

Treatment of tumour in horseshoe kidney: Our experience

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Abstract

Introduction: Horseshoe kidney is a developmental disorder of genitourinary system and is a renal fusion anomaly. This condition is itself rare in its occurrence. The occurrence of tumour in a horseshoe kidney is further rare. The tumour is more common in isthmus followed by the right and left side. It is more common in males with ratio of 2:1. If a tumour occurs in a horseshoe kidney, the best treatment is to remove the tumour surgically. We here present our experience of dealing tumour in horseshoe kidney at our institute.

Materials and Methods: This retrospective surgery was done in SMBT Institute of Medical Sciences and Research centre, Nashik, Maharashtra, India. All patients who were diagnosed with tumour in horseshoe kidneys and operated later on, from August 2016 to July 2019 were included in this study. Total three patients were included in the study. The preoperative diagnosis was made using ultrasonography (USG), computed tomography (CT) urography and CT angiography. Check-up examinations were carried out approximately 1,3 and 6 months after the surgery using USG, CT, and X-ray of the chest. Radical nephrectomy or heminephrectomy was performed in all the cases.

Results: Total three patients were included in the study. Out of this two were male and one was female. Haematuria was the first symptom in one patient. Pain in abdomen was the first symptom in one and one patient was diagnosed incidentally with tumour in horseshoe kidney.

One patient had tumour in right half of the kidney one had tumour in left half of the horseshoe kidney and third one had tumour in the isthmus that was extending into the right kidney. One patient had tumour in upper pole and two had tumour localised to lower pole. The maximum size of tumour was 10 cms and minimum size was 6 cms. In two patients, lumbar posterolateral incision was used for heminephrectomy and in one midline incision was taken because the tumour was present in the isthmus and extending to the right half. During follow-up examinations, all the patients were free of metastases.

Conclusion: RCC is the most common malignant tumour in horseshoe kidney. When surgical intervention is planned, a CT angiography should be done to get a real picture of the renal vasculature and the isthmus specially. Organ preserving surgery can be done depending on the size and site of the tumour. Surgery can be done by open, laproscopic or robotic means.

Keywords: Horseshoe shoe kidney, Tumour in horseshoe kidney, RCC in horseshoe kidney, Isthmus tumour in horseshoe kidney, Renal CT angiography.

Introduction

Horseshoe kidney is a developmental disorder of genitourinary system and is a renal fusion anomaly. This abnormality occurs between 4th and 6th week of gestation, after the ureteric bud has entered the renal blastema. Horseshoe kidney occurs in around 3% of the population.¹ Horseshoe kidney consists of two different renal entities on either side of midline fused at either pole, usually lower, by a fibrous or parenchymatous tissue. The occurrence of tumour in

horseshoe kidney is rare. But the incidence is more as compared to the general population with normal kidneys. The reason being the occurrence of urinary stasis, calculus formation, hydronephrosis and pelvi-ureteric junction obstruction simultaneously. Presence of tumour in horseshoe kidney is a different entity. The reason is the abnormal location of the kidneys, varied vasculature, the problem of accessibility. In horseshoe kidneys with tumour, preoperative knowledge of the localization, extent and vascular

supply of the neoplasm and the kidneys alongwith the isthmus is utmost important for performing a complete resection of the tumour without sacrificing the functioning renal tissue.² Preoperative renal angiography is therefore, very important for good surgical outcome. We here report our experience of treating the tumour in horseshoe kidneys.

Materials and Methods

This retrospective surgery was done in SMBT Institute of Medical Sciences and Research centre, Nashik, Maharashtra, India. All patients who were diagnosed with tumour in horseshoe kidneys and operated later on, from August 2016 to July 2019 were included in this study. Total three patients were included in the study. The data was collected retrospectively for all the patients. The records of the patients were reviewed. Age, symptoms, side of renal tumour, size and locations of tumour, diagnostic modality, the treatment given and their follow-up data were recorded. The preoperative diagnosis was made using ultrasonography (USG), computed tomography (CT) urography and CT angiography. Check-up examinations were carried out approximately 1,3 and 6 months after the surgery using USG, CT, and X-ray of the chest. Radical nephrectomy or heminephrectomy was performed in all the cases.

Results

Total three patients were included in the study. Out of this two were male and one was female. The maximum age of patient in our study was 74 years and minimum age was 55 years. Haematuria was the first

symptom in one patient. Pain in abdomen was the first symptom in one and one patient was diagnosed incidentally with tumour in horseshoe kidney.

