Double vena cava filter insertion in congenital duplicated inferior vena cava: a case report and literature review

The complex embryogenesis of the inferior vena cava (IVC) may result in several anomalies, often presenting as an incidental radiological finding. In addition to the differential diagnosis with pathological lesions, recognizing IVC defects is crucial for invasive procedures. This report describes a patient with a right femoral vein thrombosis who could not be given anticoagulant therapy due to a concomitant acute cerebral hemorrhage. He was found to have an asymptomatic duplicated IVC with interiliac communication. A filter had to be inserted in each vena cava to prevent pulmonary embolism. A review of the literature dealing with the few reported cases of filter insertion in congenital duplicated IVC is presented.

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Congenital anomalies of the inferior vena cava (IVC) and its tributaries originate from a defective embryogenesis of three paired embryonic veins and occur in about 3% of population. They can be identified by iv. contrast-enhanced radiological exams or magnetic resonance imaging, and have been encountered more frequently since the introduction of cross-sectional imaging.[1] Ultrasound might also have a diagnostic role. In most cases, the congenital anomaly is an incidental finding in asymptomatic patients, but in rare instances, the IVC anomaly is associated with congenital cardiac disorders, as described in a patient with polysplenia and dextrocardia, or with right renal aplasia/hypoplasia.[2] A few anomalies may be symptomatic, as observed in the *retrocaval ureter* variant, causing ureteral obstruction and/or urinary infections, and in the *absent infrarenal inferior vena cava* abnormality, which predisposes patients to recurrent venous thrombosis of the lower limbs.[3]

A radiological diagnosis of IVC anomalies is needed before attempting any invasive procedures. We describe a case of congenital duplicated IVC requiring the insertion of two vena cava filters to prevent pulmonary embolism. A review of the literature dealing with the rare cases of filter insertion in congenital duplicated IVC is also provided.

Case report

In October 2005, an 81-year-old male was admitted for acute-onset right hemiplegia and motor aphasia due to a left nucleocapsular hemorrhage confirmed by cerebral CT scan. The patient suffered from arterial hypertension and diabetes mellitus; he was not taking antiplatelet or anticoagulant drugs prior to admission. Vascular malformations, aneurysms, malignant lesions, and coagulation disorders were ruled out. Neurosurgical hematoma drainage was unnecessary because his neurological conditions were stable. Despite antithrombotic prophylaxis with elastic stockings, the patient developed a deep vein thrombosis involving the right common femoral vein, confirmed by compression ultrasound, 10 days after admission. A perfusion lung scan was compatible with a low to moderate probability of pulmonary embolism, prompting the decision to insert a vena cava filter since anticoagulant medication was contraindicated.

Under fluoroscopic guidance, a vena cava filter (VenaTech LP, B.Braun Medical S.A.S., France) was inserted percutaneously via the left femoral vein in the contrast-enhanced IVC just caudally to the renal vein inflow. During the procedure, the iv. contrast agent showed a rightward-directed anastomotic vein mimicking the right iliac vein, that was in fact an interiliac vein originating from the left IVC bifurcation and anastomosed distally to a true right external iliac vein, which continued with a right-sided IVC and caudally with the thrombosed right femoral vein (Figure 1A). The left IVC joined the opposite IVC in the suprarenal tract. A congenital double IVC anomaly was diagnosed. To prevent pulmonary embolism, a second filter was placed in the right-sided IVC caudally to the right renal vein inflow via the right iliofemoral vein, punctured under ultrasound guidance (Figure 1B). The procedure was uneventful, and no thromboembolic complications occurred during the hos-

