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A Histopathological Study of Lesions in Nephrectomy Specimens in A Tertiary Care Centre

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Conflict of interest: Nil

Abstract

Introduction: Nephrectomies are common and standard surgical practice in urology which is indicated in patients with various renal lesions. An indication of nephrectomy depends on factors like type of lesion, extent of damage and condition of the contralateral kidney.

Aims & objectives: This study aims to analyse histomorphological features of various lesions in nephrectomy specimens ,determine the frequency of renal lesions according to the age, gender and histology in a tertiary care centre, analyze the neoplastic and non-neoplastic lesions of kidney and compare the patterns from other observational studies.

Materials & methods: It is a retrospective study, done over a period of 5 years from Jan 2019 to December 2024 which included 52 nephrectomy cases. Descriptive and clinical data were obtained. Fuhrman nuclear grading was applied for grading of RCC.

Results: Among 52 nephrectomy cases, Male to female ratio was 1.2:1. Flank pain was the most common presenting complaint.34 cases (65.4%) were of neoplastic and 18 cases (34.6%) were of non-neoplastic lesions. Chronic pyelonephritis was observed as the most common non-neoplastic lesion indicating for nephrectomy.

Among 34 neoplastic cases, malignant lesions (94.1%) ruled out to be the common lesions requiring nephrectomy, while 2 cases (5.9%) were benign. Renal cell carcinoma was the most common neoplastic lesion followed by Wilm's tumor in our study. Regarding malignant tumors renal cell carcinoma was most commonly seen in adults and Wilm's tumor in pediatric

age group. Most common type of renal cell carcinoma is clear cell type (68.2%) followed by papillary (27.3%).

Conclusion: This study's fundamental strength is that it gives a fair insight of the current state of incidence and histomorphological spectrum of neoplastic and non-neoplastic lesions of kidney requiring surgical intervention. Our study population showed predominance of neoplastic indications for nephrectomy which indicates that, in the present time increase in availability of modalities for early diagnosis and appropriate better treatment facilities, decreases the need of surgical treatment for inflammatory and other nonneoplastic lesions of kidney.

Keywords: Nephrectomy, Renal cell carcinoma, Wilm's tumor, Chronic pyelonephritis.

Introduction

Kidneys are a pair of structurally complex organs which plays a vital role in excretion of waste products, electrolyte and water metabolism along with acid base balance, regulation of blood pressure and erythropoiesis by secretion of renin-angiotensin and erythropoietin respectively.[5]

Various pathological processes including neoplastic and non-neoplastic disease involve the kidney which are responsible for a great deal of morbidity as well as mortality.[4,5,6] Severe cases of chronic renal disease like chronic infection, trauma, obstruction and malformation as well as renal malignancy destroy the renal parenchyma of both the kidneys resulting in chronic renal failure.6Treatment of choice for patient in end stage renal disease and neoplastic lesion is nephrectomy. Various factors like type of lesion, extent of damage, general condition of the patient and status of the contralateral kidney indicates the type of nephrectomy which includes simple, partial and radical.[5,6]

When nephrectomy specimens are subjected to histopathological examination, a wide range of lesions are encountered. Most common malignant renal tumor is renal cell carcinoma accounting for more than 90% of all renal malignancies and approximately 2% of adult malignancies.[12,13,17]

Renal cell carcinoma occurs twice as commonly in men than in women, typically presenting in the fifth to seventh decades of life. Urothelial tumors of calyces and pelvis are rare. Chronic pyelonephritis is the most frequent type of non-neoplastic renal diseases seen in both adults and children.[13]

Worldwide, indications for nephrectomy in different countries can display geographical differences with different urological causes. This study aims to analyze the distribution and histomorphological features of nephrectomy specimens with various neoplastic and non-neoplastic lesions in a tertiary care centre and also to determine the frequency of renal lesions according to the age, gender and histology and compare the patterns from other observational studies.

Materials & Methods

The present study is conducted in Department of Pathology, Viswa Bharathi Medical College, Kurnool, Andhra Pradesh. It is a retrospective study done over a period of 5 years from January 2019 till December 2024. The study included 52 nephrectomy cases including all simple, partial & radical nephrectomy specimens. Core needle biopsies from renal masses and Autolyzed nephrectomy specimens are excluded from the study.

