



كلية الطب  
والصيدلة - مراكش  
FACULTÉ DE MÉDECINE  
ET DE PHARMACIE - MARRAKECH



# INFERIOR VENA CAVA

PR.M.D.EL AMRANI

DR.CHAIMA KASSI

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## I – INTRODUCTION:

The inferior vena cava is the main trunk collecting all the venous blood from the subdiaphragmatic region, which it drains into the right atrium.

## II - DESCRIPTIVE ANATOMY:

### 1. Origin:

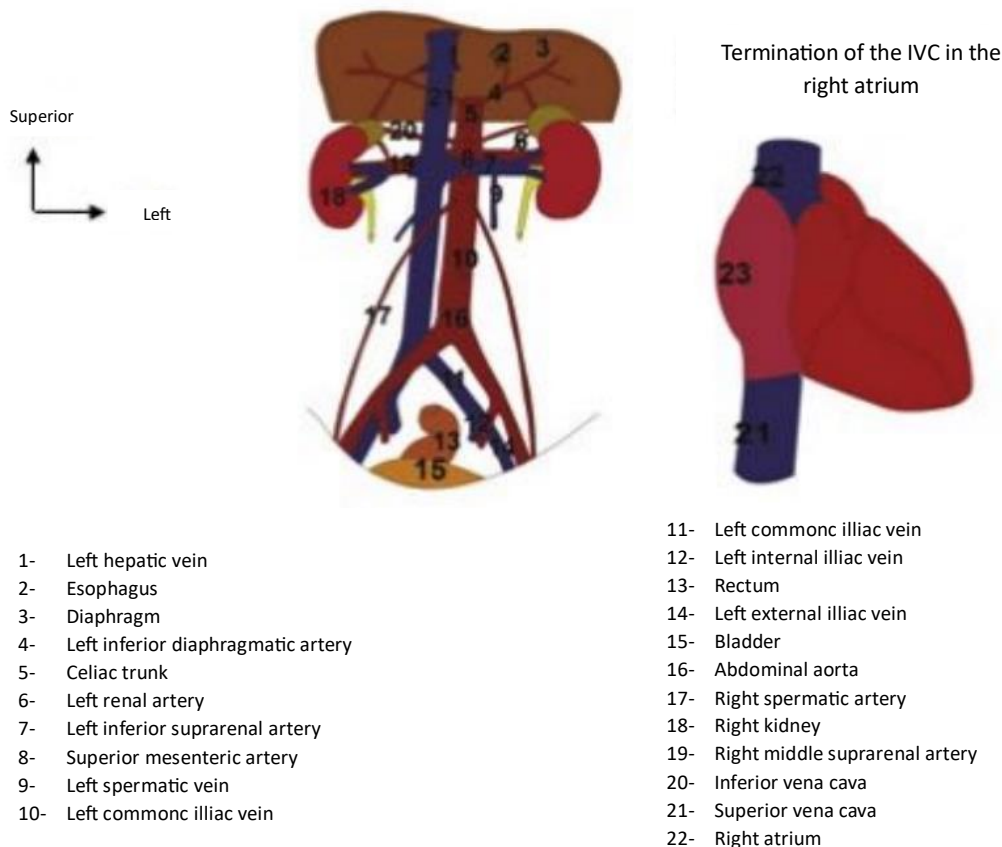
Located in the retroperitoneal space, it is formed by the union of the right and left common iliac veins at the right margin of L5.

### 2. Course:

The inferior vena cava ascends through the retroperitoneal space of the abdominal cavity, along the right side of the lumbar spine.

It follows a vertical course up to L1, passes behind the liver, and at its terminal portion, it has a short intrapericardial thoracic course.

