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Original Research Article

Histomorphological Pattern of Lesions in Nephrectomy Specimen

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Abstract

Background: Nephrectomy is a common urological procedure in urological practice. It is indicated in patients presenting with a wide range of clinical conditions ranging from symptomatic chronic infections, obstruction, calculus disease, and severe traumatic injury and neoplastic conditions. In India management of chronic kidney diseases and neoplasms are posing a great challenge as dialysis and kidney transplantations are expensive for the patients. *Aims and Objectives:* 1) To study the histopathological features of lesions in nephrectomy specimens 2) To evaluate the frequency of different pathological lesions in nephrectomy specimens 3) To correlate the histopathological diagnosis with the clinical features. *Materials and Method:* This was a prospective study conducted in the conducted in the department of pathology, M.S. Ramaiah Medical College and Hospitals, Bangalore. The study included all nephrectomy specimens received for routine histopathological examination over a period of 2 years (from July 2014 to June 2016). All the nephrectomy specimens were sent to histopathology section in 10% formalin. All specimens were subjected to detailed gross examination and representative tissue bits were taken. For microscopic examination, 4-5 µm thick paraffin sections were cut and stained with haematoxylin and eosin (H &E). Relevant patient particulars including age, sex, affected side, clinical presentation and investigations such as Computed Tomography, Ultrasonography etc were retrieved from the case files. *Results:* Out of 62 patients, 38 cases were males and 24 cases were females with male: female ratio of 1.58:1. The mean age was 43.93±18.67 years with the youngest patient aged 1 year and the oldest patient aged 75 years. The mean age of the males was 42.92±19.50 years and the mean age of females was 45.54±17.56 years. Neoplastic lesions accounted for 51.63% of the cases and were more common than non-neoplastic lesions of the kidney which accounted for 48.38% of the cases. Renal cell carcinoma was the commonest lesion of the kidney, accounting for 56.25% of the neoplastic lesions and 29.03% of all renal lesions followed by Wilms' tumor (6.45%, 4/62). Other neoplastic lesion encountered were Transitional cell carcinoma (4.84%, 3/62), Renal oncocytoma (4.84%, 3/62) Angiomyolipoma (4.84%, 3/62) and Squamous cell carcinoma (1.61%, 1/62). Chronic pyelonephritis was the commonest non-neoplastic lesion encountered in the present study which accounted for 43.33% of all non neoplastic lesions and 20.97% of all the lesions of the kidney followed by Hydronephrosis (16.13%, 10/62). Other non neoplastic lesions Tuberculous pyelonephritis (4.84%, 3/62), Xanthogranulomatous pyelonephritis (1.61%, 1/62), Cystic renal dysplasia (1.61%, 1/62), End stage kidney disease (1.61%, 1/62), Renal hydatid cyst (1.61%, 1/62). *Conclusion:* The present study provides a fair insight into the histopathological patterns of lesions in nephrectomy. Neoplastic lesions were more common than non-

neoplastic lesions of the kidney. Renal cell carcinoma was the commonest neoplastic lesion and chronic pyelonephritis was the commonest non-neoplastic lesion in this series. The histopathological diagnosis generally correlates well with the pre operative clinical diagnosis, however some benign lesion may be misdiagnosed clinically as malignant and some malignant lesions may be misdiagnosed clinically as benign. As renal lesions may be misdiagnosed clinically, it is mandatory that every nephrectomy specimen be subjected to a detail histopathological examination to ensure proper post-operative management.

Keywords: Nephrectomy Specimen; Renal Cell Carcinoma; Chronic Pyelonephritis; Histopathological Examination.

Introduction

The surgical removal of all or portion of kidney is known as "nephrectomy". The procedure is indicated in irreversible parenchymal damage due to hypertensive nephrosclerosis, chronic pyelonephritis, calculus disease, obstruction, severe devascularising traumatic injuries, renovascular hypertension due to uncorrectable renal artery disease, congenital dysplasia, cystic diseases and in neoplastic conditions [1].

Despite technological advances, it is impossible in certain cases, to differentiate between renal tumours and tumour like conditions on imaging techniques. Radiological techniques have failed to accurately differentiate benign from malignant lesions and all renal masses should be considered as malignant, unless proven benign on histopathological examination [2].

A diverse histopathological range of lesions are encountered in nephrectomy specimens, many of which pose a clinical diagnostic dilemma. Further, definite diagnosis of conditions like focal xanthogranulomatous pyelonephritis, oncocytoma and angiomyolipoma can be established only on histopathology [2]. Thus it is imperative to subject every nephrectomy specimen to diligent histopathological examination for accurate diagnosis and proper post operative management [1,2].

Further meticulous histopathological examination is indispensible for classification, grading, staging and prognostication of renal malignancies.

Aims and Objectives of Study

1. To study histopathological features of lesions in nephrectomy specimens.
2. To correlate the histopathological diagnosis with the clinical features.
3. To evaluate the frequency of different pathological lesions in nephrectomy specimens.

Materials and methods

Source of data

The study was conducted in the department of pathology, M.S. Ramaiah Medical College and Hospitals, Bangalore in collaboration with the departments of Urology, Pediatric surgery and General surgery on all nephrectomy specimens received for routine histopathological examination over a period of 2 years (from July 2014 to June 2016).

