

## Imaging Diagnosis of a Left-Sided Inferior Vena Cava: A Rare Anatomical Variant

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### Abstract

### Case Report

**Background:** The inferior vena cava (IVC) develops through a complex embryologic process, and variations may result in rare venous anomalies. Among them, a persistent left inferior vena cava is an uncommon finding, often detected incidentally on imaging. Although usually asymptomatic, its recognition is crucial to prevent diagnostic confusion and avoid complications during surgical or interventional procedures. In our case, a left-sided inferior vena cava was incidentally discovered in a patient during the work-up for recurrent deep vein thrombosis.

**Keywords:** Left sided inferior vena cava, CT scan, anatomical variant, embryology, vascular anomalies.

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## INTRODUCTION

A left-sided inferior vena cava represents an uncommon congenital venous variant, reported in approximately 0.2% to 0.5% of the population [1,2]. This anomaly results from the persistence of the left supracardinal vein rather than the right one during embryologic development [1].

## CASE PRESENTATION

We report the case of a 41-year-old male, chronic smoker, who underwent an etiological assessment for recurrent deep vein thrombosis involving the lower extremities.

He was referred to our radiology department for a thoraco-abdominopelvic CT scan as part of the etiological assessment of his deep vein thrombosis.

Imaging revealed a left-sided inferior vena cava crossing anterior to the aorta at the level of the L1 vertebral body and joining the normal suprarenal course (**figure 1**), with the presence of a short right renal vein.

A connection between the inferior vena cava and the azygos and hemiazygos veins was also observed (**figure 2**), along with a prominent tortuous collateral circulation around the spleen, stomach (**figure 3**), and posterior paravertebral region.

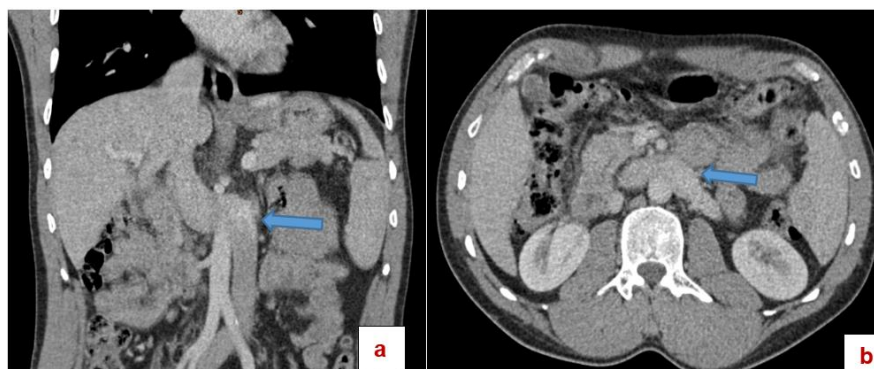
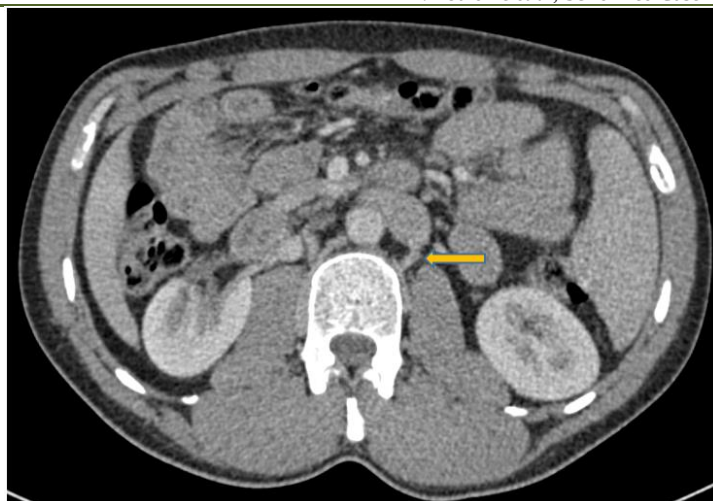
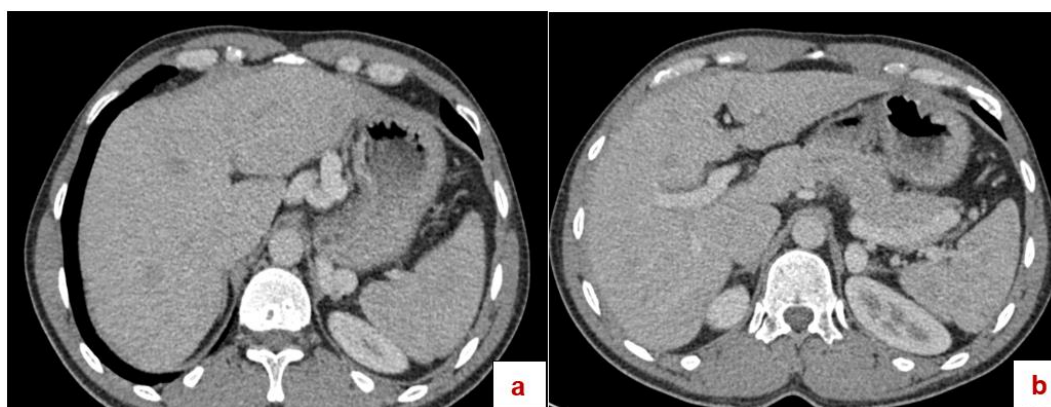


