Section: Anatomy

Original Research Article

A CADAVERIC STUDY OF RENAL VASCULAR ANOMALIES AND ITS ASSOCIATION WITH RENAL ABNORMALITIES

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Received : 05/12/2025
Received in revised form : 25/01/2026
Accepted : 12/02/2026

Keywords:
Lobulations, Ectopic Kidney, Accessory Renal Arteries, Variation.

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DOI: 10.47009/jamp.2026.8.1.194

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2026; 8 (1); 1016-1018

ABSTRACT

Background: The kidneys excrete end products of metabolism, excess water. they maintain electrolyte and water balance. They are located retro peritoneally on either side of vertebral column. superiorly the kidneys are at level with the upper border of 12th thoracic vertebra on the left and the 1st lumbar vertebra on the right, inferiorly with 3rd and 4th lumbar vertebra correspondingly.[1] Renal lobulation also known as fetal or embryonic lobulation is a rare variation of development, where renal lobules have a visible anatomical space between them. Fetal lobulation is rare in adult patients and can be seen in 0.5-4% of cases. The number, shape, size, position, rotation and vascularisation are of immense importance due to their variation, susceptibility to trauma, infection and iatrogenic injury[2]. The present study aimed to note the morphological and vascular anatomy of kidneys with respect to the location, shape, and variations in lobulations.**Materials and Methods:** Fifty specimens from 25 adult human embalmed cadavers were taken from the department of anatomy and were studied.**Result:** Persistant lobulations was observed in 10 (20%) kidney specimens. out of 50 specimens 10 kidneys have shown persistant lobulations. Ectopic kidney was noted in one(2%) cadaver and is on the left side with multiple renal arteries.**Conclusion:** Sometimes these lobulations persists in adult life mimicking inflammatory conditions like renal scars in CT. So this congenital anomaly should always keep in mind as there is no parenchymal loss in this condition. Unusual presentation of hilar structures may cause difficulty in laproscopic procedures. The knowledge of variations reported here is very useful for radiologists, urologists and surgeons.

INTRODUCTION

Kidneys may vary in shape, size, position, rotation and vascularisation. An ectopic kidney found in the pelvis is 1 in 2500 live births. Kidneys so placed often have associated malrotation anomalies and can have marked fetal lobulation. Pelvic kidneys frequently become hydronephrotic as a result of an anteriorly placed ureter and have an anomalous arterial supply.[1] Variations in the form of the kidneys depend upon persistence of fetal lobulation and are said to occur more frequently on the left side, taking 3 basic forms.[3] Renal lobulation is a rare variation of development when renal lobules have a visible anatomical space between them. Fetal lobulation is rare in adult patients and can be seen in 0.5-4% of cases.[2]There are three types of kidney surface anatomy: normal (bean-shaped),lobulated kidney and dromedary hump. All three variants are considered to be normal. However, kidneys with fetal lobulation and dromedary humps can sometimes be confused with pathological conditions such as tumours and nephrosclerosis.[4] It is also present in some developmental anomalies. For instance, in Bardet-Biedl syndrome, fetal lobulation is present in 12–84% of cases.[3]Lobulations are said to occur more frequently on the left side, taking three basic forms (Lowman and co-workers)

Aim & Objectives: The present study aimed to note the morphological and vascular anatomy of kidneys with respect to the location, shape and their abnormalities in their morphology. To determine the potential clinical implications in relation to lobulations of the kidney and ectopic kidney.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

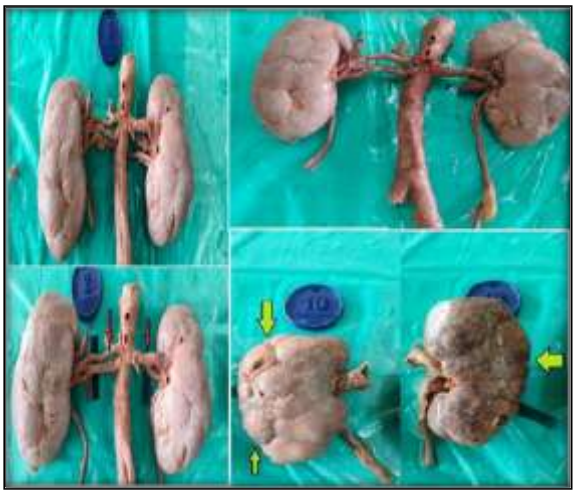
MATERIALS AND METHODS

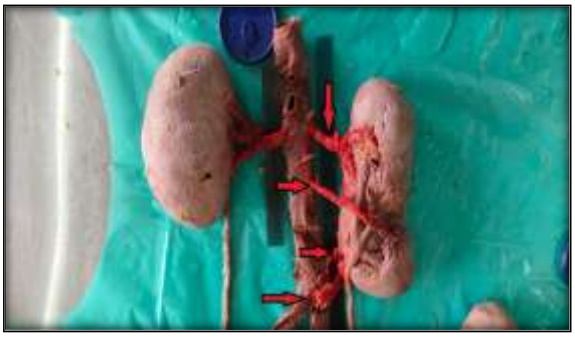
The present study was performed in 25 well preserved Human cadavers of both sexes and several age groups during routine dissection classes for first MBBS students in the Department of Anatomy (2019-2023), ACSR GMC Nellore. The abdomen was opened as per Cunningham's manual, the anterior abdominal wall was reflected, and the abdominal viscera were removed. Both the kidneys were identified. Morphological variations of the kidney with its vasculature were noted, and they were documented by photography.