Methods of Data collection:

For the above study Informed Consent was taken from all patients. All the nephrectomy specimens received, were subjected to detailed gross examination and representative tissue bits were taken as per standard protocol from "Guidelines for handling of most common and important surgical specimens", Rosai and Ackerman's Surgical Pathology, vol 2, 10th ed (b). The latter were processed and paraffin embedded tissue blocks were made. For microscopic examination, 4-5 µm thick paraffin sections were cut and stained with haematoxylin and eosin (H & E). Relevant patient particulars including age, sex, affected side, clinical presentation and investigations such as Computed Tomography, Ultrasonography etc were retrieved from the case files.

Inclusion Criteria:

1. All nephrectomy specimens surgically resected as a therapeutic measure, irrespective of age and sex were studied

2. All nephrectomy specimens received from the departments of Urology, Pediatric surgery and General surgery of M.S. Ramaiah Medical College and Hospitals.

Exclusion Criteria:

None

Sample size determination:

Kumar et al. (2012) in their series have observed that 54.4% of the nephrectomy specimens were benign and inflammatory. In the present study expecting similar result with 95% confidence and 25% relative precision, it has been estimated that the study requires a minimum of 52 subjects. However, we have included 62 cases in our study.

Statistical Analysis of Data:

All continues parameters were expressed as mean and standard deviation and all qualitative data as proportion. Descriptive statistics of histopathological lesions was analyzed and presented in terms of proportion. The frequency and percentage of each type of lesion in nephrectomy specimen was computed.

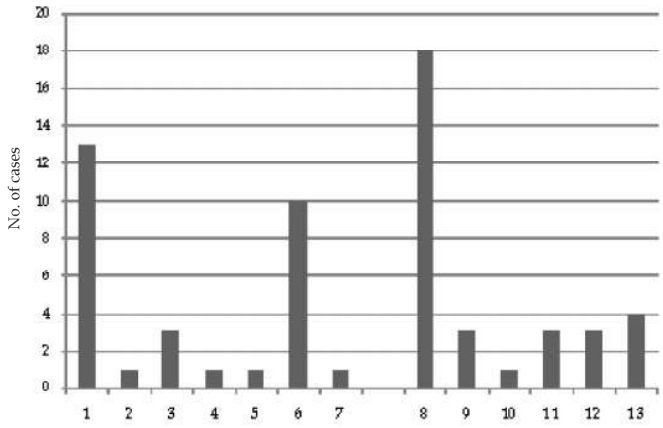
Results

The present study was carried out on a total of 62 nephrectomy specimens. Out of all the cases studied 30 (48.38%) were non-neoplastic and 32 (51.63%) were neoplastic. Table 1 shows the frequency of various lesions in nephrectomy specimens.

The most common lesion encountered was Renal cell carcinoma comprising of 29.03% of all cases followed by pyelonephritis (20.97%) and hydronephrosis (16.13%). There was one case each of Xanthogranulomatous pyelonephritis, cystic renal dysplasia, end stage kidney disease, hydatid cyst and squamous cell carcinoma and three cases each of Tuberculous pyelonephritis, transitional cell carcinoma, renal oncocytoma and angiomyolipoma. Four cases of Wilms tumor were encountered (Table 1).

Table 1: Frequency of Lesions Encountered in Nephrectomy Specimens

Non-Neoplastic Lesions	No. of cases	Percentage
Chronic pyelonephritis	13	20.97
Hydronephrosis	10	16.13
Tuberculous pyelonephritis	3	4.84
Xanthogranulomatous Pyelonephritis	1	1.61
Cystic renal dysplasia	1	1.61
End stage kidney disease	1	1.61
Hydatid cyst	1	1.61
Neoplastic Lesions		
Renal cell carcinoma	18	29.03
Transitional cell carcinoma	03	4.84
Squamous cell carcinoma	01	1.61
Renal oncocytoma	03	4.84
Angiomyolipoma	03	4.84
Wilm'stumour	04	6.46
Total	62	100



Graph 1: Lesions in nephrectomy specimens

Non-neoplastic

1 – Chronic pyelonephritis
2 – Xanthogranulomatous pyelonephritis
3 – Tuberculous pyelonephritis
4 – Cystic renal dysplasia
5 – End stage kidney disease
6 – Hydronephrosis
7 – Hydatid cyst

Neoplastic

8 – Renal cell carcinoma
9 – Transitional cell carcinoma
10 – Squamous cell carcinoma
11 – Renal oncocytoma
12 – Angiomyolipoma
13 – Wilm'stumour

Majority of the nephrectomy were performed during third, fourth and seventh decade followed by sixth and fifth decade. The youngest patient in the study was aged 1 years and the oldest patient was 75 years of age. Table 2 depicts the age and sex distribution.

