

Histomorphological Study of Renal Tumours – A Single Centre Experience

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ABSTRACT

BACKGROUND

Renal tumours encompass a wide spectrum as distinct entities both in adults and in children. Renal cell carcinomas constitute majority of all renal neoplasms. Proper typing of renal tumours is not possible before surgery and histopathological examination. Accurate histopathological diagnosis and proper tumour typing is very important for early and proper surgical treatment. We wanted to study the various histomorphological patterns of renal tumours.

METHODS

We studied nephrectomy specimens with renal tumours received in the department of pathology from January 2018 to June 2020 (2 years 6 months, retrospective study). A total of 29 cases with renal tumours were included. Relevant Clinical details along with gross findings were recorded from the histopathology forms. Nephrectomy specimens were fixed overnight in 10 % formalin. Gross examination was done, representative tissue bits taken, routinely tissue processed, embedded and the sections were cut (4 – 5 microns). Haematoxylin and Eosin staining was done. Pathological diagnosis was done by two pathologists and arrived at a common consensus.

RESULTS

A total of 29 cases were included in our study. Of these 16 patients were male and 13 were female, with a male to female ratio of 1.2: 1. Most common age group affected was 5th decade. Mean age was 48 years. Out of 29 cases, 24 cases were malignant (82.75 %) and 5 cases were benign (17.24 %). Renal cell carcinoma (RCC) accounted for 18 cases out of 24 malignant tumours. Clear cell RCC was common subtype with 13 cases followed by 3 cases of chromophobe RCC and 2 cases of papillary RCC. In benign tumours, we had 4 cases of angiomyolipoma and 1 case of oncocytoma. Right sided kidney was affected with 17 cases (58.62 %) and left sided kidney 12 cases (41.7 %). Common tumour location was in upper pole. Pathological stage pT1 was seen in 9 cases followed pT2-5 cases, pT3-4 and pT4-2 cases. WHO / ISUP nuclear grading was noted. Grade II was seen in 11 cases followed by grade III seen in 4 cases.

CONCLUSIONS

Malignant renal tumours were most common than the benign tumours. Renal cell carcinoma was most common of the malignant tumours. Clear cell RCC was the most common subtype. Pathological stage pT1 was most common. Grade II was the most common grade. Proper histological typing, staging and grading are important for appropriate surgical treatment of renal tumours.

KEYWORDS

Renal Tumours, Renal Cell Carcinoma, Nephrectomy

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BACKGROUND

Renal tumours encompass a wide spectrum as distinct entities both in adults and in children. Renal cell carcinomas constitute about 80 % to 85 % of all the renal neoplasms. Most arise from the lining cell of proximal convoluted tubule from renal cortex. Transitional cell carcinomas arising from renal pelvis are the next common. Other parenchymal epithelial tumours like oncocytomas, collecting duct tumours and renal sarcomas are relatively rare.

Proper typing of renal tumours is not possible before surgery and histopathological examination. Either the nephron sparing surgery like partial nephrectomy or radical nephrectomy remain the mainstay of treatment of renal tumours. Meticulous examination of the gross specimen with tumour, accurate histopathological diagnosis and proper tumour typing is very important for early and proper surgical treatment.

METHODS

In this retrospective study we studied nephrectomy specimens with renal tumours received in the Department of Pathology from January 2018 to June 2020 (2 years 6 months). Total of 29 cases with renal tumours were included. Clinical and radiological details along with gross findings were recorded from the histopathology request form. All the nephrectomy specimens were fixed overnight in 10 % formalin. Gross examination was done. Size and cut surface of the tumour, presence of renal vascular thrombi, capsule invasion and the other routine reporting format parameters were noted. Representative tissue bits were taken and routinely tissue processed, embedded and the sections were cut at 4 - 5 micron thickness. Hematoxylin and Eosin staining was done. Special stains like Periodic acid Schiff (PAS) and Jones Methenamine Silver (JMS) were done when required. Pathological diagnosis was done by both the pathologists after arriving at a common consensus.

