Efficacy of contrast-enhanced ultrasonography in detecting graft rupture sites after abdominal aortic aneurysm repair

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Abstract
Non-anastomotic graft rupture is a rare but critical complication after abdominal aortic aneurysm (AAA) repair. Therefore, identifying the rupture sites is important to perform endovascular stent grafting. A 78-year old man who had undergone Y-grafting for infrarenal AAA before 17 years was referred to our hospital with the complaints of abdominal pain. Computed tomography revealed acute pancreatitis and an enlargement around the grafted abdominal aorta. Contrast-enhanced ultrasonography revealed an extravasation from the graft body 1.5 cm distal to the proximal anastomosis, and endovascular stent grafting was successfully performed. Contrast-enhanced ultrasonography might be useful in detecting the graft rupture.

Keywords: Graft rupture • Contrast-enhanced ultrasonography • Aortic aneurysm • Abdominal • Endovascular procedures

INTRODUCTION
Non-anastomotic graft rupture is a rare complication after artificial graft replacement. However, limited to a Dacron graft, the incidence of graft rupture has been reported to be as frequent as 3% [1]. Recently, endovascular stent grafting has become a surgical alternative to open repair in treating the graft rupture [2]. Because endovascular stent grafting requires a sufficient landing zone to avoid an endoleak, identifying the rupture sites is important. Here, we report a case in which contrast-enhanced ultrasonography clearly revealed the site of graft rupture after Y-grafting for abdominal aortic aneurysm (AAA).

CASE REPORT
A 78-year old man was referred to our hospital with the complaints of acute right lower abdominal pain. The patient had undergone Y-grafting using a knitted Dacron graft (Vascutek Limited, Scotland, UK) for infrarenal AAA before 17 years. Furthermore, he had received total arch replacement for thoracic aortic aneurysm before 9 years and thoracic endovascular aneurysm repair before 6 years. Contrast-enhanced computed tomography (CT) revealed pancreatic gland abnormalities, peripancreatic inflammation and fluid collection (Balthazar grade D), suggesting that the patient suffered from acute pancreatitis. Moreover, the present CT reports revealed an enlargement around the grafted infrarenal abdominal aorta (Fig. 1A; 48 mm in diameter) and an extravasation of contrast medium around the graft (Fig. 1B) compared with the CT obtained a year prior to this case study. From
these findings, a graft rupture was suspected. Abdominal ultrasonography was performed to identify the origin of extravasation. However, power Doppler imaging fused with CT was not able to illustrate the origin of the extravasation. Therefore, we attempted using contrast-enhanced ultrasonography. After an intravenous administration of 0.6 ml of the ultrasound contrast agent Sonazoid (Daiichi Sankyo, Tokyo, Japan), ultrasonography was performed. This contrast-enhanced ultrasonography clearly revealed the origin of the extravasation (Fig. 2 and Supplementary Video 1). The rupture was located at the graft body 1.5 cm distal to the proximal anastomosis. Simultaneously with medical management for acute pancreatitis, we performed endovascular stent grafting for the graft rupture. Under general anaesthesia, Gore Excluder (W.L. Gore & Associates, Inc., AZ, USA) endoprosthesis was implanted to cover the rupture site. His postoperative course was uneventful. Postoperative CT and contrast-enhanced ultrasonography revealed no extravasation around the stented graft.

DISCUSSION

Delayed rupture of a knitted Dacron graft has been previously reported [1]. Kawamura et al. reported a knitted Dacron graft rupture 23 years after the initial surgery [3]. In the present case, the non-anastomotic graft rupture occurred 17 years after Y-grafting for AAA. Therefore, careful life-long follow-up should be necessary in patients with knitted Dacron graft.

Endovascular stent grafting is a good surgical alternative to open repair in treating the graft rupture. However, endovascular stent grafting requires a sufficient length of landing zone to avoid a type I endoleak. Therefore, careful identification of the ruptured site is necessary. Contrast-enhanced CT is one of the most sensitive diagnostic tools in detecting the ruptured sites. However, the diagnosis using this technique may be dependent on the timing of radiation exposure during CT. In the present case, contrast-enhanced CT could detect the extravasation around the graft, but could not
reveal the origin of extravazation. Since ultrasonography may be another sensitive tool to diagnose the rupture sites, power Doppler imaging is the simplest way to detect the rupture sites. However, in the present case, power Doppler imaging could not reveal the rupture site.

Contrast-enhanced ultrasonography is widely used for the diagnosis of intra-abdominal lesions. Sonazoid (Daichi Sankyo) comprises microspheres of perfluorobutane stabilized by a monomolecular membrane of hydrogenated egg phosphatidyl-serine, which is embedded in an amorphous sucrose structure. This contrast agent is mainly used for the detection and characterization of focal liver tumours. In addition, Sonazoid-enhanced ultrasonography is reported to be useful for the detection of intra-abdominal haemorrhage. Manabe et al. [4] reported that the sensitivity and specificity of Sonazoid-enhanced ultrasonography for active gastrointestinal bleeding were 73.7 and 97.1%, respectively. Liu et al. [5] reported that non-contrast-enhanced ultrasonography could not reveal the specific location of the experimentally induced active bleeding in livers, spleens and kidneys. On the other hand, Sonazoid-enhanced ultrasonography could detect the blood flow in normal vessels and extravazated blood from damaged vessels or organs in all cases. In the present case, contrast-enhanced ultrasonography could reveal the origin of extravazation without difficulty, and endovascular stent grafting was successfully performed with a sufficient landing zone. Contrast-enhanced ultrasonography may be useful for the diagnosis of graft rupture after AAA repair.

Conflict of interest: none declared.

REFERENCES