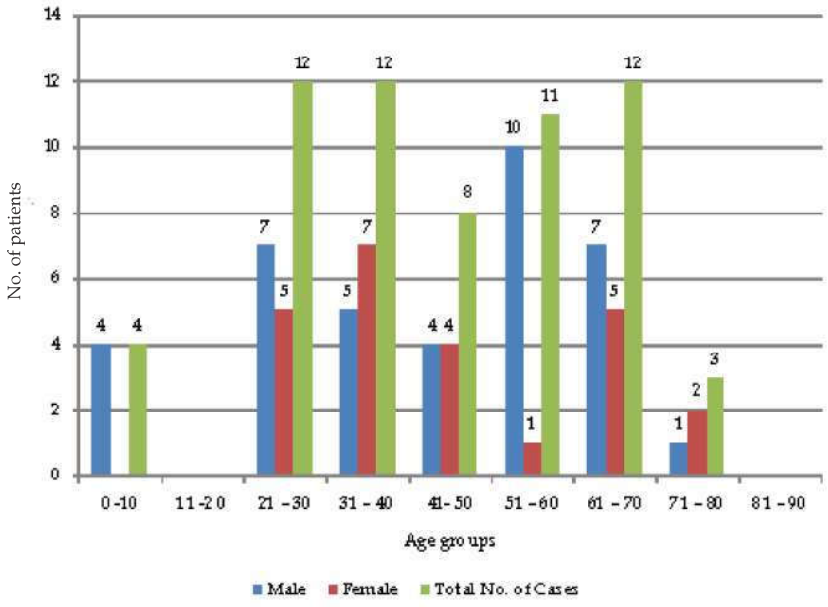
Table 3 depicts the frequency of non neoplastic lesions of the kidney with respect to age.

Table 4 demonstrates the gross features of nephrectomy specimens in cases of chronic pyelonephritis. All cases showed irregular discrete broad corticomedullary scarring with thinning of cortex (Table 4).

Microscopic features of the kidney in chronic pyelonephritis are illustrated in Table 5.

Table 2: Age and Sex Distribution

Age Group (Year)	Male	Female	Total No. of Cases	Percentage (%)
0 -10	4	0	4	6.46
11 -2 0	0	0	0	00
21 – 30	7	5	12	19.35
31 – 40	5	7	12	19.35
41- 50	4	4	8	12.90
51 – 60	10	1	11	17.75
61 – 70	7	5	12	19.35
71 – 80	1	2	3	4.84
81 – 90	0	0	0	00
Total	38	24	62	100



Graph 2: Age and Sex Distribution

Table 6 demonstrates the clinical features of non neoplastic lesions

Frequency of Neoplastic Lesions of the Kidney with Respect to age is depicted in Table 7

Renal cell carcinoma (RC99C) was the commonest tumour encountered in the present study and was found to be frequent in 6th decade. It comprised of 29.03% (18/62) of all the renal lesions and 56.25% (18/32) of the neoplastic lesions of the kidney. The second most common neoplastic lesion seen was Wilms' tumor comprising of 6.46% (4/62) of all the renal lesions and 12.5% (4/32) of the neoplastic lesions. Wilms' tumor was encountered in the first decade. Transitional cell carcinoma, Renaloncocytoma and Angiomyolipoma, each comprised of 4.84% (3/62) of all renal lesions and 9.38% (3/32) of the neoplastic lesions. Transitional cell carcinoma was predominantly seen in the 5th decade. Renal oncocytoma was predominantly seen in the 7th decade. Angiomyolipoma was distributed over a wider age range. There was a single case of Squamous cell carcinoma which was seen in the 5th decade (Table 7).

Table 8 illustrates the microscopic features of Renal cell carcinoma. Majority of the clear cell RCC (53.84%, 7/13) exhibited Furhman nuclear grade 2. Sarcomatoid change and rhabdoid differentiation were seen in 7.69% (1/13) of the clear cell RCC cases each. One (7.69%) case of clear cell RCC showed lymphatic infiltration with hilar lymph node involvement. The single case of papillary RCC showed microscopic renal vein invasion.

Table 3: Frequency of Non-Neoplastic Lesions of the Kidney with Respect of Age

Non-Neoplastic Lesions	Age Groups								Total No.	Percentage % of all Non-neoplastic lesion
	0 – 10	11 -20	21 – 30	31 – 40	41 – 50	51 – 60	61 – 70	71 – 80		
Chronic Pyelonephritis	0	0	3	5	1	1	2	1	13	43.34
Xanthogranulomatous Pyelonephritis	0	0	1	0	0	0	0	0	1	3.33
Tuberculous Pyelonephritis	0	0	0	1	2	0	0	0	3	10
Hydronephrosis	0	0	6	4	0	0	0	0	10	33.34
Hydatid cyst	0	0	0	1	0	0	0	0	1	3.33
Cystic renal dysplasia	0	0	0	0	0	1	0	0	1	3.33
End stage kidney disease	0	0	0	0	0	1	0	0	1	3.33
Total	0	0	10	11	3	3	2	1	30	100

Table 4: Gross Features Of The Kidney In Chronic Pyelonephritis

Gross Findings	No. of cases	Percentage (%)
Shrunken kidney	10	76.92%
Adherent renal capsule	07	53.84%
Renal surface scarring	13	100%
Loss of cortico – medullary differentiation	10	76.92%
Dilatation of pelvi – calyceal system	03	23.08%
Increased peri – pelvic fat	04	30.77%
Thinning of cortex	11	84.62
Calculi	01	7.7%

Table 5: Microscopic Features of the Kidney in Chronic Pyelonephritis

Microscopic Findings	No. of cases	Percentage (%)
Sclerosis of the glomeruli	11	84.62%
Peri glomerular fibrosis	08	61.54%
Focal atrophy and dilatation of the tubules	10	76.92%
Tubular colloid casts (thyroidisation)	13	100%
Hyaline arteriolosclerosis	05	38.46%
Interstitium		
Mononuclear infiltrate	13	100%
Neutrophilic infiltrate	06	46.15%
Fibrosis	07	53.84%

Discussion

The first well-designed nephrectomy was performed by Gustav Simon and the procedure was performed for Urinary fistula in the year 1869. Soon, after one year, in 1870 partial nephrectomy was performed by Simon for Hydronephrosis [3]. There are disparities in the indication for nephrectomy globally [3].

