

## OBSERVATION ON ARRANGEMENT OF HILAR STRUCTURES IN CADAVERIC KIDNEYS AND THEIR CLINICAL SIGNIFICANCE

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**ABSTRACT:** Hilum of an organ is a depression, pit or slit like opening through which vital structures enter or leave the organ. In addition to the kidney, hilum is also observed in the cerebellum, lung, ovary, spleen and suprarenal gland. Laparoscopic nephron-sparing surgery for solid renal masses can be achieved successfully both transperitoneally and retroperitoneally if a comprehensive knowledge of both normal and variant hilar anatomy of the kidneys is in the mind of the operating surgeon. Documented text is available on various aspects of the kidneys but an observation on variations in hilar arrangement is infrequently cited. In standard text from anterior to posterior the structures at the renal hilum are renal vein, renal artery and the renal pelvis.

**KEYWORDS:** Hilum, Kidneys, Arrangement, Variant, Anatomy.

**INTRODUCTION:** The kidneys are a pair of reddish brown retroperitoneal organs which secrete the end products of metabolism and excess water. They perform a dual role by maintaining water and electrolyte balance and releasing erythropoietin which affects red blood cell formation and renin which influences blood pressure. In the foetus and newborn, the kidney normally has 12 lobules. These are fused in adults to present a smooth surface although traces of lobulation may remain.<sup>[1]</sup> The normal kidney measures about 12x6x3 cm and weighs 130-150 g. The hilum of the right kidney lies just below, and of the left just above, the transpyloric plane 5 cm from the midline.<sup>[2]</sup> The hilum of each kidney lies over psoas. The hilum of the kidney leads into a central sinus, lined by the renal capsule and almost filled by the renal pelvis and vessels, the remaining space being filled by fat. Dissection into this plane can be challenging but is important in surgery on the renal pelvis, particularly open stone surgery.<sup>[3]</sup> For many operations on the kidney including nephrectomy and nephrolithotomy a lumbar approach is used. The renal vessels can be exposed, ligated and divided to mobilize the organ further and transect the ureter.<sup>[4]</sup> Clamping of individual structures at the hilum is preferred rather than en-bloc clamping.<sup>[5]</sup> Knowledge of structures at the renal hilum is thus necessary prior to any surgical intervention of the kidney.<sup>[6]</sup> The arrangement of structures at the renal hilum, anteroposteriorly as described in standard anatomical texts is: renal vein, renal artery and renal pelvis. A systematic study with this specific focus has seldom been reported in literature.

**MATERIAL & METHOD:** The present study was undertaken to observe the arrangement of structures in hilar regions. 40 (20 Right [R] and 20 Left [L]) embalmed cadaveric kidneys from the Department of Anatomy were observed in this study. Hilar dissection was carried out to observe the arrangement of structures entering or leaving the hilum of the kidney. Anteroposterior relations of the structures at the hilum were also recorded. The arrangement of

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renal artery, renal vein and the renal pelvis, anteroposteriorly exhibited noticeable variations in their hilar relations. In majority of the cases renal artery divided into anterior and posterior divisions. In few cases anterior trunk of renal artery is the most anteriorly placed structure at the renal hilum. In some cases retropelvic structures are observed at the hilum.

**OBSERVATIONS:** The following types of structural arrangements at the renal hilum were observed. They are A, B, C & D respectively.

| ANTERIOR          |                   |                   |                   |
|-------------------|-------------------|-------------------|-------------------|
| Type A            | Type B            | Type C            | Type D            |
| RV                | RV                | AD of RA          | AD of RA          |
| RA                | AD of RA          | RV                | RV                |
| RP                | PD of RA          | PD of RA          | RP                |
|                   | RP                | RP                | PD of RA          |
| N=24/40           | N=08/40           | N=05/40           | N=03/40           |
| R=14/40 & L=10/40 | R=05/08 & L=03/08 | R=03/05 & L=02/05 | R=02/03 & L=01/03 |
| POSTERIOR         |                   |                   |                   |

Table 1: Arrangement of structures at the renal hilum from anterior to posterior

**Legends:** A=Artery, AD=Anterior Division, PD=Posterior Division, P=Pelvis, R=Renal, V=Vein.

**DISCUSSION:** In our study we observed the standard textbook arrangement of hilar structures in 60% specimens. The remaining 40% specimens showed variations. In 20% specimens we observed anterior and posterior divisions of the renal artery occupying the bulk of the hilum whereas in 12.5% specimens the renal vein was sandwiched between the two divisions of the renal artery. Only in 7.5% specimens we observed the retro pelvic occurrence of posterior division of the renal artery. It may be noted that none of the variants have been mentioned in textbooks of Anatomy but have only been encountered during routine cadaveric dissections. Embryo logically the right renal vein develops from a single anastomotic channel whereas the left renal vein develops from multiple anastomotic channels. Hence the predominant left sided occurrence may have an embryological explanation. Developmental malformations may change the interrelationship of the hilar structures. Surgical interventions that require hilar dissections are technically more challenging in laparoscopic approach as compared to open surgeries.

**CONCLUSION:** Knowledge of anatomical variations at the renal hilum assumes clinical importance for operating surgeons as laparoscopic surgeries have become the treatment of choice in recent advancement. Bulk of the hilum is occupied by branches of renal arteries and tributaries of renal veins. Variations are predominant on the left side and presence of retropelvic structures should be kept in mind during renal manipulation.

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## REFERENCES:

1. Standring S. Gray's Anatomy, The Anatomical Basis of Clinical Practice. 40<sup>th</sup> Ed. London: Churchill Livingstone Elsevier; 2008. Chapter 74, Kidney and Ureter; p1225.
2. Sinnatamby CS. Last's Anatomy Regional and Applied. 12<sup>th</sup> Ed. China: Churchill Livingstone Elsevier; 2011. Chapter 5, Abdomen; p283.
3. Standring S. Gray's Anatomy, The Anatomical Basis of Clinical Practice. 40<sup>th</sup> Ed. London: Churchill Livingstone Elsevier; 2008. Chapter 74, Kidney and Ureter; p1230.
4. Sinnatamby C. S. Last's Anatomy Regional and Applied. 12<sup>th</sup> Ed. China: Churchill Livingstone Elsevier; 2011. Chapter 5, Abdomen; p286.
5. Rapp, DE. En bloc stapling of renal hilum during laparoscopic nephrectomy and nephroureterectomy. Urology 2004; 64(4):655-659.
6. Gill, IS. Laparoscopic partial nephrectomy for hilar tumours. J Urol 2005; 174(3):850- 854.
7. Lattouf, JB. Laparoscopic partial nephrectomy for hilar tumours: technique and results. Eur. Urol. (2008); 54(2):409-416.
8. Rogers, CG. Robotic partial nephrectomy for renal hilar tumours: a multi-institutional Analysis. J Urol 2008; 180(6):2353-2356.

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