Original Article

Histopathological characteristics of adult renal tumours: a preliminary report

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Abstract

Objective: To determine the relative frequencies of different renal tumours in adults and to analyze the histopathologic characteristics of renal cell carcinoma and its variants in the population studied.

Methods: The study was carried out at Histopathology Department, Sindh Institute of Urology and Transplantation (SIUT) from April 2004 to October 2004. All consecutive adult patients with renal tumours managed surgically with tumour nephrectomies, were included. Nephrectomy specimens were fixed in 10% formalin. Gross and microscopic examination of the specimens was done according to standard protocol. Patients' demographic and clinical data were obtained from clinical charts and the histopathological features of tumours were retrieved from biopsy reports.

Results: Among 50 patients, 33 (66%) were males and 17 (34%) females. Mean age was 47.9±15.1 years (range; 17 - 80 years). Most tumours were malignant: 47 (94%) vs. 3 (6%) benign. Among malignant tumours, renal cell carcinoma (RCC) was commonest; 41 (87.2%). Various subtypes of RCC included: conventional/clear cell RCC, 30 (73.2%); papillary RCC, 6 (14.6%); chromophobe RCC, 1 (2.4%) and sarcomatoid RCC, 4 (9.7%). Other malignant tumours were: rhabdomyosarcoma, 2 (4.2%); primitive neuroectodermal tumour, 1 (2.1%); transitional cell carcinoma, 2 (4.2%); and squamous cell carcinoma, 1 (2.1%). Benign renal tumours included one case each of angiomyolipoma, oncocytoma and metanephric adenoma.

Conclusion: The spectrum of adult renal tumours in this study consistent with that of previously reported literature. RCC is the commonest malignant tumor and conventional/clear cell RCC is the most common subtype. However, RCC presentation is delayed with a large size and an advanced stage of the disease, compared to published literature.

Keywords: Adults, renal tumours, histological spectrum, renal cell carcinoma (JPMA 61:224; 2011).

Introduction

Renal tumours comprise a diverse spectrum of neoplastic lesions with patterns that are relatively distinct for children and adults.[1-4] A wide variety of both benign and malignant tumours arise from different components of the renal parenchyma, notably tubular epithelium.[1-4] Accurate diagnosis of most renal tumours is not possible before surgery and histopathologic evaluation. Moreover, currently the gold standard in the treatment of renal tumours is radical or partial nephrectomy.[5] A detailed and meticulous histopathologic examination of tumour nephrectomy specimens is essential to establish histologic type and to record accepted histopathological prognostic determinants i.e. tumour size, histologic subtype, nuclear grade, and stage in cases of malignant renal neoplasms.[5-7]

There is little published data on the spectrum of renal tumours in adults in Pakistan and more specifically, the detailed histopathologic characteristics of renal cell carcinoma (RCC), which is by far the most common malignant epithelial tumour of kidney.[8,9] We undertook this study to determine the relative frequencies of different types of renal tumours, their histopathological characteristics, classification and to compare our findings with those in previously published literature.

Material and Methods

The study was conducted at the Histopathology Department, Sindh Institute of Urology and Transplantation (SIUT) from April 2004 to October 2004. Fifty tumour nephrectomy specimens from 50 adult patients were included in the study. Inclusion criteria were; nephrectomies either total, radical or partial, done for tumours, both benign and malignant of adult patients $\geq$ 17 yrs of age. Nephrectomies performed for non neoplastic conditions, paediatric tumour nephrectomies and needle biopsies carried out for tumours were excluded. Patients' demographic and clinical data were recorded from clinical charts and the histopathologic data including the gross and microscopic findings were obtained from pathology reports. The slides were reviewed by two experienced pathologists (MM, JIK) blinded to the original reports first independently and then jointly to arrive at a consensus on all pathological features including nuclear grade.

