

AN INFERIOR POLAR ACCESSORY RENAL ARTERY - A CADAVERIC CASE REPORT OF A RENAL ARTERIAL VARIATION

Dr. Yashawanth Y. K.*¹, Dr. Swapna Kumary²

P.G. Scholar¹, H.O.D. and Professor²

Department of Rachana Sharira Alva's Ayurveda Medical College and Hospital, Moodbidri,
Karnataka, India.

Article Received on 15 Sept. 2026,
Article Revised on 05 Oct. 2026,
Article Published on 16 Oct. 2026,

<https://doi.org/10.5281/zenodo.23389480>

***Corresponding Author**

Dr. Yashawanth Y. K.

P.G. Scholar, Department of
Rachana Sharira Alva's Ayurveda
Medical College and Hospital,
Moodbidri, Karnataka, India.



How to cite this Article: Dr. Yashawanth Y. K.*¹, Dr. Swapna Kumary². (2026). An Inferior Polar Accessory Renal Artery - A Cadaveric Case Report of A Renal Arterial Variation. World Journal of Pharmaceutical Research, 15(20), 1221-1227.

This work is licensed under Creative Commons Attribution 4.0 International license.

ABSTRACT

The renal arteries are classically described as paired lateral branches of the abdominal aorta that enter the renal hilum. However, additional or accessory renal arteries are well-recognized anatomical variants and may enter the kidney through the hilum or directly through a renal pole.^[1,2] The present report describes an inferior polar arterial variation identified during routine cadaveric dissection. During exposure of the posterior abdominal wall and renal vascular pedicle, an additional arterial channel was observed in relation to the kidney and traced toward the inferior pole, distinct from the principal hilar renal artery. The photographic documentation demonstrates the vessel and its relationship to the kidney, great vessels and surrounding retroperitoneal structures. Based on the gross appearance, the finding is consistent with an inferior polar accessory renal artery. Recognition of this variation is

important in renal transplantation, partial nephrectomy, laparoscopic and endourological procedures, vascular surgery, radiological interpretation and teaching of applied anatomy. Recent evidence indicates that accessory renal arteries are common enough to warrant systematic consideration, with a pooled prevalence of approximately 21% in a recent systematic review.^[5] This cadaveric observation emphasizes the continuing value of dissection in demonstrating clinically relevant vascular variation that may be underappreciated when only textbook anatomy is considered.

KEYWORDS: Accessory renal artery; inferior polar artery; renal vascular variation; cadaveric dissection; kidney; anatomical variation; renal transplantation.

1. INTRODUCTION

The kidneys receive a rich arterial supply, with the principal renal arteries usually arising from the abdominal aorta and entering the renal hilum. The renal artery divides into segmental branches that provide functionally important vascular territories. In addition to the principal renal artery, additional renal arteries may occur and are variously termed accessory, multiple, supernumerary or polar renal arteries.^[1,2,5] These vessels may arise from the abdominal aorta, the main renal artery or, less commonly, other arteries, and may enter the kidney at the hilum or at the superior or inferior pole.^[2,5] The terminology is clinically important because a vessel entering a renal pole may supply a substantial segment of renal parenchyma.

The frequency of accessory renal arteries varies considerably among anatomical studies, partly because of differences in population, developmental stage and visualization method.^[6] A recent systematic review and meta-analysis of 111 studies estimated accessory renal artery prevalence of 21.10%, while the typical pattern of a single left renal artery to each kidney was identified in 78.92% of the population.^[5] Cadaveric studies have also demonstrated substantial variation. In a large Indian study of 530 adult cadavers, accessory renal arteries were reported in approximately one-quarter of the specimens.^[7] A recent South Indian cadaveric study found accessory renal arteries in 27.7% of the kidneys examined, emphasizing the relevance of these variations in the Indian anatomical population.^[8]

Among the different patterns, an inferior polar accessory renal artery is of particular interest because of its relationship to the lower renal pole, renal pelvis and proximal ureter. A lower polar artery may cross close to the ureteropelvic junction and has been implicated in some cases of ureteropelvic junction obstruction.^[3,4] It is also important during renal transplantation and nephron-sparing surgery because division or inadvertent injury may compromise the vascular territory supplied by the artery.^[2,5] The present case was therefore documented to highlight an inferior polar arterial variation encountered during routine human cadaveric dissection and to discuss its anatomical and clinical relevance.

