Case Report

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Radiology Section

Rare Anatomical Variation of Dual IVC with Left Sided IVC Draining into Hemiazygous Vein- A Case Report

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ABSTRACT

Congenital anomalies of the Inferior Vena Cava (IVC) result from the persistence of the embryonic venous system. Knowledge of such anomaly is of great importance during abdominal surgery, liver and kidney transplantation, renal venous sampling and in the treatment of thromboembolic diseases. Here, we report a rare anatomical variation of dual IVC with normal course of right sided IVC and hemiazygous continuation of left sided IVC with interiliac communication in potential renal donor. Congenital abnormalities of the inferior vena cava are easily identified on Computed Tomography (CT) and should be considered when interpreting any CT of the abdomen or chest.

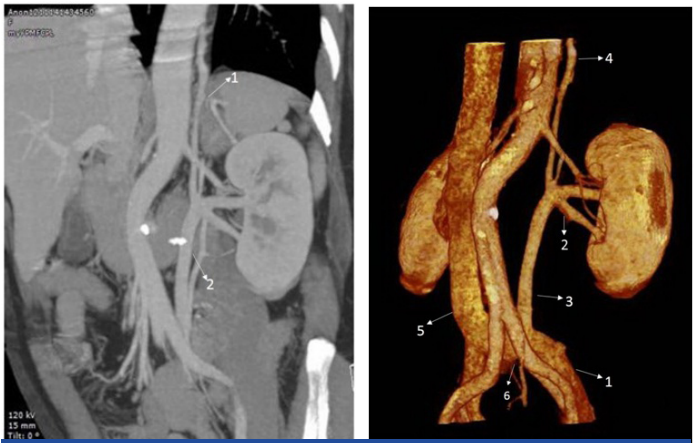
Keywords: Congenital IVC anomalies, CT angiography, Interiliac communication

CASE REPORT

A 61-year-old healthy female; a potential renal donor subjected to pre-operative Computed Tomography (CT) renal angiography. CT renal angiography was done on Somatom sensation 64 slice CT scan from Siemens using 70 ml of non-ionic contrast Iomeron 350 mg/dl. Dual inferior vena cava (IVC) was found incidentally. Right sided IVC was formed by union of two common iliac veins at the level of 4th lumbar vertebra; about 1 centimetre below the bifurcation of abdominal aorta. It continued cephalad to the right side of abdominal aorta and followed its normal course to right atrium. Left sided IVC started at level of the 4th lumbar vertebra and drained left common iliac vein. It continued cephalad to the left side of abdominal aorta and emptied into hemiazygous vein. Left renal vein drained into left sided IVC. Left sided common iliac vein also drained to right sided IVC via interiliac communication [Table/Fig-1,2]. There was no evidence of any other congenital anomaly on imaging. Echocardiography was normal. Laparoscopic left nephrectomy was performed and that remained uneventful.

DISCUSSION

Congenital anomalies of the inferior vena cava (IVC) result from the persistence of the embryonic venous system and occur in 0.3% of otherwise healthy individuals and in 0.6-2% of patients with other cardiovascular defects [1]. But this information could be underestimated, since such anomalies are usually asymptomatic and casually discovered in imaging examinations or abdominal surgery. Knowledge of such anomaly is of great importance during liver and kidney transplantation, renal venous sampling and in the treatment of thromboembolic diseases. Classification of such IVC anomaly was proposed by Huntington and McLure [2] based on developmental study on abnormal regression or persistence of various embryonic veins. Dual IVC is the most common variant of IVC anomaly. It results from persistence of both supracardinal veins. The incidence of the duplicated IVC accounted for 0.2-3% in general population [2]. In most cases of a duplicated IVC, the right and left common iliac veins drain into the right and left IVC respectively, and the left IVC ends at the level of the left renal vein, subsequently draining into the right IVC. There could be variation in this arrangement. The prevalence of Interruption of IVC with azygous or hemiazygous continuation is 0.6% [3]. A case of left sided IVC with retro aortic right renal vein and hemiazygous continuation of left IVC has also been reported [4].



[Table/Fig-1]: Coronal MIP image of CT renal angiography in venous phase shows hemiazygous continuation (arrow 1) of left sided IVC (arrow 2). **[Table/Fig-2]:** Volume rendered image of CT angiography in venous phase showing left common iliac vein (arrow 1), left renal vein (arrow 2) and hemiazygous continuation (arrow 4) of left sided IVC (arrow 3). Normal anatomical course of right sided IVC (arrow 5) with interiliac communication (arrow 6).

Here we report a case of double IVC with hemiazygous continuation of the left sided IVC and normal course of right sided IVC in potential renal donor during preoperative CT angiography. This anomaly can result from developmental persistence of the dorsal limb of the renal collar and failure to form the subcardinal-hepatic anastomosis [5]. To our knowledge, only one case of such anomaly reported in literature [6]. So the rarity of this anomaly justifies reporting of the case. In the case of a double IVC, this anomaly was further classified according to the pattern of interiliac communicating veins. An interiliac communicating vein is a vein that receives blood from the one sided common, internal and external iliac veins, and drain into the contralateral IVC [7]. Failure to recognise this anomaly may lead to unexpected haemorrhage during orthopaedic procedures like anterior lumbar interbody fusion [8]. Here we found double IVC with interiliac communication from left common iliac vein. In case of dual IVC, the size of both the vessels is variable and attempts have been made to classify such duplications as being of equal size or, left or right side dominant [9]. Size of vessels may be affected by the amount or rate of blood flow. In our case right sided IVC was of larger calibre as it also supplied partly by contralateral common iliac vein. Cases are reported where radiographic duplication of the IVC confused with saccular aortic aneurysms, aorto-lumbar

