

## DOUBLE INFERIOR VENA CAVA -A CASE REPORT

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### ABSTRACT

A case of double Inferior Vena Cave (IVC) where left sided IVC is of the dimensions of normal IVC and the right one is much smaller is reported. Various anomalies of IVC were studied to find out if such a defect is previously recorded. Double IVC, as such, is a rare anomaly<sup>1</sup>. It occurs in 0.2-0.5% of cases<sup>2</sup>. Left sided IVC is reported where right IVC is absent. What makes our case unusual is that both right & left IVC were seen. But, left IVC had proportions & tributaries of normal IVC while, right IVC was much smaller. We did not find such a case reported anywhere previously.

**Key words :** Double IVC, bigger Left IVC, smaller right IVC.

### INTRODUCTION

Anomalies of IVC are unusual & have always been reported on the left side i.e. normal IVC on the right side and a smaller vessel on the left side.<sup>3</sup> However, left sided IVC with a small right IVC, is a relatively rare defect. A case report & the embryological basis of this defect are presented.

### CASE REPORT

A big broad left sided venous channel was found while dissecting a male body 55 yrs old in the Anatomy department of L.T.M. Medical College, Mumbai.

Upon further dissection, this channel was found to be 2cm wide & thin walled. It ran on the left side of the midline of the body on the medial border of left psoas major muscle. Right & left common iliac veins joined each other between L4 & L5 vertebrae on the left of midline, to form this vessel (fig. no.1). One left renal vein opened into this, while left gonadal vein opened into the junction of left renal vein & this vessel. A common vein formed by the union of left phrenic & left suprarenal veins opened in left renal vein. (fig.no.1 Lower down, right lumbar vein opened into this channel.

This vessel crossed the midline from left to right, anterior

to aorta and just below the origin of superior mesenteric artery, at the level a little below L1 vertebra (fig.no.1). Two right renal veins joined it from right side, upper of which was wider than the lower one. Right gonadal vein was seen opening in the lower right renal vein.

Another vessel opened into this channel, from right side and below the right renal vein. This vessel was 1 cm wide & was running on the medial border of right psoas major muscle. It was in the position of normal IVC & joined right external iliac vein lower down. It had extra connection with right common iliac vein. (This vessel is totally formed by right supracardinal vein in our opinion)

### Other findings:

Diaphragmatic openings of IVC & Aorta were at normal levels of T8 just to the right of midline & T12 to the left respectively.(fig.no.1)

Aorta was in normal position & divided at L4. The origins of coeliac trunk, superior & inferior mesenteric arteries were at normal levels & took their normal course.(fig.no.1)

In the thorax, Azygos on right & Hemiazygos vein on the left were in normal position.

Inferior vena caval opening was in right atrium as it is normally.

Left kidney was slightly lower than right.

There was no Situs Inversus found.

### DISCUSSION

Normal IVC develops from

1. The lowest part of right posterior cardinal vein<sup>4</sup> (sacral segment).
2. Right supracardinal vein (post renal segment) receives 3rd & 4th lumbar veins.<sup>5</sup>
3. Right supra-subcardinal anastomosis (renal segment), receives renal & gonadal veins<sup>4</sup>.
4. Right subcardinal vein (prerenal segment) receives right suprarenal vein<sup>4</sup>
5. Right vitelline vein (hepatic segment)

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Concentrating only on the sacral, post renal, & renal segments of IVC-

- A. Normally, anastomosis between two posterior cardinal veins forms left common iliac vein<sup>6</sup>
- B. Left supracardinal vein disappears.
- C. Left subcardinal vein below the renal vein also disappears except its caudal segment which forms left gonadal vein.
- D. Left supra subcardinal anastomosis forms a part of left renal vein & receives left gonadal vein<sup>4,5</sup>
- E. Inter subcardinal anastomosis is incorporated into left renal vein.<sup>6</sup>

In our specimen, the anastomosis of two posterior cardinals has formed right common iliac vein instead of left (vide supra A), left supracardinal (vide supra B) left supra subcardinal anastomosis (vide supra D) & intersubcardinal anastomosis (vide supra E) (fig.3&4) have not only persisted but have become dilated & have assumed the dimensions of normal IVC. Right supracardinal vein which normally forms IVC is comparatively narrow and has persisted in forming double IVC in lumbar region. Above the level of renal veins the IVC is in its normal place.