At the time of primary reporting, nephrectomy specimens were received fixed in 10% buffered formalin. Gross handling of nephrectomy specimens was done according to the standard protocol for examining nephrectomy specimens.[6-9] Representative tissue blocks were taken and processed for paraffin embedding, haematoxylin and eosin (H and E) stained and examined by the pathologists. Special stains and immunohistochemistry (IHC) was done where necessary. WHO classification of renal neoplasms was employed for the diagnostic categorization of the tumours.[4] Revised Tumour, Node, Metastases (TNM) classification (1997) was used for staging and Fuhrman nuclear grading system was employed for grading the malignant neoplasms.[10,11]

Results

A total of 50 renal tumours from 50 adult patients was analyzed. Mean age of patients was 47.9±15.1 years (range; 17 - 80 years) as shown in Table-1. Of these, 33 (66%) were males and 17 (34%) females. The male to female ratio was 1.9:1. Of 50 tumours, 27 50 (54%) involved the left kidney and (46%) the right kidney. Forty seven (94%) tumours were malignant and three (6%) were benign. The histologic types and frequency distribution of these tumours is shown in Table-2. As is evident from this table, RCC formed the main bulk of malignant tumours, i.e. 41/47 (87.2%). Of these, 30/41 (73.1%) cases were of conventional/clear cell RCC (CCRCC) type. Other subtypes of RCC included; papillary RCC (PRCC), 6/41 (14.6%), chromophobe RCC (CRCC), 1/41 (2.4%) and sarcomatoid RCC (SRCC), 4/41 (9.7%). Other malignant tumours involving primarily the kidney at the time of presentation included; rhabdomyosarcoma, (2/47; 4.2%), primitive neuroectodermal tumour (PNET), (1/47; 2.1%), transitional cell carcinoma (2/47; 4.2%) and squamous cell carcinoma, (1/47; 2.1%).

Table-1: Patient demographics.

Total number	50
Males	33 (66%)
Females	17 (33%)
Male to female ratio	1.9:1
Age	
Mean age in years	47.9 ± 15.1
Range in years	17-80

Among benign tumours, there was one case each of angiomyolipoma, (1/3; 33.3%), oncocytoma, (1/3; 33.3%), and metanephric adenoma (1/3; 33.3%).

Regarding RCC, the main pathologic prognostic parameters are shown in Table-3, which shows that the mean maximum diameter of the primary tumour was 8.6±3.4 cm. The maximum diameter of primary tumour was 18 cm, as seen in 3 cases (7.3%) and the minimum, 3 cm, seen in 1 case (2.4%). In 19 (46.3%) cases, the tumour occupied more or less the entire kidney. In 10 (24.3%), it occupied the upper pole, in 6 (14.6%), the lower pole, and in 6 cases (14.6%), the mid region. Grossly, 90% of the tumours were variegated with areas of haemorrhage and necrosis. Gross capsular invasion with involvement of perinephric fat was observed

Table-2: Histological types of renal tumours in 50 adult patients undergoing tumor nephrectomy.

Tumor type	Number	Percentage
Benign tumours	3	6
Angiomyolipoma	1	33.3
Metanephric adenoma	1	33.3
Oncocytoma	1	33.3
Malignant tumours	47	94
Renal cell carcinoma	41	87.2
Clear cell variant	30	73.2
Papillary variant	6	14.6
Chromophobe variant	1	2.4
Sarcomatoid	4	9.7
Rhabdomyosarcoma	2	4.2
Transitional cell carcinoma	2	4.2
Primitive neuro-ectodermal tumor	1	2.1
Squamous cell carcinoma	1	2.1

Table-3: The main histopathologic characteristics of 41 cases of renal cell carcinoma.