### **Inferior vena cava : origin – course - termination**

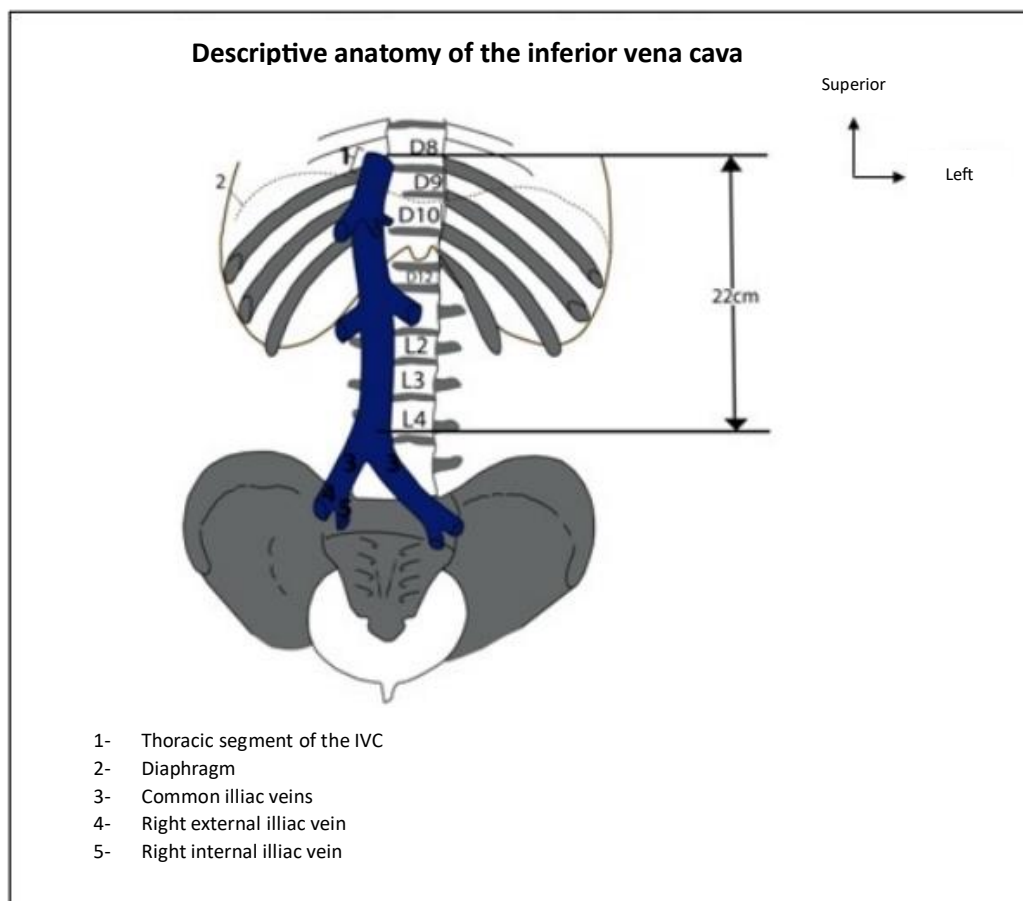


### 3. Termination:

It opens into the right posterior wall, after passing through the diaphragmatic orifice, at the level of T9.

### 4. Dimensions:

- Length: 22 cm
- Diameter: 2 to 3 cm.
- It ascends from bottom to top, with two dilatations:
  - One above the entry of the renal veins
  - And another above the entry of the hepatic veins



### **III – ANATOMICAL RELATIONS:**

#### **1. Abdominal relations :**

- The inferior vena cava is accompanied along its course by the lumbar lymph nodes: *precaval, laterocaval, retrocaval, and intermediate.*
- **Posteriorly**, it is related to:
  - the bodies of the lumbar vertebrae from L4 to L1,
  - the psoas major muscle,
  - the medial part of the right adrenal gland,
  - the right lumbar, renal , middle suprarenal, and inferior phrenic arteries.
- **Anteriorly**, from bottom to top, it is related to:
  - the root of the mesentery and its vessels,
  - the origin of the right common iliac artery,
  - the right testicular or ovarian artery,
  - the horizontal part of the duodenum,
  - the liver.
  - and the head of the pancreas,
  - the omental vestibule, which separates it from the superior part of the duodenum and the hepatoduodenal ligament,
- **On its left side**, it is related to:
  - the abdominal aorta,
  - and the caudate lobe of the liver.
- **On its right side**, it is related to:
  - the ascending colon,
  - the medial border of the right kidney,
  - and the right ureter.

