

VARIATIONS OF PELVICALYCEAL SYSTEM OF KIDNEY IN HUMAN CADAVERS

Anatomy

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ABSTRACT

The present study has been undertaken to see the variations in renal pelvicalyceal system in the human cadavers. The knowledge of different patterns in prerequisite for surgical and diagnostic procedures. Specimens were classified on the basis of position of renal pelvis in relation to hilum. Thereafter, another classification was taken into account for diving the type of pattern on the basis of number of calyces. There has been studies to see the patterns in Intravenous Urography. Since there may be chances of misinterpretation on radiological findings, present study was performed on cadavers. Intrarenal position of pelvis and bicalyceal pattern was most common the present study.

KEYWORDS

Pelvicalyceal system, Intravenous Urography, Renal pelvis, calyces

INTRODUCTION

Naked eye examination of a coronal section of kidney shows have an outer cortex and an inner medulla. Extensions of the cortex into the medulla are known as renal columns of Morgagni, which separate the medulla into pyramids. Their apices form renal papillae, which indent the minor calyces¹. Renal sinus is a space that extends into the kidney from the hilum. It contains branches of renal artery, tributaries of renal vein and renal pelvis. Renal pelvis is formed by the union of 2-3 major calyces. A major calyx is formed when 7-13 minor calyces join each other. Major, minor calyces and pelvis are together known as collecting system of kidney². There are numerous variations in the gross anatomy of the renal collecting system. The bilateral renal collecting system are not identical commonly. In a single individual, there are fair chances of having asymmetrical collecting system on both sides³. There may be difference in number and position of different parts of the collecting system in different individuals. Parts can also be absent.

The renal pelvicalyceal system can be classified into various types. Bruce *et al*⁴ classified the it on the basis of position of renal pelvis with respect to renal sinus as intrarenal, extrarenal, or borderline. Ningthoujam *et al*⁵ divided the pelvicalyceal system on the basis of number of major calyces. The different groups include multicalyceal, tricalyceal, and bicalyceal types. Graves⁶ made a different type of classification of the pelvicalyceal patterns depending on the shape of the renal pelvis along with prominences of the calyces. On the basis of pattern of drainage, Sampaio and Mandarim-De-Lacerda⁷ divided the renal collecting system into different types, based on a three-dimensional study on polyester endocasts.

The knowledge of detailed calyceal anatomy and its variations is essential for endourological procedures such as percutaneous nephrolithotomy, retrograde percutaneous nephrostomy and retrograde intrarenal surgery. This knowledge is of immense value to the clinicians of related specialties. The present study has been undertaken to study the variations in renal pelvicalyceal system and to compare them with previous studies

MATERIAL AND METHODS

100 kidney specimens (59 right and 41 left kidneys) along with the ureter were studied. Work was performed in the Department of Anatomy of GSMCH, Patiala and SLBSGMC, Mandi. Morphologically damaged kidneys were excluded from the study. Approval by the Institutional Ethics Committee was obtained before study. The collecting system were revealed by slicing the kidney coronally from lateral to medial margin⁷. Then, the specimens were studied for variations in the pelvicalyceal pattern.

We undertook the Bruce *et al*⁴ and Ningthoujam *et al*⁵'s classification. According to Bruce *et al*, there are 3 types of pelvicalyceal system. Intrarenal (which lies completely within the renal sinus), extrarenal (lies entirely outside it) and borderline (lies partly inside and partly outside the renal sinus).

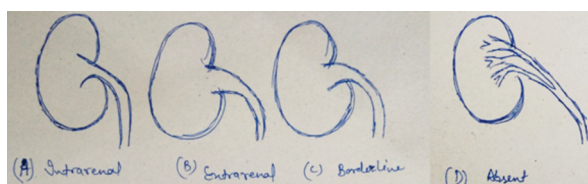


Figure 1: Classification of pelvicalyceal system on the basis of position of renal pelvis in relation to renal sinus. (a) Intrarenal (b) Extrarenal (c) Borderline (d) Absent

The collecting system was further divided into bicalyceal or Y type, tricalyceal or triangular and multicalyceal or radiate type according to Ningthoujam *et al*'s classification.

