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Case Report

Accessory Renal Artery: A Cadaveric Case Report

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ABSTRACT:

Introduction: The presence of Accessory Renal Artery, an anatomical variation has varying health implications and outcomes. Accessory Renal Artery is generally a vestigial structure caused by failure to degenerate during the ascent of metanephros.

Case Report: We found, 2 Accessory Renal Artery on anterior surface of right kidney. H&E examination revealed both were Accessory Renal Artery. The first artery lumen was obliterated while the second artery was patent. Thickness of 1st Accessory Renal Artery at the site of insertion at kidney was 21.41 mm and thickness of 2nd Accessory Renal Artery at the site of insertion at kidney was 21.28 mm. 5 segmental arteries divided 1 cm before entering the hilum.

Conclusion: Knowledge of such variations have great significance with the increasing number of renal transplants, vascular reconstructions and various surgical techniques performed in the recent years to avoid injury.

Keywords: Kidney, Multiple Renal Artery, Cadaver.

INTRODUCTION:

Renal arteries originate from the abdominal aorta and usually occur as pairs vessels which are responsible for supplying blood to the kidneys. Accessory Renal Artery are said to be among the most common vascular variants, estimated to be present in 13 – 59.5 % in Indian Population. Accessory Renal Artery is most common in North Indian Population with 39.2 %. [1, 2, 3]

Variation of renal artery is of great importance, especially for surgeons, radiologists, and anatomists. Some variations such as Accessory Renal Artery are associated with greater complication, such as renovascular hypertension and ischemic kidney diseases, especially when these accessory arteries are damaged or ignored during surgical procedures. [4, 5]

In addition, development of imaging technologies such as computerised tomography (CT) and Magnetic Resonance Imaging, Renal Angiogram, increased the detection of Accessory Renal Artery, hence improving preoperative assessment and reducing intraoperative hazards. [6, 7]

Embryologically, these anomalies originate during the early stages of kidney development. As the kidneys ascend from the pelvic region to their permanent location in the lumbar region, they are temporarily supplied by multiple mesonephric arteries. While most of these arteries regress, the persistence of one or more results in known as Accessory Renal Artery [8, 9]. Despite being well-documented in the literature, the impact of Accessory Renal Artery on surgical outcomes, particularly in renal transplantation and nephrectomy, continues to challenge clinicians even in today's scenario because of less knowledge of such variations. [10].

The result of this case report enhances our knowledge of the renal vascular defects concerning the surgical procedures including kidney transplant and kidney laparoscopic surgery. This study emphasizes the existence of such rare variations of the vascular tree and the difficulties such variations can constitute, which in turn advocates for the necessity of knowing such variations to better the surgical result,

understanding anatomical variation, and for better treatment modalities.

CASE REPORT:

During routine dissection of a 60-year-old male cadaver in the Department of Anatomy, 2 (Two) Accessory Renal Artery were identified. The dissection was performed as part of an undergraduate medical anatomy curriculum.

RIGHT KIDNEY:

The right renal artery originated from the antero-lateral aspect of the abdominal aorta at the lower border of L1 vertebra, which enters the hilum of right kidney. The renal artery length from aorta to hilum of right kidney is 5.3 cm long.

An accessory renal artery arises from the antero-lateral aspect of the abdominal aorta at the upper border of the L1 vertebra which runs laterally and enters the anterior surface of the upper pole of right kidney. It is labelled as 1st Accessory Renal Artery. The 1st Accessory renal was obliterated (Fig 1)

The right renal artery gives off an accessory branch from the superior part, just before bifurcating into 5 segmental arteries. The accessory branch enters the anterior surface of right kidney just below the first accessory renal artery. It is labelled as 2nd Accessory Renal Artery. The 2nd Accessory renal artery was patent and opened into medulla (Fig 1)

The right renal vein followed a standard anatomical course, without significant variations. The 5 segmental arteries divided 1 cm before entering the hilum of kidney. Also, Renal cyst was present at the upper pole of posterior surface of right kidney. Each measurement of kidney and Accessory Renal Artery were taken by Vernier Calliper by 3 observers. (Table 1 and Table 2).