In a study conducted by Narang V et al., out of 155 total nephrectomy specimens, 82 cases were neoplastic and 73 were non neoplastic lesions with a male to female ratio of 1.7:1. The youngest patient was 2 year old male while the oldest was 80 years old male. Renal cell carcinoma was the commonest neoplastic lesion encountered comprising of 85.36% (70/82) cases of the neoplastic lesion and 45.16% (70/155) cases of all the renal lesions. Chronic pyelonephritis with hydronephrosis were the commonest non-neoplastic lesions accounting for 60.27% (44/73) and 28.38% (44/155) of all renal lesions respectively [4].

Similarly, the present study was an analysis of 62 nephrectomy specimens comprised of

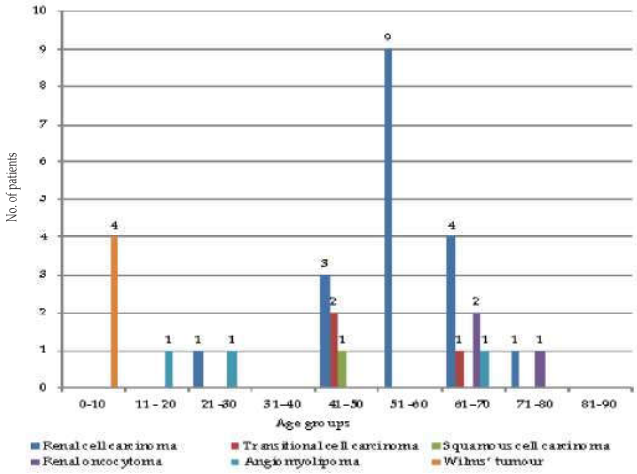
Table 6: Clinical Features of Non-Neoplastic Lesions

Clinical features	CPN	Hyd	XGP	TB	CRD	ESRD	HD
Pain abdomen	12	8	1	2	0	0	1
Fever	13	4	1	3	0	1	0
Decrease in urine volume (oliguria)	5	6	1	2	0	0	0
Hematuria	6	1	0	2	1	0	0
Increase in urine volume (polyuria)	4	4	0	0	0	1	0
Burning micturition	8	0	1	0	0	0	0
Nausea and vomiting	7	8	1	0	1	1	0

CPN – Chronic pyelonephritis, Hyd – Hydronephrosis, XGP – xantho-granulomatous pyelonephritis, TB – Tuberculous pyelonephritis, CRD – Cystic renal dysplasia, ESRD - End stage renal disease, HD – Hydatid cyst

Table 7: Frequency of Neoplastic Lesions of the Kidney with Respect to Age

Neoplastic Lesions	Age Groups									Total No.	Percent-age(%) of all neoplastic lesions
	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90		
Renal cell carcinoma	0	0	1	0	3	9	4	1	0	18	56.25
Transitional cell carcinoma	0	0	0	0	2	0	1	0	0	03	9.38
Squamous cell carcinoma	0	0	0	0	1	0	0	0	0	01	3.12
Renal oncocytoma	0	0	0	0	0	0	2	1	0	03	9.38
Angiomyolipoma	0	1	1	0	0	0	1	0	0	03	9.38
Wilms' tumour	4	0	0	0	0	0	0	0	0	04	12.5
Total	4	1	2	0	6	9	8	2	0	32	100



Graph 3: Frequency of Neoplastic Lesions of the Kidney with Respect to Age

32 neoplastic and 30 non-neoplastic lesions. The study included 38 males and 24 females with male: female ratio of 1.58:1. The youngest patient was aged 1 year and the oldest patient was aged 75 years. In synchrony with the above mention study, Renal cell carcinoma (RCC) was the commonest neoplastic lesion. Chronic pyelonephritis was the commonest non-neoplastic lesion encountered followed by hydronephrosis.