Total number of cases	41
Mean maximum diameter (in cm)	8.6±3.4
Range (in cm)	3-18
Location in the kidney	
Occupying entire kidney	19 (46.3%)
Upper pole	10 (24.3%)
Lower pole	6 (14.6%)
Mid region	6 (14.6%)
Gross capsular invasion	14 (34.1%)
Gross renal vein invasion	7 (17%)
Microscopic invasion of renal vein tributaries	11 (26.8%)
Hilar soft tissue invasion	10 (24.4%)
Pathological stage	
pT1	13 (31.7%)
pT1a	1 (2.4%)
pT1b	12 (29.2%)
pT2	13 (31.7%)
pT3	15 (36.5%)
pT4	0

in 14 cases (34.1%). Renal vein invasion was found on gross examination in 7 (17%) cases, while microscopic vascular invasion in small hilar vessels was seen in 11 cases (26.8%). Hilar soft tissue invasion was observed microscopically in 10 (24.4%) of the cases. Adrenal gland was involved in one case only. No tumour involvement was seen grossly or microscopically in adrenal gland. Lymph nodes were received in 5 (12.2%) cases. Lymph node metastases were present in 3 cases, remaining 2 nodes showed reactive changes. Fuhrman's nuclear grading system was applied to 30 cases of CCRCC and 6 cases of PRCC only and not to CRCC and sarcomatoid renal carcinoma. Among 30 cases of CCRCC, two cases (6.6%)) showed grade 1, 19 (63.3%) grade 2, six (20%) grade 3 and three (10%) grade 4. It is evident that majority of CCRCC exhibited nuclear grade 2, while grade 1 was rare. Higher nuclear grades (3 and 4) were seen in approximately one third of cases. Among PRCC, 5 cases (83.3%) exhibited low grade (1 and 2) nuclear features and one case (16.6%) showed high grade (grade 3). Immunohistochemical staining was performed in seven malignant tumours. Among these, all four cases of sarcomatoid carcinoma showed cytokeratin and vimentin positivity, two cases of rhabdomyosarcoma showed desmin and myogenin positivity, and one case of PNET showed diffuse positivity of CD99 and neuron-specific enolase (NSE).

Discussion

Renal tumours in adults are increasing in incidence throughout the world, partly as a result of widespread use of cross sectional imaging modalities and ultrasonography.[12-21] RCC is the most common primary malignant tumour of the kidney (85%) worldwide and constitutes 2-3% of all visceral malignancies in adults.[1,2] The classification of renal cell neoplasms has been extensively studied in the last two decades and is based on a combination of histological, genetic and immunohistochemical features.[4,22]

A meticulous and detailed histopathologic examination of tumour nephrectomy specimens is essential for the accurate diagnosis, classification, prognostication and management of these tumours.[5-7,22-25] In this study, we analyzed the spectrum of renal tumours in adults in our set up and the histopathologic characteristics of RCC. We recognize that it is a small scale, short duration and single centre based study. However, we believe it is an important contribution in that it sheds light on the spectrum of renal tumours in adults in our set up and characterizes in detail the pathologic prognostic features of RCC.

The mean age of our patients was slightly younger as compared with previously published studies, which show a higher age ranging 52 to 68.3 years.[1-4] The reason for this is not clear. Gender distribution of renal tumours is almost similar as reported previously in local and international studies.[1-4,8-17]

In the present study, 54% (27/50) of all tumours occupied left kidney and 46% (23/50) the right kidney. The experience of other authors is more or less similar.[2] One local study also found 55% of renal tumours on left side and 45% on right side.[8]

In our patients, the malignant tumours vastly outnumbered the benign tumours. The low frequency of benign tumours in our study may partly be due to the fact that all our cases presented with symptoms attributable to renal neoplasms and no incidental tumour was found. In contrast to this, in the developed countries incidental detection of renal masses has increased markedly, with

increasing recognition of benign and early malignant tumours.[16-20]

Regarding frequency distribution of different renal tumours, it is observed that our pattern is concordant with previously published accounts of renal tumours in adults in international and local literature.[1-4,8,9] Non-representation of some rare and newly described renal tumours is mainly due to small sample size and short duration of study.

