

## Horse Shoe Kidney

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### Abstract

Horse shoe Kidney was first recognized during an autopsy De Carpi in 1521. This anomaly consists of two distinct renal masses lying vertically on either side of midline and connected at their respective lower poles by a parenchymatous or fibrous isthmus that crosses the mid plane of the body. This isthmus lies at the level of 4<sup>th</sup> lumbar vertebra just beneath the origin of inferior mesenteric artery in about 40% of cases. Fusion of upper poles instead of the lower poles results in an inverted horse Shoe Kidney which constitute 5-10% of all Horse-Shoe kidneys, (i.e. in 95% of HSK, fusion is at lower poles). HSK is found more commonly in males by a 2:1 margin. *Summary & Conclusion:* The abnormality originates between 4<sup>th</sup> and 6<sup>th</sup> weeks of gestation, after the ureteral bud has entered the renal blastema. Boyden (1931) postulated that at the 14 mm stage (4.5 weeks) the developing metanephric masses lie close to one another, any disturbance in their relationship may result in joining at their inferior poles. Usually the fusion of the both kidneys occurs before they have rotated on their long axis, thus pelvis and ureters of HSK are being usually placed anteriorly. Rarerly, fusion occurs after some rotation had already taken place in which case the pelvis are anteromedially placed.

**Keywords:** Horse Shoe Kidney; Unilateral Fused Kidney; Nephrolithiasis; Autopsies.

### Introduction

Horse Shoe Kidney was first recognized during an autopsy by De Carpi in 1521. This anomaly consists of two distinct renal masses lying vertically on either side of the mid line and connected at their respective lower poles by a parenchymatous or fibrous isthmus that crosses the mid plane of the body. This isthmus lies at the level of 4<sup>th</sup> lumbar vertebra just beneath the origin of inferior mesenteric artery in about 40% of cases. Fusion of upper poles instead of the lower poles results in an inverted horse Shoe Kidney which constitute 5-10% of all Horse-Shoe kidneys, (i.e. in 95% of HSK, fusion is at lower poles). HSK is found more commonly in males by a 2:1 margin.

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The comparative statement of the incidence of HSK is as follows:

Name of the worker (s)	Incidence	Method Adopted
Morris (1901)	1:1000 (0.18%)	Autopsy
Joly (1940)	1:750 (0.13%)	Autopsy
5 Zees & Beenighan (1954)	1:700(0.14%)	Autopsy
Hugo delgaard (1964)	1:500 (0.20%)	Excretion Urography
Cambell (1970)	1:425(0.23%)	Excretion Urography
Pitte's et al (1975) <sup>7</sup>	1:250(0.40%)	Excretion Urography

### Aim of the Study

- An attempt has been made to know the various anomalies.
- The study has been taken up with the fond hope of helping the clinician, sinologist, and urographers, surgeons during their routine work.
- To apply this knowledge to the incoming post graduates in their research works.

### Embryological Basis & Kidney Anomalies

The abnormality originates between 4<sup>th</sup> and 6<sup>th</sup> weeks of gestation, after the ureteral bud has entered the renal blastema of the embryogenesis. Boyden (1931)

8 postulated that at the 14mm stage (4.5 weeks) the developing metanephric masses lie close to one another, any disturbance in their relationship may result in joining at their inferior poles. A slight alteration in the position of the umbilical or common iliac artery could change the orientation of migrating kidneys thus leading to contact and fusion. In 1941 Dees (Nation 1945, Bell 1946, Gleen 1959, Campbell 1970) described horse-shoe kidney disease occurrence in 0.25% of the population or about 1 in 400.

### Review & Literature

- De Carpi in 1521 first recognized horse- shoe kidney during an autopsy.
- Morgagni in 1820 the first diseased horseshoe kidney and since then more has been written about this condition than about any other renal anomaly. Almost every renal disease has been described in the horse-shoe kidney.
- Wilmar in 1938 described kidneys located to one side that from which its ureter inserts into the bladder, crossed ectopia, fusion anomalies are logically categorized.
- Beer & Menches in 1938 observed incomplete duplication of kidney. In their series 85.5% were unilateral and 14.5% were bilateral.
- Wayroucech in 1939 [9] found 5 laterally facing kidneys in his series of 23 cases of malrotation of kidney .
- Joly in 1940 stated the incidence of horse shoe kidney in 1:750, whereas Campbell (1963) reported the same a 1:425.
- In 1940 Dees (Nation 1945 [10,11] Bell 1946, Gleen 1959, Campbell 1970) Described horse shoe kidney disease occurrence in 0.25% of the population or about 4 in 400.

### Materials & Methods

- During routine dissections in KMC, Guntur. male aged 60 years presented H.S.K Kidney.
- It should be emphasized once again that the incidence of congenital anomalies varies greatly depending upon the methodology adopted for the study. For xample Hollinshed (1956) and K.Mortan (1958)observed renal anomalies in 2-3% of all operations and 0.5 to 1% in all autopsies.