Table 8: Microscopic Features of Renal Cell Carcinoma

	Clear cell RCC	ChromophobeRCC	Papillary RCC	Multilocular cystic RCC
Clear cells	13	0	0	2
Granular cells	7	0	0	0
Papillary areas	0	0	1	0
Spindle cells	1	0	0	0
Rhabdoid cells	1	0	0	0
Raisinoid nucleus	0	2	0	0
Furhman nuclear1 grade	2	0	0	2
2	7	1	0	0
3	2	1	1	0
4	2	0	0	0
Areas of haemorrhage and necrosis	10	1	1	0
Evidence of capsular infiltration	0	0	0	0
Evidence of Renal vein infiltration	0	0	1	0
Evidence of lymphatic infiltration	1	0	0	0
Evidence of adrenal involvement	0	0	0	0

Table 09: Clinical Presentation of Neoplastic Lesions of the Kidney

Clinical Symptoms	RCC	TCC	SCC	RO	AML	WT
Pain abdomen/flank pain	12	1	1	1	2	3
Haematuria	15	03	1	1	1	1
Mass per abdomen	10	0	0	1	-	3
Pain in abdomen + Mass per abdomen	08	0	-	-	-	2
Pain in abdomen + Mass per abdomen + Hematuria	4	-	-	-	-	-
Dysuria	2	1	1	0	0	1

RCC-Renal cell carcinoma, TCC-Transitional cell carcinoma, SCC-squamous cell carcinoma, RO- Renal oncocytoma, AML- Angiomyolipoma, WT- Wilms tumor

Table 10: Staging of Malignant Tumours of the Kidney

Tumour	Stage	No. of Cases
Tnm Staging(Ajcc Cancer, 7Th Edition)		
Renal Cell Carcinoma	I	10
	II	3
	III	5
	IV	0
Transitional cell Carcinoma	I	0
	II	0
	III	2
	IV	1

Tumour	Stage	No. of Cases
Squamous cell Carcinoma	I	0
	II	0
	III	1
	IV	0
Pathologic Staging of Wilms' Tumour (the National Wilms' Tumor Study Group – 5)		
Wilm'sTumour	I	2
	II	1
	III	1
	IV	0
	II	0
	III	0
	IV	0

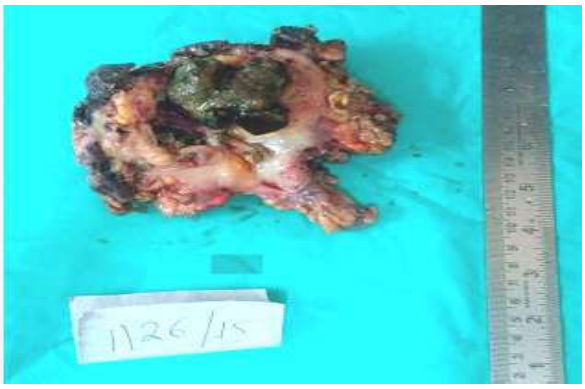


Fig. 1: Gross specimen of Tuberculous pyelonephritis showing loss of corticomedullary differentiation, grey yellow nodules and areas of caseous necrosis. Also noted is a large staghorn calculous

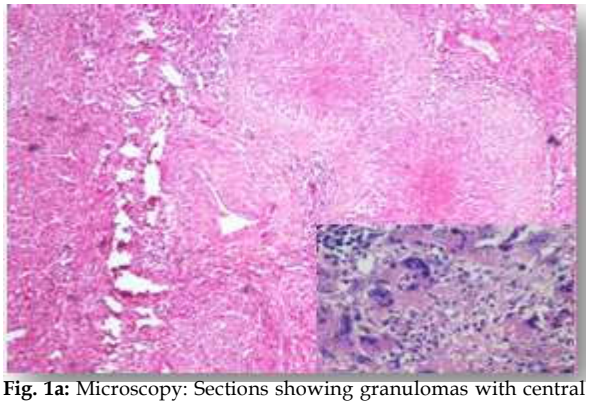


Fig. 1a: Microscopy: Sections showing granulomas with central necrosis (H & E, 10X). Langhans giant cells (H & E, 40X)

Fig. 2: Gross specimen of Renalhydatid cyst which is unilocular and filled with gelatinous material

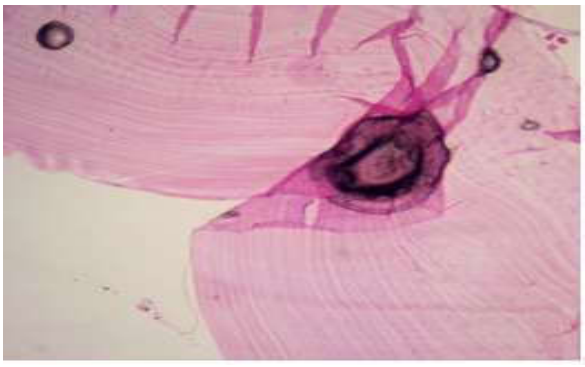


Fig. 2a: Section showing eosinophilic laminated membrane containing larval scolices (H & E, 10X)

Fig. 3: Gross specimen of Clear cell renal cell carcinoma with cut surface showing ill circumscribed grey yellow growth

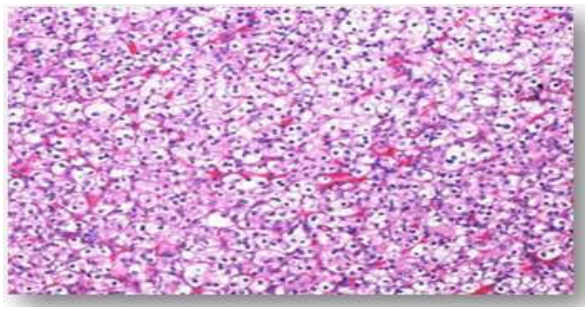


Fig. 3a: Microscopy: Section showing groups of tumour cells characterised by round to oval shape and thenucleus have irregular outlines and mildly prominent nucleoli {Furhman nuclear grade – 2}(H & E, 10X)

