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CASE REPORT

ANOMALOUS FORMATION OF INFERIOR VENA CAVA

*Col Sushil Kumar

Department of Anatomy, Armed Forces Medical College, Pune – 411040, India

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ABSTRACT

Inferior vena cava (IVC) is a composite vessel and the precise mode of development its post renal segment is somewhat uncertain. Because of the various transformations that occur during its development, variations do occur, but are not common. The common anomalies of abdominal part of IVC include absence of hepatic segment of IVC and a double IVC. An anomalous formation of the inferior most segment of the IVC is reported and discussed wherein the IVC was formed by the union of left common iliac vein and right external iliac vein at the level of S-1/S-2 vertebra. The right common iliac vein was absent.

INTRODUCTION

The inferior vena cava (IVC) forms during a series of changes in the primordial veins of the trunk that occur as blood, returning from the caudal part of the embryo is shifted from the left to the right side of the body. In embryonic stage this function is initially carried out by right and left posterior cardinal veins, which receive the venous drainage of the lower limb buds and pelvis. The subcardinal and supracardinal veins gradually replace and supplement the posterior cardinal veins. The subcardinal veins appear first. They are connected with each other through inter subcardinal anastomosis and with posterior cardinal veins through mesonephric sinusoids.

On the right side an extension takes in a cranial direction, which meets and establishes continuity with a corresponding new formation growing caudally from the right Vitelline hepatocardiac (common hepatic) vein. The supracardinal veins are the next pair of vessels to develop lateral to the sympathetic chain. They communicate caudally with the posterior cardinal veins and cranially with the Subcardinal veins in the neighborhood of intersubcardinal anastomosis. In addition, the supracardinal veins communicate freely with each other through azygos line and subcentral veins. The formation of an oblique transverse anastomosis between the Posterior cardinal veins diverts an increasing volume of

blood into the right longitudinal veins accounting for the ultimate disappearance of most of those on the left. The right supracardinal vein persists and forms greater part of post renal segment of IVC, the continuity with the portion formed by subcardinal vein being maintained by right supracardinal-subcardinal anastomosis. Thus, though the precise mode of development of IVC is uncertain, by and large according to Moore and Persaud (1998) IVC is composed of four main segments. (Fig- 1)

- Hepatic segment: derived from the hepatic veins and hepatic sinusoids
- Prerenal segment: derived right subcardinal vein
- Renal segment: derived from subcardinal-spracardinal anastomosis
- Postrenal segment: derived from the right supracardinal vein

However, according to Gray's Anatomy (1989) IVC is formed below upwards by: (Fig. 2)

- Confluence of common iliac veins
- Short segment of right posterior cardinal vein
- Posterior cardinal – supracardinal anastomosis
- Part of right supracardinal vein
- Right supracardinal-subcardinal anastomosis
- Part of right subcardinal vein
- New anastomotic channel and termination of right vitelline hepatocardiac (common hepatic) vein

*Corresponding author: Col Sushil Kumar,
Department of Anatomy, Armed Forces Medical College, Pune – 411040, India.

