ANOMALOUS COMMUNICATION BETWEEN RIGHT EXTERNAL ILIAC VEIN AND INFERIOR VENA CAVA – A CASE REPORT

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ABSTRACT

A considerable variation exists in the patterns of the branching of veins, arteries, and nerves. Some variations are clinically important and any surgeon operating without knowledge of them is certain to have problems. In the recent decades, advances in medical imaging technologies and the increasing availability and accessibility of these methods in clinical use have provided reliable methods to investigate these anomalies. During the routine educational dissection for medical undergraduates, a rare variation in the formation of inferior vena cava associated with an anomalous communication between right external iliac vein and inferior vena cava was found in a 55 year old male cadaver. Development of the inferior vena cava occurs during the 4th to 8th week of gestation, and due to its developmental complexity, there are many opportunities for malformations to occur. The embryological basis and clinical significance of unusual variations of major veins forming the inferior vena cava are discussed.


INTRODUCTION

The external iliac vein (EIV) is the proximal continuation of the femoral vein. It begins posterior to the inguinal ligament, ascends along the pelvic brim and end anterior to the sacroiliac joint by joining the internal iliac vein to form common iliac vein. On the right side it lies medial to the iliac artery, gradually inclining behind it as it ascends. On the left side it is wholly medial. It’s tributaries are the inferior epigastric, deep circumflex iliac and pubic veins. The internal iliac veins (IIV) are the union of various tributaries those correspond to the branches of internal iliac artery. The common iliac vein (CIV) is formed by the union of the external and internal iliac veins, anterior to sacroiliac joint, it ascends obliquely to end at the right side of fifth lumbar vertebra and uniting at an angle with the contralateral vessel to form the inferior vena cava (IVC). The IVC conveys blood to the right atrium from all structures below the diaphragm. The right CIV is shorter and more nearly
vertical, lying posterior and then lateral to its artery. The left common iliac vein (LCIV) is longer and more oblique and lies first medial, then posterior to its artery. Each vein receives iliolumbar and sometimes lateral sacral veins. The left CIV usually drains the median sacral vein. There are no valves in these veins. [Gray & Carter, 2008]

Embryogenesis of IVC is a complex process involving the development, regression, anastomosis and replacement of 3 sets of paired embryonic veins: the post cardinal, sub cardinal and supracardinal veins. The post cardinal veins appear first on the posterior aspect of the embryo. These veins regress, except for the distal aspects which become the iliac bifurcation [Mathews, Smith, Fishman & Marshall, 1999]. The right CIV develops from the caudal part of the right postcardinal vein below the transverse anastomosis between the two postcardinal veins. The left CIV develops from the transverse anastomosis between the two postcardinal veins and part of the left postcardinal vein below the anastomosis. The IVC is formed from below by the convergence of two CIV and the right postcardinal vein. On each side, the EIV develops from one of the inter-segmental veins in the region of lower limb bud. It drains the lower limb and joins the caudal end of posterior cardinal vein of the respective side [Singh, 2012]. The IVC forms during a series of changes in the primordial veins of the trunk and is shifted from the left to the right side of the body, consisting of four main segments (1) hepatic segment from the hepatic vein (proximal part of right vitelline vein) and hepatic sinusoids (2) pre-renal segment from the right subcardinal vein (3) renal segment from the subcardinal-supracardinal anastomosis (4) post-renal segment from the right supracardinal vein [Moore and Persuad, 2008].

In our case report, the anomaly was found in a 55 year old formalin-fixed cadaver of an indigenous Ethiopian descent. Ethiopia is situated in the Horn of Africa. The total area of the country is about 1.1 million square kilometres. Ethiopia has a total population of 77 million and an annual growth rate of 2 percent [Zhuzhi, Pav, Julie, Genene & Albert, 2008]. This was an extremely rare case where the right common iliac vein was absent and IVC was formed by union of right external iliac vein and left common iliac vein.

A case of an anomalous communication between right EIV and IVC was observed during a routine dissection of the retroperitoneal region of an adult male, formalin fixed cadaver of an Ethiopian ancestry, at the Department of Anatomy, Hawassa University. The right CIV was absent. The IVC was formed by the union of right EIV and left CIV. The right IIV was found to drain into the left CIV. The right external iliac vein was traced down to the
inguinal ligament and confirmed its continuation with the femoral vein. It was about 11.5 cm long and ascends obliquely to end at the right side of 5th lumbar vertebra. The right EIV was crossed anteriorly by the right external iliac artery and ureter [Fig.1.]. The left CIV was about 4.3 cm long and crossed the median plane to join the IVC after receiving the right IIV as its tributary.

The left EIV was 9 cm long. It was crossed anteriorly by left internal iliac artery and ureter. The internal iliac veins received drainage from visceral (vesical, prostatic and rectal) and parietal (gluteal and lateral sacral) veins, respectively. The course and branching patterns of the abdominal aorta were as usual [Fig.2.]. The vessels in this region were carefully dissected and the surrounding structures were cleaned and photographed.