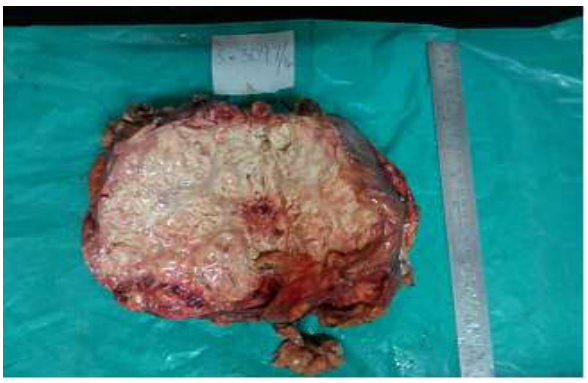


Fig. 4: Gross specimen of Chromophobe renal cell carcinoma with cut surface showing ill circumscribed grey yellow growth with prominent scarring

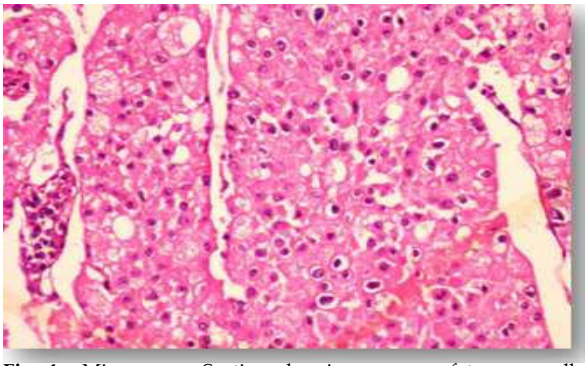


Fig. 4a: Microscopy: Section showing groups of tumour cells acinar growth pattern separated by branching fibrovascular septa with individual cells showing clear to eosinophilic granular cytoplasm with few showing perinuclear halo (H & E, 10X)

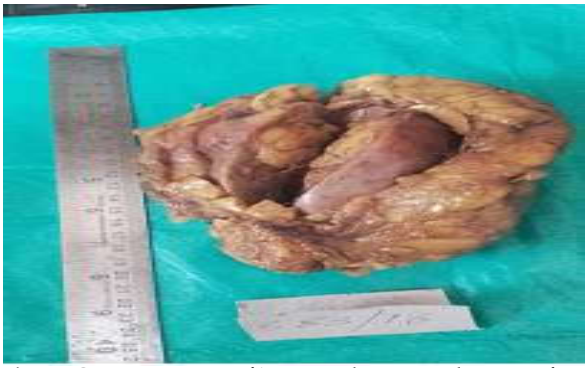


Fig. 5: Gross specimen ofAngiomyolipoma with cut surface showing well circumscribed yellow tumor

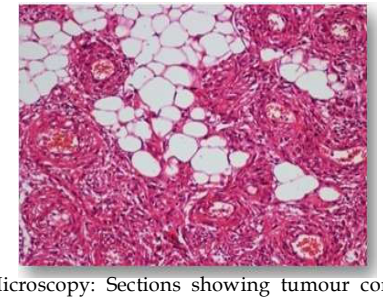


Fig. 5a: Microscopy: Sections showing tumour composed of intimately admixed adipose tissue, blood vessels and spindle cells in varying proportion (H & E, 10X)

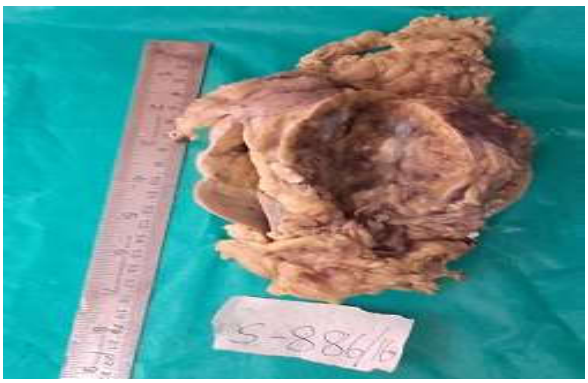


Fig. 6: Gross specimen of Renaloncocytoma with cut surface showing ill circumscribed mahagony brown growth with central stellate scarring

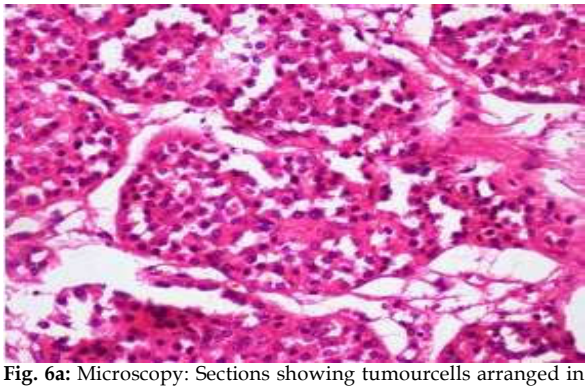


Fig. 6a: Microscopy: Sections showing tumourcells arranged in nests of polygonal cells with granular eosinophilic cytoplasm, round nuclei and single central nucleoli (H & E, 10X)

Fig. 7: Gross specimen ofSquamous cell carcinoma with cut surface showing grey white mass with necrotic area.

