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Horseshoe Kidneys: Tertiary Care Centre Experience

Shubhangi D. Sakore[1], Tejas A. Shinde[2], Ramesh S. Waghmare[3]

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Abstract:

Context: Horseshoe kidney (HSK) is well known congenital anomaly of the upper urinary tract. It is occurring in approximately 0.25% of the general populations and two to three times more frequently in men than in women. Isolated HSK can be isolated, remain undiagnosed until adulthood.

Aims: The present study reports gross and histological findings of horseshoe kidney detected during autopsy.

Settings and Design: All clinical autopsies which were carried out during 2017 to 2022 at Topiwala National Medical College, Mumbai, India and during gross examination and dissection of kidney specimen were carried out.

Methods and Material: Amongst 2524 clinical autopsies which were carried out during 6 years of period 2017 to 2022 at Topiwala National Medical College, Mumbai, India gross examination and dissection, was performed and renal anomaly was noticed.

Statistical analysis used: No.

Results: During period of six years study, we noticed a total 3 cases of horseshoe kidneys. On gross examination the lower poles of kidneys were fused to form the isthmus in all 3 cases. On histological examination, in all above cases kidneys showed global glomerulosclerosis, cloudy change in tubules, areas of subcapsular fibrosis with lymphocytic infiltration.

Conclusions: Horseshoe kidney is one of the most common congenital anomalies of the upper urinary tract. Many times it may function normally and remain unnoticed/ asymptomatic till adulthood causing no harm. An isolated finding of a horseshoe kidney is generally considered benign. Such cases incidentally come to notice due to other medical or surgical scenarios or at the autopsies.

Key-words: Congenital renal anomalies; Horseshoe kidney; Autopsy.

Key Messages: While conducting autopsy examination we should notice renal anomaly like horseshoe kidney. Detail dissection will be useful to find further detail of such anomaly.

Author's Affiliation: [1]Associate Professor, Department of Anatomy, Lokmanya Tilak Municipal Medical College, Sion, Mumbai 400022, Maharashtra, [2] Senior Resident, Department of Pathology, SMBT Institute of Medical Sciences & research centre, Dhamangaon, Igatpuri, Nashik 422403, Maharashtra [3]Associate Professor, Department of Pathology, Topiwala National Medical College, Mumbai 400008, Maharashtra India.

Corresponding Author: Ramesh S. Waghmare, Associate Professor, Department of Pathology, Topiwala National Medical College, Mumbai 400008, Maharashtra, India

E-mail: rameshpathmumbai@gmail.com

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INTRODUCTION

Horseshoe kidney (HSK) is well known congenital anomaly of the upper urinary tract. It is occurring in approximately 0.25% of the general populations and occurs two to three times more frequently in men than in women.[1-5] Isolated HSK can be isolated and remain undiagnosed until adulthood. Clinically HSK produce no symptoms Literature stated fusion as occurring between weeks four and six of development, although there is some evidence for later fusion, particularly when the isthmus is fibrous rather than renal parenchyma.[1,4,6-15] These cases have been detected during autopsy, anatomic dissection, and radiological imaging.

MATERIALS AND METHODS

A total of 2524 clinical autopsies which were carried out during 2017 to 2022 at Topiwala National Medical College, Mumbai, India. We found three cases of horseshoe kidney. Previous medical history was retrieved from medical record. Medico legal cases and paediatric autopsies were excluded from the study. During gross examination and dissection, we noticed renal anomaly. We fixed these kidneys in 10% formalin. After fixation external, cut surface findings noted. Section were taken and stained with haematoxylin and eosin, and microscopic examination findings were noted.

RESULTS

During 6 years of study period, we noticed a total 3 cases of horseshoe kidney out of 2524 adult autopsy. The details are as follows:

Case 1: A 37 years old male admitted for acute febrile illness and pancytopenia. At autopsy, both the kidneys were fused at lower poles and apparently placed at lower level compared to normal position of kidneys. The upper poles were seen at the level of L2 vertebra, right pole was slightly higher than left pole. The lower poles were fused to form the isthmus opposite to the L4 vertebra. Combined weight of both kidneys was 410 grams (Fig. 1 A).

Gross examination: Decapsulation was easy, External surface was smooth. Cut surface revealed normal cortico-medullary ratio and Pelvicalyceal system. Both ureters were unremarkable. There was no extra renal anomaly. On histological examination, both kidneys showed cloudy change in tubules. Final Cause of death was certified as disseminated miliary tuberculosis (involving lungs and liver) and bronchopneumonia in a case of pancytopenia.