2. AIM

To document and discuss a variant arterial supply to the inferior pole of a kidney observed during cadaveric dissection, with emphasis on its anatomical identification and clinical significance.

3. PROCEDURE

A formalin-preserved 68 years old male adult human cadaver undergoing routine anatomical dissection for 1st professional B.M.A.S students in the year 2026 of Alva's Ayurveda medical college & hospital, Moodubidiri was used for the observation. The abdominal cavity was opened according to the standard dissection approach, and the abdominal viscera were removed as required to expose the posterior abdominal wall and retroperitoneal structures. The kidneys, abdominal aorta, inferior vena cava and ureters were identified. The perirenal tissues were carefully cleared to expose the renal vessels. The principal renal artery was traced from the abdominal aorta towards the renal hilum, after which the renal arterial branches were followed toward the renal parenchyma and poles. The additional vessel was observed near the inferior pole of left kidney was observed carefully to determine its course, relationship with the ureter and renal vessels, and point of entry into the kidney. Photographs were taken at different stages of dissection for documentation.

4. OBSERVATION / GROSS ANATOMICAL FINDING

During dissection, the renal vascular pedicle demonstrated the expected principal hilar renal artery together with an additional arterial channel directed toward the inferior aspect of the kidney. The additional vessel was distinguishable from the main hilar artery by its separate course toward the lower pole of left kidney. The supplied photographs show the vessel in relation to the abdominal aorta, inferior vena cava, renal hilum, kidney and adjacent retroperitoneal structures. The appearance is consistent with an inferior polar accessory renal artery.

5. PHOTOGRAPHIC DOCUMENTATION



Figure 1: Close-up view showing the kidney, renal vascular pedicle and the additional vessel directed toward the inferior pole of left kidney.



Figure 2: Anterior view of the posterior abdominal wall demonstrating the renal arteries and the additional inferiorly directed arterial channel.



Figure 3: Wider dissection view showing both kidneys, abdominal aorta, inferior vena cava and renal vascular relationships.



Figure 4: Detailed view of the renal pedicle and inferior pole region; the additional vessel should be traced to its origin before final labeling.

6. DISCUSSION

The renal arteries are among the abdominal vessels in which anatomical variation is frequently encountered. Accessory renal arteries are not simply incidental structures; many are end arteries supplying specific renal territories. The terms “accessory” and “supernumerary” are commonly used in the literature, although terminology is not completely uniform.^[2,5,6] In the present dissection, the additional vessel was directed to the inferior pole of left kidney and was separate from the principal hilar left renal artery, making an left inferior polar accessory renal artery the most appropriate descriptive diagnosis. inferiorly left psoas major, quadratus lumborum muscle was observed.

A cadaveric study specifically examining accessory renal vessels at the renal poles reported accessory arteries in 4% of 50 kidneys, including a lower-pole artery in a left kidney that divided into anterior and posterior branches.^[3] Other cadaveric investigations have reported considerably higher overall frequencies of accessory renal arteries, demonstrating that prevalence depends on the definition used, population studied and method of examination.^[6,7] The recent South Indian cadaveric study by Manoharan and colleagues reported accessory renal arteries in 27.7% of 72 kidneys, with inferior polar termination among the recognized patterns.^[8] These findings place the present observation within a well-established spectrum of renal arterial variation rather than an isolated anatomical curiosity.

From a developmental perspective, renal vascular variation is related to the changing vascular relationships of the kidney during its ascent from the pelvic region to the upper retroperitoneum. Multiple temporary arterial supplies arise during this migration, and persistence of one or more vessels can result in additional renal arteries in the adult. The persistence of such vessels may therefore be understood as a consequence of the complex developmental remodeling of renal blood supply.^[6]

The inferior pole is clinically important because an inferior polar artery may pass close to the renal pelvis or ureteropelvic junction. Anatomical studies have demonstrated vessels crossing in the vicinity of the ureteropelvic junction, and clinical literature documents cases in which lower polar vessels contribute to obstruction.^[4,9,10] Therefore, a lower polar accessory artery should be identified before procedures involving the renal pelvis, proximal ureter or lower renal pole. In minimally invasive surgery, an unrecognized vessel can be a source of bleeding.

