



ORIGINAL RESEARCH PAPER

Anatomy

PERSISTANT FETAL LOBULATIONS AND HYPOPLASIA OF ADULT KIDNEYS

KEY WORDS: kidney,fetal lobulations,hypoplasia,ureteric bud,metanephric blastema

Dr.A.Himabindu*

Professor&HOD, Department of Anatomy, GITAM Institute of Medical sciences &Research, Rushikonda, Visakhapatnam*correspondence Author

Dr.S.Muralikrishna

Associate professor Department of Anatomy, GITAM Institute of Medical sciences &Research, Rushikonda, Visakhapatnam

ABSTRACT

Kidneys are important excretory organs. In intrauterine life they are developed in the form of lobules from intermediate mesoderm. The fetal lobules disappear in postnatal life with increase in number and size of nephrons. But this feature persists in some adult kidneys as lobulated kidneys. The study was conducted on 40 adult kidneys dissected during the teaching program of undergraduate medical students. Out of these, three kidneys showed varied presentation in the form of lobulations and renal hypoplasia. Even though it doesnot affect its function, the lobulated kidneys mimic as renal scars in investigative procedures. The varied relation of hilar structures of these kidneys may cause ureteropelvic obstruction.

Introduction:

Kidneys are important organs of excretion. They are retroperitoneal organs present in the lumbar region of the abdomen.Developmentallyit is derivedfrom intraembryonic mesoderm. It has two components- collecting part & excretory part.Collecting part is developed fromureteric budand excretory part is derived from metanephric blastema.The metanephric kidney in fetal life is developed in the form of lobules,with the growth of nephrons these lobules fusein adult kidney but in some conditions the lobular patterns persists leading to lobulated kidney in adults. Functionally they are like normal adult kidneys but morphologically it shows the lobular pattern revealing its fetal life.These lobulations mimic as renal infarcts or renal scars in CT &MRI.The present study was on renal anomalies in the adult kidney in the form of lobulations,renal hypoplasia and varied arrangement of hilar structuresof these kidneys and their clinical aspects

Materials &Methods:

The present study was conducted on 40 kidneys that were removed during the routine dissection of undergraduate medical students.The fascia was cleared and their morphology was studied .The arrangement of hilar structures was observed .During this process persistant fetal lobulations and renal hypoplasia were observed. The parameters of these kidneys were studied using vernier calipers.

Observations:

The present study observed lobulated kidneys that had very prominent lobular pattern and hypoplasia of the kidney. The hilar structures of these kidneyshowed varied presentation.(fig.1)



Fig.1 showing the anomalous kidneys

In a right kidney, lobulations were seen very prominently. This kidney measured 10cm in length,4.5cm in width, 3.2cm in thickness.At the hilum there was earlier division of renal artery into anterior& posterior divisions.Anterior division again divided into upper& lower trunk. Upper trunk gave a polar & antero superior branches.Lower trunk gave antero middle&anteroinferior branches. The posterior division had a polar branch and a posterior

branch. The posterior division passed behind theextrahilar formation of the ureter.So the relation of hilar structures in this kidney was renal vein,anterior divisions of renal artery, the formation ureter and posterior division of renal artery.(fig.2)



Fig.2 showing lobulations & hilar relations of a kidney

Another loblated left kidney measured9.4cm in length,4.2cm in width and 4.0cm in thickness.The lobulations were few and in the form of big lobules. At the hilum the relations from anterior to posterior were-renal artery, renal vein&ureter.The artery divided into anterior &posterior divisions . The anterior division of the artery had a tortuous course. It gave a polar artery, antero superior, antero middle and antero inferior branches.The posterior division of renal artery passed behind the ureter.The renal vein tributaries were seen in this specimen.(fig.3)



FIG.3 SHOWING BIG LOBULES & ITS HILAR STRUCTURES

A unilateral hypoplastic kidney was observed on the left side of a male cadaver. It measured 6.4cm in length, 3.6cm in width and 2.8cm in thickness. This also showed the lobular pattern. There was prehilum division of renal artery into anterior & posterior divisions. Anterior division gave polar branch to upper pole & numerous small branches entered the hilum. The posterior division of the artery was the posterior most structure at the hilum. Between the two arterial divisions the renal vein & pelvis of ureter were present. On sectioning the kidney cortico medullary differentiation was observed. The pelvis of ureter was dilated and occupied by a calcified mass. The ureteric opening was narrow. (fig.4)