## **2. Thoracic relations:**

The inferior vena cava has a short thoracic course of approximately 3 cm, entirely covered by the fibrous pericardium.

Through the pericardium, it is related to the following structures:

- **Anteriorly:**
  - to the inferior wall of the right atrium.
- **Posteriorly:**
  - on the right, to the triangular ligament of the right lung,
- **Laterally:**
  - to the right phrenic nerve,
  - and to the right mediastinal pleura and the right lung.

## **3. Relations at the level of the diaphragm:**

The inferior vena cava is tightly adherent to the margins of the diaphragmatic foramen.

## **IV – COLLATERAL BRANCHES:**

The inferior vena cava receives:

### **1. Lumbar veins:**

They arise opposite the intervertebral foramen, then run transversely above the lumbar arteries.

### **2. Renal veins:**

The renal veins are located anterior to the arterial plane. The left is longer than the right. They pass in front of the aorta and the superior mesenteric artery.

### **3. Middle suprarenal veins:**

The right suprarenal vein drains into the inferior vena cava, whereas the left drains into the left renal vein.

#### 4. Gonadal veins (spermatic or uterine-ovarian veins):

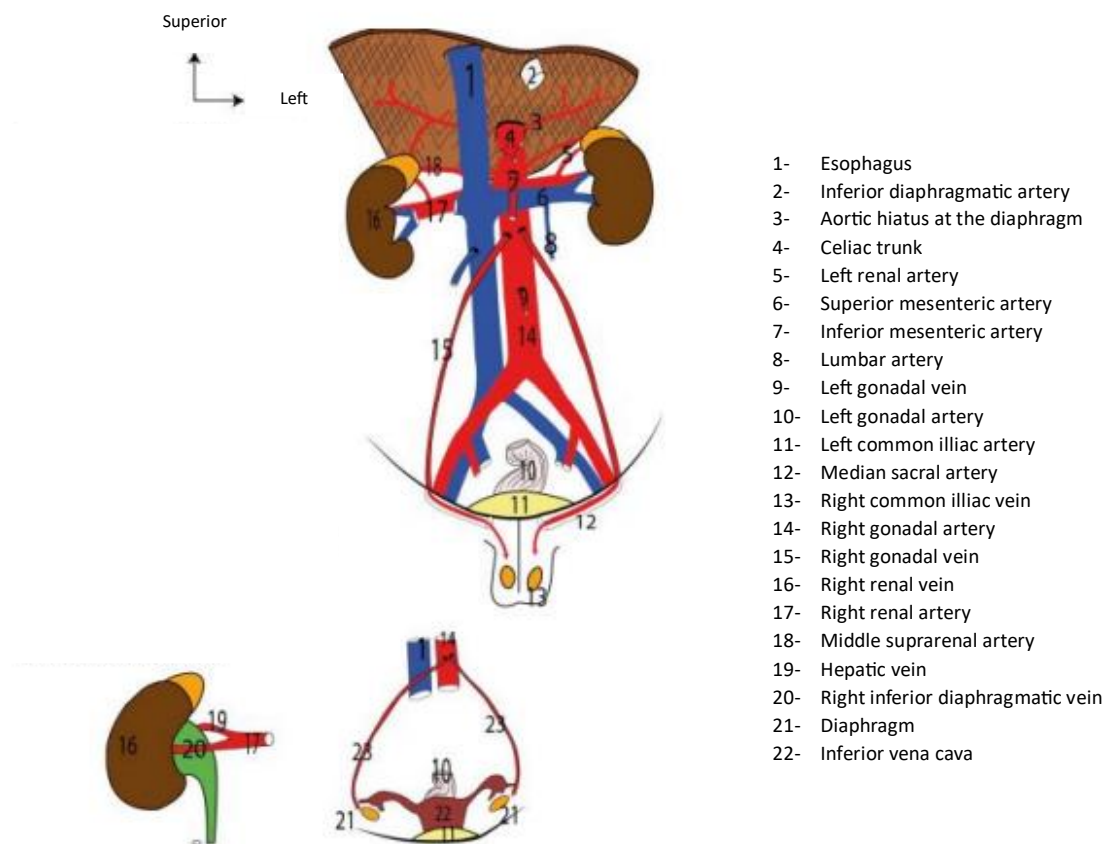
- They originate from the testes and ovaries, and ascend lateral to the inferior vena cava.
- The right gonadal vein drains into the inferior vena cava, while the left one drains into the left renal vein.