Descriptive and clinical data of all nephrectomy cases was collected from the records of the department of histopathology. Relevant clinical findings were noted. Paraffin blocks and slides were retrieved and blocks were

stained conventionally by Hematoxylin and eosin. Fuhrman nuclear grading was applied for grading of RCC.

Results

In the present study out of 52 nephrectomy cases, flank pain was the most common presenting complaint noted in 30 cases (57.7%) followed by hematuria in 6 cases(11.5%) and burning micturition in 5 cases (9.6%).

Table 1: Clinical presentation in patients undergoing nephrectomy

S.no	Clinical features	No.of patients
1.	Flank pain	30
2.	Haematuria	6
3.	Burning micturition	5
4.	Fever	4
5.	Vomiting	3
6.	Abdominal lump	2
7.	Incidental finding	2

Table 2: Histopathological distribution of various renal lesions

S.no	Diagnosis	No. of PTS	Percentage
1.	Renal cell carcinoma	22	42.30%
2.	Wilms tumor	8	15.38%
3.	Chronic pyelonephritis	8	15.38%
4.	Chronic pyelonephritis with hydronephrosis	3	5.80%
5.	Hydronephrosis	2	3.84 %
6.	Renal sarcoma	2	3.84%
7.	Tuberculous nephritis	2	3.84%
8.	Xanthogranulomatous nephritis	1	1.92 %
9.	Interstitial nephritis	1	1.92 %
10.	Angiomyolipoma	1	1.92 %
11.	Adult polycystic kidney disease	1	1.92 %
12.	Benign spindle cell neoplasm	1	1.92 %
	Total	52	100%

Table 3: Age wise distribution of various renal lesions

Age group	No.of cases (52)	Percentage
0-10	9	17.3%
11-20	2	3.84%

21-30	7	13.46%
31-40	5	9.61%
41-50	7	13.46%
51-60	8	15.4%
61-70	10	19.23%
71-80	4	7.69%

Males constituted 28 cases (53.8%) and females with 24 cases(46.2%) of all nephrectomy cases. Male to female ratio was 1.2:1.The left kidney was most commonly affected (57.5%) than right kidney (42.4%)

Table 4: Gender wise distribution of various renal lesions

Gender	No. of cases	Percentage
Males	28	53.8%
Females	24	46.2%

34 cases (65.4%) were of neoplastic and 18 cases (34.6%) were of non-neoplastic lesions indicating that neoplastic lesions were a more common indication for nephrectomy in the present study.

Table 5: Age wise distribution of non- neoplastic renal lesions

Non neoplastic lesions	0-20	21-40	41-60
Chronic pyelonephritis	1	4	3
CPN with hydronephrosis	0	2	1
Hydronephrosis	2	0	0
Tuberculous nephritis	0	1	1
Xanthogranulomatous nephritis	0	1	0
Interstitial nephritis	0	1	0
Adult polycystic kidney disease	0	1	0

Table 6: Gender wise distribution of non- neoplastic renal lesions

Non neoplastic lesions	Males	Females	No. of cases
Chronic pyelonephritis	5	3	8
CPN with hydronephrosis	3	0	3
Hydronephrosis	1	1	2
Tuberculous nephritis	1	1	2
Xanthogranulomatous nephritis	0	1	1
Interstitial nephritis	1	0	1
Adult polycystic kidney disease	0	1	1

Among 34 neoplastic cases, malignant lesions (94.1%) ruled out to be the common lesions requiring nephrectomy, while 2 cases (5.9%) were benign. Renal cell carcinoma was the most common neoplastic lesion followed by Wilm's tumor in our study.

Renal cell carcinoma was most commonly seen in the age group of 61-80 years with 11 cases (50%) followed by 41-60 years with 10 cases (45.5%) and one case was diagnosed at the age of 33 years. Renal cell carcinoma showed male predominance (59%).Wilm's tumor was the most common pediatric renal tumor with 7cases accounting for 87.5% diagnosed at the age group of 0-10 years and was found equally in both genders.