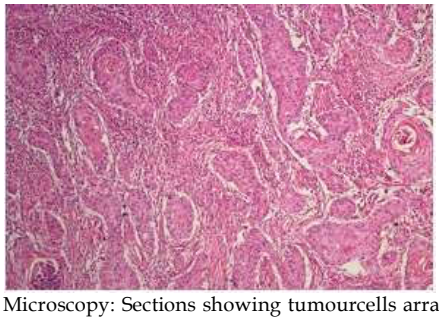


Fig. 7a: Microscopy: Sections showing tumourcells arranged in nests of polygonal cells with abundant eosinophilic cytoplasm. Also noted are keratin pearls (H & E, 10X)

Non neoplastic lesions

In a study done by Pawar V et al., Chronic pyelonephritis caused by renal calculi was the leading cause for nephrectomy with a predominance of males [5]. In the present study chronic pyelonephritis was found to be the most common non-neoplastic lesion encountered comprising of 43.34% of all non-neoplastic lesions and 20.97% of all renal lesions with the male: female ratio of 1.16: 1.

Prasanna LC. et al., after conducting a clinical study of 30 cases of unilateral hydronephrosis concluded that 65% of the cases had ureteric stones as predisposing factor and 30% had pelvi-ureteric junction obstruction [6]. Male predominance was seen with majority of the cases presenting with loin pain which is in synchrony with our study.

In our study, Hydronephrosis accounted for 16.13% of all renal lesions and 33.34% of all non-neoplastic lesions. It was commonest during 3rd decade and was predominantly seen in males (male: female ratio - 4:1). Pelviureteric junction obstruction was seen in 20% of the cases

In a retrospective study conducted by Siddappa et al., after evaluating 16 cases of xanthogranulomatous pyelonephritis, there was female predominance comprising of 10 females and 6 males (male: female ratio – 1:1.6) with mean age of 51.5±17.04 years. The most common age group involved was 41 – 50 -years. Clinically, all the cases presented with loin pain followed by fever (68.7%) and dysuria (62.5%). In addition, hematuria, anorexia and weight loss were seen in few cases [7].

In our study, xanthogranulomatous pyelonephritis comprises of only one case that occurred in a 23 year old female. Similar to the above study our case showed increase in peri-pelvic fat, pus formation and adherent capsule, loss of cortico-medullary differentiation, dilatation of pelvi-calyceal system and presence of foamy macrophages along with few giant cells in the interstitium. In synchrony with the above study, our case of xanthogranulomatous pyelonephritis presented with fever, pain abdomen, oliguria and burning micturition. However unlike above study there was no hematuria or weight loss.

In another study by Simon et al., male preponderance of renal tuberculosis was noted, with the highest incidence between the age of 20 – 50 years [8].

In the present study, Tuberculous pyelonephritis comprises of 4.84% of all renal lesions and 10% of the non-neoplastic lesions. Tuberculous pyelonephritis was relatively more common in females (male: female – 1:2). The age ranged from 31 – 50 years which is in synchrony to the study by Simon et al. [9]. The predominating clinical features were fever, pain abdomen, hematuria

There was a single (1.61%) case of unilateral cystic renal dysplasia and hydatid cyst respectively.

Neoplastic lesions

Neoplastic lesions

The most frequent primary malignant tumours of the renal parenchyma are renal cell carcinoma and nephroblastoma (Wilms' tumor) as reported in various literature [10]. A similar finding was noted in the present study, with renal cell carcinoma (RCC) was the commonest tumour encountered and comprised of 29.03% of all the renal lesions and 56.25% of the neoplastic lesions of the kidney followed by Wilms' tumor which comprised of 6.46% of all the renal lesions and 12.5% of the neoplastic lesions. Benign epithelial tumours of the renal parenchyma, although quite common are small and asymptomatic being for the most part incidental findings at autopsy [10]. In contrary, three cases of primary benign epithelial tumor i.e., renal oncocytoma was encountered which comprised of 4.84% of all renal lesions and 9.38% (3/32) of the neoplastic lesions. The commonest primary malignant tumor of the renal pelvis have been found to be transitional cell carcinoma [10]. This is in synchrony with our study in which Transitional cell carcinoma was the commonest primary renal pelvis tumour and accounted for 4.84% of all renal lesions and 9.38% of the neoplastic lesions.

In a study by Bashir N et al., most common tumor in adults was renal cell carcinoma and Wilms' tumor was the most common childhood tumor, which is in synchrony to our study. Mean age for renal cell carcinoma was 54 years. For Wilms' tumor it was 2 years. Upper pole was involved by 50.5% of the cases, 29.3% cases showed lower pole involvement, 20.1% cases was involving the whole kidney. In majority of their cases, the tumor size ranged from 4-7cm [11]. Similarly, in the present study the mean age for renal cell carcinoma was 55.72 years and the mean age for Wilms' tumor was 4.5 years. Similarly, in our study RCC predominantly involved the upper poles comprising of 53.12% of the cases with lower pole involvement in 21.87%. Further similar to the above study, majority (40.62%) of our cases showed tumor sized ranging from 4-7 cm.