#### 5. Hepatic veins (or supra-hepatic veins):

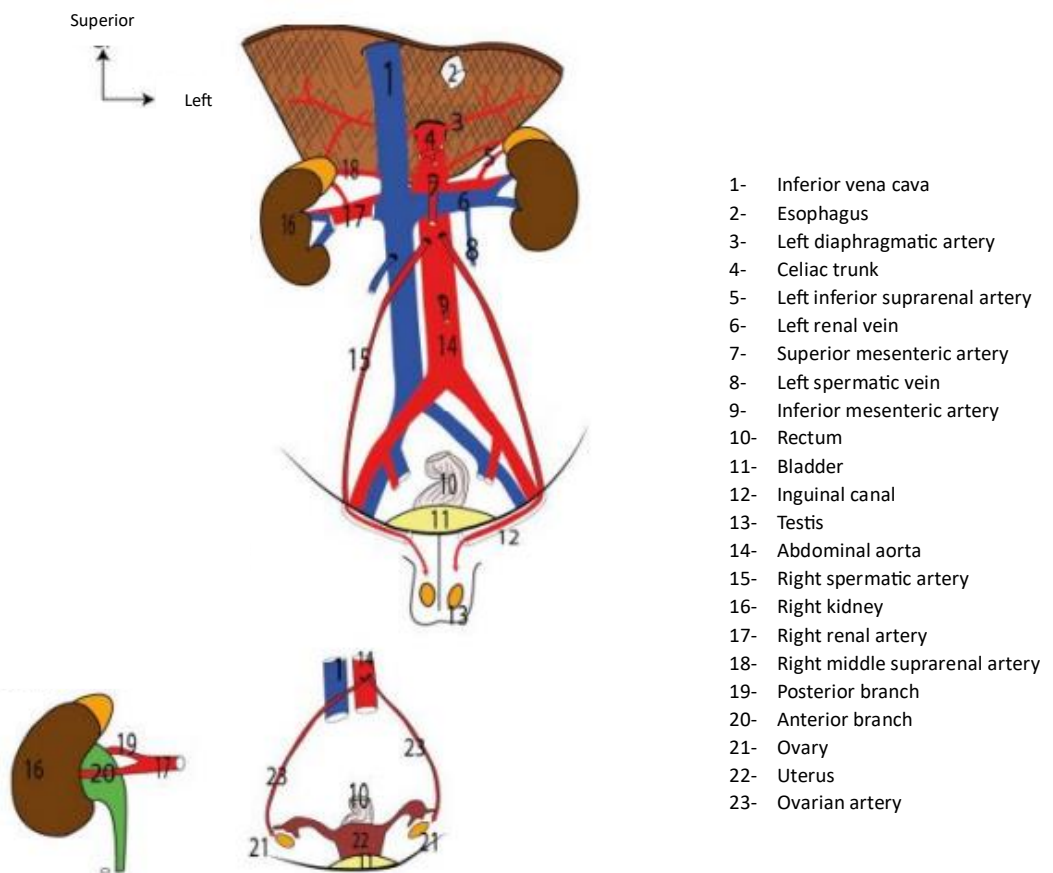
- They carry blood from the liver to the inferior vena cava.
- They are divided into two main hepatic veins, the right and left, as well as the middle suprahepatic vein.

#### 6. Inferior diaphragmatic veins:

The inferior vena cava receives one or more inferior diaphragmatic veins at the level of its diaphragmatic orifice.