lymphadenopathy, left pyeloureteric dilatation, retroperitoneal cysts, and loops of small bowel [10]. However, with development of Multidetector Computed Tomography and magnetic resonance imaging volumetric technique demonstration of IVC anomalies became easier. Taoufix et al., has reported a case of double IVC mimicking lymphadenopathy on ultrasound; which subsequently diagnosed as case of double IVC on CT [11]. However, it is not uncommon that such finding not being described in radiology report. The presence of a duplicated IVC may complicate retroperitoneal surgery as it can be misidentified as a lumbar vein or a variant of the internal spermatic vein [12].

A clear picture of retroperitoneal vascular anatomy is required especially with laparoscopic and robotic surgeries as the field of view may be narrow and it may be difficult to appreciate aberrant venous anatomy. Safe ligation of left renal vein in case of left nephrectomy with double IVC demands careful surgical approach with medial dissection to the level of aorta or left limb of double IVC [13]. So, it is crucial to identify and report such congenital variations preoperatively to avoid iatrogenic injury or inadvertent ligation. Failure to diagnose them may lead to disastrous consequences. Our surgeon also found that the preoperative CT scan could assist surgical planning to reduce complication of the surgery.

Hemiazygous continuation of IVC leads to its dilatation which may mimics mediastinal or paracardiac mass on chest radiograph. Accidental ligation of hemiazygous continuation of a left IVC during thoracic surgery may occur. In selective renal vein sampling, presence of double IVC will dilute the left renal vein sample because of the blood flow carried by the left IVC. So clinician must be aware of this condition. There were a few case reports of thromboembolic disease in patients with a duplicated IVC [14]. In patients with deep vein thrombosis requiring caval interruption, it is important to identify such variations as an IVC filter needs to be inserted into both IVC to prevent recurrent pulmonary embolism. Whether dual IVC predispose to thromboembolism due to venous stasis is unclear.

CONCLUSION

Congenital abnormalities of the inferior vena cava are rare but potentially important to the radiologist, the surgeon, clinician and the patient. Dual IVC with normal course of right sided IVC and hemiazygous continuation of left sided IVC with interlilac communication is rare. They are easily identified on CT and should be considered when interpreting any CT of the abdomen or chest.

REFERENCES

[1] Phillips E: Venography of the inferior vena cava and its branches. Edited by Ferris EJ, Hipona FA, Kahn PC, Phillips E, Shapiro JH. Williams & Wilkins; 1969:1-32.
[2] Huntington GS, McLure CFW. The development of the veins in the domestic cat (felisdomestica) with especial reference, 1) to the share taken by the supracardinal vein in the development of the postcava and azygous vein and 2) to the interpretation of the variant conditions of the postcava and its tributaries, as found in the adult. *Anat Rec*. 1920;20:1-29.
[3] Ginaldi S, Chuang VP, Wallace S. Absence of hepatic segment of inferior vena cava with azygous continuation. *JComput Assit Tomogr*. 1980;49(1):112-14.
[4] Assefa G, Gebrewold Y, Kebede T A case report of left sided IVC with retroaorticright renal vein and hemiazygos continuation. *Ethiop Med J*. 2013;51(1):73-76.
[5] Lao WT, Chan WP, Chuanlee R, Chang CY, et al. Duplicated Infrarenal IVC with Azygous Continuation of Left IVC: Pre-operative CT and 3-D Reconstruction *Image Findings Chin J Radiol*. 2003;28:249-53.
[6] Brochert A, Reynolds T. Unusual duplication anomaly of the inferior vena cava with normal drainage of the right IVC and hemiazygous continuation of the left IVC. *J Vasc Interven Radiol.* 2001;12(12):1453-55.
[7] Morita S, Higuchi M, Saito N, Mitsuhashi N. Pelvic venous variations in patients with congenital inferior vena cava anomalies: Classification with computed tomography. *Acta Radiol.* 2007;48(9):974-79.
[8] Inamasu J, Guiot BH. Laparoscopic anterior lumbar interbody fusion: a review of outcome studies. *Minim Invasive Neurosurg*. 2005;48:340–47.
[9] Faer M, Lynch RD, Evans HO, Chin FK. Inferior vena cava duplication: demonstration by computed tomography. *Radiology*. 1979;130(3):707-09.
[10] Senecail B, Lefevre C, Person H, Meriot P. Radiologic anatomy of duplication of the inferior vena cava: a trap in abdominal imaging. A report of 8 cases. *Surg Radiol Anat*. 1987;9(2):151-57.
[11] Amezyane T, Bassou D, Ghafir D, Ohayon V. Double inferior vena cava mimicking lymphadenopathy. *Ann Saudi Med*. 2011;31(6):663.
[12] Shingleton WB, Hutton M, Resnick MI. Duplication of inferior vena cava: Its importance inretroperitoneal surgery. *Urology.* 1994;43(1):113-15.
[13] Eldefrawy A, Arianayagam M, Kanagarajah P, Acosta K, Manoharan M. Anomalies of the inferior vena cava and renal veins and implications for renal surgery. *Cent European J Urol*. 2011;64(1):4–8.
[14] Kouroukis C, Leclerc JR. Pulmonary embolism withduplicated inferior vena cava. *Chest*. 1996;109(4):1111-13.

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