In our study, the mean maximum dimension of RCC was 8.8±3.9 cm. This is almost concordant with overall mean size of RCC in a local study and symptomatic RCCs from India and Saudi Arabia.[9,10,21] However, the mean overall size of the primary tumour is markedly lower in western studies, where majority of RCCs are now detected as incidental finding.[18-20]

In our study, in 19 (46.3%) cases, the entire kidney was affected. This is in keeping with large mean size of the tumours in our patients. In contrast, in a Canadian study by Kassouf et al, most of the tumours (45%) occupied mid portion, while in 30%, they occupied upper pole and in 25%, the lower pole.[18] Interestingly, all these tumours were detected incidentally. Our findings reflect late presentation of patients in advanced stages of disease with large tumours replacing most of the kidney parenchyma.

We applied nuclear grading to cases of CCRCC and PRCC only and not to CRCC and sarcomatoid RCC. The latter represents a high grade transformation of other subtypes of RCC and not a specific entity.[2] In our study, Fuhrman's nuclear grade 2 was the most common, seen in 63.3% of CCRCC, while both grade 1 and higher grades (3 and 4) were rare. In a Japanese study, Fuhrman's nuclear grade was 1 in 38.8%, 2 in 44.4%, and 3 in 16.6%.[17] These differences again reflect the late presentation of tumours in our set up and partly smaller sample size in the present study. Among PRCC, a vast preponderance of cases (5/6; 83.3%) showed lower nuclear grades (1 and 2), which is similar to the experience of other investigators.[2]

Regarding pathologic staging of RCC according to 1997 revised TNM staging system, it is observed that most of our cases (68.2%) presented at an advanced stage (pT2 or above) as compared with studies from the developed world, where majority of these tumours were detected as incidental findings and presented at a lower stage.[17-20] In an Indian study, 65.6% of the incidentally detected tumours were found at pT1 stage as compared with 21.1% of symptomatic RCC presenting as pT1 tumours, which is lower than 31.7% pT1 tumours in our study.[10] The Indian study also found that majority of symptomatic tumours presented at advanced stages, as in our study.

Two cases of transitional cell carcinoma (TCC) and one case of squamous cell carcinoma (SCC) were also found. These tumours originated from the urothelial lining of the renal pelvis and involved the renal parenchyma at the time of detection. Ureters and bladder cuff were negative for tumour involvement or dysplasia. Imaging studies and cystoscopy were also negative for tumour involvement of rest of the urothelial tract, thus confirming their localization to the kidney. One TCC was of grade 2 and occurred in a 70 year male, the other tumour was of grade 3 and found in a male of 45 years. Squmous cell carcinoma was found in a female of 60 years with a large staghorn stone in the renal pelvis.

Although rhabdomyosarcoma (RMS) and peripheral primitive neuroectodermal tumour (PNET) are primarily tumours of soft tissue in children and adolescents, they are occasionally localized in the kidney at the time of presentation.[2] Both types of RMSs were of pleomorphic type and each occurred in a 21 year old female and a 60 year female. Their morphology was strongly suggestive of diagnosis, which was confirmed by IHC. The only case of renal PNET was seen in a 17 year old male and showed round blue cell tumour histology which was confirmed on IHC for CD99. No evidence of primary localization elsewhere in the body of both above tumour types was found on clinical or radiological examination at the time of nephrectomy.

The analysis of survival and follow up was not the objective of our current study. This information would have strengthened our study. Further, large scale and long term follow up studies are needed to determine the prognostic value of histologic types of renal tumours and other tumour characteristics in our patient population. Our study may be considered the first step in this direction.

Conclusion

In conclusion, majority of renal tumours in adults in our setting are malignant. Benign neoplasms are rare. Conventional/clear cell RCC is the most frequent histologic type; however, papillary RCC and chromophobe RCC also occur at a frequency compared to that already reported. Most malignant tumours of kidney in our population are of large size and present at advanced stage and higher nuclear grade.

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