Original Article

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Malignant Lesions in Nephrectomy Specimens: A Histopathological Study

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Abstract

Introduction: Renal tumors comprise a diverse spectrum of neoplastic lesions with patterns that are relatively distinct for children and adults. A wide variety of both benign and malignant tumors arise from different components of the renal parenchyma, notably tubular epithelium. *Methodology:* In the retrospective analysis of cases, the descriptions of the gross findings were taken from the records maintained in the department. Following the receipt of nephrectomy specimen in 10% formalin, a detailed gross examination of the specimen was recorded. *Results:* Neoplastic lesions of kidney constituted 43.75% of the total nephrectomy specimen studied. They were three benign (8.57%) and 32 malignant tumuors (91.43%) of the renal tumours. *Conclusion:* Proper evaluation of nephrectomy specimens, a detailed clinical history, related laboratory and imaging findings are necessary.

Keywords: Nephrectomy; Renal Cell Carcinoma; Sarcomatoid; Multilocular Cystic; Collecting Duct; Fuhrman Grading; Robson Staging.

Introduction

Nephrectomy is a common procedure in urological practice. Simple nephrectomy is indicated in patients with an irreversible damaged kidney resulting from symptomatic chronic infections, obstruction, calculus, severe traumatic injury and renal dysplasia [1]. Renal diseases are responsible for a great deal of morbidity but, fortunately, are not equally major causes of mortality. Twenty percent of all women suffer from infections of the urinary tract or kidney at sometime in their lives.

Renal tumors comprise a diverse spectrum of neoplastic lesions with patterns that are relatively distinct for children and adults [2-5]. 1-4 A wide variety of both benign and Malignant tumors arise from different components of the renal parenchyma, notably tubular epithelium. 1-4 Accurate diagnosis of most renal tumors is not possible before surgery and histopathologic evaluation. Nephrectomy remains the standard of cure for patients with a suspected renal mass, despite studies that have established nephrectomy as an independent risk factor for developing chronic renal insufficiency .Both benign and malignant tumors occur in the kidney. A detailed and meticulous histopathologic examination of tumor 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 [6-8].

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Methodology

The present study was done on the nephrectomy specimens sent for histopathological evaluation to the Department of pathology, Medical College and Hospital during a period of 3 years . This is 1 year retrospective and 2 years prospective study.

In the retrospective analysis of cases, the descriptions of the gross findings were taken from the records maintained in the department. Following the receipt of nephrectomy specimen in 10% formalin, a detailed gross examination of the specimen was

recorded. The required number of representative sections was taken for histopathological study. After routine paraffin processing, serial sections of 5-micron thickness were cut and routinely stained with haematoxylin and eosin stain. Detailed microscopic features were studied and recorded. Special stains were used as and when required. The final diagnosis was arrived at after correlating the clinical features, gross and microscopic findings. Required relevant clinical and imaging details were obtained from patient case sheets or records wherever required. In the present study 80 nephrectomy specimens morphology was analyzed as per the proforma protocol.

Results

In the present study, neoplastic lesions were encountered in 35 cases of the total 80 nephrectomy specimens (43.75%) received at the department. They were classified into parenchymal 27 cases (33.75%), renal pelvis 4 cases (5%) and primitive parenchymal (Wilms. Tumour) 4 cases (5%).

The parenchymal Tumours composed of renal cell carcinoma (24 cases), 2 cases of Angiomyolipoma and 1 case of metanephric adenoma. The pelvis Tumours included 3 cases of Transitional Cell Carcinoma (TCC); 1 case of Squamous Cell Carcinoma (SCC). There were 4 cases of Wilms Tumour.

Age

Renal cell carcinoma was the commonest Tumour encountered in the present study and was found to be frequent between 51 to 60 years of age. Wilms. Tumour was the next common tumour presenting between 0 to 5 years followed by Transitional cell carcinoma of renal pelvis between 6th and 7th decade. Squamous cell carcinoma occurred between 31 to 40 years of age

Sex

All neoplastic lesions were more common in males (M:F-1.5:1).