Case 2: A 42 years old female with dyspnoea since 3 days, history of fall at home with knee injury and profuse bleeding from site of injury on the day of hospital admission. Patient underwentmitral valve replacement 10 years back and was on medications. Patient died within 24 hours of hospitalization. At autopsy, both the kidneys were placed at lower level compared to normal position. Lower poles of kidneys were fused. The upper poles were seen at the level of L2-L3 vertebra. The lower poles were fused at the level of L5 vertebra. Combined weight of both kidneys was 220 grams. Gross examination: Decapsulation was slightly difficult. External surface revealed superficial as well as few deep scars and fusion of lower poles of both kidneys. Cut surface revealed reduced cortico -medullary ratio with thinning of cortex. Pelvicalyceal system and both ureters were unremarkable. There was no extra renal anomaly (Fig. 1: B & C). Final Cause of death was certified as fibrocavitatory tuberculosis with tuberculous bronchopneumonia and subdural hematoma in an operated case of mitral valve replacement.

Case 3: A 48 year's old male with pain in abdomen and urinary complaints like burning micturation since 6 days. Patient is chronic alcoholic had history of bronchial asthma since 8 years and was on medications. Patient died within 24 hours of hospitalization. At autopsy, both the kidneys were placed at lower level compared to normal position. Combined weight of both kidneys was 350 grams. Gross examination: Decapsulation was slightly difficult. External surface revealed superficial as well as few deep scars and fusion of lower poles of both kidneys. Cut surface cortico-medullary differentiation was difficult with thinning of cortex. Pelvicalyceal system was dilated and both ureters were unremarkable. There was no extra renal anomaly. Final Cause of death was certified as shock due oesophageal varices bleeding in cirrhosis in known asthmatic.

On histological examination, in all above cases kidneys showed global glomerulosclerosis, cloudy change in tubules, areas of subcapsular fibrosis with lymphocytic infiltration. Few blood vessels were thickened (Fig. 1 D). In all cases, cause of death was not related to renal system (table 1). None of the above cases showed presence of renal stones.

Table 1: Findings in horseshoe kidney cases

Age / sex	Clinical presentation	Past history	Cause of death	Wt	Pole involved	Microscopic findings
37/ male	Acute febrile illness	Tuberculosis	Disseminated miliary tuberculosis	410	lower	Decapsulation easy. Corticomedullary differentiation seen plevicalaceal system, ureters normal. global glomerulosclerosis, cloudy change in tubules, areas of subcapsular fibrosis with lymphocytic infiltration
42/ female	Knee injury	Mitral valve replacement	Tuberculous bronchopneumonia	220	lower	Corticomedullary differentiation seen plevicalaceal system, ureters normal. Glomerulosclerosis, cloudy change in tubules, areas of subcapsular fibrosis with lymphocytic infiltration and
48/ male	Pain in abdomen,	Bronchial asthma, chronic alcoholic	shock due oesophageal varices bleeding in cirrhosis	350	lower	Decapsulation difficult. Deep scars present. Dilated. Plevicalaceal system but ureters appeared normal. Global glomerulosclerosis, cloudy change in tubules, areas of subcapsular fibrosis with lymphocytic infiltration.

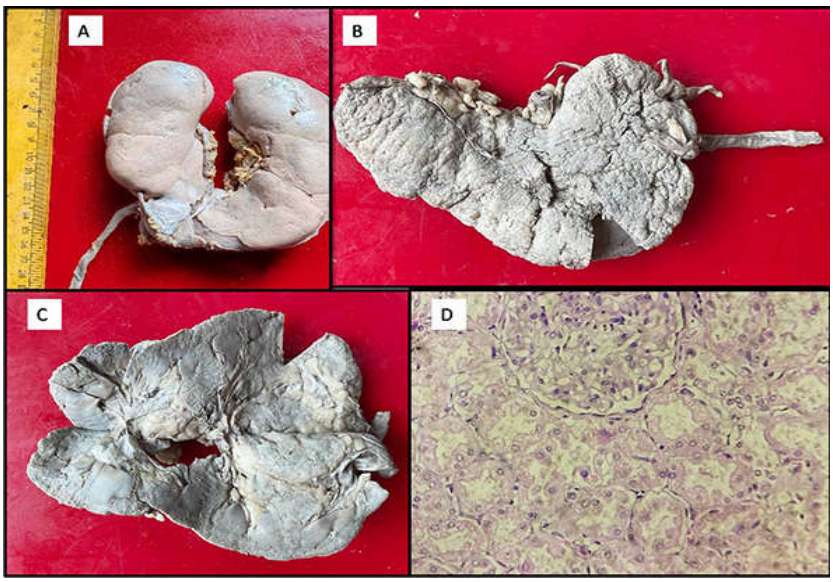

Fig. 1: A) Lower poles of kidneys were fused. B) and C) external and cut surface of another case with loss of cortico-medullary differentiation.