Renal transplantation is another important application. Preoperative vascular mapping is necessary because the number, origin, course and termination of renal arteries influence donor selection, surgical planning and vascular anastomosis. The presence of multiple arteries may require modification of the operative approach, and preservation of a polar artery may be necessary to maintain perfusion of its renal territory.^[5,7,8] Similar considerations apply to partial nephrectomy, renal artery reconstruction, abdominal aortic surgery, endovascular procedures and interpretation of CT angiography.

The present observation also illustrates the value of cadaveric dissection in undergraduate and postgraduate anatomy. A textbook description generally presents one renal artery on each side, whereas actual specimens may show additional arteries, variant courses and unusual relationships. Direct tracing of the vessel from its source to its termination allows the learner to understand not only the variation but also its surgical implications.

7. CONCLUSION

An inferior polar accessory renal artery represents an important variation of renal vascular anatomy. The present cadaveric dissection demonstrated an additional arterial channel directed toward the inferior pole of left kidney, distinct from the principal hilar left renal artery. Such a vessel may have a specific renal territory and may have close anatomical relationships with the ureter and renal pelvis. Published anatomical studies and recent systematic evidence demonstrate that accessory renal arteries are sufficiently frequent to be considered during routine anatomical assessment, radiological interpretation and renal surgery.^[3,5,8] Careful dissection and tracing of the vessel from origin to termination are essential for accurate classification. Documentation of such variants in cadaveric teaching not only enriches anatomical knowledge but also provides clinically relevant information for transplantation, partial nephrectomy, endourology, vascular surgery and interventional radiology. The present case supports the importance of systematic inspection of the renal pedicle and both renal poles during cadaveric dissection.

8. REFERENCES

1. Standring S, editor. Gray's Anatomy: The Anatomical Basis of Clinical Practice. 41st ed. Edinburgh: Elsevier, 2016.
2. Hlaing KPP, Das S, Sulaiman IM, Latiff AA, Ghafar NA, Suhaimi FH, et al. Accessory renal vessels at the upper and lower pole of the kidney: a cadaveric study with clinical implications. *Bratisl Lek Listy*, 2010; 111(5): 308-310. doi:10.1007/BF03657377.

3. Jamkar AA, Khan B, Joshi DS. Anatomical study of renal and accessory renal arteries. *Saudi J Kidney Dis Transpl*, 2017; 28(2): 292-297. doi:10.4103/1319-2442.202760.
4. Budhiraja V, Rastogi R, Jain V, Bankwar V. Anatomical variations of renal artery and its clinical correlations: a cadaveric study from central India. *J Morphol Sci.*, 2013; 30: 228-233.
5. Triantafyllou G, Paschopoulos I, Węgiel A, Olewnik Ł, Tsakotos G, Zielinska N, Piagkou M. The accessory renal arteries: a systematic review with meta-analysis. *Clin Anat.*, 2025; 38(6): 660-672. doi:10.1002/ca.24255.
6. Gulas E, Wysiadecki G, Cecot T, Majos A, Stefańczyk L, Topol M, Polguy M. Accessory (multiple) renal arteries - differences in frequency according to population, visualizing techniques and stage of morphological development. *Vascular*, 2016; 24(5): 531-537. doi:10.1177/1708538116631223.
7. Manoharan MB, Kuppusamy R, Subramanian M. Exploring the occurrence and clinical implications of accessory renal arteries: a descriptive study in South Indian cadavers. *Fukushima J Med Sci.*, 2025; 71(3): 155-161. doi:10.5387/fms.24-00021.
8. Cases C, García-Zoghby L, Manzorro P, Valderrama-Canales FJ, Muñoz M, Vidal M, et al. Anatomical variations of the renal arteries: cadaveric and radiologic study, review of the literature, and proposal of a new classification of clinical interest. *Ann Anat.*, 2017; 211: 61-68. doi:10.1016/j.aanat.2017.01.012.
9. Grasso M, Caruso RP, Phillips CK. UPJ obstruction in the adult population: are crossing vessels significant? *Rev Urol.*, 2001; 3(1): 42-51.
10. Lee JY, Chung JW, Kim SH, Cho SW, Park JH. Proximal ureter obstruction caused by a lower polar renal artery: demonstration with spiral CT angiography. *J Comput Assist Tomogr*, 1997; 21(4): 641-642. doi:10.1097/00004728-199707000-00024.