BATTICALOA MEDICAL JOURNAL
Establishd 2005
Volume 19, Issue 02 December 2025

Case Report

Renal Artery Variation Encountered During A Deceased Donor Organ Surgery

Kugapiragash R[1], Arudchelvam J[2]

[1] *Postgraduate Trainee in General Surgery, National Hospital of Sri Lanka, Colombo*

[2] *Professor of Vascular & Transplant Surgery, National Hospital of Sri Lanka, Colombo*

Abstract:

Renal arterial anatomy exhibits significant variation, which holds important implications for donor nephrectomy, deceased donor retrieval, transplantation, and other surgical procedures. Among these, accessory renal arteries and precaval courses represent clinically relevant anomalies that may complicate surgical dissection and graft revascularization. We describe a rare vascular anomaly identified during deceased donor organ retrieval in a 70-year-old female. In addition to the normal right renal artery, an accessory renal artery was noted arising from the abdominal aorta at the level of L2 and coursing anterior to the inferior vena cava (precaval) to enter the renal hilum. The left kidney demonstrated a single renal artery in its usual anatomical position. Both kidneys were successfully retrieved and transplanted, with both recipients showing immediate graft function and no early postoperative complications. Multiple renal arteries occur in 25–30% of individuals, whereas a precaval course is reported in only 0.8–5%. The simultaneous presence of precaval and postcaval renal arteries on the same side is exceedingly rare. Although accessory renal arteries are associated with higher surgical complexity and increased risk of vascular complications, meticulous procurement and reconstruction techniques enable favorable outcomes: This case highlights the importance of recognizing renal arterial variations during donor retrieval to ensure safe procurement and optimize transplantation success.

Keywords: Renal artery variant, cadaveric kidney donor, renal transplant

Introduction

The anatomy of the renal arteries plays a crucial role in the selection of kidney donors, particularly in live donor evaluations. However, during cadaveric organ retrieval, preoperative imaging is often unavailable to assess vascular anatomy. Therefore, a thorough understanding of renal vascular anatomy and its variations is essential for safe and effective organ procurement.

Typically, each kidney is supplied by a single renal artery arising as a lateral branch of the abdominal aorta between the first and second lumbar vertebrae. The left renal artery is usually shorter, while the longer right renal artery passes posterior to the inferior vena cava (IVC) to reach the renal hilum. Common morphological variations include differences in the number of renal arteries, their course, and early (prehilar) branching patterns. Reported variations include multiple renal arteries, precaval courses, and even thoracic origin of the renal artery.

Here, we report a case encountered during deceased donor organ retrieval, in which multiple right renal arteries were identified, including both precaval and postcaval arteries. This case emphasizes the importance of recognizing renal arterial anomalies during procurement to avoid inadvertent injury.

Case report

A deceased donor organ retrieval was performed on a 70-year-old female. A midline laparotomy with transverse extension was carried out to facilitate the procedure. During mobilization, an accessory right renal artery was identified arising from the aorta at the level of the second lumbar vertebra. This artery coursed anterior to the inferior vena cava (IVC) to enter the right renal hilum. There was no evidence of hydronephrosis. The left kidney had a single renal artery in its typical anatomical position. The right kidney also had a normal renal artery present in

the usual location. Both kidneys were drained by a single renal vein each.

Both kidneys were successfully retrieved for transplantation. Postoperatively, both recipients demonstrated immediate graft function with no early transplant-related complications.

Figure 1 - Accessory renal artery to right kidney running anterior to the inferior vena (IVC)

Discussion

A thorough understanding of renal vascular anatomy is essential in both live and deceased donor organ retrieval, renal transplantation, and various urological and vascular procedures. Anatomical variations in renal arteries are not uncommon, and failure to recognize them intraoperatively may result in vascular injury, inadequate organ perfusion, or technical difficulties in anastomosis during transplantation (Abdessater et al., 2022). The classical description states that each kidney is supplied by a single renal artery branching from the abdominal aorta at the level of L1–L2. However, studies have consistently reported that multiple renal arteries occur in approximately 25–30% of individuals, with a single artery present in only about 70% (Abdessater et al., 2022; Triantafyllou et al., 2024). These additional arteries may supply either the renal hilum (accessory hilar arteries) or directly enter the poles (polar arteries). Their presence is a result of the persistence of embryonic vessels that normally regress as the kidneys ascend from the pelvis to their final lumbar position (Singh et al., 2018).

In the present case, the unusual finding was the coexistence of both precaval and postcaval right renal arteries. A precaval course is reported in only 0.8–5% of cases (Modi et al., 2008), making this a relatively rare anatomical anomaly. Even more exceptional is the simultaneous presence of both pre- and postcaval renal arteries in the same kidney, which has been documented only sporadically in the literature. Such variations have clinical relevance not only in transplantation but also in the interpretation of radiological imaging, endovascular interventions, and retroperitoneal surgery.

From a clinical standpoint, accessory and precaval renal arteries may be associated with pathological conditions. A precaval renal artery has been implicated in ureteropelvic junction obstruction and hydronephrosis due to its anterior compression of the ureter (Modi et al., 2008). However, in this donor, no hydronephrosis was observed, and both kidneys functioned well post-transplantation. Nonetheless, this reinforces the need for careful dissection during retrieval, as unrecognized accessory vessels may be inadvertently damaged, leading to ischemic injury in the graft or increased risk of postoperative complications in the recipient.