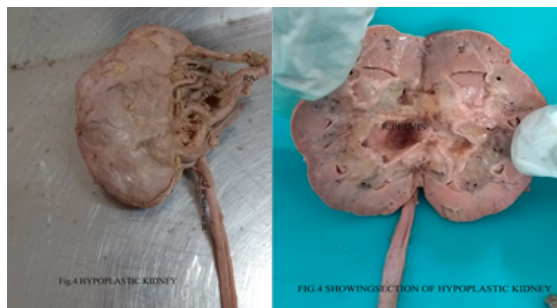


FIG.4 SHOWING HYPOPLASTIC KIDNEY

Discussion

Anomalies of urinary tract are common among the congenital anomalies. They are due to the interaction between environmental factor such as maternal illness and exposure to toxic agents. It may be due to chromosomal aberrations & teratogenic factors (1) According to Pankar et al renal abnormalities in Willeaums Beruen Syndrome was common than normal population. The abnormality may vary from minor bladder diverticulitis to serious malformations like renal hypoplasia or agenesis. (2)

Developmentally the kidneys arise in several lobules. In later period by increase in nephrons lobular pattern disappear in adult kidney. Incomplete fusion of these lobules leads to lobulated kidneys in adults. This normal lobular variation should always be differentiated from inflammatory scarring of the kidney due to chronic infection. It is an incidental finding in CT & MRI as smooth regular indentation without parenchymal thinning that occur between the medullary pyramids, compared with renal scars that are located overlying the medullary pyramids (3)

Extra renal calyces are an uncommon congenital anomaly. It was originally reviewed by Eisendrath. This unusual condition is due to disparity between slow development of metanephric tissue and rapid development of ureteric bud resulting in extra renal formation of ureter. (4)

Accessory renal arteries are common in these lobulated kidney are regarded as persistent embryonic lateral splanchnic arteries. (5) Variant courses of renal vessels that cross the renal pelvis were responsible for uretero pelvic obstruction. Surekha et al study on arrangement of renal hilar structures described various pattern of renal hilar structures. They described a branch of renal artery crossing the renal vein was a rare presentation. (6) The present study also described a tortuous renal artery passing in front of the renal vein giving smaller branches to the kidney. These crowded hilar structures cause difficulty during surgical procedures at hilum and may produce iatrogenic trauma creating an emergency during laproscopic procedures. (7,8) Congenital renal hypoplasia was described by Pabbatti raji reddy in their study on 50 cadavers. They observed this variation in the left kidney measuring 7x4x2 cm. He described renal hypoplasia as a mal development of the kidney that effects its size, shape or structure. In true hypoplasia the kidneys are small and have less than the normal number of calyces and nephrons (9)

Conclusion:

Fetal kidneys are lobulated because they are developed in the form

of small lobules. Later with increase growth of nephrons these lobulations disappear giving the smooth contour to adult kidney. 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.

References:

1. Barakat AJ, Drougas JG. Occurrence of congenital abnormalities of kidney and urinary tract in 13,775 autopsies. *Urology*. 1991;38(4):347-350.
2. Rodriguez MM., Pankau R, Partsch CJ, Winter M, Gosch A, Wessel A. Incidence and spectrum of renal abnormalities in Williams-Beuren syndrome. *Am J Med Genet* 1996;63:301-4.
3. Manisha S More, Manoj D Togale, Shilpa Bhimalli, Daksha Dixit, S P Desai A study of congenital anomalies of human adult cadaveric kidneys *MedPulse – International Medical Journal*, ISSN: 2348-2516, EISSN: 2348-1897, Volume 2, Issue 6, June 2015 pp 364-368.
4. Tulika Gupta, Suresh K Goyal, Anjali Aggarwal, Kunal Chawla, Harjeet Kaur, Daisy Sahni Congenital Renal Anomalies in Indian population. *Journal of postgraduate Medicine, Education and Research* January-March 2017, 51(1) 12-16
5. Vikram Rao KE, Sadananda Rao B., A study of renal artery variations in cadavers. *Asian Pac. J. Health Sci.*, 2015; 2(4):55-61
6. Surekha Dilip Jadhav, Balbhini Ramchandra Zambare. Anatomical study of arrangements of renal hilar structures in Indian adult human cadavers. *National Journal of Integrated Research in Medicine* 2015; vol. 6930 May-June 49-53
7. Rouviere O, Lyonnet D, Berger P et al. Ureteropelvic junction obstruction: use of helical CT for preoperative assessment: comparison with intra-arterial angiography. *Radiology*. 1999; 213: 668-73.
8. Sampaio F J. The dilemma of crossing vessels at ureteropelvic junction: precise anatomic study. *J Endourol*. 1996; 10(5): 411-15.
9. Pabbatti Raji Reddy A study of congenital renal anomalies in adult cadavers *Indian Journal of Clinical Anatomy and Physiology*, April-June, 2017; 4(2):181-184