RESULTS

Persistant lobulations was observed in 20% of kidneys.Out of 50 specimens taken 10 kidneys have shown persistant lobulations. In these kidneys presence of accessory renal artery associated with lobulations was noted in 40%. 4 cadavers have showed bilateral lobulations and 2 cadavers showed unilateral lobulation on the right side. The lobulations on the right kidneys were prominent than the left. The approximate measurements of right lobulated kidneys were10.5cm in length,4.5cm in width, 3cm in thickness and the left lobulated kidneys were 9.6cm in length,4.2cm in width and 3.4 cm in thickness. The lobulations were few and big on the right.

In the present study Ectopic kidney was observed in one(2%) cadaver on the left side with the presence of multiple renal arteries in the lumbar region. Its lower pole is located just above the pelvic brim. The hilum of the kidney is wide and facing anteriorly. Hilum is wide showing major calyces on the anterior surface. Multiple renal vessels are noted,from above downwards 1 renal artery and 3accessory renal vessels was present. Right kidney is normal and is showing early division of renal artery.





1st accessory renal artery arising from aorta and passes anteriorly enter the kidney on the lateral most part.3rdartery arising from aortic bifurcation enter the lower pole of the kidney.

2nd artery also arising from aorta entered the kidney from the lateral and inferior part of the hilum.

DISCUSSION

Persistent foetal lobulation of kidney is a rare anatomic variant and can pose pitfalls in diagnostic imaging.[7] Embryologically, the kidneys develop in several lobules. In the foetus and new-born, the kidney normally has 12 lobules that fuse as they develop and grow.[3] Incomplete fusion of these renal lobules can persist postnatally and may be observed in 7% of adults as lobulated kidneys. After 28th week of gestation, varying degrees of assimilation of independent 14 renal lobes occur. Normally this lobulated appereance of kidney will be present at birth and it gradually disappears during infancy as the nephrons grows and they will fully disappear over the first 5 years of life.[5,6]

Patil et.al reported a rare condition of the kidney where bilateral lobulation and malrotation were observed. And it is in association with the open hilar structure of the kidney.[8] Manish et al in their study observed lobulation in 5% of the right kidneys and 10% of the left kidneys.[9]

The lobulation observed in the present study, although it had no associations with any other structural variations or defects, might highlight certain clinical significance. Our study is compared with similar studies done previously and shows statistical significance of occurrence.

There is minimal data on renal lobulation in adults.[2] Lorenz and coworkers assessed kidney anatomy and diseases in potential donors and encountered fetal lobulation in only 0.5% of cases (CI 95%, 0.2–0.9). There was no difference in the incidence of lobulation between males and

ISSN (O): 2687-5365; ISSN (P): 2753-6556

females.[10] Harrison and coworkers analysed 166 renal arteriograms and found that 4% of kidneys had kidney lobulation.[2] Our study demonstrated a higher incidence of kidney lobulation (20%). The persistence of foetal lobulated contour of the kidneys into adult life is not uncommon. However, the degree of irregular contour may vary from notch deformities to diffuse multilobulated kidneys. The previous studies have suggested that irregularity of contour occurs more commonly on the left side.[9,10] A single local lump occurs most commonly on the lateral border. In the case reported by Tulika gupta three well-defined lobes were reported on the right side.[11]

Anomalies of renal rotation are typically associated with renal ectopia and with fusional deformities, but may be exhibited by kidneys that are normal. Pusztai et al. have reported the case of a 57-year-old man who presented with four left RAs, one main RA and three additional RAs, discovered by multi-detector computed tomography (MDCT) angiography, used to explore the vasculature of the lower limbs.[12] Miclaus ¸ et al., in 2012, have reported a rare case of a 58-year-old man with eight arteries (four bilateral) discovered by routine MDCT angiography. The eight arteries came from the abdominal aorta.[13] Gratien D Miclaus et al. have reported six renal arteries, arising from the right internal iliac artery, the right common iliac artery and the Abdominal aorta. Out of 6 arteries, 4 arteries are present on the anterior aspect of the kidney and 2 renal arteries on the posterior aspect of the kidney.[14]

CONCLUSION

The knowledge of these variations provides safety guidelines for endovascular procedures like therapeutic embolisation and angioplasties. It is very useful for radiologists, urologists and surgeons. Knowledge of renal vascular anatomy is essential, especially in kidney transplantation. A kidney with multiple arteries is associated with more chances of infarction and haemorrhage, acute tubular necrosis and rejection episodes, postoperative hypertension and calyceal fistula formation. It has been said that failure to restore circulation to the accessory renal artery during surgery may cause ischemia or necrosis of renal tissue. In operations upon kidneys which present malrotations, it is necessary, according to weyrauch to examine the renal vessels with care, not to establish the diagnosis as to excessive or reverse rotation, but to be sure that vessels which may have to be ligated are not necessary to the life of the kidney.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556