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Case Report

Anatomy Section

Polycystic Kidney with Gross and Histological Aspects: A Case Report

AMARJYOTI CHATURVEDI[1], RASHMI MALHOTRA[2], KANCHAN BISHT[3], YASHU BHARDWAJ[4], BRIJENDRA SINGH[5]

ABSTRACT

Renal cysts are fluid-filled cavities on the surface of kidneys which may be solitary or multiple. They may present as incidental finding during routine radiological investigations for chronic renal failure, end-stage renal disease or due to associated abdominal symptoms. During routine cadaveric dissection at the Institute, multiple cysts were observed on the surface of left kidney in a 67-year-old male cadaver. The cysts were carefully observed for gross appearance and histological examination of the cysts and biochemical analysis of cystic fluid was done. The right kidney was normal in gross appearance but was associated with double renal arteries. The left kidney, which appeared smaller, showed polycystic appearance with total 14 cysts on the surface of left kidney and distorted histology. Knowledge of renal cysts and variations in renal vascular anatomy should be kept in mind for planning effective treatment.

Keywords: Cadaveric dissection, Chronic renal failure, Renal cysts

CASE REPORT

During routine cadaveric dissection of a 67-year-old male cadaver, multiple cysts were observed on the surface of left kidney. The cysts were carefully observed for gross appearance and histological examination of the cysts and biochemical analysis of cystic fluid was done. The cadaver was donated to the Institute for teaching and research purpose after obtaining consent from the relatives and proper formalities.

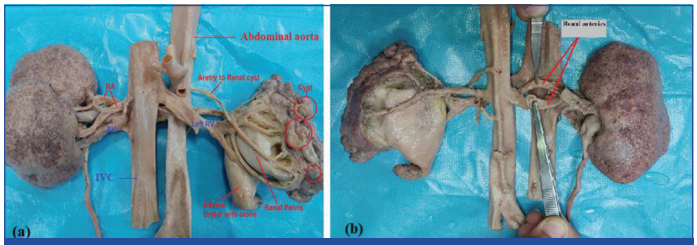
The past medical history of the patient from the record, revealed that he presented with pain in left flank region along with painful micturition, which on radiological investigation showed clear signs of space-occupying cystic lesions with polycystic kidney and low-grade ascites. However, imaging studies could not be obtained from the relatives. On enquiry, family history of renal disease was also confirmed. The patient was receiving the treatment from Department of Urology and in the further course, he eventually became dialysis dependent because of progressive renal failure. He was able to receive only two sessions of dialysis after which, he died.

On dissection, the right kidney (12.5×5.8×7.4 cm) was normal in gross appearance but was associated with double renal arteries. The left kidney, which appeared smaller (11×5.3×6.6 cm), showed polycystic appearance with total 14 cysts on the surface of left kidney, out of which nine were irregular, three were circular and two were oval in shape. All the cysts were greyish-black in colour while the fluid inside them was white in colour and viscous in consistency. [Table/Fig-1] represents the dimensions of various parameters of kidneys. Left ureter was dilated with a calculus lodged inside it, as shown in [Table/Fig-2a,b], which represents the posterior view with dual renal arteries supplying the right kidney. Origin of these two renal arteries was traced carefully and was found to be arising from anterior and posterior aspects of abdominal aorta.

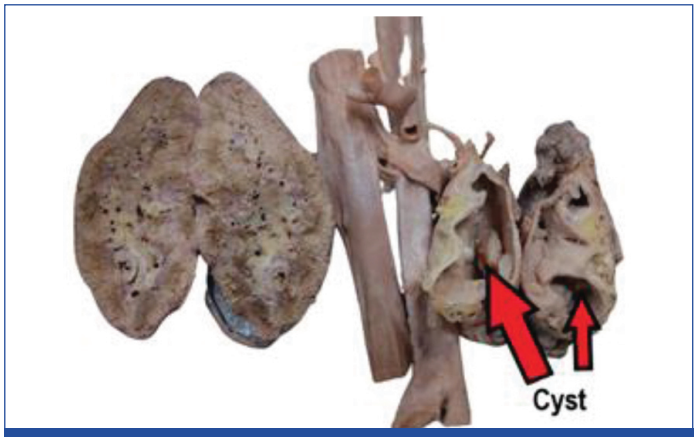
On coronal section, the renal cysts were seen communicating with the blood vessels as well as the parenchyma, as illustrated in [Table/Fig-3]. The histological image of Haematoxylin and Eosin (H&E) stained left polycystic kidney showed distorted cortex (100% encroachment) and medulla (80% encroachment). Multiple cysts were seen in left kidney having cluster of nuclei with colloid solution like appearance. [Table/Fig-4a] represents H&E stained left polycystic kidney in 10X magnification, with distorted glomerulus, collagen fibres and cyst labelled as 1,2 and 3, respectively. Proximal Convoluted Tubules (PCT) and Distal Convoluted Tubules (DCT) were not distinguishable with cortex and medulla containing dilated blood vessels and cluster of Red Blood Cells (RBC), as shown in [Table/Fig-4b] in 40X magnification. The irregular cysts in left kidney were lined by distorted simple cuboidal epithelium along with distorted cortex and collagen fibres. [Table/Fig-4c] again depicts 40X magnified view with distorted PCT, medullary nephrons and glomerulus. Nephrons had dense large nuclei and lesser cytoplasmic content. Urine strip test or dipstick test of cystic fluid was done and it was found to be positive for amylase (carbohydrate) but negative for lipase, protein and fat.

