

Horseshoe Kidney



Medical Science

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ABSTRACT

While we studied the anomalies of the upper urinary tract over a period of ten years, Horseshoe kidney was found in one cadaver and in ten cases which were detected by IVP and MRI in nephrology department out of 184 cases of upper urinary tract anomalies

Horseshoe kidney was found in the lumbar region. Right kidney was slightly at a higher level measuring 8.5x5x2.5cms and the left kidney was slightly at a lower level measuring 8.5x5x3 cms. The lower poles were united by a bridge of tissue. The entire structure of horseshoe kidney measured 15x11 cms. Bridging tissue measured 5x2.5 cms. The hila of the kidneys were facing forwards. The pelvis of the kidney was seen in the region of the sinus of the kidney, more dilated on the right side. The ascent of horseshoe kidney was prevented by inferior mesenteric artery. Bits of tissues were processed from the right and left kidneys and from the connecting region. The connecting region mainly had PCT, DCT and Loop of Henle and fibrous tissue. It has been reported that incidence of horseshoe kidney is 1 in 500, 7% were presenting Turner's syndrome. Tumours are two to eight times more frequent in children with horseshoe kidney than in general population.

INTRODUCTION :

Horse shoe kidney is one of the most common congenital renal anomalies. Either lower or upper poles of the two kidneys were fused across the midline, so that the fused structure formed a shape somewhat like a horseshoe. Less than 0.3% of the general population had horseshoe kidneys and were seen in approximately 1 out of 300. In Pyelographies (Dees 1941, Allen 1951 and Lowsley 1952). Horseshoe kidney was found 1 in 1000 necropsies and more common in men.

MATERIALS AND METHODS:

Over a period of ten years out of 100 cadavers horseshoe kidney was found in one male cadaver during routine dissection

of abdomen, and ten cases were detected by IVP or MRI in the nephrology department out of 184 cases of upper urinary tract anomalies.

OBSERVATION:

Horseshoe kidney was found in the lumbar region opposite L3 & L4. Right kidney was slightly at a higher level measuring 8.5x5x2.5 cms. And the left kidney was at a lower level measuring 3.5x5x3 cms. The lower poles were united by a bridge of connecting tissue, the isthmus. The connecting bridge was solid and looked like a fibrous structure. The maximum width of the entire structure was 15x11 cms and the bridging tissue measured 5x2.5 cms. (Fig.1)

of the right kidney was dilated very much and a plexus of vessels was seen through its wall. Both right and left renal veins drained into IVC. A single renal artery was entering each right and left kidneys. Inferior mesenteric artery was running anterior to the isthmus. (Fig. 2)



Fig 1 Horseshoe kidney (HSK) Solid connecting isthmus (I)

The hila of the kidneys were facing forwards. The pelvis of the kidney was seen in the region of the sinus of the kidneys, and the ureters passed anterior to the connecting bridge. The pelvis

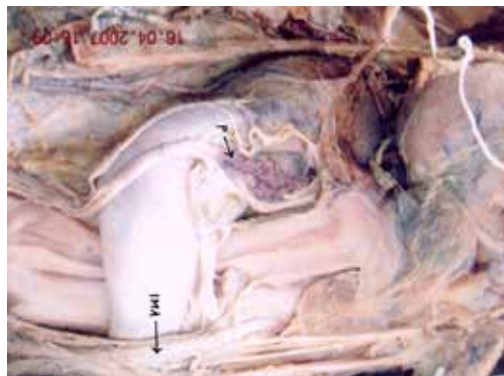


Fig :2 pelvis of the kidney dilated and showed rich plexus of vessels (P)

Inferior mesenteric artery anterior to isthmus (IMA)

Bits of tissues were taken from the right and left kidneys and from the bridging part. Microscopic appearance of right and left kidneys were normal. (Fig.3a & 3b). The connecting part mainly showed PCT, DCT, Loop of Henle and fibrous tissue. (Fig 4a & 4b)