This Double IVC is due to persistence of both supracardinal veins inferior to renal vein, suprasubcardinal anastomoses as well as intersubcardinal anastomosis. It has failed to lose its connection with the left subcardinal vein and also with the anastomosis between posterior cardinal veins. This persistence of anastomosis has maintained left supracardinal vein.

#### Embryological causes

1. In developing, bilaterally symmetrical vascular system, regression affects mainly the left side of the venous system<sup>1</sup>. Most vascular malformations result from the failure of some primitive element to undergo regression<sup>1</sup>.
2. According to Larsen, venous anomalies are caused by failure of cardinal veins on the left to undergo normal regression. Double IVC with left IVC being a smaller channel, results due to preservation of left supracardinal vein inferior to kidney<sup>1</sup>.

In our case, this left vein has, not only been preserved but has become wider to form normal IVC. If this vein has persisted, then the right supracardinal vein should have disappeared. But it has also persisted to form a smaller channel.

3. Double IVC is reported to be due to non development of anastomosis between veins of the trunk i.e. between posterior & supracardinal veins. As a result, inferior part of left supracardinal vein persists as a left IVC<sup>3</sup>.

In our case, in spite of all anastomoses (A, D, &E) being present, both IVCs have developed.

4. Double IVC occurs when the left sacrocardinal (Posterior cardinal) vein fails to lose its connection with the left subcardinal vein<sup>7</sup>.
5. Situs Inversus (see below for explanation)

In our case, (1) Left posterior cardinal anastomosis (sacral segment), (2) Left supracardinal (post renal segment), (3) Left supra-subcardinal anastomosis (renal segment) & (4) Intersubcardinal anastomosis, have taken over the formation of left IVC with hepatic & prerenal segment being in the normal site.

The corresponding right sided elements are also present but have not achieved the usual normal proportions forming a smaller right IVC. We label this vessel on right side, as persisting right supracardinal vein as it joins right common iliac vein below & joins the junction of right renal vein with IVC above. This is the right IVC. It had two right renal veins & right gonadal vein opened into right renal vein instead of IVC<sup>8</sup>. So it can be assumed that renal & postrenal segments of this vessel are abnormal. The connection of right IVC with right external iliac vein & right common iliac vein shows that the right posterior cardinal & its anastomosis with the left has also persisted.

Normally intersubcardinal anastomosis is around aorta below the origin of superior mesenteric artery.<sup>4</sup> In our case, this anastomosis is dilated & has crossed in front of aorta below the level of superior mesenteric artery (vide supra) showing that it is normal position.

- (5) It is NOT a case of Situs Inversus as we see that IVC opening in central tendon of diaphragm is normally placed & Aorta with its branches are also normally placed.

Situs Inversus is a developmental anomaly where there is transposition of the viscera in thorax & abdomen. It is the organ reversal. This condition is associated with the mirror image positioning of great vessels, aortic arch, heart<sup>9</sup> (Gray's Anatomy, 36th ed. Pg 666.) and some abdominal organs.

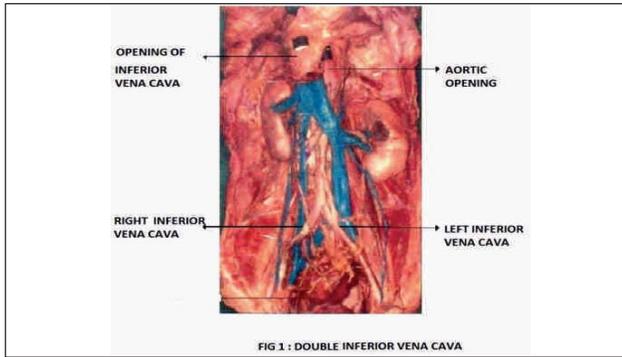


Fig.1

Title- Double inferior vena cava.

Right & left IVCs were present.

Left IVC was much bigger.

Top of the figure—black tubes showing aortic & IVC openings

Legends—Right IVC, Left IVC, Right common iliac vein, Aortic opening, IVC opening

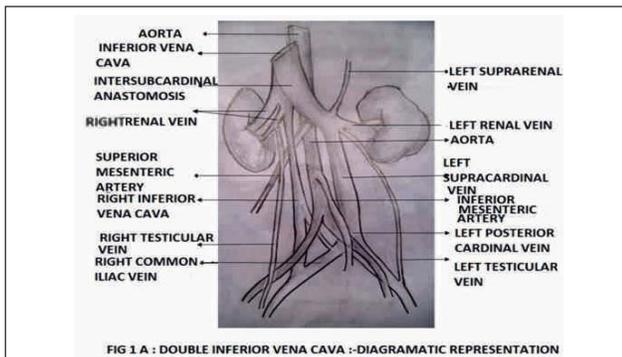


Fig.1-A

Title—Diagrammatic representation of the Anomaly

Top of the figure—Two kidneys

Legends—Aorta, IVC, Right IVC, Left IVC, Left testicular vein, left renal vein,

Left suprarenal vein, Inferior mesenteric artery, right common iliac vein, right IVC,