Table 1: Sex distribution of the neoplastic lesions

Neoplastic lesion	Male	Female	No. of cases	% of cases
Benign lesions:				
Metanephric adenoma	-	1	1	**2.85**
Angiomyolipoma	1	1	2	**5.72**
Malignant lesions:				
RCC	14	10	24	**68.57**
TCC	2	1	3	**8.57**
SCC	1	-	1	**2.85**
Wilms, Tumour	3	1	4	**11.42**
Total	**21**	**14**	**35**	**99.98**

Table 2: Tumour location in the neoplastic lesions of kidney

Neoplastic Lesions	Right Kidney					Lift Kidney				
	Upper pole	Middle	lower pole	Entire surface	pelvis	Upper pole	middle	pole	Entire Surface	pelvis
Metanephric adenoma	-	-	-	-	-	-	-	1	-	-
Angiomyo-lipoma	-	-	1	-	-	-	-	1	-	-
RCC	10	3	1	2	-	4	2	1	1	-
TCC	-	-	-	-	2	-	-	-	-	1
SCC	-	-	-	-	-	-	1	-	-	-
Wilms' Tumour	-	-	-	2	-	-	-	-	2	-

Regarding the side of occurrence, there was no significant difference between right and left kidney, but majority of the renal cell carcinomas involving the upper pole of kidney was noted in 14 cases.

Gross Morphology

External Surface

In the present study, out of 35 cases of neoplastic lesions enlargement of kidney was seen in 28 cases, while 5 were normal in size and 2 were contracted. 32 cases showed normal shape and rest of the 3 were distorted. 16 cases showed thickened and adherent capsule.

Cut Section

Benign Tumours

Two cases of angiomyolipoma showed mass in the lower pole of kidney m/s 5x3x2 cms, grey white to yellow in colour with areas of hemorrhage and necrosis in one case.

One case of metanephric adenoma showed a grey white solid mass m/s 10x8 cms in the lower pole of kidney.

Malignant Lesions

Tumour size was observed in 24 cases of renal cell carcinoma and the size ranged from 3-13cms. 23 cases of RCC showed yellow grey white areas with cystic change in 13 cases. A calculus was noted in a single case which was single black in colour m/s 3x2x1 cms. Three cases of TCC showed exophytic grey white granular papillary areas; in cases of Wilms. tumour, solid grey white areas were seen in all the four cases with cystic areas in only three cases. Hemorrhage and necrosis was noted in twenty one cases.

Table 3: Gross features of the kidney in neoplastic lesions

Gross findings	RCC	TCC	SCC	WT	No. of cases
External surface:					
Normal size	3	1	-	-	**5**
Enlarged kidney	21	1	1	3	**28**
Shrunken kidney	-	1	-	1	**2**
Normal shape	24	3	1	2	**32**
Distorted	-	-	-	2	**3**
Adherent renal capsule	13	1	1	-	**16**
Cut section:					
Solid grey white to yellow areas	23	-	1	4	**28**
Exophytic grey white papillary areas	-	3	-	-	**3**
Cystic areas	13	-	-	3	**16**
calculi	1	-	1	-	**2**
Hemorrhage and necrosis	16	1	1	3	**21**
Adrenal involvement	-	-	-	-	**-**

Microscopic Features of The Neoplastic Lesions

Benign Lesions

Angiomyolipoma

Two case of angiomyolipoma was found in the present study and microscopically showed predominantly fascicles of smooth muscle cells admixed with foci of tortuous thick walled blood vessels and lobules of adipose tissue.

Metanephric Adenoma

A single case of metanephric adenoma showed microscopic feature composed of cells arranged in tubules and papillae with scant stroma and bland nuclei.

Malignant Lesions

Renal Cell Carcinoma

Cellular Architecture

The most common cellular architecture observed was solid pattern in 18 cases (75%) followed by glandular pattern in 16 cases (66%), papillary in 6 cases (25%) and cystic pattern in 1case (4%).

