Case report - Aortic and aneurysmal

Endovascular aortic repair for spontaneous rupture of a non-aneurysmal infrarenal aorta

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Abstract
We report the case of a patient who underwent an endovascular aortic repair for spontaneous rupture of a non-aneurysmal infrarenal aorta. A 67-year-old male with a diagnosis of infrarenal aortic rupture was referred to our hospital. Preoperative computed tomography showed focal ulcers adjacent to the site of rupture, with no evidence of aneurysm formation, suggesting that this aortic rupture was likely to be associated with perforation of penetrating atheromatous ulceration. Open surgical repair might have carried a high-risk because of the patient's history of laparotomy and respiratory impairment, so endovascular aortic repair was planned. We deployed a Powerlink proximal infrarenal cuff 25-25-75L at the rupture site through the femoral artery, with the additional placement of two extra large Palmaz stents at the proximal and distal sites of the Powerlink stent-graft. Completion angiography showed total exclusion with no endoleaks. The patient was successfully extubated on the third postoperative day and recovered well until he contracted aspiration pneumonia two weeks after surgery. Unfortunately, he eventually died of a non-aortic cause three months after the operation. Endovascular aortic repair may be an alternative to conventional surgical repair for high-risk patients with spontaneous infrarenal aortic rupture.

Keywords: Endovascular aortic repair; Infrarenal aorta; Penetrating atheromatous ulceration; Spontaneous aortic rupture

1. Case report
A 67-year-old male with a history of distal gastrectomy for gastric ulcer, hypertension and chronic obstructive pulmonary disease was referred to our hospital because of a sudden onset of abdominal pain. The clinical examination revealed an obese male who was 155 cm tall and weighed 75 kg. His vital signs on admission showed a pulse rate of 95 beats/min and blood pressure of 77/49 mmHg, with a tense abdomen.

Axial and reconstructed three-dimensional computed tomography (CT) images confirmed active extravasation of contrast medium at the infrarenal aorta, extending into the horizontal part of duodenum and the left retroperitoneum (Fig. 1a,b). The preoperative CT-scan also showed a heavily calcified aorta and focal ulcers adjacent to the site of rupture, but there was no evidence of aneurysm formation or an intimal flap at the infrarenal aorta.

The conventional surgical repair through a re-do laparotomy for this patient might have carried a high risk because of the patient’s unstable hemodynamics as well as severe respiratory impairment, so an emergent endovascular aortic repair was planned, and informed consent was obtained.

Under general anesthesia, the left and right common femoral arteries were surgically isolated as access routes. Intraoperative aortography showed a saccular protrusion in the abdominal aorta 1.5 cm below the renal arteries (Fig. 1c). A Powerlink proximal infrarenal cuff 25-25-75L (Endologix, Irvine, CA, USA) was deployed via the left common femoral artery. Control angiography showed a type I endoleak, immediately treated with the additional placement of two extra large Palmaz stents (Johnson & Johnson, New Brunswick, NJ, USA) at the proximal and distal sites of the Powerlink stent-graft.

Completion angiography showed total exclusion with no endoleaks (Fig. 1a), and the patient’s hemodynamics became remarkably stable. No immediate complications were noted, and the total procedural time was 92 min. Postoperative CT-scanning demonstrated an intact stent-graft with no endoleak or migration (Fig. 2b).

The patient was successfully extubated on the third postoperative day and recovered well until he suffered from aspiration pneumonia 2 weeks after surgery. Unfortunately, he eventually died of a non-aortic cause (acute respiratory distress syndrome) three months after the operation.

2. Discussion
Spontaneous aortic perforation not associated with aneurysm, trauma or infection is extremely rare [1]. It may be speculated that some spontaneous aortic ruptures in
elderly patients might result from a penetrating atheromatous ulcer (PAU) of the aorta, defined as ulceration of an atheromatous plaque that extends through the intima and into the aortic media [1–3]. We consider that the spontaneous aortic rupture in this case was also associated with perforation of a PAU, because the preoperative CT-scan showed focal ulcers adjacent to the site of rupture, with no evidence of aneurysm formation or aortic dissection. Furthermore, this patient had a medical history of hypertension and a heavily calcified aorta detected on the CT-scan, which are the two most common risk factors for infrarenal aortic PAU.

Most patients with PAU are middle-aged men with hypertension, diabetes mellitus and other risk factors for atherosclerotic disease, including coronary artery disease. In patients with the associated risk factors who are in the appropriate age range and have a history of symptoms such as persistent abdominal pain, back pain or flank pain, the diagnosis of PAU at the infrarenal aorta must be entertained [4]. Abdominal CT imaging of the aorta should be performed for symptomatic patients, but the absence of an aortic aneurysm or dissection should not completely eliminate the aorta as the source of symptoms [5].

The natural prognosis of PAU remains unclear, and the treatment of PAU remains controversial [4]. Possible progressive complications of PAU extending beyond the aortic wall are subadventitial pseudoaneurysms and transmural rupture with an extra-aortic hematoma [1]. Our report indicates that ulcerations of the abdominal aorta can progress to transmural rupture even if the PAU is small. Thus, if a patient has a non-aneurysmal infrarenal aorta with severe calcification, we should consider the risk of spontaneous rupture and observe the patient carefully.

Most vascular surgeons consider that asymmetry and the focal bulge represent a zone of weakness and thus an increased risk of rupture [6]. In symptomatic patients who have evidence of aortic ulceration associated with PAU, early surgical intervention is recommended; however, most

Fig. 1. Preoperative axial (a) and reconstructed three-dimensional (b) computed tomography images showing active extravasation of contrast medium at the infrarenal aorta, extending into the horizontal part of duodenum and the left retroperitoneum. (c) Intraoperative aortography showing a saccular protrusion in the abdominal aorta 1.5 cm below the renal arteries.
patients with PAU are generally not ideal candidates for open surgical repair because of serious co-morbidities. Recently, endovascular grafting has been reported as a less invasive and effective treatment for PAU of the infrarenal aorta [6–8]. Although about 50% of patients are not amenable to endovascular aortic repair because of unfavorable proximal neck anatomy [9, 10], our patient was, on the basis of the length and angulation of a proximal neck, considered to have an aortoiliac morphology amenable to endovascular aortic repair. Indeed, the endovascular stent-grafting allowed adequate coverage of the rupture site and exclusion of the false aneurysm, avoiding the associated complications of invasive open abdominal surgery. Subsequently, we were able to stabilize him hemodynamically with minimal dissection of the access route, and prevent aorta-related event postoperatively.

3. Conclusions

We report here a patient who underwent an endovascular aortic repair for spontaneous rupture of a non-aneurysmal infrarenal aorta. Secondary to our patient’s co-morbidity and anatomical condition, we believe he was a candidate for stent-graft repair. We advocate that endovascular aortic repair might be suitable for high-risk patients with spontaneous infrarenal aortic rupture when their aortoiliac morphology is amenable to stent-grafting.

References