Right renal veins, Right testicular vein, Superior mesenteric artery

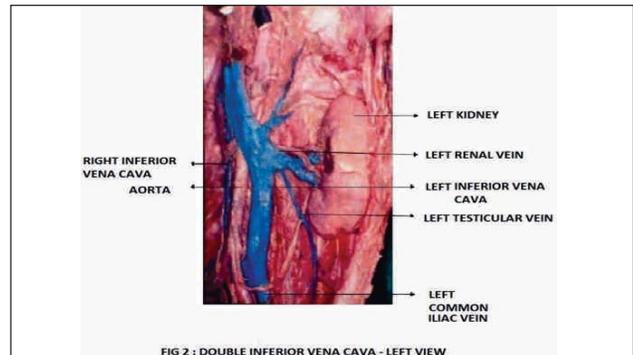


Fig.2 : Double Inferior Vena Cava-Left view

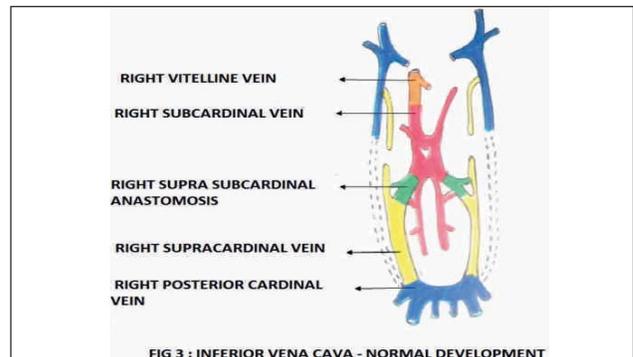


Fig.3 : Normal development of IVC

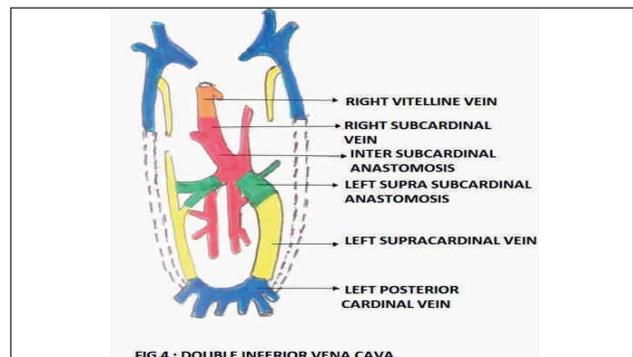


Fig.4 : Embryological explanation of double IVC

**Incidence**

Double IVC are unusual cases.<sup>3</sup> It is a relatively rare anomaly.<sup>1</sup>

According to Anson<sup>10</sup>, in 66 lab specimens,<sup>5</sup> left IVCs were seen.

In earlier record of 550 cadavers, it is said that accessory or left IVC was the smaller of the two canals except in four cases. Out of these four cases, both vessels were of equal caliber in three & one in which, vessel on the right side was the larger<sup>10</sup>.

We state this to say that the review of literature showed that the anomaly which we found is one of its kind and such a defect is not reported so far. Its clinical importance is stated below

### CONCLUSION

Persistence of left supracardinal & subcardinal veins in fetal life have resulted in the formation of left IVC of the size of the normal right IVC. Persistence of right supracardinal & subcardinal veins have resulted in formation of right IVC of much smaller dimensions. Above the renal veins IVC was normal and in its usual position.

Double IVC has importance in resection of abdominal aortic aneurysm. If the left IVC is quite small, it may not present any difficulty in Aortic resection<sup>6</sup>. In the present specimen, the left IVC is large & may make such resection not only difficult but also dangerous. If it is the case of only left IVC & if it goes anterior to aorta (as in this case), right renal vein can be divided, provided right adrenal & gonadal veins open into it<sup>6</sup>.

The possible presence of this vessel is of surgical significance during left lumbar sympathectomy because it may conceal the sympathetic trunk.

The patient had lived up to the age of 55 yrs. So we deduce that this anomaly has no bearing on morbidity or mortality.

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