Cell Type

The predominant cell type observed was clear cells in 13 cases, mixed pattern in 9 cases and spindle cells in 2 cases.

Histologic Variant

Most common variant in the present study was clear cell carcinoma (20 cases) followed by single case of sarcomatoid, collecting duct carcinoma, multilocular

cystic renal cell carcinoma and mucinous tubular spindle cell tumour.

Secondary Features

Cystic change in 13 cases (54.16%), Hemorrhage and necrosis was seen in 14 cases (58.32%), and in 1 case each Psammoma bodies and cholesterol clefts were noted.

Invasion

Out of 24 cases, 10 showed capsular infiltration (46.67%), 5 cases renal vein invasion (20.83%) and 1case involving adrenal gland. Lymphnode metastasis was seen in three cases of renal cell carcinoma.

In all the cases of RCC, Fuhrman nuclear grading was applied. Most of the RCC were grade II followed by grade III and IV.

Table 4: Microscopic features of renal cell carcinoma

Microscopic findings	No. of cases	% of cases
Arrangement of cells:		
Solid sheets	18	**75**
Papillary areas	6	**25**
Cystic areas	1	**04**
Glandular(tubular)	16	**66**
Cell type:		
Clear cell	13	**54**
Granular cell	-	
Mixed	9	**37.5**
Spindle cell	2	**08.5**
Histologic variant:		
Clear cell	20	**83.2**
Sarcomatoid	1	**04.2**
Collecting duct	1	**04.2**
Multilocular cystic	1	**04.2**
Mucinous tubular spindle cell tumour	1	**04.2**
Secondary features:		
Cystic change	13	**54.2**
Hemorrhage and necrosis	14	**58.3**
Cholesterol cleft	1	**04.2**
Psammoma bodies	1	**04.2**
Infiltration of:		
Capsule	10	**41.67**
Renal vein	5	**20.83**
Lymphatic's	-	
Adrenal gland	1	**04.20**
Lymph node metastasis	3	**12.50**

Table 5: Nuclear grading of the RCC

Fuhrman nuclear grading	No. of cases	% of cases
I	03	**13.62**
II	13	**59.10**
III	04	**18.18**
IV	02	**09.10**

Table 6: Staging of the RCC

	Stage I	Stage II	Stage III	Stage IV
RCC	15 (62.5%)	8 (33.33%)	1(4.16%)	-

Staging of RCC

Among 24 cases of RCC, 15 cases were of stage I; stage II - 8, Stage III – 1 Case. There were no cases belonging to stage IV.

Microscopic Features of Renal Pelvis Tumours

4 out of 35 cases were renal pelvis Tumours. 3 cases were transitional cell carcinoma predominantly showing papillary pattern with capsule infiltration

and lymphnode metastasis. Two cases were low grade and one high grade tumour. A single case of squamous cell carcinoma noted with hydronephrotic changes and a staghorn calculi m/s 5x4cms. The tumour was well differentiated

Wilms. Tumour

The present study consisted of 4 Wilms. Tumours and was the second most common neoplastic lesion. 1 case showed triphasic pattern and rest of the cases were biphasic. 4 cases showed blastemal and epithelial components and 1 case showed mesenchymal differentiation with skeletal muscle and smooth muscle. 3 cases showed cystic change with one case of capsule infiltration. There were no features of anaplasia noted in any of the four cases. Among four cases three were of stage I and one case of stage II.

Table 7: Microscopic Features of the Kidney in Renal Pelvis tumour

Microscopic findings	No. of Cases of TCC	No. of Cases of SCC
Papillary pattern	3	0
Solid pattern	1	1
Keratin	0	1
Areas of haemorrhage and necrosis	2	1
Invasion:		
Capsule	1	0
Renal vein	0	0
Lymphatic	-	0
Adrenal gland	0	0
Lymphnode metastasis	1	
Secondary changes (Hydronephrosis, pyelonephritis)	-	1

Correlation between Ultrasonographic Findings and the Final Histopathological Diagnosis

In a single case of non-neoplastic lesion, ultrasonographic diagnosis of a cystic nephroma/ renal cell carcinoma was made but the histopathological features were suggestive of hydatid cyst. In case of neoplastic lesions, the case of angiomyolipoma was diagnosed as renal cell carcinoma on ultrasound. In all the remaining cases, a correct diagnosis of non-neoplastic and neoplastic lesions was made on ultrasound. However, all the cases of renal pelvis tumours were also diagnosed as renal cell Carcinoma.