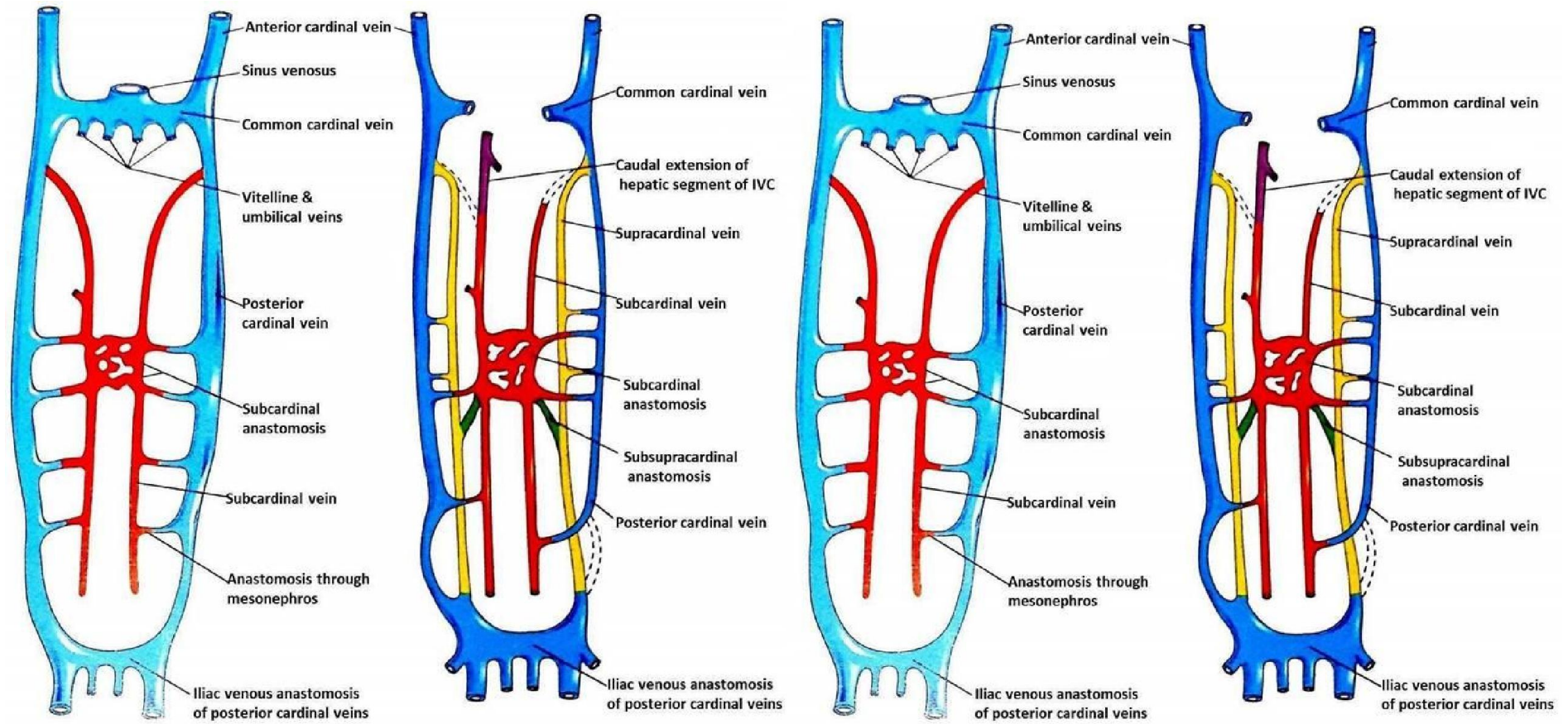


Fig. 1. Development of IVC