D) On Microscopic examination: the glomeruli are congested, tubules show cloudy change (H&E, 40X

Appendixes (if necessary): No, Abbreviations (if necessary): No

DISCUSSION

In humans, congenital anomalies most commonly affect the upper urinary tract system.[1] It may associated with urological sequelae due largely to the associated ureteric obstruction, stones, trauma infections, impaired urinary drainage and tumours. Formation of horseshoe kidney is suggested by Lewis and Papez, in 1915 and reiterated by many authors.[6] They are characterized by abnormalities in the position, rotation, and vascular supply of the kidney. Crossed fused renal ectopia is another type of renal fusion anomaly and is less common than HSK. The present study reports autopsy examination, gross morphology, dissection findings and histological findings of this anomaly.

These consist of a wide spectrum of disorders ranging from simple anomalies with no clinical significance which remain asymptomatic throughout the life without altering the lifespan of subjects while others are complex anomalies

resulting in life threatening complications and are associated with considerable morbidity and early death due to renal failure in childhood and middle age group.[1,2,3,4] The occurrence of the congenital anomalies of kidney is not an uncommon phenomenon,[2,3] and accounts for approximately 3.3-11.1% incidence in the general population and about 50% of all the congenital abnormalities,[1,4,5] with scientific advances in today's era, many congenital anomalies of the upper urinary tract are diagnosed in the prenatal and neonatal periods, however some are detected in children or adults either as an incidental finding or a due to some complications (e.g., upper urinary tract obstruction, renal calculi, infection, hypertension etc.[1]

Fusion anomalies occur during the cranial migration of the kidneys from the pelvic region to the lumbar region. The fusion may be partial (e.g., horseshoe kidney and crossed renal ectopia with fusion) or total (i.e., pancake kidney). Horseshoe kidney occurs because of the fusion of either of the poles of the kidneys, usually the inferior poles. They usually remain asymptomatic because of normal development of its collecting system and ureters which enter the bladder.[2-4,8] Horseshoe kidney is the most common fusion anomaly occurring in every 1 out of 400, more common in male than in females.[3,9,10] Most of data on renal anomalies is available from studies done on western populations. Little data is available on incidence of renal anomalies in Indian population. Our study helps to determine the prevalence of horseshoe kidneys in western Indian population.

A horseshoe kidney is most common fusion abnormalities in the kidney which is formed by fusion of two distinct functioning kidneys; one on each side of the midline. It is estimated to occur in 1 in 400 people with males predominance.[2,5,8,9] Estimated occurrence of horseshoe shaped kidney is 0.2% in general population[10] but in our study, out of 2524 adult autopsies, we encountered 3 cases of horseshoe kidney (1: 1262). Tulika Gupta *et al*[4] observed 3 cases of horseshoe kidney out of 1,900 cases. Flower[11] reported 1 horseshoe kidney in 1000 cases. Campbell MF *et al*[10] reported occurrence of horseshoe kidney with ratio of 1:400.

In our study, one case was 2 male and one female had these anomaly with male preponderance similar to other study as Tulika Gupta *et al*[2], Flower[16], Basar *et al*[10] and Perimutter *et al*[17] stated that it is more common in males with ratio of 2:1. However, male to female ratio in our study is 2:1. The majority of patients with a horseshoe kidney are asymptomatic.[1-10] Several authors have stated that Horseshoe kidneys may function normally in upto 75% cases; however, surgery is required in upto 25% cases.[20-22] Studies have revealed that some complications such as ureteropelvic junction obstruction, lithiasis (2243), renal infections and although rare but increased incidence of malignancies have been associated with horseshoe kidneys.[10] In our study, all the cases presented to hospital with complaints which were not associated with renal system. In all the cases, presence of horseshoe kidneys was diagnosed with radiologically during their present and previous hospitalizations. However, both cases showed normal renal functions and no surgical interventions were required. Even after autopsies, final cause of death was not found associated with horseshoe kidney. In these cases of horseshoe kidney, isthmus was located at lower pole. Love L *et al*[24] reported similar findings in 95% of the cases. Tulika Gupta *et al*[4] and Dajani[21] reported isthmus was lying anterior to the aorta and the IVC. In our study, both cases showed isthmus lying anterior to the aorta and the IVC at the level L4 and L5 respectively.

CONCLUSION

The congenital renal anomalies are not uncommon and horseshoe kidney is one of the most common congenital anomalies of the upper urinary tract. Many times, horseshoe kidneys may function normally and remain unnoticed/ asymptomatic till adulthood causing no harm to patient. An isolated finding of a horseshoe kidney is generally considered benign. These cases come into notice incidentally due to other medical or surgical scenarios or at the autopsies. Majority of cases may require no surgical intervention throughout their life. However, It is important to know the anatomical variations in the blood supply of horseshoe kidney as the surgery could be complicated in the presence of anomalous blood supply as there is no collateral circulation.

Acknowledgement: No

Conflict of Interest: No

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