WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
Coden USA: WJPRAP Impact Factor 8.453
Volume 15, Issue 3, 954-959. Case Study ISSN 2277–7105

# VARIATION IN THE ORIGIN OF INFERIOR PHRENIC ARTERIES FROM THE COELIAC TRUNK

**Dr. Yasmeen Choudhary*[1], Dr. Anju Thomas[2]**

[1]Third Year Post Graduate Scholar, Department of Rachana Shareera, Sri Dharmasthala Manjunatheshwara College of Ayurveda, Hospital and Research Centre, Kuthpady, Udupi, Karnataka, India.

[2]Associate Professor, Department of PG and PHD Studies in Rachana Shareera, Sri Dharmasthala Manjunatheshwara College of Ayurveda, Hospital and Research Centre, Kuthpady, Udupi, Karnataka, India.

Article Received on 28 Dec. 2025,
Article Revised on 17 Jan. 2026,
Article Published on 01 Feb. 2026,

https://doi.org/10.5281/zenodo.18430892

***Corresponding Author**

**Dr. Yasmeen Choudhary**
Third Year Post Graduate Scholar, Department of Rachana Shareera, Sri Dharmasthala Manjunatheshwara College of Ayurveda, Hospital and Research Centre, Kuthpady, Udupi, Karnataka, India.

**How to cite this Article:** Dr. Yasmeen Choudhary*[1], Dr. Anju Thomas[2] (2026). Variation In The Origin Of Inferior Phrenic Arteries From The Coeliac Trunk. World Journal of Pharmaceutical Research, 15(3), 954–959.



## ABSTRACT

The inferior phrenic arteries (IPA) are major arterial supply to the diaphragm and also contribute arterial branches to the suprarenal glands and oesophagus. Normally, they originate from the abdominal aorta however; variations in their origin have been reported. During routine cadaveric dissection of 65 years old male cadaver, a variation was observed in which both the right and left inferior phrenic arteries originated from the coeliac trunk instead of the abdominal aorta. This variation may be attributed to the persistence of embryonic connections between the coeliac trunk and inferior phrenic arteries during development, awareness of such vascular anomalies is crucial for surgeons and radiologists performing hepatobiliary, adrenal and upper abdominal procedures to avoid inadvertent vascular injury and ensures accurate interpretation of angiographic findings. Recognition of these variations enhances surgical precision and supports safer operative and interventional planning.

**KEYWORDS:** Coeliac trunk, inferior phrenic artery, anatomical variation, embryological basis.

## INTRODUCTION

Abdominal aorta is the largest artery in the body and lies in the midline.[1] It begins as continuation of descending thoracic aorta at aortic hiatus of the diaphragm opposite to lower border of 12$^{th}$ thoracic vertebra. It terminates at the level of fourth lumbar vertebra by dividing into right and left common iliac arteries.[2] Its branches are arranged in four groups as Ventral: coeliac, superior and inferior mesentric, Dorsal: lumbar, median sacral, Lateral: Inferior phrenic artery, middle suprarenal, renal, ovarian or testicular, Terminal: common iliac arteries.[3]

The inferior phrenic arteries are paired vessels, namely the right inferior phrenic artery (RIPA) and left phrenic artery(LIPA)[4] and are typically described as the first lateral branches of abdominal aorta arising above the coeliac trunk.[5] Each artery ascends superolaterally anterior to the crus of diaphragm, near the medial border of suprarenal gland. The LPA passes behind the oesophagus and forwards on the left side of its diaphragmatic opening, while RPA passes posterior to the inferior venacava and then ascends on the right side of its opening. They constitute the chief arterial supply to the diaphragm and other organs such as adrenal gland, oesophagus, stomach, liver and peritoneum.[6] The origin of inferior phrenic artery was first described by Quain.[7]

The coeliac trunk is a short, wide, unpaired ventral branch of the abdominal aorta arising just below the aortic hiatus. It passes almost horizontally forwards and slightly right above the pancreas and splenic vein and represents the first anterior branch supplying the foregut. It terminates dividing into three terminal branches the left gastric artery, common hepatic artery and splenic artery.[8]

From a clinical perspective, in hepatocellular carcinoma (HCC), IPA is the most frequent source of extrahepatic collateral blood supply, especially tumours located in bare area of liver.[9]

## CASE REPORT

### METHOD

The variation was observed during routine postgraduate dissection of the posterior abdominal wall in a 65-Year-old male cadaver. After opening anterior abdominal wall, the abdominal viscera including the stomach, liver, pancreas, transverse colon and peritoneum were removed to expose the abdominal aorta and its branches.

## RESULT

During a routine dissection, a variation in the origin of inferior phrenic arteries was observed. Normally, the inferior phrenic arteries are paired vessels and constitute first lateral branches of the abdominal aorta, arising just above the coeliac trunk and pass superolaterally over the crura of the diaphragm. [Fig.1]

In the present case [Fig. 2] both inferior phrenic arteries originated directly from the coeliac trunk instead of the abdominal aorta. The coeliac trunk shows a normal branching pattern as Left gastric artery, Common hepatic artery and Splenic artery. From the coeliac trunk both inferior phrenic arteries ascended superiorly towards the diaphragm.