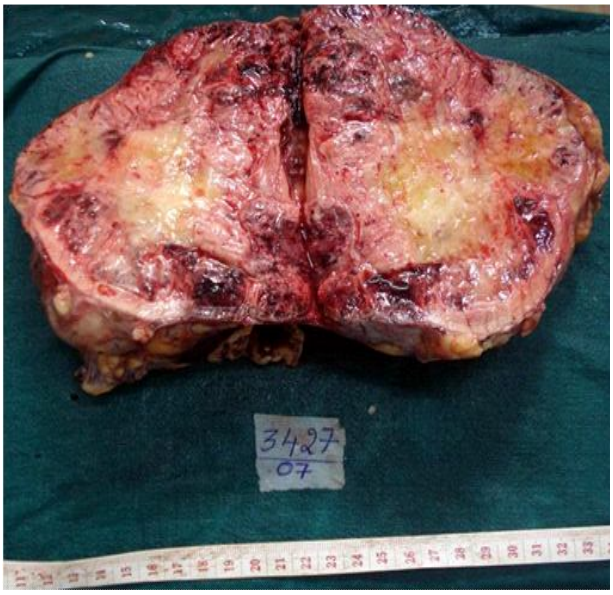

Fig. 1: Renal cell carcinoma C/s showing huge tumour with variegated appearance, yellow to tan colour

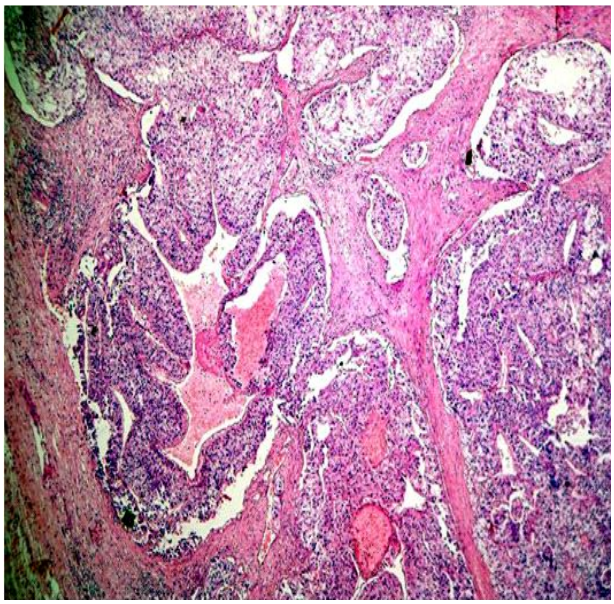

Fig. 2: Showing tumour cells withclear and granulareosinophilic cytoplasm indiffuse pattern (scanner: H-E)

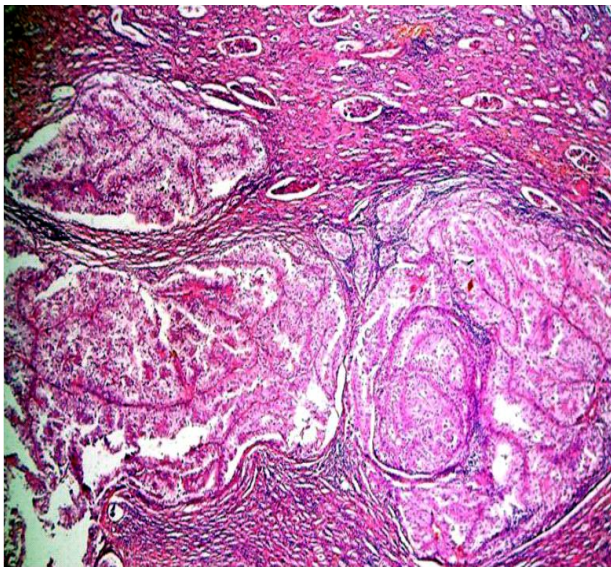

Fig. 3: Showing tumour cells in papillary pattern with normal renal tissue (scanner: H-E)

