# Radiological evidence of double inferior vena cava in a young adult male

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## ABSTRACT

The development of the inferior vena cava (IVC) is a complex process comprising the formation and regression of some anastomoses, so various anomalies may occur during embryogenesis. These variations can increase the difficulty of aneurysm resection as well as the risk of venous injury and subsequent excessive bleeding during retroperitoneal and thoracic surgical interventions. Here, we report a patient with double inferior vena cava by radiographically during his investigation for the etiology of pancytopenia.

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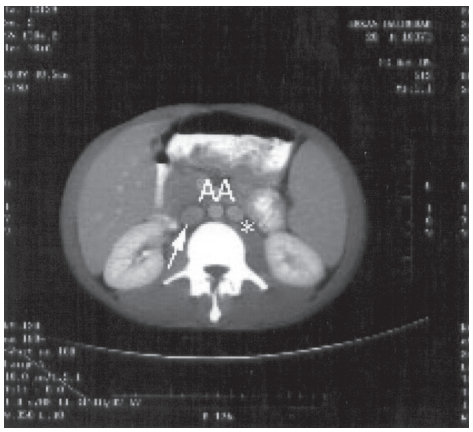
A double inferior vena cava (DIVC) is a congenital anomaly that commonly results from persistence of the embryonal venous system, and occurs in 1-3% of the population.[1] The venous system begins its development in the earliest stages of intrauterine life.[1] Inferior vena cava (IVC) develops in a complex process beginning from the fourth week of conception through the embryonic period and ends at approximately on the eighth week. The aberrant development of these venous systems causes anomalies of the IVC system.[2,3] Many patient of DIVC have been diagnosed by angiography, ultrasonography or CT scanning in the clinic.[3-9] A DIVC occurs when the left sacrocardinal vein fails to lose its connection with the left subcardinal vein.[10] The infrarenal portion of the IVC is formed by the persistence of the right supracardinal vein and the renal veins are formed by the anastomosis between the subcardinal and the supracardinal veins.[3] Double inferior vena cava arises from the persistence of both supracardinal veins in the subrenal tract. At the level of the renal hila, the 2 vessels join to form a single right inferior vena cava.1 Many case reports of DIVC also suggest that the bilateral supracardinal veins tend to asymmetrically anastomoses with the subcardinal sinus during embryogenesis.[5] Here, we report a patient with DIVC diagnosed by radiographically and review the literature briefly.

**Case Report.** A 20-year-old male patient being complaint of headache and diarrhea was accepted to our clinic with pancytopenia (hemoglobin: 10.9 g/dL; white blood cells: 3.52 x $10^9$ L-1; platelet: 72.3 x $10^9$ L-1). He had no symptom related to DIVC. In his examination, we determined hepatosplenomegaly and portal hypertension. We found bilateral paraaortic IVC (double inferior vena cava) in the spiral CT (**Figure 1a & 1b**). Both of the IVC ran upwards bilaterally, lateral to the abdominal aorta as far as the level of the renal vein. At the level of the left renal vein, the left IVC joined to form a common trunk with the left renal vein and crossed the midline. With the entrance of the right IVC to this common trunk, the IVC ran upwards as a single vein to the right atrium, and left the abdomen was in its normal anatomical position. In the intravenous digital substraction angiography (IV DSA) of IVC, we observed DIVC in the abdominal region. The present IVC was united in the level of the T11, and drained into right atrium as single IVC. The right IVC was found slightly larger than the left (**Figure 2**).