Table 7: Age wise distribution of neoplastic lesions

Tumour type	0-20	21-40	41-60	61-80
BENIGN				
Angiomyolipoma	0	1	0	0
Benign spindle cell neoplasm	0	0	0	1
MALIGNANT				
Renal cell carcinoma	0	1	10	11
Wilms tumor	0-10 11-20 7 1	0	0	0
Renal sarcoma	0	0	0	2

Table 8: Gender wise distribution of Neoplastic lesions

Name of tumour	Males	Females	No. of cases
BENIGN			
Angiomyolipoma	0	1	1
Benign spindle cell neoplasm	0	1	1
MALIGNANT			
RCC	13	9	22
Wilms tumor	4	4	8
Renal sarcoma	0	2	2

Most common type of renal cell carcinoma is clear cell type (68.2%) followed by papillary (27.3%).one case was diagnosed as chromophobe type of renal cell carcinoma (4.5%).

Table 9: Distribution of renal cell carcinoma histologic variants

s.no.	Histological variants of RCC	No. of cases
1.	Clear cell type	15
2.	Papillary type	6
3.	Chromophobe type	1

Fuhrman nuclear grade II was the most common (46.7%) nuclear grade followed by grade III (26.7%) and I (20%), while grade IV (6.6%) was the least common nuclear grade observed.

Table 10: Fuhrman nuclear grading of renal cell carcinoma

s.no.	Nuclear grades	No. of cases	percentage
1.	Grade 1	3	20%
2.	Grade 2	7	46.7%
3.	Grade 3	4	26.7%
4.	Grade 4	1	6.6%

Discussion

Among 52 nephrectomy specimens analysed, a wide histopathological range of lesions comprised of neoplastic and non-neoplastic lesions was observed in the current study.

Male predominance was seen in nephrectomy specimens with overall Male: Female ratio 1.2:1. This is in concordance with other studies like Thakur A S et al (1.3:1), Chaitra B et al (1.18:1), Anitha Padmanabhan et al (1.5:1),Nilay shah et al (1.63:1),Bajaj H et al (1.9:1), Sushma Praveen Kulkarni et al and Basnet et al also show male predominance in their studies.

Highest percentage of patients undergoing nephrectomy belonged to age group of 51-70 years (34.63%). This is consistent with other studies done by Chaitra B et al with age groups between 5th and 6th decade, Chandanwale et al. In this study slight left side predominance (57.5%) was seen among nephrectomy specimens. This was in concordance with studies by Lal and Philipose et al with 20 cases (57.1%), Chaitra B et al, Mahjabeen Salma et al. Basnet et al showed majority of cases with right sided lesion.

Flank pain (57.7%) was the most common clinical presentation in patients undergoing nephrectomy which is consistent with other studies like Mahjabeen Salma et al (67%), Lal and Philipose et al (45.7%), Bajaj H et al and Aiman et al. One case each of RCC and renal sarcoma were presented as an incidental finding during routine radiographic examination.

34 cases (65.4%) had neoplastic lesions and 18 cases (34.6%) cases had non-neoplastic lesions. Hence neoplastic conditions were a more common indication for nephrectomy in our study. This is in concordance with studies done by Lal and Philipose et al with 35 neoplastic cases (67.3%) and Thakur A S et al showed 70.4% of neoplastic and 29.6% of non-neoplastic cases. Because of better availability of antibiotics, usage of minimally invasive techniques for treating renal stones and the patients being treated at an earlier age, number of nephrectomies done for non-neoplastic conditions has been decreased. However, studies like Bajaj et al and Chaitra B et al showed predominance of non-neoplastic cases with 61.6% and 63.8% respectively. Among the neoplastic lesions malignant were 94.1% and 2 benign cases with 5.9% which is similar to studies like Bajaj et al (96.4%), Srikanth S et al (97.4%) and Anitha Padmanabhan et al (83.34%). A rare case of Angiomyolipoma of a 39-year female presented with lump in the right lumbar region was reported in our centre. Renal Cell Carcinoma (64.7% of neoplastic lesions) was the most common neoplastic lesion in the present study showing male predominance followed by Wilms tumour(23.5%) with equal gender predominance This is consistent with studies done by Bajaj et al, Basnet

et al, Madhu Kumar et al, Aiman et al and Sushma Praveen Kulkarni et al.