Parameters	Right	Left
Kidney	12.5×5.5×7.4 cm	11×5.3×6.6 cm
Major calyx	4 mm	7 mm
Minor calyx	1.5 mm	3 mm
Ureter	2 mm	5 mm
Renal artery	a) Anterior: 2 mm	a) Direct: 2 mm
	b) Posterior: 3 mm	b) To cyst: 1.5 mm
Renal vein	3 mm	4 mm

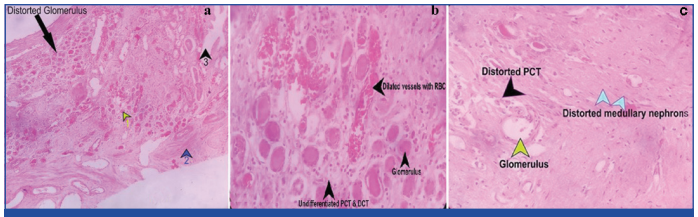
[Table/Fig-1]: Measurement of different parameters of right and left kidneys.



[Table/Fig-2]: (a) Anterior view: Dilated left pelvis and ureter with stone inside; (b) Posterior view: Showing double right renal arteries.



[Table/Fig-3]: Coronal section of kidneys showing left renal cyst with communications.



[Table/Fig-4a-c]: a) Left polycystic kidney showing-1: Glomerulus; 2: Collagen fibres; 3: Cyst (H&E,10X); b) Left polycystic kidney showing indistinguishable PCT, DCT, glomerulus, dilated RBC (H&E,40X); c) Left polycystic kidney showing distorted PCT, medullary nephrons and glomerulus (H&E,40X).

DISCUSSION

A simple kidney cyst is a collection of fluid originating from the surface of kidney lined by a thin wall [1]. Cysts may appear when excretory tubules of metanephros fail to communicate with collecting tubules [2]. However, newer theories explain, the cause of congenital polycystic kidney as faulty dilatation of uriniferous tubules, especially Henle's loops [3]. Pattern of inheritance of polycystic kidney can be either, Autosomal Dominant Polycystic Kidney Disease (ADPKD), Autosomal Recessive Polycystic Kidney Disease (ARPKD) [4].

The more common form, ADPKD mostly presents in adulthood and is a multisystem disorder characterised by slow growing renal cysts, found in the distal part of the nephron and the collecting ducts [5]. It is mostly attributed to the mutation in PKD1 (80%) or PKD2 (15%) genes, located in chromosomes 16p13.3 and 4q22.1, respectively and coding for Polycystin 1 and 2 (PC1 and PC2) proteins, respectively [4]. Mutation in polycystic kidney and hepatic disease 1 gene (PKHD1) is considered as the chief cause, which codes for fibrocystin [6]. The paired renal arteries arise from abdominal aorta at a level, just below the origin of superior mesenteric artery [7].

Two cases of ADPKD were reported by Bear RA, in 1974, one with unilateral ADPKD and agenesis of the opposite kidney and the other case with unilateral ADPKD and opposite kidney removed. The family history of the former case revealed polycystic kidney in father, who later died of hypertension and kidney failure [8].

Levine E and Huntrakoon M, reported two cases using abdominal Computerised Tomography (CT) and proposed the term Unilateral Renal Cystic Disease (URCD) as a distinct disease entity from ADPKD. They proposed that, URCD was little different from ADPKD, as the former is usually located unilaterally, not associated with any family history and usually does not progress to kidney failure [9].

In a histopathological study reported by Shakuntala N and Sujatha K, most of the cysts were situated in the cortical region of kidney. No clue of communication was found in the cysts located in parenchyma. According to them, the cysts were lined by collagenous fibres and ill-defined epithelium, with bloody lumen in some of them [10]. However, in the present case, cysts were found to be encroaching the whole cortex and almost 80% medulla with poorly differentiable proximal and distal convoluted tubules.

The present case is a lot in concurrence with a research by Kaur M et al., in 2012, who also reported multiple cysts only on the left side of an old male cadaver along with dilated ureter. They also reported the presence of dual renal arteries on the right side without any abnormality in other visceras. However, they reported slightly larger dimensions of left cystic kidney compared to the right one in contrast to the present study findings, where the left cystic kidney appeared smaller than its right counterpart. In present case, double renal arteries on the right side were arising from anterior and posterior aspects of abdominal aorta whereas in their study, right renal artery appeared from aorta which after a short distance divided into two parts with main trunk entering the hilum of right kidney and the branch entering the kidney through its upper pole [11]. Extra renal arteries usually arise from abdominal aorta or one of its branches and various studies support the fact that, their presence might be associated with other conditions like increased blood pressure or blockage in urinary tract, when ureter is compressed or even renal transplantation failure [11,12]. However, in the present case, authors could not find any such association with polycystic kidney in the cadaver.

CONCLUSION(S)

Although in the present case report, no other clinical condition was observed to be associated with polycystic kidney or accessory renal artery on dissection or from medical history, but thorough awareness and understanding of these variations is of paramount significance for surgeons for various surgeries.

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PARTICULARS OF CONTRIBUTORS:
1. M.Sc. Student, Department of Anatomy, All India Institute of Medical Sciences, Rishikesh, Uttarakhand, India.
2. Additional Professor, Department of Anatomy, All India Institute of Medical Sciences, Rishikesh, Uttarakhand, India.
3. Senior Resident, Department of Anatomy, All India Institute of Medical Sciences, Rishikesh, Uttarakhand, India.
4. M.Sc. Student, Department of Anatomy, All India Institute of Medical Sciences, Rishikesh, Uttarakhand, India.
5. Professor and Head, Department of Anatomy, All India Institute of Medical Sciences, Rishikesh, Uttarakhand, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Rashmi Malhotra,
Additional Professor, Department of Anatomy, All India Institute of Medical Sciences, Rishikesh, Virbhadra Road, Rishikesh, Uttarakhand, India.
E-mail: rashmi.ana@aiimsrishikesh.edu.in

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