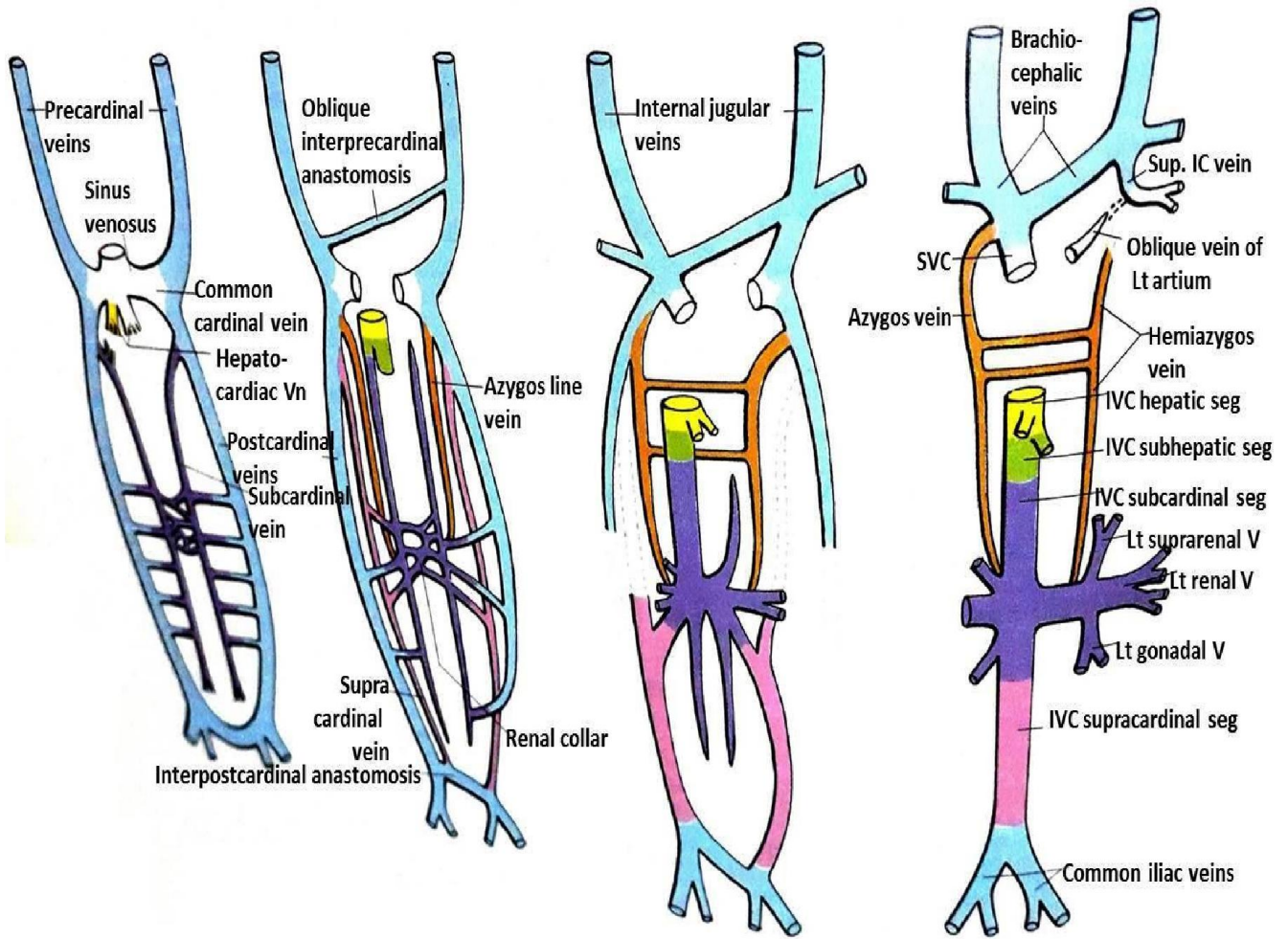
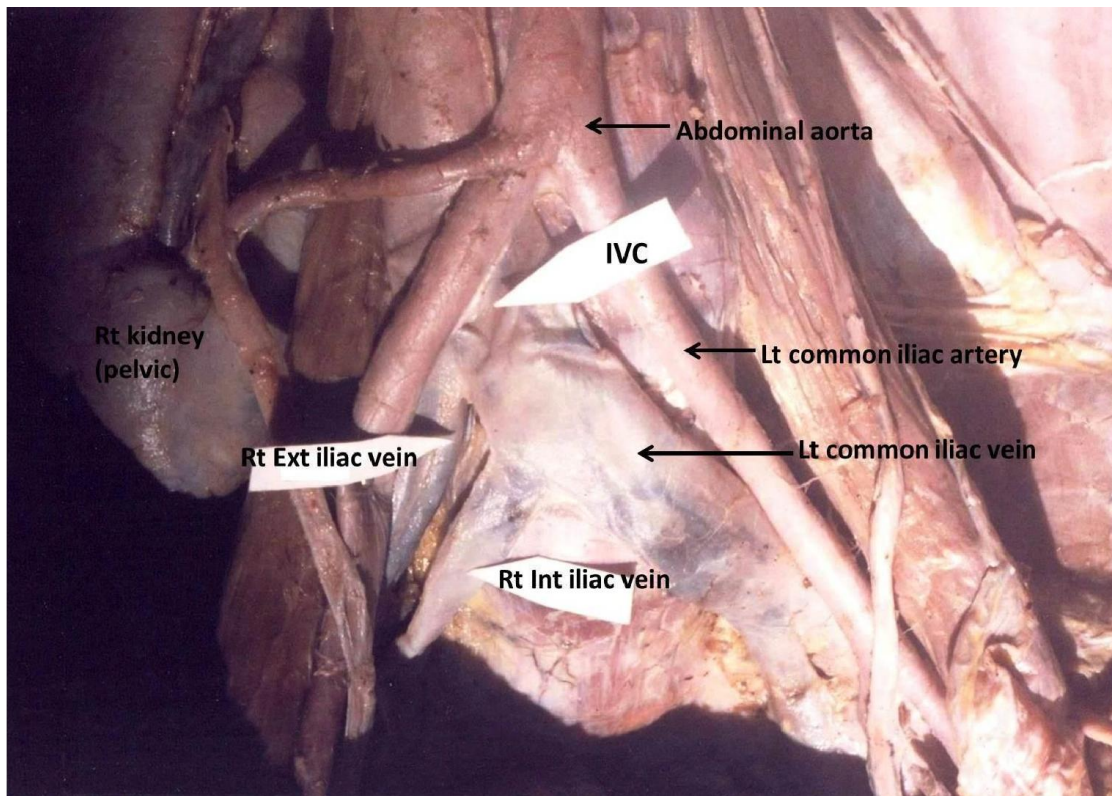