RESULTS

A total of 29 cases was included in our study, 22 were radical nephrectomies, 4 partial nephrectomies and 3 cases of simple nephrectomies. Of these 16 patients were males and 13 were females, with a male to female ratio of 1.2: 1 (Table 1). Most common age group affected is 4th decade. Mean age was 48 years with the youngest age of patient being 5 years and the oldest being 76 years. Out of 29 cases, 24 cases (82.71 %) were malignant tumours and 5 cases (17.23 %) were benign tumours (Table 1). Renal Cell Carcinoma (RCC) was the most common diagnosis accounting for 18 cases out of 24 malignant tumours. Clear cell RCC was most common subtype with 13 cases followed by 3 cases of chromophobe RCC and 2 cases of papillary RCC. Among the rest we had 1 case of collecting duct carcinoma, 2 cases of

urothelial carcinoma, 1 case of Wilm's tumour and 2 cases of unclassified RCC (Table 2).

Studies	Mean Age in Years	M:F Ratio	Benign	Malignant
Basavaraj Y et al	43.43	2.19:1	12.5 %	87.5 %
Nusrat B et al	54	1.70:1	10.86 %	10.86 %
Datta B et al	54.5	1.9:1	14.5 %	55.5 %
Fauzia L et al	47.9	1.9:1	94 %	6 %
Present study	48	1.2: 1	17.23 %	82.7 %

Table 1. Comparison of Mean Age of Patients, Sex Ratio, Incidence and Percentage of Benign vs. Malignant Tumours in Different Studies

Tumour Sub Type	Number	Percentage
Benign		
Oncocytoma	1	3.44 %
Angiomyolipoma	4	13.79 %
Malignant		
Clear cell RCC	13	44.82 %
Papillary RCC	2	6.89 %
Chromophobe RCC	3	10.34 %
Collecting duct carcinoma	1	3.44 %
Unclassified RCC	2	6.89 %
Wilm's tumour	1	3.44 %
Urothelial carcinoma	2	6.89 %

Table 2. List of Renal Tumours with Percentages (%)

Pathological Tumour Staging	Fauzia et al	Nilay et al	Basavaraj et al	Present Study
pT1	14 (34.1 %)	3 (37.5 %)	7 (33.3 %)	9 (45 %)
pT2	12 (29.2 %)	2 (25 %)	7 (33.3 %)	5 (25 %)
pT3	13 (31.7 %)	2 (25 %)	7 (33.3 %)	4 (20 %)
pT4	15 (36.5 %)	1 [12.25 %]	-	2 (10 %)

Table 3. Comparison of Pathological Staging of Kidney Tumours in Various Studies

In the benign category of tumours, we had 4 cases of angiomyolipoma and 1 case of oncocytoma. Right sided kidney was most commonly affected with 17 cases (58.62 %) and left sided kidney 12 cases (41.7 %). Most common tumour location being upper pole in 12 cases (41.37 %) followed by 7 in lower pole (24.13 %), 4 in mid pole (13.79 %) and 3 involved all the three poles (10.34 %). Renal pelvis location was seen in 3 cases (10.34 %).

Pathological staging was noted in 20 cases (Table 3). In rest 9 cases staging was not applicable (benign tumours, partial nephrectomies). Pathological stage pT1 (tumour size < 7 cms in greatest dimension) was most common with 9 cases followed by pT2 (tumour size > 7 cms in greatest dimension and is limited to kidney) with 5 cases. Four cases belonged to pT3 (tumour involving renal vein and perinephric tissues) and 2 cases belonged to pT4 (tumour beyond Gerota's fascia and involving ipsilateral adrenal gland).

WHO (World Health Organization) / International Society of Urologic Pathology (ISUP) nuclear grading was noted. Grade II was most common grade seen in 11 cases followed by Grade III in 4 cases. One case belonged to grade I and 2 belonged to grade IV. Tumour necrosis was present in 10 cases. Sarcomatoid change was seen in 3 cases. Renal sinus infiltration was seen in 3 cases. Capsular invasion was seen in 1 case. Lymph node metastasis was seen in 2 cases. Lympho-vascular emboli were seen in 1 case. Adrenal gland metastatic deposit was seen in 1 case. The most common finding seen in uninvolved adjacent kidney was focal global sclerosis and focal interstitial inflammation.