Figure 1: Picture showing the variant formation of inferior vena cava. [IVC-inferior vena cava, RE-right external iliac vein, RI-right internal iliac vein, LCI-left common iliac vein, LI-left internal iliac vein, LE-left external iliac vein]
DISCUSSION

Variations from the normal anatomy of the IVC occur in 3% of the population and most of the variations are asymptomatic and incidental. Multi detector computed tomography (MDCT) obtained with intravenously administered contrast material is the suitable technique for depicting these variations [Hashmi and Smaroff, 2007]. The first reported inferior vena cava (IVC) anomaly was in 1793 by Abernethy; his studies described a congenital mesocaval shunt and azygos continuation of the IVC in a 10-month old infant with dextrocardia [Abernethy,1793]. The most frequently encountered IVC developmental anomalies include the left vena cava, double vena cava, azygos continuation of the IVC, left circumaortic renal vein, left retroaortic renal vein and retrocaval ureter [Qian, Yang, Zuo, Cheng, Xia &Ding, 2013]. It was reported radiologically that the IVC anomalies were more common in men (39 of 3821 cases) than in women (12 of 2473 cases); men/women ratio is 2:1 [McClure &Butler,1925]

It is imperative to review the embryogenesis of IVC in order to understand the possible causes of the anomalies of IVC. Panchal and Chaturvedi [2014] reported a case of agenesis of right CIV and a variation in the formation of inferior vena cava. They described that, agenesis
of right CIV is due to the segmental deterioration of right post cardinal vein caudal to the oblique transverse anastomosis after sprouting out of external iliac and internal iliac veins.

They also found a significant dilation at the junction of right iliac vein with left CIV. On the contrary, present case does not depict any dilation along the course of these vessels. The regression of a part of the right postcardinal vein and the oblique transverse anastomosis lead to bilateral agenesis of CIV [Biswa& Singh, 2007]. The present case study observed the absence of right CIV only, there would have been defect or deviation in the development of lower part of right posterior cardinal vein below the transverse anastomosis between the two postcardinal veins. This leads to the absence of common iliac vein on the right side. The iliac bifurcation and iliac veins derived from the non-regressed distal parts of the postcardinal veins and iliac vein variations are due to the mal development of the postcardinal system.

Cardinot et al. [2006], Oto et al. [2003] & Thomas et al. [2014] revealed the cases of right IIV draining into the left CIV. Our present case is compatible with the above reports. The normal IVC is formed by four segments: hepatic, suprarenal, renal and infrarenal.

The posthepatic IVC segment develops during sixth to eighth week of intrauterine life as a composite structure from continuous appearance and regression of three paired embryonic veins- the postcardinal vein, the subcardinal vein and the supracardinal vein. The posterior cardinal vein drains the lower limb and the abdomen, they are progressively replaced by subcardinal and supracardinal veins. Postcardinal vein forms the lowest part of IVC and common iliac veins. The complex embryological development is such that variations and anomalies are common where embryological connections persist, either alone or in conjunction with aplasia or hypoplasia of normally developing channel [Cornillie, Broeck & Simoens, 2008].

The studies of Alicioglu et al. [2009] and Ramanathan et al. [2001] supported the theory of perinatal thrombosis is hypothesised to lead to the development of absent infrarenal IVC. Some clinical conditions, like haematuria [Fitoz & Yalcinkaya, 2008] and urinary tract infection [Avellaneda, 2005] of unknown aetiology, recurrent deep vein thrombosis (DVT) and pulmonary embolism [Mano et al, 2004 & Sartori et al. 2006] are correlated with various Types of anomalies of the IVC.

Awareness of the inferior vena cava (IVC) and pelvic venous variations would make a great contribution toward reducing or eliminating the risk for severe haemorrhage during abdominal surgery [Shaw et al., 2003]. Pelvic venous variations are important for
retroperitoneal intervention on the pelvis such as the retroperitoneal lymphadenectomy, hypogastric neurectomy, and anastomosis during a kidney transplant and hysterectomy [Bergman, Thompson, Afifi & Saadeh, 1988]. A good scanning knowledge of the IVC and its abnormalities appears necessary, either to prevent any mistaken interpretation or to specify a pathological element with regard to a vascular exploration [Pinot & Hermanowicz, 1987].

CONCLUSION

This case report concludes that, discovering variations and congenital anomalies in cadavers enables the students to develop an awareness of the occurrence of variations and a sense of their frequency. The retroperitoneal venous variations should be considered in minds of anatomists, radiologists and surgeons who are to manipulate in this anatomic area. Although most of them do not cause functional damage, these venous variations should be taken into account during the cadaver dissections, application of imaging techniques and various retroperitoneal surgeries.

References