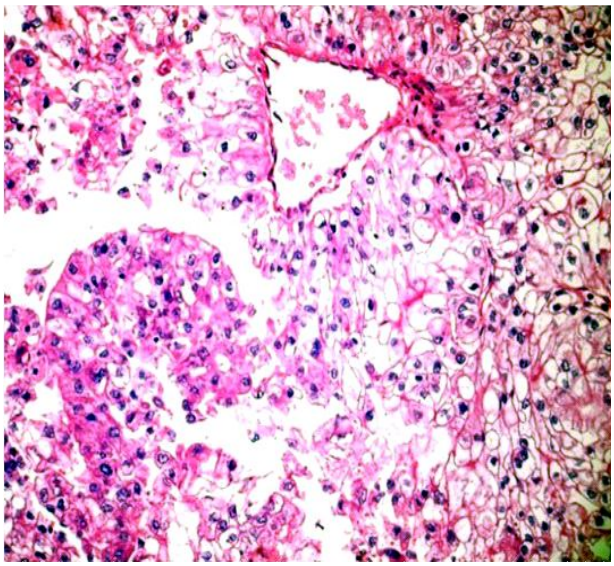

Fig. 4: Renal cell carcinoma Showing clear and granular tumour cells with blood vessels (20x: H-E)

Discussion

In the present study, neoplastic lesions constituted 35 cases (43.75%) out of total 80 nephrectomy specimens. It has been reported that the most frequent primary malignant Tumours of the renal parenchyma are renal cell carcinoma and Wilms. Tumour [9]. A similar finding was noted in the present study, with renal cell carcinomas comprising a distinct majority of 24 cases out of 35 neoplastic lesions (68.57%) and Wilms. Tumour accounting for 11.43% (4 out of 35 neoplastic lesions). The commonest primary malignant Tumour of the renal pelvis has been found to be transitional cell carcinomas [9]. In the present study, there were 2 cases of transitional cell carcinoma and one case of squamous cell carcinoma. Benign epithelial Tumours of the renal parenchyma, although quite common are small and asymptomatic, being for the most part incidental finding at autopsy, only two cases of angiomyolipoma and one case of metanephric adenoma was encountered.

Renal Cell Carcinoma

The incidence of renal cell carcinomas increases with advancing age and thus majority of the patients in the present study were between 51-60 years of age. Reports indicate a male: female ratio of about 3:1 for renal cell carcinoma [9]. In the present study, it was1.4:1. Age distribution was comparable to other studies [9-11].

Showing Age Range of Different Studies and Present Study [9-11]

Authors	No. of Cases	Age (years)
Medeiros et al (1978)	121	22-87
Roosen et al (1994)	76	44-91
Akhtar et al (1994)	21	30-80
Thoenes et al (1988)	32	31-75
Present study	80	30-70

Most common variant in the present study, observed was clear cell carcinoma 20 cases (83.2%) followed by each case of sarcomatoid (4.2%), collecting duct carcinoma (4.2%), multilocular cystic renal cell carcinoma (4.2%) and mucinous tubular spindle cell tumour (4.2%). Renshaw (2002) states that clear cell or conventional renal cell carcinoma comprise 75% of all renal cell carcinoma [12].

Papillary renal cell carcinomas are defined histologically as Tumours with at least 50% true papillae and comprise between 7- 15% of all renal cell carcinomas 79 and chromophobe renal cell carcinoma which is rare, comprising only 3.5% of renal cell carcinomas were not encountered in the present study. Histological features of the renal cell carcinoma in our studies were similar to the findings observed in the literature [13,14].

