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Spectrum of pathological lesions in nephrectomy specimens: A study of 50 lesions

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ABSTRACT

Introduction: Kidneys are involved in variety of pathological processes. Renal diseases are an important cause of morbidity worldwide. Chronic pyelonephritis and its variants still continue to be the leading cause of nephrectomies in developing country like India. In some developed countries, neoplastic lesion is the commonest indication for nephrectomy.
Aim: The study is carried out to study the frequency of various neoplastic and non-neoplastic lesions in nephrectomy specimens and to study histomorphological features in a teaching hospital.
Materials and Methods: The t otal of 50 nephrectomy cases were studied. Detailed clinical finding were collected from case sheets. Detailed gross findings and histomorphological features were studied.
Results: Out of 50 lesions 35 were non neoplastic and 15 were neoplastic. Out of 35 nephrectomy lesions, 32 cases were of chronic pyelonephritis and males (n=18) were commonly affected than female (n=14). Out of 15 neoplastic lesions majority(n=12) were renal cell carcinoma and most commonly (n=12) involved males.
Conclusion: In developing country like India pyelonephritis is the commonest cause of nephrectomy. Better treatment modalities of inflammatory lesions of kidney in the develop ing countries will reduce the rate of nephrectomies.

1. Introduction

In urological practice, nephrectomy is a common practice on tumors.[1,2] It is indicated in neoplastic and non-neoplastic conditions. Chronic pyelonephritis, obstructive nephropathy and hydronephrosis are the most common types of nephrectomy specimens for non-neoplastic conditions.[3–7] Nephrectomy may also be indicated for the treatment of severe unilateral parenchymal damage resulting from nephrosclerosis, vesicoureteric reflux, and congenital dysplasia. It is the treatment of choice in renal cell carcinomas.[8]

Renal cell carcinoma is the most common malignant renal tumor and it accounts for more than 90% of all renal malignancies[9–12] and approximately 2% of adult malignancies.[1] Renal cell carcinoma occurs twice as commonly in men than in women, typically presenting in the fifth to seventh decades of life. However, it has been reported in much younger patients as well.[13] Urothelial tumors of calyces and pelvis are rare.[14] Chronic pyelonephritis is the most frequent type of nephrectomy specimen for non-neoplastic renal diseases in both adults and children.[15–18]

Knowledge of morphology and age specific characteristics can help refine the diagnosis and indirectly it can also suggest the prognosis and management. Though newer techniques in imaging and genetics have evolved, the diagnosis of renal tumors primarily depends on histopathological examination. The present study is undertaken to study the histopathological spectrum of lesions in nephrectomy specimens and to find out the commonest cause of nephrectomy in rural teaching hospital.

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2. Materials and Methods

This is a prospective study over the two years. Institute Ethics Committee Clearance (IECC) was obtained before start of the study. The total of 50 nephrectomy cases were studied. A complete clinical history of the patients which underwent complete or partial nephrectomy in our hospital was taken. Detailed clinical findings such as signs and symptoms, clinical examination and radiological findings including Ultrasonography, Computed Tomography (CT), Magnetic Resonance Imaging (MRI) and important laboratory investigations including renal function tests were recorded from case sheets.

2.1. Inclusion criteria

All the surgical specimens of neoplastic and non-neoplastic specimens of partial or complete nephrectomies received for the histopathological examination were included in the study.

2.2. Exclusion criteria

Nephrectomy specimens received from traumatic injuries were excluded.

Gross findings of specimens were noted. Multiple sections taken were formalin fixed and paraffin processed. Tissue sections of 3 to 5 micron sections were cut and stained with hematoxylin and eosin. Histological features were studied in detail. Nuclear grading of clear cell RCC and papillary RCC was done as per World Health Organization/International Society of Urological Pathology Nuclear Grading System. Other malignant tumors were graded based on degree of differentiation. Staging was done by TNM Staging of WHO. Histopathological findings were co-related with clinical findings.

3. Results

All specimens received for histopathological examination were of complete nephrectomy. No specimen was of a partial nephrectomy. The final diagnosis was based on histological features and USG, CT-Scan, MRI, Intravenous pyelography findings. Clinical findings were correlated with histomorphogical features. Out of 50 cases maximum number of cases were seen in the age group of 41-60 years (n=21) followed by 21-40 years of age group (n=11) [Table 1].

Out of 50 lesions 35 were non neoplastic and 15 were neoplastic. Maximum patients seen were males (n=32) followed by females (n=18). Right and left kidneys were equally (n=25) distributed.

The 30% cases on non- neoplastic lesions (n=15) were in the age group of 41-60 years followed by 9 cases in 21-40 years of age group. Neoplastic lesions (n=15) were further classified as malignant (n=13) and benign (n=2). In Malignant lesions maximum number of cases were seen in age group of 41-60 years (n=6). Out of two Benign lesions one case each was found in age group of 0-20 years and 21-40 years each [Table 1].