Renal cell carcinoma

The incidence of renal cell carcinoma increases with advancing age and as reported in the literature, the male: female ratio is 3:1 [10]. Majority of the patients in the present study belong to the 6th decade with the male: female ratio of 2.6:1. Renshaw states that clear cell or conventional renal cell carcinomas comprise 75% of all renal cell carcinomas [12]. Similarly, in the present study Clear cell renal cell carcinoma comprises of 72.22% cases of all renal cell carcinoma**.** Macroscopically, multilocular features were seen in 15.38% of the cases of clear cell carcinoma. Areas of haemorrhage and necrosis were noted in 76.92% of the cases which is in synchrony with the study by Mughlia VF et al. [13]. Microscopically, all the cases of Clear cell carcinoma illustrated clear cells which is synchrony with the study by Amin AA et al. [14]. According to Mughlia VF et al., lymph node infiltration can be seen upto 15% of RCC [13]. In our study one (7.69%) case of clear cell RCC showed lymphatic infiltration with hilar lymph node involvement. Sarcomatoid change and rhabdoid differentiation were seen in 7.69% of the clear cell RCC cases each. However, Renshaw gives the opinion that sarcomatoid change cannot be consider a separate subtype of renal cell carcinoma, since sarcomatoid change can be seen in Conventional renal cell carcinoma, Chromophobe renal cell carcinoma, Papillary renal cell carcinoma and collecting duct carcinoma [12].

According to Park HS et al., cystic change in clear cell renal cell carcinoma was significantly associated with younger patient age (< 55), smaller tumor size (≤ 4 cm) and lower Furhman grade [15]. In synchrony to the above study, there were two cases of multilocular cystic renal cell carcinoma and both the cases were less than 55 years of age, small tumor size of ≤4 cm and lower Furhman nuclear grade.

According to Vera-badillo FE et al., chromophobe RCC comprises 5–10% of the total cases of RCC. The age ranges from 27–86 years, more commonly observed in women (52%) than in men (48%) (Male: female – 1: 1.1). Typically, chromophobe RCC presents as a solid mass without necrosis or calcification [16]. In the present study, chromophobe RCC comprises 11.11% of all the cases of RCC. Among the two cases, one was 55 year old male and the other was 50 year old female (Male: female – 1:1). Grossly, both the cases had enlarged kidney with cut surface showing variegated appearance in one and the other had prominent scarring. Microscopically, tumour cells were sharply defined with abundant eosinophilic cytoplasm, a wrinkled nucleus (raisinoid nucleus) with a perinuclear halo.

Papillary renal cell carcinomas are defined histologically as tumours with at least 50% true papillae and comprise between 7% and 15% of all renal cell carcinomas. In the present study, there was a single case of papillary renal cell carcinoma comprising of 5.55% of all renal cell carcinoma. Microscopically, tumour cells were arranged in papillary pattern separated by delicate, intricately branching fibrovascular septae.

According to Furhman SA et al., four nuclear grades (1-4) were defined in order of increasing nuclear size, irregularity and nucleolar prominence. Nuclear grade was more effective than each of the other parameters in predicting development of distant metastasis following nephrectomy. In their study the authors found that none of the 45 cases, Furhman grade 1 stage I tumors metastasize for at least 5 years, unlike higher Furhman grade and stage I tumours which showed metastasis within 5 years in 50% of the cases [17].

In the present study, majority (66.66%) of the cases showed Furhman nuclear grade 1 and 2. 33.33% of the cases showed Furhman nuclear grade 3 and 4. In a study conducted by Bashir N et al., majority (51.4%) of the RCC cases exhibited grade 2 nuclear features which is in accordance with our study where 44.44% of the cases exhibited Fuhrman nuclear grade 2 features [11]. The above authors also found that renal vein invasion was present in 9.2% of their cases, which is slightly similar to our study where renal vein invasion was found in 5.55% of the cases [11].

Conclusion

The present study provides a fair insight into the histological patterns of lesion in nephrectomy specimens. A wide range of lesions were encountered when nephrectomy specimens were subjected to histopathological examination. Neoplastic lesions were more common than non-neoplastic lesions of the kidney. Renal cell carcinoma was the commonest neoplastic lesion encountered followed by Wilms' tumour. Chronic pyelonephritis was the commonest non-neoplastic lesion in this series followed by Hydronephrosis. The most common presenting feature of Renal cell carcinoma was hematuria followed by mass per abdomen and the most common presenting features of Wilms' tumour were pain abdomen and mass per abdomen. The commonest clinical presentation of chronic pyelonephritis

was fever followed by pain abdomen and the commonest clinical presentation of Hydronephrosis were pain abdomen and nausea and vomiting. The histopathological diagnosis generally correlates well with the pre operative clinical diagnosis, however some benign lesion may be misdiagnosed clinically as malignant and some malignant lesions may be misdiagnosed clinically as benign. As renal lesions may be misdiagnosed clinically, it is mandatory that every nephrectomy specimen be subjected to a detail histopathological examination to ensure proper post-operative management. Further detailed histopathological evaluation is essential to classify the benign and malignant neoplastic lesions and grading of the malignant lesions as these help in deciding the treatment protocols.

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