Table 1: Measurements of Kidney

SL. NO.	PARAMATERS	RIGHT KIDNEY	LEFT KIDNEY
1.	Length of kidney	94.46 mm	89.64 mm
2.	Breadth at upper pole	57.04 mm	57.40 mm
3.	Breadth at hilum	59.61 mm	45.72 mm
4.	Breadth at lower pole	72.21 mm	54.76 mm
5.	Thickness at the level of hilum	59. 61 mm	38.60 mm
6.	Hilum length	34.08 mm	29.78 mm

Table 2: Measurements of Accessory Renal Artery in Right Kidney

SL. NO.	PARAMATERS	RIGHT KIDNEY
1.	Distance of 1st ARA from upper pole	33.83 mm
2.	Distance of 2nd ARA from upper pole	38.60 mm
3.	Distance between 1st and 2nd ARA (at renal surface)	25.67 mm
4.	Length of 1st ARA (from aorta to renal surface)	58 mm
5.	Thickness of 1st ARA (origin site)	25.21 mm
6.	Thickness of 1st ARA (entry site)	21.41 mm
7.	Length of 2nd ARA (from aorta to renal surface)	31 mm
8.	Thickness of 2nd ARA (origin site)	23.02 mm
9.	Thickness of 2nd ARA (entry site)	21.28 mm

LEFT KIDNEY:

No Accessory Renal Artery were present. The main renal artery, originating from the Antero – lateral aspect of abdominal aorta at the lower border of L1 vertebral, enters the hilum and supplies the left kidney. The left renal vein followed a standard anatomical course, without significant variations. The 5 segmental arteries divided 1 cm before entering the hilum of kidney. Renal cyst was present at the upper pole of anterior surface of the left kidney. (Table 1)

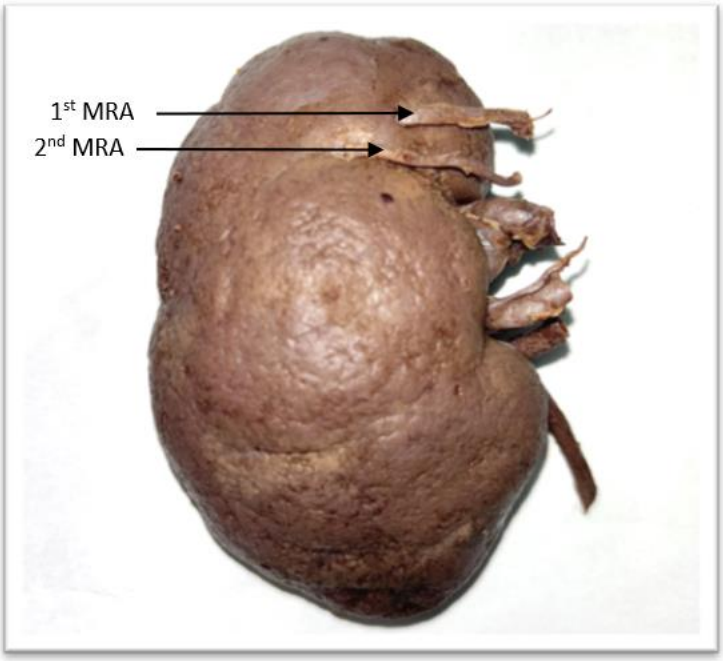

Fig 1 - 1ST and 2nd ARA seen on Anterior Surface of Right Kidney

Fig 2 – Upper pole to 2nd ARA distance measurement by Vernier Calliper

HISTOPATHOLOGICAL FINDING:

Histological examination of the Accessory Renal Artery with Haematoxylin and Eosin staining showed the typical structural arrangement of the arterial walls (Fig 3):

1. Tunica Intima: There was only one layer of flattened endothelial cells that lined the lumen, and this was supported by a thin subendothelial connective tissue layer. The internal elastic lamina (IEL) was visible as a distinct, wavy band of elastic fibres, marking the intima from the tunica media.

2. Tunica Media: It was composed of three layers of smooth muscle cells interposed with elastic fibres. The external elastic lamina (EEL) was much less prominent than the IEL but could be distinguished and divided the media from the adventitia.

3. Tunica Adventitia: It is the outermost layer. It comprises of loose connective tissue comprising of collagen and elastic fibres, fibroblasts, and vasa vasorum. There are scattered haemosiderin laden macrophages at places within the adventitia and perivascular spaces, which indicated preceding microscopic haemorrhage or breakdown product of blood in the areas.