Out of the 50 cases 28 presented with urinary tract infection followed by 8 patients with abdominal lump and hematuria each, 5 cases with flank pain, 3 cases with Flank pain and hematuria. One case of neoplastic was diagnosed incidentally on USG which turned out to be oncocytoma on histopathological examination.

Table 2 show histological diagnosis of 50 nephrectomy patients. Out of 32 cases of chronic pyelonephritis maximum (n=18) males were commonly affected than female (n=14). Maximum cases (n=13) were in 41-60 years [Table 3].

Out of 12 neoplastic lesions Majority (n=1 0) cases were of RCC and were in males and commonest age group was of 41-60 years (n=6) [Table 4].

Out 12 cases of RCC, the most common was Clear cell renal cell carcinoma (n=6) followed by Papillary (n=4) and then one case of each chromophobe and sarcomatoid RCC.

Table 5 show nuclear grading of renal cell carcinoma. In Chromophobe Renal cell carcinoma Fuhrman / ISUP grading has no prognostic value grading was not done.

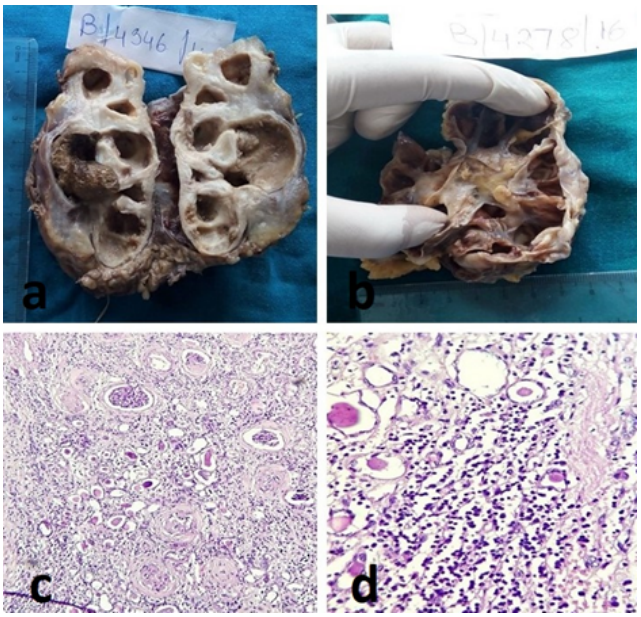

Fig. 1: Gross- (a) Chronic pyelonephritis with stone. (b) Chronic pyelonephritis without stone. Microscopy- (c) Chronic pyelonephritis (H and E x100). (d) lymphocytes and thyroidisation (H and E x400).

4. Discussion

Nephrectomy is commonly done in patients with chronic renal infection with renal stones leading to end stage

Table 1: Age wise distribution of 50 neoplastic and non -neoplastic lesions of kidney.

Age (Years)	Non-neoplastic n/%	Neoplastic (Malignant)	Neoplastic (Benign)	No of case (n)
0-20	6 (12%)	2 (4%)	1 (2%)	9 (18%)
21-40	9 (18%)	1 (2%)	1 (2%)	11 (22%)
41-60	15 (30%)	6 (12%)	0 (0%)	21 (42%)
61-80	5 (10%)	3 (3%)	0 (0%)	8 (16%)
81-100	0 (0%)	1 (2%)	0 (0%)	1 (2%)
Total	35(70%)	13 (26%)	2(4%)	50(100%)

Table 2: Histopathological diagnosis in 50 lesions of kidney.

Histopathological diagnosis		Total no. of cases (n)	Percentage (%)
Non Neoplastic Lesions		35	
Chronic pyelonephritis	with renal stones	25	50%
	without renal stones	7	14%
Xanthogranulomatous pyelonephritis with renal stones		1	2%
Tuberculous pyelonephritis		1	2%
Autosomal dominant polycystic kidney disease		1	2%
Neoplastic Lesions		15	
Renal cell carcinoma		12	24%
Renal Oncocytoma		1	2%
Wilms tumor		1	2%
Meroblastic Nephroma		1	2%
Total		50	100%

Table 3: Age, sex and site distribution in 32 cases of chronic pyelonephritis.

Age	Male (n=32)	Female (n=32)	Right kidney (n=32)	Left kidney (n=32)
0-20	4	2	5	1
21-40	4	4	3	5
41-60	8	5	3	10
61-80	2	3	3	2
80-100	0	0	0	0
Total	18	14	14	18

Table 4: Age, sex and site distribution in 12 cases of Renal cell carcinoma.

Age	Male (n=12)	Female (n=12)	Right kidney (n=12)	Left kidney (n=12)
0-20	0	1	0	1
21-40	1	0	0	1
41-60	6	0	5	1
61-80	2	1	3	0
80-100	1	0	0	1
Total	10	2	8	4

Table 5: Nuclear grading in WHO/ISUP for clear cell renal cell carcinoma.