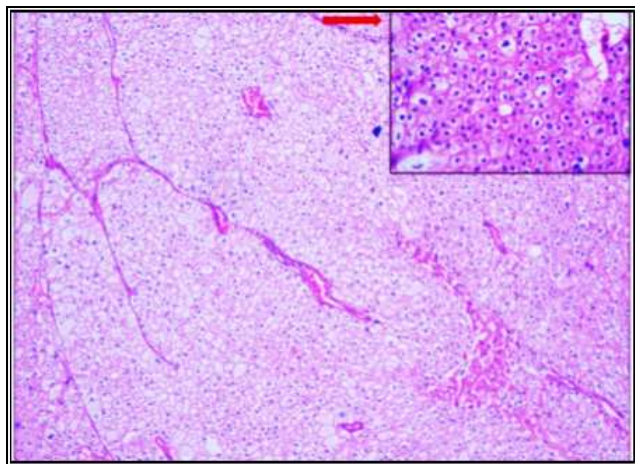


Figure 1. Chromophobe RCC – Tumour Predominantly in Sheets Separated by Incomplete Vascular Septa [H & E, 10x], Tumour Cells having Eosinophilic Granular Cells with Irregular Nuclei and Perinuclear Halos. [Inset-Red Arrow, H & E Stain, 40 x]

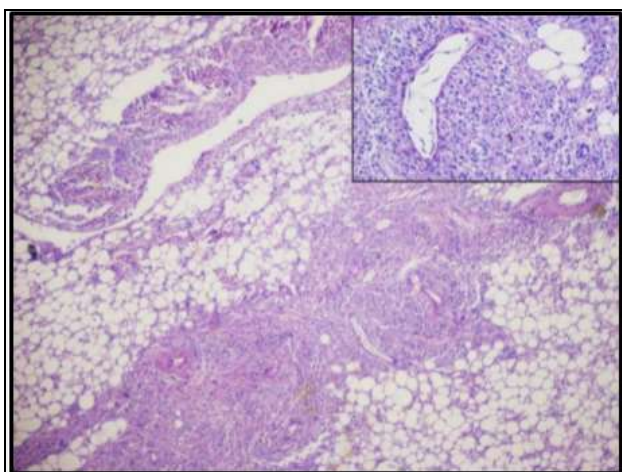


Figure 2. Angiomyolipoma - Thickened Blood Vessels, Smooth Muscle Cells with Mature Adipocytes, [H & E, 20x]. Blood Vessel with Surrounding Smooth Muscle Cells along with Adipocytes

DISCUSSION

The incidence of renal tumours is on rise worldwide due to increased use of radiological imaging techniques with increased number of incidentally detected tumours, RCC being the most common malignant renal tumour. Early detection of RCC helps in effective surgical treatment which includes radical nephrectomy and importantly nephron sparing surgery like partial nephrectomy in selected cases.

Meticulous gross examination of the tumour specimen along with microscopic histomorphological examination is very essential for proper staging, histological typing and grading of the tumour.¹

Present study included renal tumour specimens received in Department of Pathology at Institute of Nephrourology, Bengaluru, in South India which is a government referral super-speciality centre for nephrology and urology.

Most common age group affected was 5th decade with a mean age of 48 years. This is in concordance with the findings of the study done by Basavaraj et al² from

Karnataka, South India and Fauzia et al³ Karachi, Pakistan, where authors reported mean age of 43.4 and 47.9 years respectively (Table 1).

Renal tumours are more common in adults and are relatively rare in children.

In present study male patients were more affected than female patients with a male to female ratio of 1.2:1. This finding is similar with other studies done by Bashir N et al,⁴ Basavaraj Yamakanamaradi et al,² Datta et al⁵ where the authors reported males being more affected than females with male to female ratio of 1.7:1, 2.19:1 and 1.9:1 respectively (Table 1). Renal cell carcinoma is approximately two-fold times more common in men compared with women. Aetiological factors for RCC include obesity, smoking, acquired cystic disease, occupational exposure of trichloroethylene etc. There is convincing evidence that body fatness is a cause for kidney cancer, although exact mechanism by which obesity induces renal carcinogenesis is unclear. Sex steroid hormones may affect renal cell proliferation by direct endocrine receptor mediated effects.⁶

In present study right kidney tumours were slightly more common (55.17 %) than left sided with upper pole being the most common tumour location. This is similar to findings by Amin AN et al⁷ where right sided tumours were slightly more common (53.1 %) than left side. Whereas in study by Fauzia L et al³ authors reported left sided tumours with upper pole involvement in majority of the cases. In studies done by Bashir N et al⁴ and Basavaraj Y et al² upper pole involvement of tumour was more common than the other pole s (50.5 %, 28 % and 24.3 %) respectively.