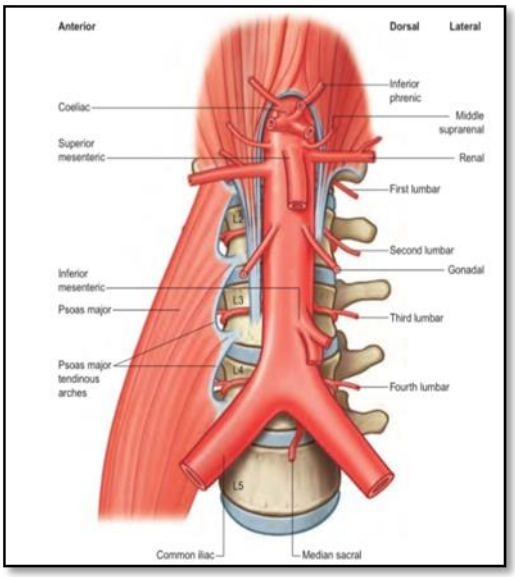


**Fig 1. Normal branching pattern of abdominal aorta.**

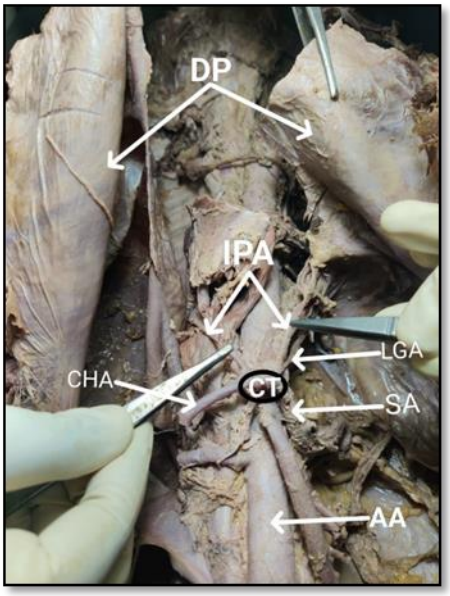


**Fig 2: Variation of IPA from coeliac trunk.**

DA-Diaphragm, IPA-Inferior phrenic artery AA- abdominal aorta, CT- Coeliac trunk, SA-Splenic artery, LGA- Left gastric artery, CHA- Common hepatic artery

## DISCUSSION

According to standard anatomical descriptions, including Gray's Anatomy, the inferior phrenic arteries usually arise from the abdominal aorta below the diaphragmatic hiatus. In the present case, both inferior phrenic arteries originated from the coeliac trunk, while the coeliac trunk showed normal trifurcation. This bilateral variation is uncommon and contributes to existing anatomical knowledge, with important clinical implications. Such arterial variations arise due to changes during embryonic development. In this case, the variation was limited to the inferior phrenic arteries, suggesting a localized developmental alteration rather than a

generalized abnormality of foregut arterial formation. During embryogenesis, several primitive vessels supply the diaphragm and upper abdominal organs. Persistence of embryonic connections between the coeliac trunk and diaphragmatic vessels, along with regression of their usual aortic origin, may explain the observed pattern. Anatomically, the inferior phrenic arteries supply not only the diaphragm but also the suprarenal glands, oesophagus, and surrounding structures, and they are closely related to the liver. Hence, a variation in their origin can alter the vascular arrangement of the upper abdomen.

Clinically, awareness of this variation is essential during surgical procedures involving the coeliac trunk and suprarenal region, as well as during angiographic and interventional procedures. Failure to recognize such variations may increase the risk of vascular injury or incomplete treatment.

The vascular variations are commonly observed during dissection, the knowledge of variations in their origin, course and branches are very important for radiologists and surgeons.[10]

Gurses et al. studied the origin of the inferior phrenic arteries in 26 cadavers with special reference to their branching pattern and clinical importance. They reported a common trunk origin of both right and left inferior phrenic arteries from the abdominal aorta in five cadavers. Additionally, the right inferior phrenic artery originated from the renal artery, coeliac trunk, and left gastric artery, while the left inferior phrenic artery arose from the coeliac trunk in six specimens. The present observation is consistent with these findings, further supporting the wide variability in the origin of inferior phrenic arteries, which holds significant importance during radiological and surgical procedures involving the upper abdomen.[11]

Petrella et al. analysed the origin of the inferior phrenic arteries in 89 cadavers and observed that the coeliac trunk was a frequent source, with the left inferior phrenic artery arising from the left aspect of the coeliac trunk in 19 specimens. Comparable findings were reported by Pick and Anson, who documented a similar origin in 34 out of 200 cadavers, highlighting the consistency of this variation across different populations.[12]

