Short Report

Abdominal Aortic Repair and Inferior Vena Cava Interposition in a Patient with Ruptured Aneurysm

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Introduction

Left-sided inferior vena cava (IVC) has been occasionally reported in aorto-iliac surgery. We report a successful open repair of ruptured abdominal aortic aneurysm (RAAA) in a patient with left-sided IVC.

Case Report

A 52-year-old man presented with a 2-day duration of abdominal pain, severe pain and coldness of the left calf and history of syncope without loss of consciousness. There was a pre-existing moderate claudication for the right leg, untreated arterial hypertension and smoking abuse. Examination revealed pulsatile abdominal mass, palpable bilateral femoral pulses and severe left limb ischaemia without detectable Doppler signals at the ankle. The general condition was relatively stable with 90–100 mmHg systolic blood pressure, moderate tachycardia, anaemia and elevated to 4000 U l⁻¹ creatine phosphokinase levels. Computed tomography (CT) demonstrated 67 mm AAA, with a 3-mm neck and a right-posterior wall rupture with massive retroperitoneal haematoma. The IVC was localised not on the right of the infrarenal aorta, but on its left side, compressed by the aneurysm (Fig. 1). Distal arterial scans revealed occlusions of both superficial femoral arteries (SFAs). RAAA associated with left-sided IVC, acute thrombosis of the left SFA and chronic occlusion of the right one were concluded.

The patient underwent emergent open repair of the RAAA via a midline transperitoneal approach. Temporary control was achieved by compression over the supraceliac aorta because of blood pressure drop after the induction. Expectedly, the access to the perirenal aorta was prevented by the anteriorly crossing atypical IVC, which was severely compressed and stretched by the aneurysm. The dissection and mobilisation of the IVC failed to allow adequate access, and the vein was divided at the level between the influences of the left and the right renal vein, just in front of the aneurysmal neck. This allowed rapid exposure of the aorta, infrarenal clamping and standard repair of the aneurysm with a 20-mm tube graft. Despite the partial resection of the aneurysmal sack and additional mobilisation of the divided IVC, it could not be directly anastomosed without tension. Therefore a short, about 15 mm long, 20 mm in diameter Dacron graft was interposed. Upon abdominal closure, the acute left SFA occlusion was treated with Fogarty thrombectomy from the groin, intra-operative angiography and 8 × 200 mm Nitinol stent placement for the causal stenosis.

After surgery, the patient was anticoagulated with 800 U h⁻¹ intravenous heparin. The postoperative period was uneventful except for the mild reperfusion compartment syndrome of the left limb, resolved without fasciotomy. The patient was discharged on
the tenth postoperative day on oral anticoagulant, with no leg oedema and patent IVC, confirmed by computed tomography (CT) phlebography (Fig. 2). The Doppler sonography 6-month follow-up showed patent reconstructions.

**Discussion**

The IVC is formed from three pairs of primitive veins by a complex embryogenesis during the sixth to tenth week of
gestation. Faults in this process may result in four major anatomic anomalies: duplication of the IVC, transposition or left-sided IVC, retroaortic left renal vein and circumaortic left renal vein, with total incidence of 5.65%. Although not frequent, the venous anomalies can cause serious complications in abdominal aortic surgery. Retroperitoneal venous anomalies are best distinguished by CT or magnetic resonance angiography, but ultrasound and phlebography are of lower value.

Aortic rupture is a life-threatening condition. The best diagnostic modality is CT, providing information about the aneurysm itself, as well as associated conditions and abnormalities, including IVC and renal vein variants. In the era of multislice detectors, the scanning time is short and CT evaluation should be performed routinely unless the patient is very unstable. In our case, the contrast-enhanced CT demonstrated concomitant arterial occlusion and a venous anomaly.

Left-sided IVC in association with infrarenal aortic aneurysm is periodically reported, but few cases with rupture could be found in the literature. The left-sided IVC consists of a vein to the left of the aorta that crosses to the right side, usually anterior to the aorta at the level of the renal arteries. Even if detected preoperatively, this position of the cava presents a barrier for access to the proximal aorta. Careful mobilisation of the left-sided IVC described previously is time consuming and not always possible when the vein is severely compressed and stretched by the aneurysm. The alternatives are division and ligation of the right renal vein, providing additional mobilisation or division of the IVC with subsequent reconstruction. The requirement of rapid clamping and limited ability for venous dissection forced us to transect the IVC at the area crossing the aorta. This manoeuvre offered perfect access to the aneurysmal neck for clamping and repair. The IVC should be afterwards directly reanastomosed, but if technically difficult, short graft interposition is a good option. Since the prosthetic graft in the venous circulation is highly thrombogenic, therapeutic lifelong anticoagulation is advisable. The use of a distal arteriovenous fistula to improve graft patency is controversial. It is generally accepted that distal arteriovenous fistula for grafts in suprarenal position or in infrarenal one with good inflow is not required. We did not add a distal arteriovenous fistula because the graft was very short and was interposed proximally to the left renal vein, receiving sufficient additional flow from the left kidney.

Endovascular aneurysm repair (EVAR) for RAAA has shown lower early postoperative mortality rates in suitable anatomies. In our case, it was not appropriate for the short aneurysmal neck.

**Conclusion**

Left-sided IVC is rarely detected in patients with ruptured AAA. Good preoperative imaging assessment is important in identifying this and other venous anomalies, thus preventing unexpected venous trauma and haemorrhage during surgery. If the access to the aneurysmal neck is technically difficult, the aberrant IVC can be divided as a final option. Direct venous repair or grafting, if needed, can be performed afterwards with good result.

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**References**