Wilms tumor was the most common childhood tumor and in adults renal cell carcinoma was most common malignancy whereas chronic pyelonephritis was most common non-neoplastic lesion. Most common age group affected in Wilms tumour is 0-10 years. This is consistent with studies done by Bajaj et al and Chaitra et al.

Most common type of renal cell carcinoma in the present study is clear cell carcinoma(68.2%). This is in concordance with studies done by Madhu Kumar et al (58.3%) , Chaitra B et al (50%), Bajaj et al and Sushma Praveen Kulkarni et al. One case of chromophobe type of renal cell carcinoma was also reported in our centre.

Fuhrman Nuclear Grade 2 was the most common grade reported in renal cell carcinoma in the present study (46.7%) which is in concordance with studies done by Chaitra B et al (53%), Aiman et al (52%), Lal and Philipose et al(55.2%), Bajaj et al, Basnet et al, Anitha Padmanabhan et al, Nilay shah et al and Chandanwale et al.

Figure 1a: Gross specimen showing enlarged kidney & cut section with loss of corticomedullary demarcation;

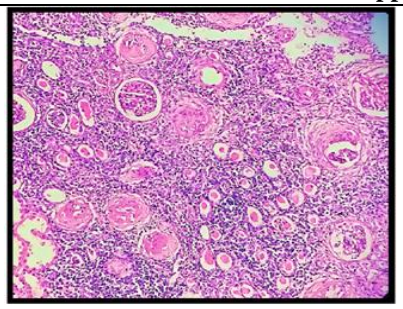

Figure 1b: Microscopy showing features of chronic pyelonephritis with hydronephrosis.(H&E 40X)

Figure 2a: Gross specimen of kidney with Cut section showing markedly dilated pelvicalyceal system with thinned out cortico medullary areas;

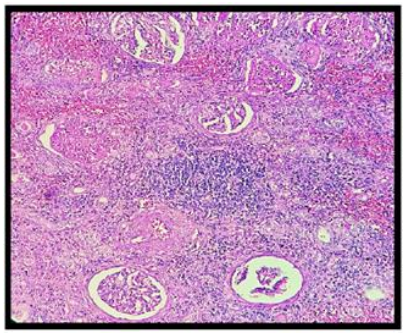

Figure 2b: Microscopy showing features of chronic pyelonephritis.(H&E 40X)

Figure 3a: Gross specimen of Angiomyolipoma, cut surface showing solid tan white and yellowish areas;

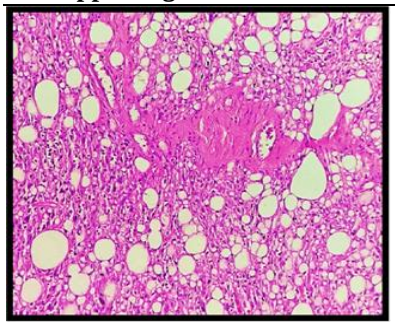

Figure 3b: Microscopy shows components of adipose tissue, blood vessels and spindle cells. (H&E 40X)

Figure 4a: Gross specimen of Wilm's tumor with cut section showing a solid cystic growth involving upper and middle pole with variegated appearance;

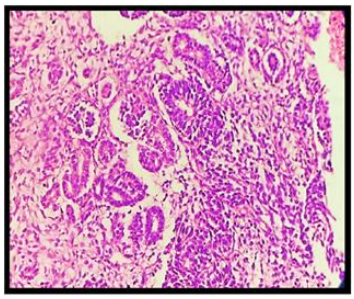

Figure 4b: Microscopy showing epithelial, mesenchymal and blastemal components. (H&E 40X)