The well-preserved integrity of IEL and EEL with the presence of smooth muscle and elastic fibres in the

media confirms the functional nature of both arteries. No pathological changes, including fibrosis, atherosclerosis, or inflammatory cell infiltration, were found.

This case is unique because it brings attention to the rare discovery of two accessory renal arteries in the right kidney of a single individual. What sets it apart is the detailed documentation of their structure and positioning, combined with histological analysis that offers a deeper understanding of their anatomical structure patency and functionality.

This case goes beyond identification, exploring how these arteries could impact critical surgeries like kidney transplants and nephrectomies. By providing precise measurements and highlighting the clinical challenges these anomalies may pose, this case adds a valuable perspective to understanding and addressing the complexities of renal vascular variations.

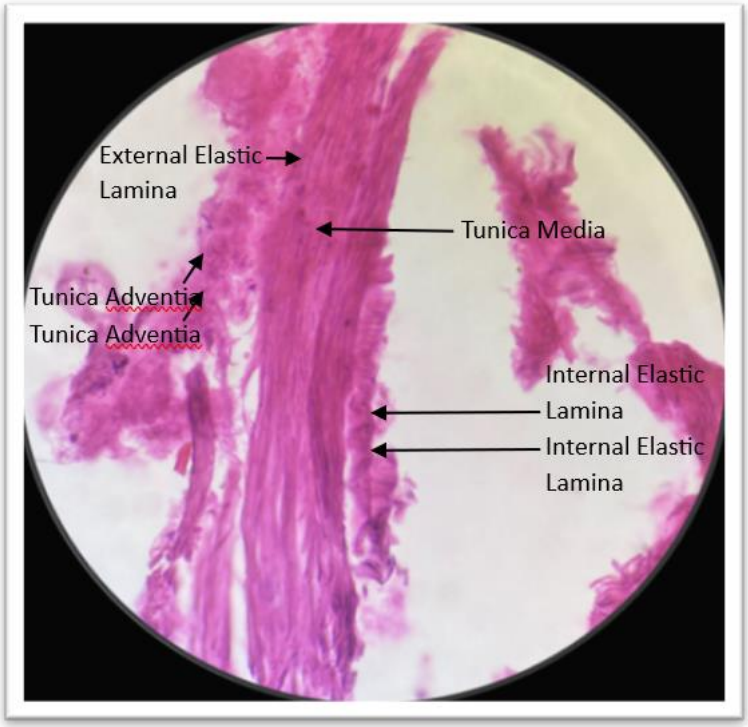

Fig 3 – Haematoxylin & Eosin Staining of 1st ARA

DISCUSSION:

Several studies in the literature have documented anatomical variation of the renal arteries, which are seen to be similar to that in the present case which is presence of Accessory Renal Artery on the right kidney.

For example, Patra et al.[1] reported from a cadaveric dissection that supernumerary renal arteries were found on the right side in 30% incidence. In their study, those arteries entered the kidney hilum, while others through the upper poles. They underscored the embryological basis of such variations and their consequences on surgical procedures.

Rajakumari et al.[11] noted early branching and accessory renal arteries in 30% of cadaveric kidneys. Such variations can create problems during laparoscopic donor nephrectomies and other renal surgeries since the risk of intraoperative complications is increased with accessory arteries.

A study by Sirikonda et al.[12] reported renal artery variations in 16% of cadavers, with double renal arteries on the right side. Such anomalies should be identified to avoid surgical complications and enhance surgical planning.

These studies point to the clinical relevance of Accessory Renal Artery and resonate well with the observations in the present case. Thus, emphasizes the need for comprehensive anatomical knowledge and proper preoperative imaging to maximize surgical safety and ensure the best possible clinical outcomes.

CONCLUSION:

The identification of accessory renal arteries during cadaveric dissection provides valuable insights into anatomical variations and their clinical significance. Such anomalies underscore the necessity for precise preoperative imaging and a thorough understanding of renal anatomy to avoid complications during surgical procedures and interventions. This case contributes to the growing body of literature on renal vascular anomalies, highlighting their importance in both medical education and clinical practice.

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