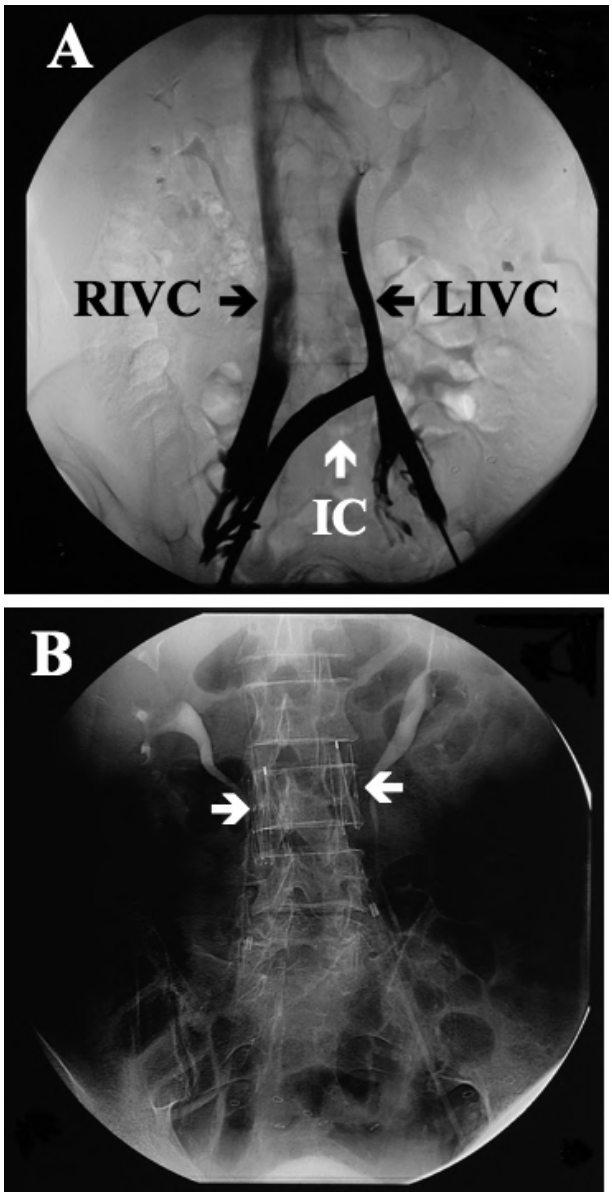

Figure 1. Congenital double inferior vena cava and dual filter placement. (A): Venography showing the congenital double inferior vena cava (IVC) with an infrarenal interiliac communication (RIVC= right IVC; LIVC = left IVC; IC = interiliac communication). (B): Direct abdominal X-ray showing two VenaTech filters placed in the duplicated IVC (arrows).

pital stay. Prophylactic low-dose sc. nadroparin (3800 anti-Xa IU/day) was administered as soon as the cerebral CT scan showed a stable recovery from the hemorrhage.

Discussion

The reported prevalence of double IVC is about 0.2-0.3%4. The left IVC usually ends at the left renal vein, which crosses anterior to the aorta to join the right IVC1. The presence of (recurrent) pulmonary embolism after IVC filter placement should arouse the clinical suspicion of a double IVC. Approved indications for inserting a filter are recurrent pulmonary embolism despite suitable anticoagulant therapy, major bleeding episodes while on anticoagulants, and in cases where such treatment is contraindicated - as in our case, due to concomitant cerebral hemorrhage. Since our patient's IVC anomaly was not known, it made sense to choose the percutaneous approach via the left femoral vein, unaffected by the thrombosis. The double IVC with infrarenal communication was an incidental finding and only became clearly evident after the first filter had been inserted in the left IVC, making it necessary to insert a second filter in the right IVC to prevent pulmonary embolism. If the IVC anomaly had been identified beforehand, a single suprarenal filter in the common IVC might have been chosen instead.

There are few reports on filter placement in patients with venous thrombosis and congenital IVC anomalies, especially duplicated IVC. The complex anatomy of the defect, the frequent difference in size of the two IVC, and the extension of the thrombus are crucial issues affecting the choice of procedure, and the optimal position for inserting an IVC filter has yet to be established. Via the right jugular vein, a single filter was placed infrarenally and just cranially to the right IVC thrombus in a patient with no infrarenal communication between the two IVC.[5] In two other cases, a single filter was successfully inserted suprarenally in the common IVC5,[6]. Dual filter placement in duplicated IVC has only been described in two instances, one involving the transjugular insertion of a Greenfield filter in each IVC in a patient with a left iliofemoral thrombosis,[7] and the other involving a bilateral bird's nest filter placed in a patient with pulmonary embolism who also had an azygos continuation of the right vena cava and a hemiazygos continuation of the left vena cava8. Our report describes the third case.

Other procedures for preventing pulmonary embolism have been used in patients with IVC anomalies, such as a steel coil embolization of a small left IVC combined with a filter inserted in the right IVC in a patient with duplicated IVC9, and a bird's nest filter placed in an enlarged hemiazygos vein combined with a Greenfield filter in the IVC of a patient with right femoral vein thrombosis.[10]

Venography currently appears to be the best way to study IVC anomalies, especially before surgery or invasive procedures. It has recently been noted that both CT and MR imaging occasionally lead to a misdiagnosis, since venous defects might be mistakenly taken for lymph node enlargements or other pathological masses in the retroperitoneum and mediastinum.[1,11] As cross-sectional imaging is commonly used by clinicians, CT and MR should be performed and interpreted with care to detect congenital IVC abnormalities. There may be a role for MR-venography as a supplementary diagnostic technique in doubtful cases.

Bedside intravascular ultrasound has recently been proposed to guide the insertion of IVC filters.[12] This procedure seems to be a promising alternative for selected cases, e.g. critically-ill patients who cannot be moved, or cases where contrast agents are contraindicated. Though simple and safe, the high costs and risk of missing venous anomalies are still major concerns regarding the routine use of this technique.

In conclusion, the recognition of congenital IVC anomalies has major clinical implications. In addition to preventing an erroneous diagnosis, it is of crucial relevance to the choice of the right approach during surgery or other invasive procedures.

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