**Collateral branches of the inferior vena cava**



**Collateral branches of the inferior vena cava**

## **V - ANASTOMOSES:**

### **1. Porto-caval anastomoses:**

Porto-caval anastomoses can be schematized into five systems:

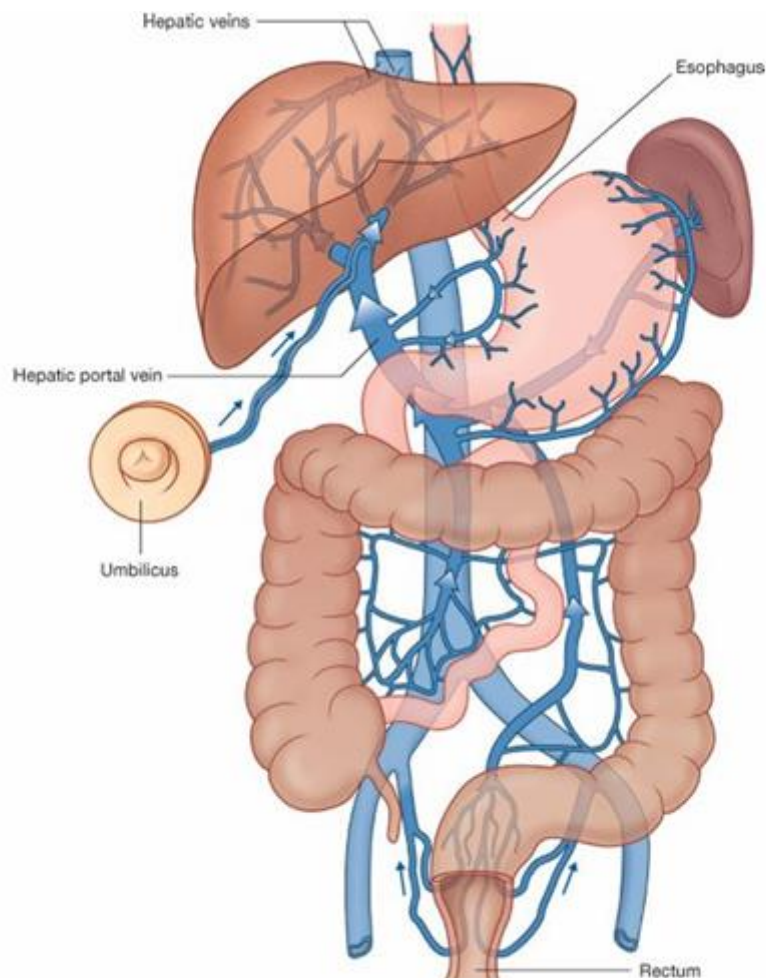
- The anastomoses in the cardia region.

**Note:** These are responsible for forming cardioesophageal varices in cases of portal hypertension.

- The anastomoses in the umbilical region with the paraumbilical veins.
- The rectal anastomoses with the superior hemorrhoidal veins.



- The porto-suprahepatic anastomoses.
- The peritoneal-parietal anastomoses.
- Cardia region anastomoses, vascularized in part by the inferior diaphragmatic arteries.