In the present study, sarcomatoid variant of RCC

was noted in a 50 year old male on right side. Tomera et al observed 13 cases of renal tumour with sarcomatoid features. There were 11 men and 2 women with mean age of 56 years, 7 on right side and 6 left sides. Microscopic features of the present study were similar to the features observed by Tomera et al [15].

Collecting duct carcinoma was observed in 40 years female, tumour m/s 6x6 cms grey white. Kennedy et al observed 6 cases of collecting duct carcinoma between ages 27-54 years with male predominance (4 cases) 45 but in other study by Rumplet et al tumour was noted in age groups 37-80 years with male to female ratio 1:1.83 In both the studies the size of the tumour ranged from 3-7.5 cms and was grey white in colour.

Multilocular cystic renal cell carcinoma in the present study was noted in 32 years female with well defined Multilocular cystic mass m/s 4x2 cms with yellowish solid areas. Suzigan et al observed 45 cases of MCRCC between age groups 30-78 years with male predominance (28 cases) and tumour size ranged from 2.5-5 cms. Microscopic findings were similar to those observed by Suzigan et al [16].

In the present study, out of 24 cases of renal cell carcinoma, 10 showed capsular infiltration, 5 renal vein invasions, and one case each of adrenal gland and lymphnode metastasis. Medeiros et al observed 41 cases of capsular infiltration, 58 renal vein invasions and 13 cases lymphnode metastasis out of 121 cases [11].

Nuclear grade of the Tumour as determined in microscopic sections is an important predictor of survival. The most marked prognostic difference is between grades I and II on one side and grades III and IV on the other. In the present study, 16 out of 24 renal cell carcinomas (66.68%) showed nuclear grades I or II and 6 cases (33.32%) showed nuclear grades III and IV.

In the present study, majority of the cases were in stage I which was observed in other studies done by Skinner et al., Medeiros et al., Bielsaetal et al [11,17,18].

Squamous cell carcinoma of renal pelvis is comparatively a rare Tumour in the kidney and accounted for 2.86% of cases is our study and was found in 31 to 40 years of age, histologically well differentiated. Randine et al (1984) reported 4 cases of squamous cell carcinoma in their study, 75% were well differentiated and 25% poorly differentiated. Squamous cell carcinoma of the renal pelvis is often associated with squamous metaplasia (leukoplakia), renal calculi and infection. In the present study case was associated with renal calculi and was well differentiated. These Tumours have a poor prognosis [19].

WilmsTumour

Crest and Kin observed 10% of Wilms. tumours before the age of 3 years and 90% below the age of 5 years [20]. However in the present study, we encountered 4 cases of Wilms. Tumour 2 cases were 2yrs of age and other 2 cases were between 3-5 years of age. In these cases, there was no associated syndromes or congenital malformation described in the literaute [21]. Most Wilms. Tumours have been found to be triphasic, with a representation of blastemal, mesenchymal and epithelial components [22]. However in the present study, three cases had biphasic component (75%) with only 1 case (25%) having triphasic components. Pendergrass et al, Lemerle et al, in their study observed mean age of 3yrs which was similar in the present study. With 66% of epithelial differentiation, mesenchymal 22% and 18% blastemal out of 205 cases where as in our study 75% of cases showed epithelial and blastemal differentiation and 25% of mesenchymal differentiation. Anaplasia has been reported in 7% of Wilms Tumour and has been linked with a poor prognosis [23]. Anaplasia was not found in the present study

Conclusion

A highly significant association was found between the histologic type and nuclear grade and both Fuhrman nuclear grading and Robson staging are important determinants in predicting prognosis of individual cases. Therefore for proper evaluation of nephrectomy specimens, a detailed clinical history, related laboratory and imaging findings are necessary. It needs a better co-ordination among the clinician, radiologist and pathologist for early and accurate diagnosis and to evaluate the prognostic factors in case of malignant lesion of the kidney

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