Diagnosis and treatment of abdominal aortic endoleaks using color Doppler US: Two clinical cases

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KEYWORDS

Endoleak;
Color Doppler US;
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Abstract Endovascular treatment of abdominal aortic aneurysm (AAA) involves placement of an endoluminal graft inside the aneurysmal sac in order to exclude it from blood circulation and thereby prevent the risk of aneurysmal sac rupture. A possible complication is endoleak, i.e. persistent blood flow outside the lumen of the endograft into the aneurysmal sac. The protocol for treatment monitoring includes abdominal computed tomography (CT) and color Doppler ultrasound (US). The aim of this case report is to present our experience in two cases of endoleak in which diagnosis and treatment were carried out using color Doppler US.

Sommario Il trattamento endovascolare dell'aneurisma dell'aorta addominale consiste nel posizionamento di una endoprotesi all'interno della sacca aneurismatica con lo scopo di escludere quest'ultima dal flusso, quindi annullare il rischio di rottura. Una possibile complicanza è l'endoleak, vale a dire la persistenza di rifornimento extraprotesico della sacca aneurismatica. Al fine di monitorare il trattamento, i protocolli di sorveglianza prevedono l'esecuzione di TC addome ed eco color Doppler (ECD). Lo scopo del lavoro è di riportare la nostra personale esperienza in due casi di endoleak in cui diagnosi e trattamento sono stati effettuati mediante ECD.

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Introduction

Endovascular therapy of abdominal aortic aneurysm (AAA) is increasingly common. Patients undergoing this treatment require accurate clinical and instrumental monitoring for evaluating the efficacy of the treatment and

identifying possible endoleaks. Gold standard in the follow-up of these patients is still angiographic computed tomography (CT). Various studies have compared the efficacy of CT and color Doppler US concluding that the two methods are equally reliable in evaluating the volume of the sac. However, positive predictive value of color Doppler US is poor in the identification of endoleaks, whereas this method is effective in the assessment of the endoleak type (Table 1) [1,2]. When an endoleak has been identified, and if the volume of the aneurysmal sac is increasing, the patient should undergo endovascular surgery as a first line treatment.

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Table 1 Endoleak classification in the follow-up of patients after endovascular treatment for AAA

Type I A: due to ineffective proximal seal at the infrarenal neck.
I B: due to ineffective distal seal at the iliac artery.
Type II: due to retrograde flow from collateral arterial branches into the aneurysmal sac.
Type III: due to disconnection of the graft components.
Type IV: due to graft fabric defects (rupture of the graft, porosity of the graft fabric).
Endotension: increased volume of the aneurysm sac in the absence of endoleak.

Clinical cases

Two male patients (72 and 79 years old) underwent treatment in our department with insertion of bifurcated aortic

stent-grafts (Vascutek-Anaconda and W.L. Gore-Excluder) for AAA affecting the infrarenal aorta. Abdominal CT follow-up after 3 and 6 months evidenced a persistent blood flow into the aneurysmal sac. In both patients immediate post-treatment angiography showed perfect exclusion of the aneurysm. Contrast enhanced CT evidenced the presence of contrast agent inside the aneurysmal sac but no definite diagnostic about the origin of the endoleak. Both patients therefore underwent color Doppler US which provided a definitive diagnosis regarding the origin.

In patient 1, color Doppler US clearly showed flapping of the distal part of the stent-graft main body which was ineffectively sealed to the iliac graft limb and there was blood flow towards the aneurysmal sac from this area (type III endoleak) (Table 1, Fig. 1).

In patient 2, color Doppler US showed a perfect sealing of the stent-graft on the proximal neck but blood flow into the aneurysmal sac already at the level of the graft bifurcation. Examination of the iliac seals showed that the distal

Fig. 1 Sequence (a and b): transversal B-mode images of the abdominal stent-graft at 1 msec distance, the flapping of the anterior wall of the graft is evident; c: B-mode image with color flow mapping (CFM) which evidences the site of the leakage and flow into the aneurysmal sac.

Fig. 2 B-mode without CFM shows the iliac limb of the stent-graft opening into the aneurysm sac with blood flow into the sac.

part of the left graft limb had withdrawn into the common iliac artery aneurysm resulting in type I distal endoleak (Table 1, Fig. 2)

Both patients underwent endoleak treatment due to a concomitant increase of the aneurysmal sac volume. In the operating room the procedure was performed under combined angiographic and US guidance. Color Doppler US can quite accurately follow the passing of the guidewire and the graft, and it proved essential for positioning the graft at the site of the endoleak and for assessing the final result after treatment. At the release of a new graft connecting the main body of the stent-graft and the iliac limb already present (patient no. 1) and of an extension on the external iliac artery (patient no. 2), color Doppler US showed immediate disappearance of the extragraft blood flow thus indicating complete exclusion of the aneurysm.

Another significant color Doppler US image in B-mode, obtained during the procedure, shows the modification of blood flow into the aneurysmal sac. Before the exclusion there was movement, but after release of the limb the blood flow stopped and there was an initial thrombosis which completed within a few days.

Conclusion

Even though Color Doppler US is not the most reliable examination in the diagnosis of endoleak after endovascular treatment of AAA due to its numerous limitations (obesity, intestinal tympanites), it has proved useful in the classification of endoleak type and in the planning of the correction procedure [1–3]. In patients, whose general condition permits diagnosis of endoleak using Color Doppler US, this method can be used also to monitor endovascular treatment and thereby avoid unnecessary radiation exposure to the patient and use of iodinated contrast agent. However, the patients should be adequately selected and prepared for the use of color Doppler US during endovascular abdominal procedures. So far color Doppler US guided endovascular surgery has been described in peripheral infrainguinal and carotid procedures [4,5].

Conflict of interest

The authors have no conflict of interest.

Ethical approval

Ethical approval for this study was granted by the Medical Research Ethics Committee of our university, and informed consent was obtained from all patients.

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