Present study included RCC with varying tumour sizes with a maximum of 15 cms and a minimum of 2 cms. Mean tumour size was 8.23 cms. In a study done by Turun S et al⁸ authors reported a mean size of 5.02 cms. In that study authors exclusively studied correlation between tumour size and its relation with other parameters like Fuhrman grade, TNM (Tumor Nodes Metastases) stage, renal capsule involvement and renal vascular invasion.⁸

In the present study majority of the tumours were malignant (69 %) with rest (31 %) being benign tumours (Table 2). This is in concordance with most of the studies including study findings by Basavaraj Y et al² and Fauzia L et al³ where malignant tumours were most common affecting 87.5 % and 94 % of the total cases respectively.

Most common malignant tumour in this study was RCC accounting to 75 % of all malignant tumours. Clear cell RCC was the common histological type followed by chromophobe RCC and papillary RCC variant.

This goes with the study findings by Basavaraj Y et al² where RCC was seen in 65.6 % of kidney tumours and out of them clear cell RCC was the most common histological sub-type observed in 46.9 % cases followed by papillary RCC in 15.6 % and chromophobe RCC in 3.1 % of cases.

In a similar study done by Nusrat B et al⁴ and Fauzia et al³ malignant tumours were more common than benign tumour and of these clear cell RCC was most common (60.8 %) followed by papillary RCC and chromophobe RCC.

Clear cell RCC morphologically shows of tumour cells arranged in alveolar and acinar pattern admixed with small and thin walled blood vessels. Cytoplasm is filled with

glycogen and lipids which are dissolved by routine tissue processing giving clear cytoplasmic appearance with distinct cell membrane

Chromophobe RCC morphology shows tumour typically arranged in solid sheet like pattern separated by incomplete vascular septa (Picture / Figure 1). Papillary RCC are composed of papillae formed by thin fibrovascular cores that may contain foamy macrophages and psammoma bodies.

Nuclear grading was done in clear cell RCC and papillary RCC using WHO / International Society of Urologic Pathology (ISUP) nuclear grading system.⁶ Grade II was most common followed by Grade III. This finding is in concordance with other studies done by Basavaraj Y et al,² Narang et al⁹ and Nilay Shah et al¹⁰ where authors reported more common Grade II tumours followed by Grade III tumours. Whereas in a study done by Amin et al⁷ Grade I nuclei was more commonly reported in about 44.4 % of cases followed by Grade II in 33.3 %.

In the present study pathological tumour staging (pT) was applied. Most RCC were in pT1 followed by pT2 and pT3. This is in comparison with study done by Shalini et al¹¹ where authors reported most of the RCC in pT1 (34.1 %) followed by pT2 (24.9 %), pT3 (18.3 %) and pT4 (15.9 %). In other studies, done by Basavaraj Y² et al, Fauzia et al³ and Nilay Shah et al¹⁰ had varying distribution of cases in different stages (Table 3).

We had 1 case of Wilm's tumour in present study. Wilm's tumour also called Nephroblastoma is a malignant embryonal neoplasm derived from nephrogenic blastemal cells. It is one of the most common malignant tumours in children.⁶ Age of the patient in our study was 5 years. This is in comparison to study by Basavaraj Y et al² where authors reported 3 cases (9.4 %) of Wilm's tumour with a mean age of 3.5 years. Whereas in a study done by Bashir N et al⁴ Wilm's tumour was reported in 27 cases (14.7 %). This is one of the largest studies with 184 cases with a 10 years study period and included both adults as well paediatric patients. Paucity of nephroblastoma cases in present study may be attributed to the fact that ours is a super-speciality hospital primarily catering to adult urology patients. Paediatric patients are usually referred to paediatric surgery department at Bangalore Medical College which is in the same premises.