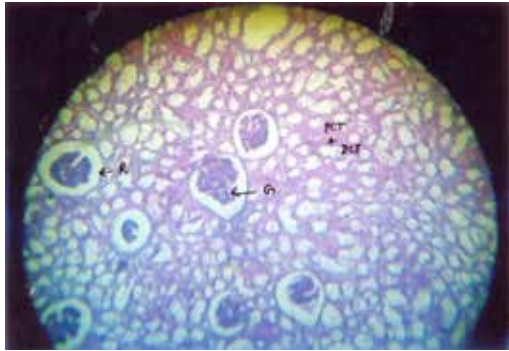


Fig 3a : Right kidney showing normal picture. Renal corpuscle (R) Glomerulus (G)

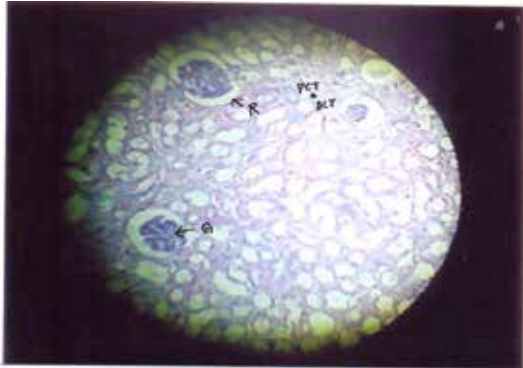


Fig 3b Left kidney showing normal picture Renal corpuscle (R) Glomerulus (G) Proximal convoluted tubules(PCT) Distal convoluted tubules (DCT)

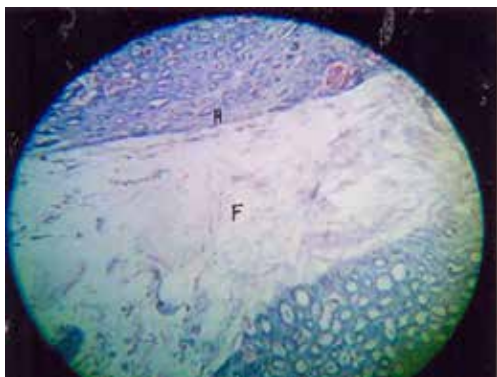


Fig 4a : Connecting part showing fibrous tissue(F) and Loop of Henle(H)

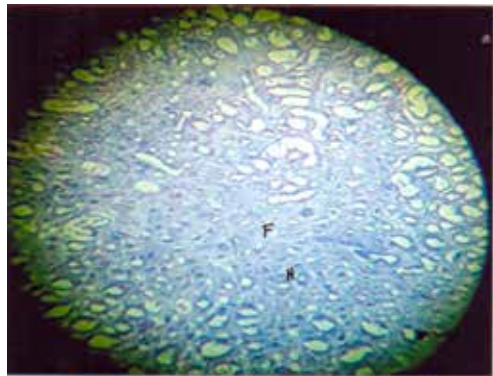


Fig 4b connecting part showing fibrous tissue (F) & Loop of Henle (H)

In the Nephrology department, presence of horseshoe kidney was made out 10 cases with IVP & MRI while investigating for colicky pain in the abdomen. (Fig. 5)

- i. due to repeated infection in 4 cases
- ii. due to calculi in 2 cases
- iii. due to pelviureteric obstruction in 3 cases
- iv. due to a mass palpable per abdomen where MRI revealed the presence of horseshoe kidney. (Fig. 6)

DISCUSSION:

Nation (1945) found an incidence of 1 in 468 in the necropsy series which he studied, which showed that it was 2.6 times more frequent in males as compared to females. The present specimen is from a male cadaver. In the present study horseshoe kidney was present in 1 male cadaver out of 100 cadavers forming 1 % of incidence. In case study out of 184 cases with upper urinary tract anomalies 10 cases of Horseshoe kidney were found forming 5.4%.

