removal of the stent in 33% of the cases only. This was also associated with high transfusion rate and prolonged hospitalisation [21]. A “clamp and pull” technique for complete extraction of the stent might also be applied. However, such technique might be dangerous and might lead to significant renal vessel injury or haemorrhage if the bare metal portion is incorporated to the intima. Constriction of the bare metal stent by a nylon tape or its collapse by a large syringe are also amongst the various suggested techniques but their practical application in an unstable ruptured patients remain debateable. Despite all the suggested methods the removal of the bare stent portion (hooks and metal barbs) after clamping might not be necessary after all. This technique reduces or diminishes the suprarenal clamp or balloon time and avoids the undue trauma to renal vessels. Similarly, this approach can also be adopted in distal control of the iliac vessels.

Another important technical aspect of the open repair is related to the site of the anastomsis. Due to possible over sizing of the original stent (EVAR), foreign body reaction or primary poor vessel wall quality, complete excision of the stent is not always advisable. Even if achieved, the site of the anastomsis becomes prone to leakage, pseudoanuerysm or further reconstruction. Therefore, partial or near total stent explantation with end-to-end or end-to-side incorporation of the new graft to the stent would be a suitable alternative. This anastomosis can incorporate the bare metal portion of the proximal aorta and the iliac vessels with minimum technical difficulty and restore full flow without haemodynamic instability. Furthermore, this technique reduces the blood loss, the anaesthesia time and the long-term morbidities that might rise from them. In our opinion, full stent extraction should be reserved for patients that had the primary EVAR for the infected aneurysms.

4. Conclusion

Despite advances in endovascular salvage techniques for failed EVARs, certain presentations demand open conversion. Such conversions are technically demanding and are very different to the primary open approaches. The crucial decision, regarding complete or partial extraction of stents should be tailored to individual patients. In our opinion, partial removal of the stent over its full extraction permits minimum vessel wall damage, blood loss and hospitalisation. In addition, this technique diminishes the need for supra-renal or supra-celiac clamp and extra anatomical bypasses.

Conflict of interest

None.

Consent

Patient consent was obtained for this cases report and the accompanying images without enclosing patient’s details.

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