In all the patients, pre-operative sonography of abdomen (USG) and pelvis, CT urography and CT renal angiogram was performed (Figure 1,2 and 3), (Table 1).

One patient had tumour in right half of the kidney one had tumour in left half of the horseshoe kidney and third one had tumour in the isthmus that was extending into the right kidney (Fig 1 & 2). One patient had tumour in upper pole and two had tumour localised to lower pole. The maximum size of tumour was 10 cms and minimum size was 6 cms. In two patients, lumbar posterolateral incision was used for heminephrectomy and in one midline incision was taken because of the tumour was present in the isthmus and extending to the right half (Table 2).

In all the patients the presence of thick parenchymal isthmus was confirmed alongwith the vascularity.

Clear cell renal cell carcinoma was the most common type of tumour in all the cases.

The mean hospitalisation time was 10 days in our study.

The follow-up examinations were performed in all the patients and done at 1, 3 and 6 months. The investigations done included routine blood tests, chest X-ray, USG, and CT abdomen and pelvis. During follow-up examinations, all the patients were free of metastases.

Table 1: Characteristics of patients

No.	Age	Sex	Symptoms	Radiological investigations
1	74	F	Haematuria	USG, CT urography, CT angiography
2	67	M	Pain in abdomen	USG, CT urography, CT angiography
3	55	F	Incidental	USG, CT urography, CT angiography

Table 2: Characteristics of patients W.R.T. tumour, surgical approach, surgical procedure, histological type and grading

No.	Location of tumour	Incision	Type of surgery	HP	Grade
1	Right lower pole (8.5 cm)	Posterolateral	Heminephrectomy	RCC II*	T2aNoMo
2	Left lower pole (6 cm)	Posterolateral	Heminephrectomy	RCC II	T1bNoMo
3	Isthmus and right lower pole (10 cm)	Open midline	Heminephrectomy and isthumelectomy	RCC III	T2bNoMo

*RCC – Renal cell carcinoma, and Furrman's grading

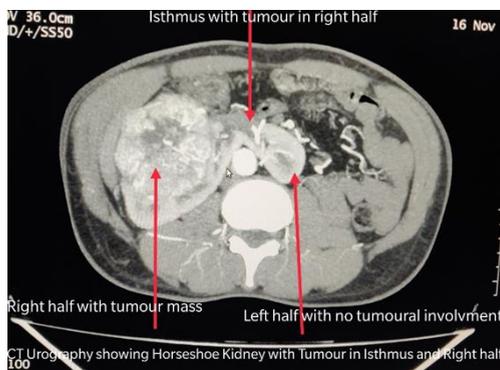


Fig. 1:

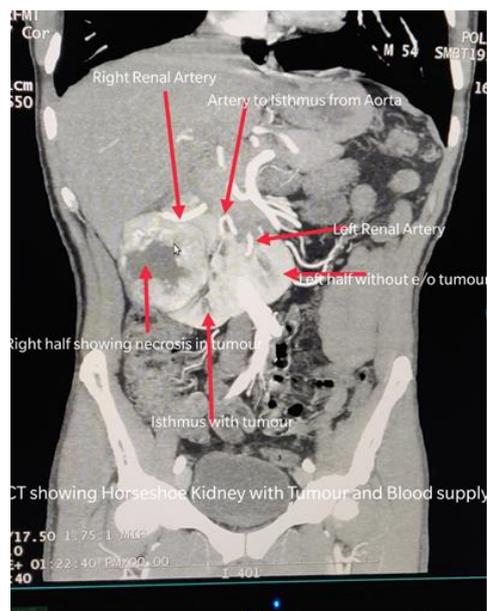


Fig. 2:

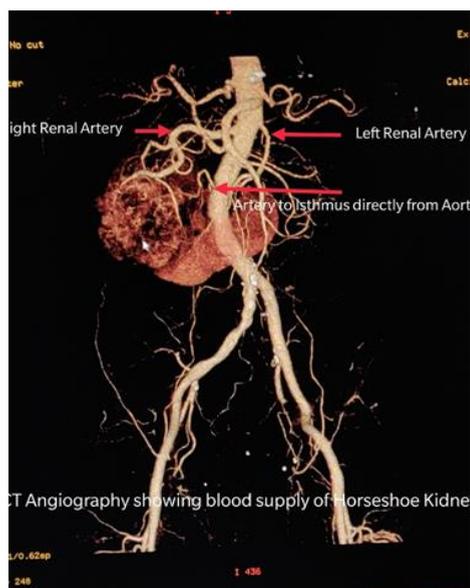


Fig. 3:

Discussion

Horseshoe kidney is the most common fusion anomaly of all the renal fusion anomalies. It has an incidence of 1 in 400 cases.³ This abnormality occurs between 4th and 6th week of gestation, after the ureteric bud has entered the renal blastema. Horseshoe kidney consists of two different renal entities on either side of midline fused at either pole, usually lower, by a fibrous or parenchymatous tissue. In less than 5% cases the isthmus connects the upper poles of the kidneys forming inverted horseshoe.

Horseshoe kidneys are more common in males, with male to female ratio of 2:1.⁴ In our study also the males were more as compared to females.

Around one-third of all patients with a horseshoe kidney remain asymptomatic. The pathology is usually discovered incidentally or during physical examination or CT and ultrasound scans done for other symptoms⁵. In our study also one patient was diagnosed incidentally.

When symptoms are present, they are related to hydro-nephrosis, infection, or calculus formation. In our study two patients had symptoms of haematuria and pain in abdomen and were investigated further. The incidence of renal tumour in a horseshoe kidney is around 3 to 4 times greater than in general population. The reason could be chronic obstruction, urolithiasis, and infection.⁵⁻⁷

The diagnosis of tumour in horseshoe kidney is done by CT scan, supported by CT angiography and spiral CT, if available. This increases the accuracy regarding the extent of location and the vascular supply of the kidneys as well as the isthmus.^{8,9} We did CT scan of abdomen and pelvis supported by CT angiography. We were able to localise tumour clearly in all the cases.

The tumour in horseshoe kidney can be located in any part, but isthmus is the most common site of tumour occurrence.¹⁰ In our study, one patient had tumour located in the isthmus and two were located in the right and left parts respectively.

An aberrant vascular supply is a major problem in horseshoe kidneys. The vascular supply cannot be easily predicted during surgery. Therefore, angiography is must before any surgical intervention. CT angiography is recommended in horseshoe kidney

to check the renal vascularity.¹¹ The vascular supply is varied and it should be clear before pre-operative planning. The usual blood supply is one renal artery for each kidney in 30% cases¹². But it could be duplicate or even triplicate arteries on one or both sides.¹¹ The blood supply of isthmus is important whenever planning for heminephrectomy or isthmectomy. The is usually supplied by the either a branch from the main artery or from the aorta.¹¹ But it may it is blood supply from the inferior mesenteric artery, common iliac artery, external iliac artery, or the sacral artery.¹³ In our study, all the patients had normal blood supply, bilateral single renal arteries and the isthmus was supplied by single artery directly from the aorta.

The standard treatment for malignant tumour in any kidney is radical nephrectomy, when it is resectable. In case of tumour in horseshoe kidney, we can do heminephrectomy, a limited resection or isthmectomy. It is important to take care of the abnormal vascular supply and the abnormal renal pelvic anatomy. We did heminephrectomy in two case and isthmectomy with heminephrectomy in another case.

Surgical approach for tumour removal could be postero-lateral or midline.^{10,14} We used posterolateral approach in two cases and midline approach in one case.

Renal cell carcinoma (RCC) is the most common neoplasm associated with horseshoe kidney. However, other types can also occur like transitional cell carcinoma, Wilm's tumour, squamous cell carcinoma and adenocarcinoma.¹⁵ Urothelial carcinoma occurs in more than 90% of cases and squamous cell carcinoma occurs in 0.7–7% of cases in the general population.¹⁶ In our study also all the tumours came out to be renal cell carcinoma.

Conclusion

RCC is the most common malignant tumour in horseshoe kidney. Incidence of tumour in horseshoe kidney looks similar to general population. Diagnosis of tumour and of horseshoe kidney is done by the same imaging methods as in normal kidneys. But when surgical intervention is planned, then a CT angiography should be done to get a real picture of the

renal vasculature and the isthmus specially. Organ preserving surgery can be done depending on the size and site of the tumour. Surgery can be done by open, laproscopic or robotic means.

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Conflict of Interest

None.

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None.

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