The present study was conducted

- a. 76 adults cadavers.
- b. 20still born fetuses of kidney specimens of 40.
- c. 60 Kidneys from Patients attending generak outpatient department of Radiology, GGH, Vijayawada
  - Screening of the patitents for any renal anomalies, who were attending to the urological out patients departments:
  - Sonograms of 60 kidneys were obtained and parameters and anomalies were noted .
    - a. SL. NO.
    - b. External appearance
    - c. Sex of the patient
    - d. Parameters – crown rump and down heel length and weight of the fetus.
    - e. Anomalies.

#### *Cadavers from Anatomy Dissection Hall and Autopsy*

- 78 specimens were studied and the study of upper urinary tract was under taken in detail, after noting the Sl.No, Sex, Parameters. Anomalies were studied and photographs were taken.

#### *Unclaimed Still Born Fetuses*

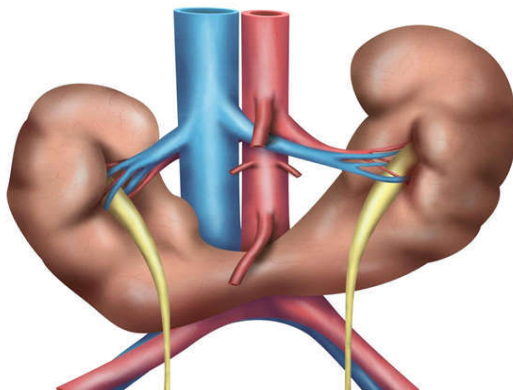
- 32 Specimens were studied after noting the following particulars.
  - a. SL. NO.
  - b. Approx. Age of fetus
  - c. Sex of the patient
  - d. Parameters
  - e. Anomalies

#### *Procedure*

The abdomen was opened by right paramedian incision and two parallel transverse incisions, which were taken at the ends. Of the right paramedian incision. The superficial viscera were studied in detail and noted the anomalies if any present. Next the coils of small intestine and large intestines were removed from abdominal cavity to get a clear view of the posterior abdominal organs. The size, shape and position of the kidney were recorded. The hilum of the kidneys and the structures in relation to it were noted down. Next the pelvic viscera, diaphragm, great vessels were examined for any anomalies.



**Fig. 1:** Showing Fusion of Lower Poles of the Kidneys



**Fig. 2:** Diagram showing Large vessels behind the horse-shoe kidney

## Results

Most (90%) of the cases of horse shoe kidney are asymptomatic. Horseshoe kidneys are sometimes at a greater risk than normal kidneys for obstruction, usually at the uretero pelvic junction, as well as for vesico ureteral reflux, infection, urolithiasis and malignancy. The presence of horse shoe kidney is technically demanding during renal surgeries, renal transplants, or surgical and endovascular procedures on the aorta because of the anomalous complexity of the kidney, its collecting system, and renal blood vessels. Hence its morphological structure and variations are important factors to be considered. The bulky isthmus located anterior to the abdominal aorta and its bifurcation, in the horse shoe kidney can cause

considerable difficulty in medical and surgical management.

## Discussion

In the present case review, the horse shoe kidney is the result of an anomalous fusion of the inferior pole to form the parenchymatous isthmus. Its characteristics include a lower position (L1-L4 vertebrae), an isthmus at the level of the fourth lumbar vertebra, an anterior facing hilum, the ureters on the anterior surface of horse shoe kidney, and the abnormal blood vessels, appearance of which are similar to the previous studies 17-20.

## Summary & Conclusion

- The abnormality originates between 4<sup>th</sup> and 6<sup>th</sup> weeks of gestation, after the ureteral bud has entered the renal blastema. Boyden (1931) postulated that at the 14mm stage (4.5 weeks) the developing metanephric masses lie close to one another, any disturbance in their relationship may result in joining at their inferior poles.
- Usually the fusion of the both kidneys occurs before they have rotated on their long axis, thus pelvis and ureters of HSK are being usually placed anteriorly. Rarely, fusion occurs after some rotation had already taken place in which case the pelvis are antimedially placed.
- Usually in this anomaly, the ascent is incomplete and the kidneys lie lower in the abdomen than normal. The ascent is also prevented by the origin of Inferior mesenteric artery obstructing the movement of the isthmus.
- The blood supply to HSK is numerous and variable. The isthmus and adjacent parenchyma masses may receive a branch from each main renal artery or directly from aorta originating either above or below the level of the isthmus. Sometimes this area may be supplied by the branches of IMA. HSK is frequently accompanied by other anomalies of CNS and cardiovascular systems.
- Fusion of upper poles instead of the lower poles results in an inverted Horse Shoe Kidney which constitute 5-10% of all Horse Shoe Kidneys, (i.e, in 95% of HSK, fusion is at lower poles). HSK is found more commonly in males by a 2:1 margin.

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