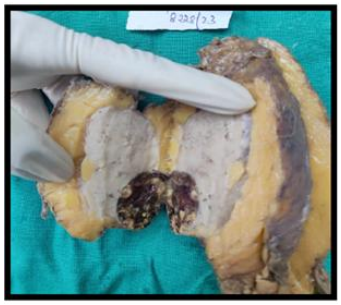

Figure 5a: Gross specimen of Clear cell RCC with cut section showing well defined tan brown area in lower pole;

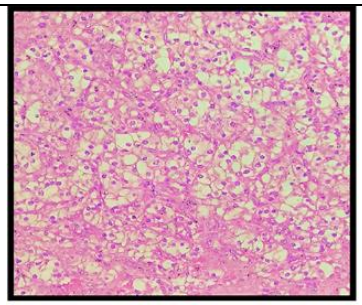

Figure 5b: Microscopy showing nuclear features of grade-1. (H&E 40X)

Figure 6a: Gross specimen of Clear cell RCC, cut section shows tan brown area involving upper pole of the kidney;

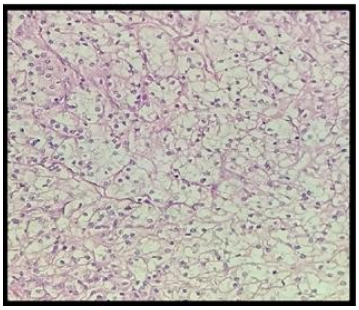

Figure 6b: Microscopy shows groups of clear tumor cells of round to oval shape and nuclear features of grade-2. (H&E 40X)

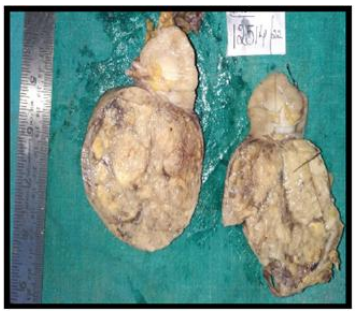

Figure 7a: Gross specimen of papillary RCC, cut section shows tan white tumor proper with papillary growth;

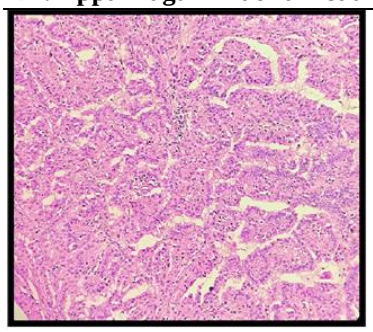

Figure 7b: Microscopy of papillary RCC shows tumor cells arranged in papillary pattern with central fibrovascular core. (H&E 10X)

Figure 8a: Gross specimen of kidney with cut section showing tan white growth in the mid pole;

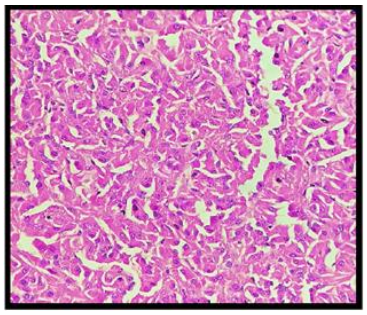

Figure 8b: Microscopy showing features of papillary RCC. (H&E 40X)

Conclusion

A wide variety of histomorphological spectrum of nephrectomy specimens was observed in our study. Frequency in distribution of neoplasms was similar to the reports in literature. Our study's fundamental strength is that it gives a fair insight of the current state of incidence and histomorphological spectrum of neoplastic and non-neoplastic lesions of kidney requiring surgical intervention. Number of clinical parameters such as age of the patient, presenting complaints was correlated with renal tumours and non-neoplastic lesions demanding surgical removal. All these clinical and histopathological parameters can help in early diagnosis and to plan the line of treatment and also have a prognostic significance. A detailed Histopathological examination of every specimen should be done to help in clinic-morphological correlation and proper management. Our study population showed predominance of neoplastic indications for nephrectomy than non-neoplastic lesions. This trend indicates that, in the present time increase in availability of modalities for early diagnosis and appropriate better treatment facilities, decreases the need of surgical treatment for inflammatory and other nonneoplastic lesions of kidney. However further immunohistochemical and cytogenetics studies are required to categorize the neoplastic lesions according to new WHO classification.

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