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Case Report

Duplication of IVC Diagnosed on Multi Detector Computed Tomography - A Case Report

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ABSTRACT

Many conditions of inferior vena cava have been noted in individuals irrespective of gender without any predilection to specific age group. However, abdominal IVC anomalies are conditions with an atypical relation with recurrent thromboembolism resulting in unusual presentation. As formation of IVC is a complex process, various anomalies occurring during embryogenesis make it essential to diagnose anatomical vascular deviations to reduce the risk of potential venous injury and haemorrhage during retroperitoneal surgeries.

Keywords: Vena Cava, Inferior, Thromboembolism, Venous Thrombosis, Pulmonary Embolism, Anatomic Variation.

INTRODUCTION

Inferior vena cava (IVC) is one of the major venous channels returning blood from the abdominal-pelvic organs and lower extremities to the right atrium of heart.

Formed from the unification of bilateral common iliac veins at L5 vertebral level, the IVC progresses cranially on the right side of midline through the central tendon of diaphragm to reach right atrium of the heart. Various variants with congenital anomalies have been noticed involving the IVC because of complex embryological formation of this vessel. [1,2]

CASE REPORT

A 40 year old male presented with abdominal distension and accelerated hypertension. On Laboratory investigations, his liver function tests were deranged indicating liver parenchymal disease. In view of hypertension, CT renal angiography was performed. Both renal arteries with their extrarenal branches showed normal origin, course, calibre and patency. A variation of right inferior phrenic artery originating from proximal right main renal artery was also noted (Figure 2). Rest of the visualized abdominal aorta, coeliac and mesenteric arteries was unremarkable. Venous phase revealed duplication of infrarenal inferior vena cava (Figure 3). The duplicated left sided IVC was seen draining the left common iliac and left renal veins (Figure 1, 4), and was further seen joining its counterpart in the suprarenal infrahepatic segment, thus, forming a single retrohepatic IVC. Similarly, the right sided IVC was seen draining the right common iliac and right renal veins (Figure 1, 4). Rest of the visualized hepatic, portal and mesenteric veins were unremarkable.

Incidentally noted, marked hepatosplenomegaly, moderate ascites and divarication of recti (Figure 5).

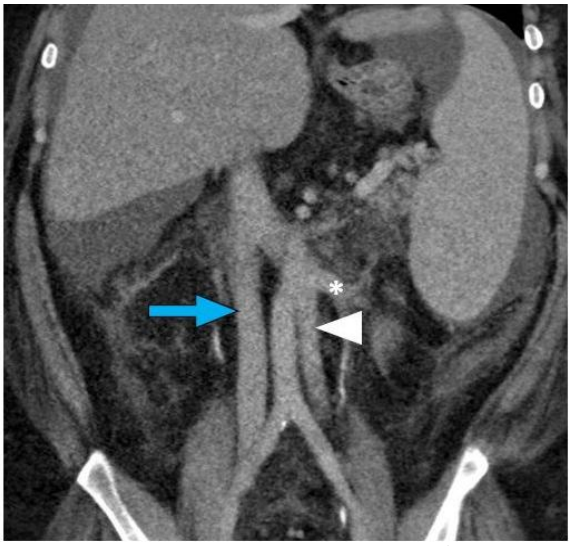

Figure 1: Coronal venous phase showing left sided IVC (arrowhead) draining in left renal vein (asterisk), which is ultimately draining into right sided IVC (solid arrow).

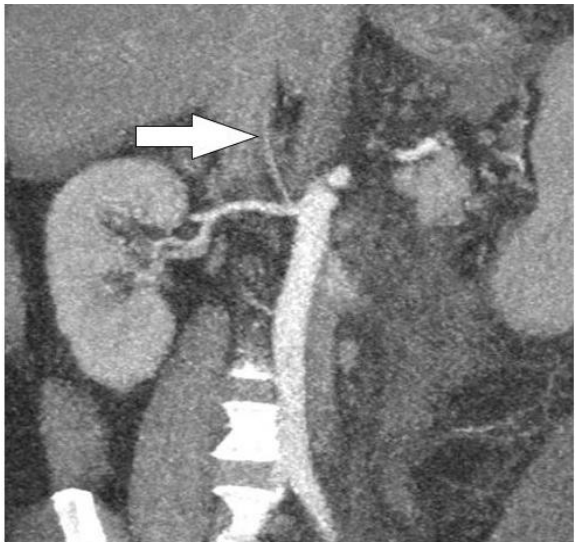

Figure 2: Coronal angiographic image showing right sided inferior phrenic artery (solid arrow) arising from right main renal artery.