Fig. 2. Development of IVC



Photograph 1. Showing anomalous formation of IVC

Observations

The formation, course, relations and tributaries of IVC were observed during the routine dissection of an adult male cadaver (Photograph- 1). No relevant history was available.

1. It was found that the IVC was as usual on the right side of abdominal aorta, but was formed by the junction of left common iliac vein and right external iliac vein at the level of S-1/S-2 vertebra. The right common iliac vein was absent.
2. The right external iliac vein was running behind right common iliac artery and joined the left common iliac vein directly at the level of S-1/S-2 vertebrae to form the IVC.
3. The right internal iliac vein was running medial to external iliac vein and was seen entering the left common iliac vein directly at the level of S-2/S-3 vertebrae.
4. The left external iliac and left common iliac veins were found medial to and below the corresponding arteries.
5. The IVC in its infrarenal course was almost parallel to the aorta but in the suprarenal portion it was separated from the aorta by the right crus of the diaphragm.
6. No trace of any remnant of the primitive vessels was found either on the right side or on left side to suggest double IVC.
7. No variations in the pattern of its other tributaries were noticed.

Anomalies of the IVC are a consequence of its complicated mode of development, during which three parallel channels, the posterior cardinal, the supracardinal and subcardinal veins develop bilaterally and form various communications. Though rare, anomalies of IVC have been noted by various workers from time to time. Double IVC has been described by Givens (1912). Gladstone (1929) presented presence of left IVC. Absence of IVC below the diaphragm by Dwight (1900) and absence of hepatic segment of IVC has been reported by Huseby and Boyden (1941). Double IVC along with absence of hepatic segment of IVC has also been described. Johnston (1913) described IVC forming anterior to common iliac artery and Aorta, instead of behind them.

Givens and Gladstone described the presence of left IVC in 0.45% of population. They stated that double IVC is twice as common. Moore confirms that in such cases the left IVC is much smaller. This condition probably occurs due to failure of anastomosis to develop between the primitive veins of the trunk. In such cases both the IVC's may communicate below with the common iliac veins on their respective sides or the connection of one of the two IVC's with the common iliac vein of its side may be small or defective. Givens has reported that in such cases the right and left common iliac veins may join in a fairly normal fashion, while in others there may be a very tiny communication between the two common iliac veins.

Two German workers Buurman and Bucheler (1976) after a detailed account of the developmental anatomy of IVC made an attempt at a systematic classification of anomalies of the IVC. For this purpose the angiographic appearances and available literature was considered.

The following anomalies were distinguished:

- a. Left sided position
- b. Duplication
- c. Anomalous opening into left atrium
- d. Agenesis
- e. Stenosis and occlusion

Thus the case being discussed is rather a rare one, which shows the absence of right common iliac vein with the IVC being formed by the junction of left common iliac vein and right external iliac vein at the level of S-2/S-3 vertebrae. The right internal iliac vein was found opening directly into left common iliac vein. Such an anomaly could probably result from an anomalous anastomosis of the Posterior cardinal veins. If the anastomotic channel joins the right posterior cardinal vein at a lower level or alternately the caudal end of right posterior cardinal vein bifurcates at a higher level, the result will be that the right external and internal iliac vein will be opening directly into IVC and left common iliac vein respectively. The right common iliac vein will be absent. Such variations are rare and may not be detected clinically, yet are important for they change the relationships and positions of the vessels. The position of left common iliac vein below aortic bifurcation is taken into account for presacral neurectomy and hence the importance of being aware of certain rare anomalies.

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