**Discussion.** Some reports related to anomalies of the IVC exist in the medical literature. Minniti et al,[1] reported 3 new variants of the vena cava: a right DIVC with azygos continuation of the posterior-medial vein; an agenesis of the superior vena cava with drainage through the azygos and hemiazygos veins to the IVC; and a DIVC with hemiazygos and azygos continuation of the left one.[1] Mano et al[4] reported a case of deep venous thrombosis (DVT) accompanied by a DIVC.Itoh



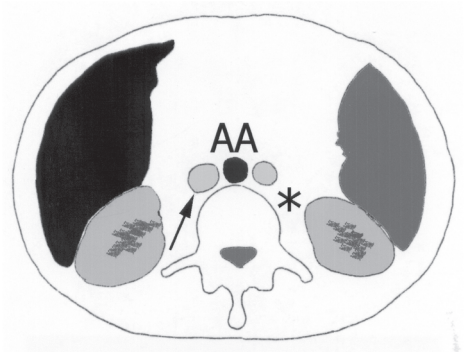




**Figure 1 -** **a)** A computed tomography (CT) scan shows a double inferior vena cava (DIVC). arrow - right inferior vena cava, asterisk - left inferior vena cava, AA - abdominal aorta. **b)** Schematic illustrated CT scan shows a double inferior vena cava . Arrow - right inferior vena cava, asterisk - left inferior vena cava, AA - abdominal aorta.

et al[5] reported a DIVC, with the left suprarenal vein draining into the left vena cava and the right testicular vein drained into the right renal vein. A patient of DIVC impeding surgery of the abdominal aorta presented. The patient also had duplication of the kidney and ureter on both sides.[6] In our case, we found DIVC without any additional anomaly contrary to other authors' reports. So, there was no complained related to the DIVC. In recent years, radiological diagnosis of congenital anomalies of the IVC were increased in importance in planning any abdominal surgery, liver or kidney transplantation.[8] It is important to confirm the presence of DIVC, because patients undergoing certain surgical procedures would be of greater risk for injury to the IVC as well as other complications.[9] In the past, the radiologic assessment of these rare anomalies performed only with angiography. Today, besides angiography, less invasive examinations can be performed, such as ultrasound (US), computed

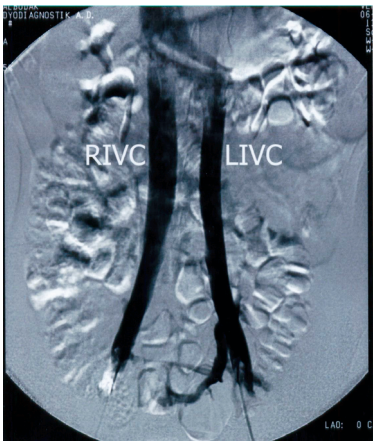



**Figure 2 -** Venography shows a double inferior vena cava. RIVC - right inferior vena cava, LIVC - left inferior vena cava.

tomography (CT) and magnetic resonance imaging (MRI), with magnetic resonance angiography (MRA).[8] Ultrasound can suspect the diagnosis but may have limited role in the assessment of the whole IVC.[8] Enhanced CT is a good diagnostic modality to demonstrate such a vascular anomaly, however it is used with contrast agents and ionizing radiation. Davis et al,[9] described the appearance of DIVC by radionuclide angiography, CT, and digital angiography. We used spiral CT and IV DSA at the diagnosis of DIVC in our case. The congenital anomalies of systemic veins are asymptomatic. Such an anomaly should be recognized prior to abdominal surgery.[1] Anatomical variations of this main venous trunk are relatively infrequent during surgery or diagnostic procedures in patients without symptoms such as an aberrant venous drainage or abdominal pain.[2] Unexpected finding of this anomaly during retroperitoneal surgery may complicate the surgical procedure. Therefore, the diagnosis of DIVC is important for a clinician in order to avoid major surgical complications, to reduce the risk of severe hemorrhage from the left IVC during surgery. We can consider that DIVC in the present case is mainly caused by disappearance of the right supracardinal vein and persistence of the left one during the embryological development of the IVC.

In conclusion, although venous anomalies are rare, they have particular importance for the various interventions that may take place during retroperitoneal and thoracic surgeries or in the treatment of thromboembolic disease.

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