The RIPA is the major collateral blood supply to hepatocellular carcinoma (HCC) second only to hepatic arteries. Inferior phrenic arteries were found to have varied origin. These

arteries are of small caliber and surgeons must be cautious to avoid unintentional sectioning of small caliber arteries, as it may occur during celiac artery decompression in compression syndrome of celiac trunk by median arcuate ligament.[13]

Inferior phrenic arteries also supply adrenal gland, hence are important in angiographic examination of adrenal lesion.[14]

Awareness of variations in the origin of the inferior phrenic arteries is crucial to ensure the safety and efficancy of transarterial chemoembolization performed through the inferior phrenic artery, in the management of hepatic, suprarenal and diaphragmatic lesions.[15]

When the inferior phrenic artery originates from the renal artery or shares a common trunk with it, the suprarenal arteries are consistently supplied by the renal artery. This variation has important implications during angiographic evaluation of adrenal lesions and should be carefully considered while clamping the renal artery during nephrectomy.[16]

Apart from being the main arterial supply to the diaphragm, both IPA arteries are extra hepatic collateral arterial pathways that supply hepatic malignancies, because they neighbor hepatic segments as they traverse the bare area of liver.[17]

## CONCLUSION

Knowledge of arterial variations, particularly of inferior phrenic arteries supplying the diaphragm is essential for surgeons and interventional radiologists to prevent inadvertent injury to small calibre arteries during procedures such as coeliac artery decompression. In cases of hepatic arterial occlusion, angiography evaluation of inferior phrenic artery becomes crucial, as accurate anatomical knowledge is required for effective management.

This case report provides additional anatomical data to existing literature and awareness of such variations may aid in the planning and execution of procedures including treatment of hepatic neoplasms, liver transplantation, biliary tract surgery and transcatheter arterial chemoembolization.

## REFERENCES

1. Singh V. Textbook of Anatomy: Abdomen and Lower Limb. 4th ed. New Delhi: Elsevier India, 2018; p. 178.

2. Standring S, editor. Gray's Anatomy: The Anatomical Basis of Clinical Practice. 41st ed. London: Elsevier, 2016; p. 1089.
3. Standring S, editor. Gray's Anatomy: The Anatomical Basis of Clinical Practice. 36th ed. London: Elsevier, 2020; p 711–712.
4. Singh V. Textbook of Anatomy: Abdomen and Lower Limb. 4th ed. New Delhi: Elsevier India, 2018; p. 180.
5. Standring S, editor. Gray's Anatomy: The Anatomical Basis of Clinical Practice. 41st ed. London: Elsevier, 2016; p. 1089.
6. Standring S, editor. Gray's Anatomy: The Anatomical Basis of Clinical Practice. 41st ed. London: Elsevier, 2016; p. 1089-1090.
7. Pick JW, Anson BJ. The inferior phrenic artery: origin and suprarenal branches. Anat Rec, 1940; 78: 413–27.
8. Standring S, editor. Gray's Anatomy: The Anatomical Basis of Clinical Practice. 41st ed. London: Elsevier, 2016; p. 1088.
9. Gwon DI, Ko GY, Yoon HK, Sung KB, Lee JM, Ryu SJ, et al. Inferior phrenic artery: anatomy, variations, pathologic conditions, and interventional management. Radiographics, 2007; 27: 687–705.
10. Lipshutz B. A composite study of the coeliac axis artery. Ann Surg, 1917; 65: 159–160.
11. Gurses IA, Gayretli O, Kale A, Ozturk A, Usta A, Sahinoglu K. Inferior phrenic arteries and their branches, their anatomy and possible clinical importance: an experimental cadaver study. Balkan Med J., 2015; 32: 189–195.
12. Patrella S, Rodrigues CFS, Sgrott ER, Fernandez GJM, Marques SR, Prates JC. Origin of inferior phrenic arteries in the celiac trunk. Int J Morphol, 2006; 24(2): 275–278.
13. Pulakunta T, Potu BK, Gorantia VR, Rao MS, Madhyastha S, Vollala VR. The origin of the inferior phrenic artery: a study in 32 South Indian cadavers with a review of the literature. J Vasc Bras, 2007; 6(3): 225–230.
14. Kahn PC. Selective angiography of the inferior phrenic artery. Radiology, 1967; 88: 1–8.
15. Loukas M, Hullett J, Wagner T. Clinical anatomy of the inferior phrenic artery. Clin Anat, 2005; 18(5): 357–365.
16. Paraskevas GK, Raikos N. Multiple aberrant coeliac trunk ramifications. Singapore Med J. 2011; 52(7):147.
17. Takanami L. Massive haemoptysis due to chronic pancreatitis: control with inferior phrenic artery embolization. Eur J Cardiothorac Surg, 2000; 18(1): 120–122. doi: 10.1016/S1010-7940(00)00468-1. [PubMed:10869951]