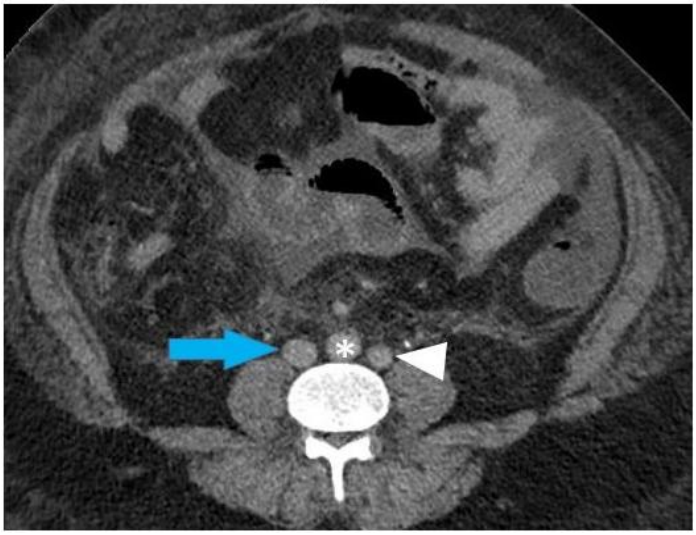

Figure 3: Axial venous phase showing right sided IVC (solid arrow) and left sided IVC (arrowhead) on either side of abdominal aorta (asterisk).

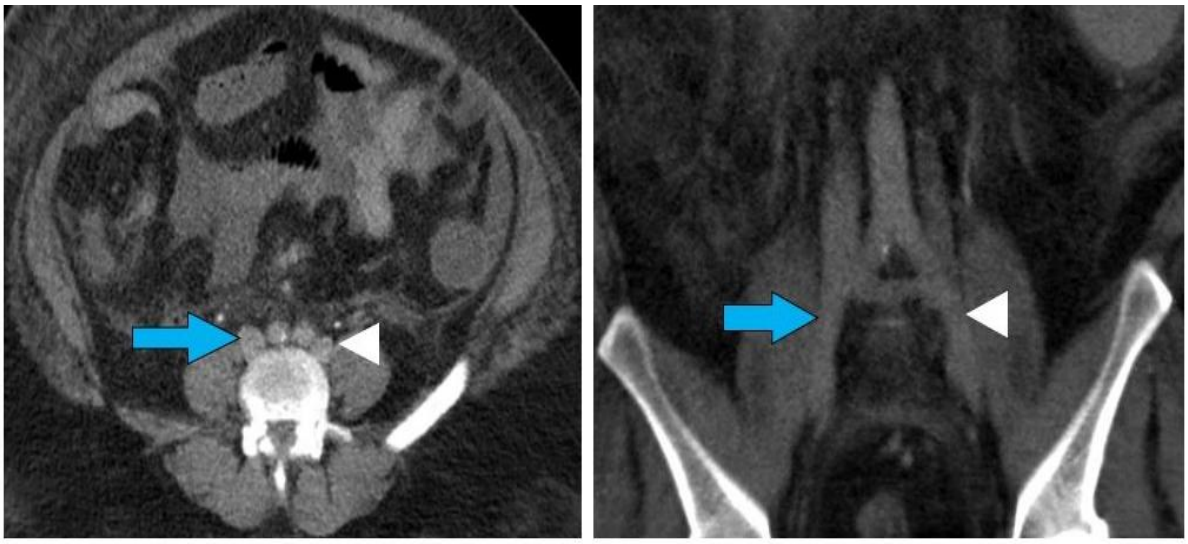

Figure 4: Axial and coronal venous phase showing right sided common iliac vein (solid arrow) draining into right sided IVC and left sided common iliac vein (arrowhead) draining into left sided IVC.