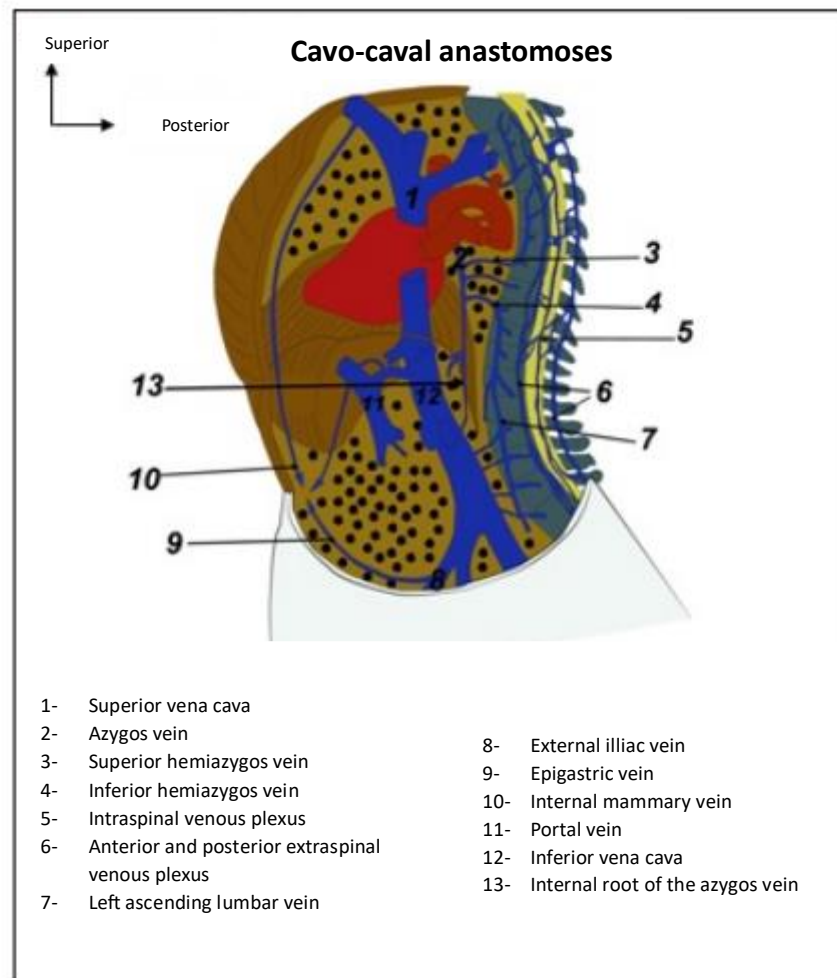
Drake: Gray's Anatomy for Students, 2nd Edition.  
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Figure 4.19 Hepatic portal system.

## 2. Cavo-caval anastomoses:

- The anterior parietal system, formed by the epigastric veins and internal mammary veins.

- The lumbo-azygos system, formed by the ascending lumbar veins, the right azygos vein, and the left hemiazygos vein.

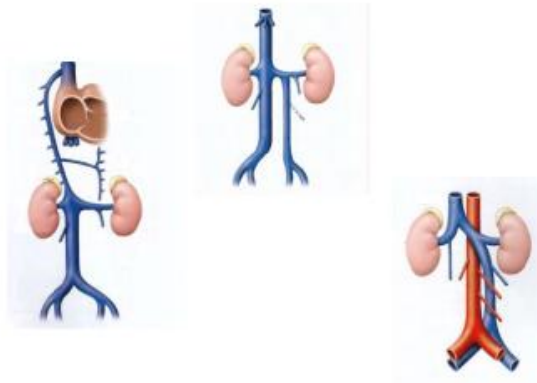
**Note:** These anastomoses allow the ligation of the inferior vena cava below the renal veins, and the restoration of circulation in case of obstruction.



## **VI – CLINICAL APPLICATIONS:**

### **Variants of the inferior vena cava :**

- Their incidence is rare, and their clinical impact is most often minimal.
- **IVC to the left of the aorta / duplicated IVC / atresia of the IVC.**
- Knowledge of these variants helps correct certain diagnostic errors and better organize interventional procedures.



**Variants of the inferior vena cava (according to KAMINA)**

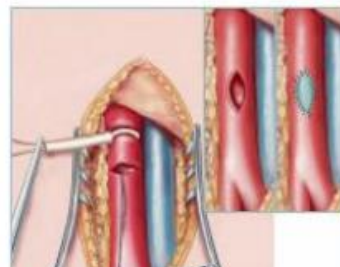
## **VII – SURGICAL APPROACHES**

### **Median xipho-pubic laparotomy:**

From the xiphoid process to the subumbilical region.

### **Bi-subcostal laparotomy:**

The incision is made two fingerbreadths below the costal margin, and may be extended with an incision along the midline up to the xiphoid process.



## **VIII - CONCLUSION:**

The inferior vena cava is a large vein that carries deoxygenated blood from the lower half of the body to the right atrium of the heart. The management of its various pathologies requires a thorough understanding of its anatomy.