The surgical implications of accessory renal arteries are significant in transplantation. Studies indicate that kidneys with multiple arteries are at increased risk of vascular complications, delayed graft function, and higher technical complexity in arterial reconstruction[(Bernal-García et al., 2022). Specifically, recipients of grafts with accessory arteries show a nearly 20% higher incidence of acute rejection and post-transplant viability loss compared to those with single renal arteries (Bernal-García et al., 2022). Despite this, modern microsurgical techniques and meticulous vascular reconstruction have largely mitigated these risks, allowing excellent outcomes even in kidneys with complex vascular anatomy. The present case highlights this, as both recipients had immediate graft function without early vascular or urological complications. Recent cadaveric and radiological studies further emphasize the high prevalence and variability of accessory renal arteries.

Triantafyllou et al. (2024) observed ARAs in 30.56% of specimens, with unilateral anomalies more common than bilateral ones, and a left-sided predominance. Similarly, in a donor nephrectomy series, Arudchelvam & Waruna Laksiri (2021) found multiple renal arteries in 14.5% and early branching in 21.4% of cases, often accompanied by multiple renal veins. These findings underscore the importance of comprehensive preoperative imaging in live donors and vigilant dissection in deceased donor procurement. Embryologically, the persistence of caudal mesonephric arteries explains the occurrence of ARAs.

Normally, as the kidneys ascend from the pelvis to the retroperitoneum, the lower arterial branches regress, while new branches form cranially from the abdominal aorta (Abdessater et al., 2022). Failure of regression results in accessory or polar arteries. Understanding this developmental process provides a framework for anticipating and recognizing such anomalies during surgery.

In conclusion, this case demonstrates a rare but clinically relevant vascular variation involving both precaval and postcaval renal arteries on the right side. Recognition of such anomalies during procurement is vital to avoid inadvertent vascular injury, ensure optimal graft perfusion, and facilitate successful transplantation. Although multiple or aberrant renal arteries increase surgical complexity, careful dissection and reconstruction allow excellent graft outcomes, as demonstrated by the immediate function observed in both recipients.

Corresponding Author: Dr R Kugapiragash,
<rkugapiragash@gmail.com>
ORCID- 0009-0005-7517-4405

References

1. Panis, A., De La Taille, A., Parier, B., Drouin, S. J., Matignon, M., Anglicheau, D., Fournier, C., Méjean, A., & Timsit, M.-O. (2025). Does the Sacrifice of Accessory Renal Arteries Impair Functional Outcomes After Living Donor Kidney Transplantation? A Retrospective Single-Center Cohort Study of 251 Recipients. Clinical Transplantation, 39(7), e70229. https://doi.org/10.1111/ctr.70229
2. Triantafyllou, G., Paschopoulos, I., Węgiel, A., Olewnik, Ł., Tsakotos, G., Zielinska, N., & Piagkou, M. (2024). The accessory renal arteries: A systematic review with meta-analysis. Clinical Anatomy. https://doi.org/10.1002/ca.24255
3. Bernal-Garcia, M., Matamoros, J., Sofia, G., & Alejandra, M. (2022). Clinical implications of the accessory renal artery. A systematic literature review. Revista de NefrologyA, Di Lisis Y Trasplante, 41(3), 214–228. https://www.medigraphic.com/cgi-bin/new/resumenI.cgi?IDARTICULO=108537
4. Abdessater M, Alechinsky L, Parra J, Malaquin G, Huot O, Bastien O, et al. Anatomical variations of the renal artery based on the surgeon's direct observation: A French perspective. Morphologie [Internet]. 2022;106(352):15–22. Available from: http://dx.doi.org/10.1016/j.morpho.2021.01.005
5. Tardo DT, Briggs C, Ahern G, Pitman A, Sinha S. Anatomical variations of the renal arterial vasculature: An Australian perspective. J Med Imaging Radiat Oncol [Internet]. 2017;61(5):643–9. Available from: http://dx.doi.org/10.1111/1754-9485.12618
6. Researchgate.net. [cited 2025 Apr 9]. Available from: https://www.researchgate.net/publication/341256980_VARIATIONS_OF_RENAL_ ARTERY_A_CADAVERIC_STUDY
7. Farahzadi A, Mahmoodzadeh H, Gopal N. A solitary precaval right renal artery: A case report. Clin Case Rep [Internet]. 2022;10(6):e05866. Available from: http://dx.doi.org/10.1002/ccr3.5866
8. Modi PR, Rizvi SJ, Gupta R, Patel S, Trivedi A. Retroperitoneoscopic right-sided donor nephrectomy with pre- and postcaval renal arteries. Urology [Internet]. 2008;72(3):672–4. Available from: http://dx.doi.org/10.1016/j.urology.2008.06.006
9. Arudchelvam, J. and Laksiri, W. (2021) 'Anatomical variations of the renal vasculature and outcome of live donor nephrectomies: experience of a single surgeon', Sri Lanka Journal of Surgery, 39(2), p. 28-30. Available at: https://doi.org/10.4038/sljs.v39i2.8817