We had 2 cases of urothelial carcinoma (6.89 %) in our study. This is in concordance with the study findings done by Fauzia L et al³ where authors reported 2 cases of urothelial carcinomas. Urothelial carcinoma is the most common malignancy of the urinary tract. We had one case of Collecting Duct Carcinoma (CDC) in our study. CDC is a malignant epithelial tumour arising from principal cells of the renal collecting ducts of Bellini. CDC is a rare neoplasm accounting for only 1 - 2 % renal tumours.¹² The prognosis is usually poor due to rapid progression with widespread metastasis. In our case patient was referred to regional cancer centre for further treatment and couldn't be followed up.

Present study had 2 cases of unclassified RCC. Unclassified RCC is not a distinct type of RCC but a diagnostic category of tumours that do not readily fit into any of the recognizable subtypes of RCC. Their histological features do

not fit any of the well characterized RCC.¹² They usually show sarcomatoid morphology. This finding is similar with the study done by Bashir et al³ where authors reported 2 cases of unclassified RCC.

Benign tumours in the present study include Angiomyolipoma (AML) and oncocytoma.

AML is the most common benign tumour in the present study followed by oncocytoma. AML is a benign mesenchymal tumour composed of variable proportion of adipose tissue, spindle cells, epithelioid smooth muscle cells and abnormally thickened blood vessels¹³ (Picture / Figure 2). AML is four to five times more common in women than in men.¹⁴ In present study there were 4 cases of AML (13.79 %) and all patients were women with mean age of 42.25 years. In a study done by Bashir et al⁴ and Nilayshah et al¹⁰ authors reported 11 cases (5.9 %) and 3 cases (4.05 %) of AML accounting for 5.9 % of all the cases.

Oncocytoma is a benign epithelial cell tumour composed of large round eosinophilic cells with granular cytoplasm packed with mitochondria usually in solid-nested architecture. Present study has one case of oncocytoma (3.44 %). In study done by Bashir N et al⁴ and Basavaraj Y et al,² 2 cases (1.1 %) and 3 cases (9.4 %) of oncocytoma were reported respectively.

Tumour Spread

In the present study renal sinus invasion was seen in 3 cases, renal vein thrombus was seen in 1 case – was seen in gross as well confirmed by microscopy, capsular invasion was seen in 1 case and adrenal gland metastasis was noted in 1 case. These findings can be compared to the study findings of Nilay shah et al¹⁰ where authors reported 2 cases each of renal vein invasion, renal sinus invasion and perinephric fat invasion. The authors in addition also reported 1 case of Gerota's fascia invasion and 3 cases of capsular invasion. In present study lymph nodes were sent for evaluation in 2 cases (6.69 %) of which both showed the presence of metastasis. In the above-mentioned study by Nilay Shah et al¹⁰ lymph nodes were received in 3 cases (37.5 %), however, there was no metastatic deposits in any of the 3 cases.

The limitation of our study is relatively smaller sample size so we have not come across other rarer renal tumour entities. Advanced stage renal tumours from our institute are usually referred to regional cancer centre for multi-modal treatment. Another limitation of present study is that, this is only a morphological study and other molecular / genetic tests and Immune-Histo-Chemistry (IHC) have not been done. With the recent WHO classification of renal tumours, good number of the RCC sub-class have characteristic IHC or genetic mutation or molecular signatures which help in navigating the RCC treatment by assisting specific targeted therapy wherever available.^{12,15}

CONCLUSIONS

This was two- and half-year histomorphological study of renal tumours. Malignant tumours were most common than

the benign tumours. Renal cell carcinoma was most common of the malignant tumours. Clear cell RCC being the most common subtype. Most common pathological staging was pT1. Grade II was most common grade. Proper histological typing, staging and grading are important for appropriate treatment of renal tumours. Morphologic diagnosis and sub-classification RCC are still very important and helps to shorten the list of differential diagnosis so that appropriate ancillary tests can be done for exact typing of RCC.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.

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