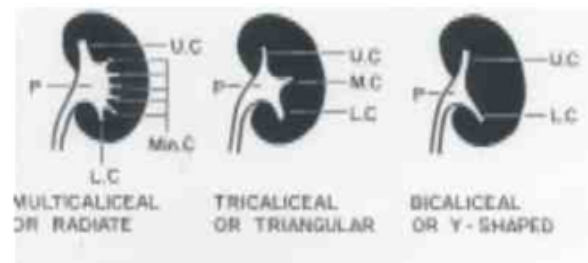


Figure 2: Ningthoujam *et al*'s classification (a) Multicalyceal (b) tricalyceal (c) bicalyceal

RESULTS

In the present study, extrarenal position of pelvis was found in 9% specimens. 17% specimens were having borderline pattern. Majority of specimen (72%) showed intrarenal pattern. There were 2% cases in which pelvis was absent and ureter was formed by union of major calyces only.

The following chart shows frequency of different types of patterns according to the position of renal pelvis.

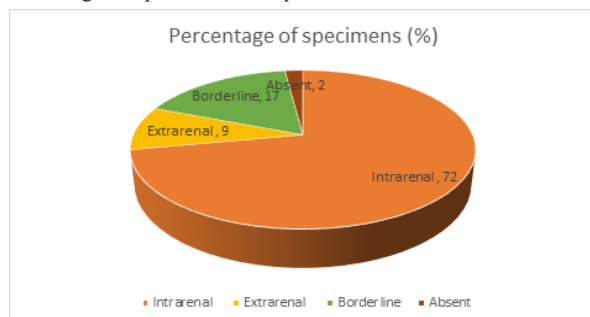


Figure 1: frequency of different types of patterns according to the position of renal pelvis.

On the basis of number of major calyces, 31% specimen were multicalyceal in the present study, 22% tricalyceal and 39% bicalyceal pattern was observed. There were 18% specimens which were unclassified.

DISCUSSION

The knowledge of pelvicalyceal system is essential for endourological procedures. This study was done to provide anatomical data on the various types of pelvicalyceal patterns in north Indian cadavers. Since the study was conducted in cadaveric kidneys, chances of error are minimized because there may be misinterpretation in radiological studies. Present study offers an insight into the various calyceal patterns in North Indian population. In present study, the most common position of renal pelvis was found to be intrarenal (72%). Extrarenal pelvis has been found in 9% specimens, while in literature, the incidence of extrarenal pelvis is quoted around 10%⁸. The knowledge of the position of renal pelvis has its clinical importance, because on injection of contrast material, the extrarenal pelvis may become dilated as it is not well supported. In our study, the major calyces united with each other outside the renal sinus to form the ureter with no demonstrable renal pelvis [Figure 1(D)]. It is essential to be aware of this condition when operating on a kidney to prevent the injury to calyces^{9,10,11}.

On the basis of number of calyces, the bicalyceal type is the most common type (39%) in the present study which goes well with the study performed by T.S.R. Anjana *et al*¹². Fine and Keen⁸ also reported the bicalyceal pattern to be most common in their study, while in Ningthoujam *et al.*'s study the multicalyceal pattern was the most common pattern.

Table 1: Comparison of pelvicalyceal patterns in different studies

Author	Multicalyceal (%)	Tricalyceal (%)	Bicalyceal (%)	Unclassified (%)
Ningthoujam <i>et al</i>	45	17	21	16
Anjana <i>et al</i>	23	27	35	15
Present study	31	22	39	18

CONCLUSION

In the present study an attempt was made to classify the pelvicalyceal system first according to position of renal pelvis and on the basis of number of major calyces and a comparison as made between different studies. Present study indicates that intrarenal pattern with bicalyceal system is more common in North Indian population. These various patterns including extrarenal calyces and absent pelvis must be borne in mind before a surgical or diagnostic procedure intended to be performed.

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