Figure 1: Contrast-enhanced abdominal CT in the venous phase, with coronal (a) and axial (b) reconstructions, showing a left-sided inferior vena cava (arrow) crossing anterior to the aorta at the level of the L1 vertebral body and joining its subhepatic course



**Figure 2:** Contrast-enhanced abdominal CT in the venous phase, axial view, demonstrating a communication between the inferior vena cava and the hemiazygos vein (arrow)



**Figure 3:** Contrast-enhanced abdominal CT in the venous phase, axial view, showing tortuous perigastric (a) and perisplenic collateral circulation with splenic vein dilatation (b)

## DISCUSSION

The inferior vena cava (IVC) is a major retroperitoneal vessel that returns venous blood from the lower extremities, pelvis, and abdominal viscera to the heart. It ascends on the right side of the vertebral column, posterior to the duodenum, portal vein, and liver [3].

The inferior vena cava (IVC) is anatomically divided into four segments, each originating from paired embryologic veins: the infrarenal segment from the right supracardinal vein, the renal segment from the right sub-supracardinal anastomoses, the suprarenal segment from the right subcardinal vein, and the hepatic segment from the right vitelline vein [4].

Anomalies of the inferior vena cava (IVC) are uncommon. Among these, a left-sided IVC represents the second most frequent variant [5], observed in approximately 0.2–0.5% of individuals. During early embryogenesis, the venous systems of the right and left sides of the body develop separately [6].

Under normal circumstances, regression of the left supracardinal vein and the intersacrocaval connections redirects venous return from the left lower

limb to the right, leading to the formation of the typical inferior vena cava. Any interruption or alteration in this intricate developmental process may give rise to positional anomalies, including a persistent left inferior vena cava [6].

A left-sided inferior vena cava is usually asymptomatic and is most often discovered incidentally on CT imaging performed prior to abdominal surgery [1,2]. Although this variant is asymptomatic, it may occasionally be associated with venous insufficiency, deep vein thrombosis, or pelvic congestion syndrome [3]. In our case, a thromboembolic event was the first clinical manifestation of this venous anomaly.

The predominant pathophysiological mechanism of deep vein thrombosis in individuals with an inferior vena cava anomaly is insufficient venous return, even in the presence of prominent collateral circulation [7].

Preoperative recognition of this anomaly on imaging is essential to prevent potential complications or errors during surgical or interventional procedures involving the IVC [3,5].

Computed tomography (CT) is the imaging modality of choice for detecting vascular variations, demonstrating sensitivities and specificities of 91.6% and 98.2% for arterial anomalies, and 96.7% and 90% for venous anomalies, respectively [8].

In our patient, as in the majority of reported cases, the left inferior vena cava coursed anterior to the abdominal aorta at the level of the left renal vein, merging to form the typical suprarenal segment of the inferior vena cava.

However, certain imaging pitfalls such as apparent left ureteral dilatation or para-aortic lymphadenopathy may lead to misinterpretation, particularly by inexperienced observers who might overlook a left-sided inferior vena cava [8].

## CONCLUSION

In conclusion, awareness of venous anomalies such as a persistent left inferior vena cava is essential for accurate image interpretation and procedural planning. Careful recognition of this rare variant can prevent diagnostic errors and contribute to safer patient care.

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