As we look into the embryology, with the change in the curvature of the embryo, renal rudiments appear to ascend up. They normally remain separate. They may come in contact and adhere, resulting in horseshoe kidney. Two theories regarding the embryogenesis of the horseshoe kidney had been proposed. The classic teaching of mechanical fusion holds, when the horseshoe kidney was formed during organogenesis, when the inferior poles of these early kidneys touch, fusing in the lower midline. The theory of mechanical fusion is valid for horseshoe kidneys with a fibrous isthmus. Alternatively, more recent studies postulate that the abnormal fusion of tissue associated with the parenchymatous isthmus of some horseshoe kidneys is the result of a teratogenic event involving the abnormal migration of posterior nephrogenic cells, which then coalesce to form the isthmus. This teratogenic event may also be responsible for the increased incidence of related congenital anomalies and of certain neoplasias, such as Wilms tumour and Carcinoid tumour associated with the isthmus of the horseshoe kidney.

The area of fusion across the midline is known as the isthmus (Gutierrez 1942). It is usually of true renal parenchyma and is only seldom it is a band of fibrous tissue. In the present case a band of fibrous tissue was seen.

Typically it is the lower poles of the kidneys that are involved in this fusion and hence the open part of the horseshoe kidney points upwards, Gutierrez (1942), described the fusion as involving the lower poles in 24 of the 25 cases which he studied, and the upper poles in the remaining one only. Culp (1944) found that the literature indicated that fusion is at the lower poles in about 90 to 95% of cases and the upper poles in only 5 to 10%. Usually the lower poles are connected (Decker and Ples-sis 1996), so also in the present specimen.

It is prevented from ascent by the inferior mesenteric artery (Moore and Dalley 1999), and hence lies at a lower level. This was observed by us. The same observation was made by the

previous authors.

Pepin's (1928) autopsy study of 139 horseshoe kidneys served as the basis for a classification system, consisting of three groups: Group 1- kidneys have normal renal arteries and account for 20% of all horseshoe kidneys. Group 2- kidneys have three to five renal arteries and account for 66% of cases. Group 3- Have more than five renal arteries and account for 14%. The present case belongs to Group 1 of Pepin's (1928) classification.

Quiet rarely the isthmus may lie behind the IVC and the Aorta (Jarman 1938) or even behind the IVC and in front of the Aorta (Meek and Wadsworth 1940). In the present specimen, the isthmus was seen lying in front of IVC and Aorta.

The pelvis apparently lies regularly anterior to the renal vessels, as observed in the present specimen. The ureters almost always pass downward anterior to the isthmus but Culp (1944) said that in some instances they lie dorsal to it.

According to Gutierrez (1942), the occurrence of horseshoe kidney may be associated with no symptoms and the majority of the individuals, who have symptoms, are that of urinary tract, often with indefinite abdominal pain and gastrointestinal dis-

turbance (sometimes referred to as Rovsing's syndrome). Gutierrez (1942), has advocated division of the renal isthmus (symphysiotomy), followed by a nephropexy in which, care is taken to fix both the upper and lower poles, so as to prevent rotation of the kidneys and interference with the ureters.

SUMMARY:

As per the present study the incidence of horseshoe kidney is 1 % in cadavers and 5.4% among patients with upper urinary tract anomalies. Horseshoe kidney occurs in 1 per 400 to 800 live births. There is a 7% incidence of horseshoe kidney in individuals with Turner's syndrome. Children with this condition are 2 to 8 times more likely to have Wilm's tumour. No genetic determinant is known although it has been reported in identical twins and in siblings within the same family.

The variable blood supply, High insertion point, abnormal course of ureters, presence of isthmus, all contribute to problems. Because of these embryogenic and anatomical factors, the rates of hydronephrosis, stone formation, infection and certain cancers are common. The presence of horseshoe kidney alone does not affect survival. The fact that the present specimen is from an elderly male of 60 years, shows that he has survived up to this age.

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