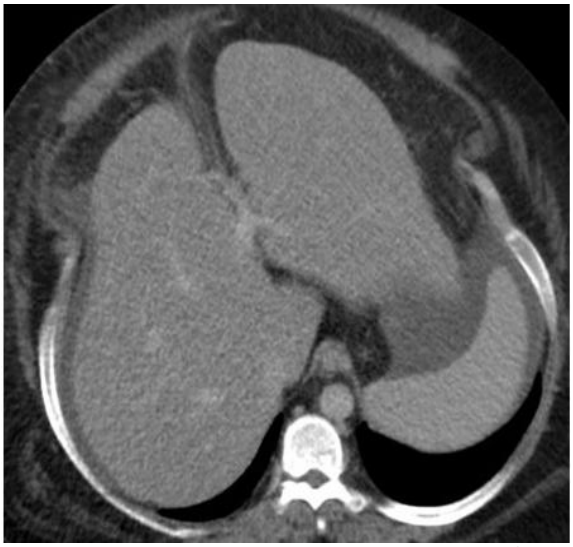

Figure 5: Axial venous phase showing divarication of recti with resultant out pouching of peritoneal contents causing contoural bulge on the overlying anterior abdominal wall.

DISCUSSION

Embryology: IVC consists of 4 segments, namely, hepatic, suprarenal, renal and infrarenal. Hepatic segment is formed from the vitelline vein. Suprarenal segment is formed by the right subcardinal vein along with a subcardinal-hepatic anastomosis. Renal segment is formed from right suprasubcardinal - postsubcardinal anastomosis. Infrarenal segment is formed from right supracardinal vein. [1]

Inferior to the kidneys, there is regression of left supracardinal vein and the persistent right supracardinal vein forms the normal right sided IVC. [3] Anatomic variations of IVC are found in 0.4 to 4 % of the population. [4]

Various anomalies of the IVC are duplication, transposition, absent hepatic segment of the IVC, azygous continuation of IVC, absent infrarenal segment with preserved suprarenal segment, duplication of IVC with normal drainage of right IVC and hemiazygos continuation of left IVC, double superior vena cava with double inferior vena cava. [3] Duplication of IVC shows a prevalence of 1- 3 %. Usually, left IVC terminates into the left renal vein, which further drains into right IVC. [5]

Anomalies associated with double IVC are congenitally absent right kidney, renal ectopia with abdominal aortic aneurysm, right retrocaval ureter, congenital heart diseases (ostium primum and ostium secundum defects), transcaval ureter, left retrocaval ureter and congenitally absent iliac anastomosis. [3]

Other associated anomalies are circumaortic renal vein also known as venous collar, retroaortic left renal vein, cloacal exstrophy and horseshoe kidney. [6]

Patients may remain asymptomatic or may present with lower limb venous thrombosis. Other presentation may be of lower limb varicosities due to inappropriate venous return and resultant blood stasis. Patients may also present with low backache in lumbar region due to underlying dilated lumbar veins. In rare cases of compression of the retroaortic renal vein, patients may present with haematuria. [7]

These patients undergo venous color Doppler for evaluation of lower limb venous system. Ultrasonography is used to assess iliofemoral veins and IVC. [8] However, visualization of entire IVC is difficult with USG because of artifact from overlying bowel gas and patient's body habitus. [9]

Hence, multi-detector computed tomography (MDCT) is the preferred modality for imaging entire IVC and offers several advantages like multiplanar reconstruction, non-invasive nature, 3 dimensional volume rendering, rapid image acquisition, post imaging processing with high spatial resolution, thereby making it an observer independent imaging modality. [8]

IVC imaging pitfalls consist of volume averaging artifact (termed as pseudolipoma) and admixture artifact. The former being due to prominence of pericaval fat superior to caudate lobe in cirrhotic patients, while the latter being due to mixture of contrast enhanced blood from the kidneys with non-enhanced blood from lower limbs or due to retrograde flow of contrast into IVC in cases of right heart failure. [9]

It is important to recognize these vascular variations to prevent or reduce the

risk of venous haemorrhage during retroperitoneal surgeries, organ transplant procedures like radical nephrectomy, sympathectomy, or procedures involving ureters. [10]

Treatment options consist of surveillance for asymptomatic patients, anticoagulation therapy, and placement of IVC filter inferior to the level of the renal veins in both the left duplicated IVC and the main right IVC or insertion of a single suprarenal filter in the main IVC with simultaneous embolization of anomalous vein. [11]

CONCLUSION

Although congenital anomalies of IVC are uncommon, it is important to recognize these entities in planning of different interventions as well as surgeries involving retroperitoneal space and in cases of deep vein thrombosis presenting with recurrent pulmonary embolism.

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