Grade	No of cases (n)	Percentage (%)
Grade 1	2	18.18%
Grade 2	6	54.54%
Grade 3	2	18.18%
Grade 4	1	9.90%
Total	11	100%

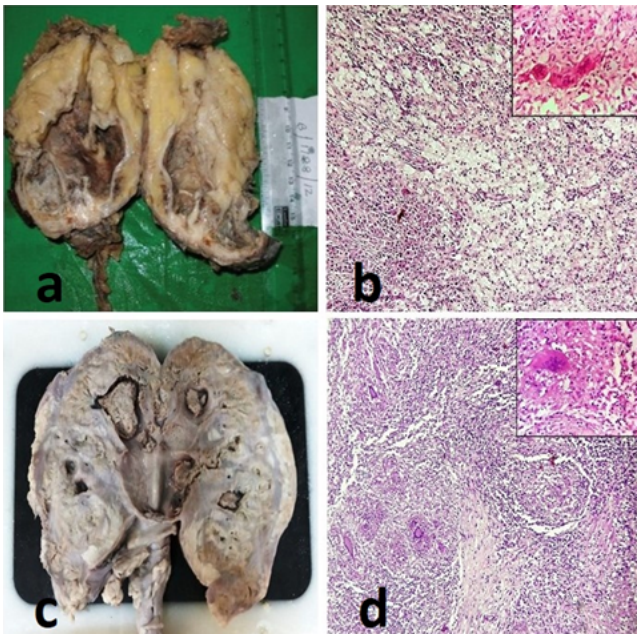

Fig. 2: Gross- (a) Xanthogranulomatous pyelonephritis. (b) Microscopy of xanthopyelonephritis, insight xanthoma cells and giant cells (H and E x 100). (c) Gross- Tuberculous pyelonephritis. (d) Microscopy show epithelioid granuloma and giant cells (H and E x100)

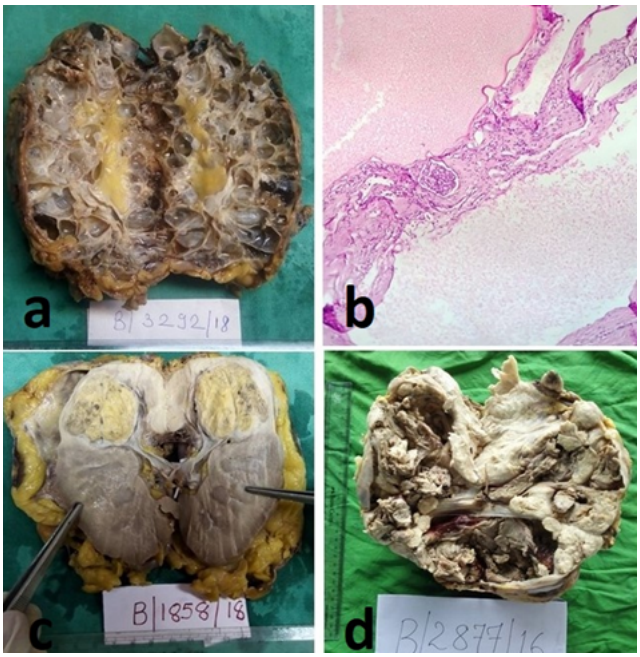

Fig. 3: (a) Gross- Adult polycystic kidney disease. (b) Microscopy adult polycystic kidney disease (H and E x100). (c and d) Gross- Renal cell carcinoma.

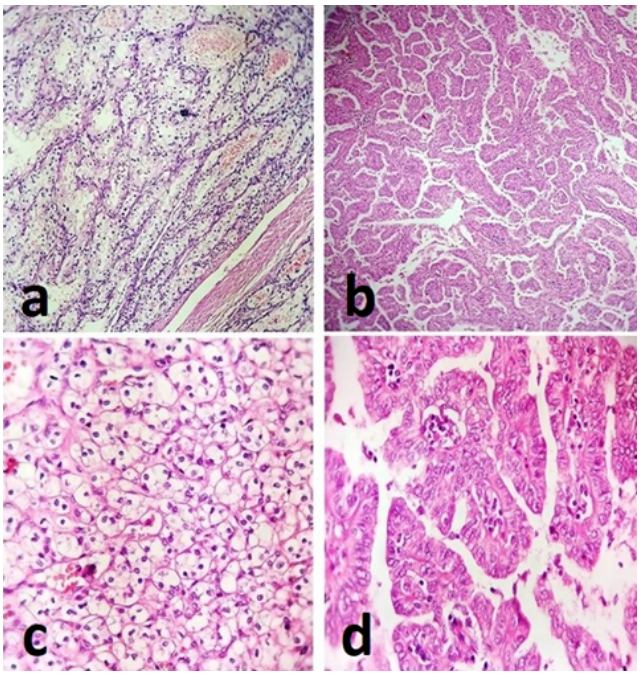

Fig. 4: (a) Clear cell renal cell carcinoma with clear cells (H and E x100). (c) Clear cell renal cell carcinoma (H and E x400). (b and c) Papillary renal cell carcinoma (H and E x100 and x400)

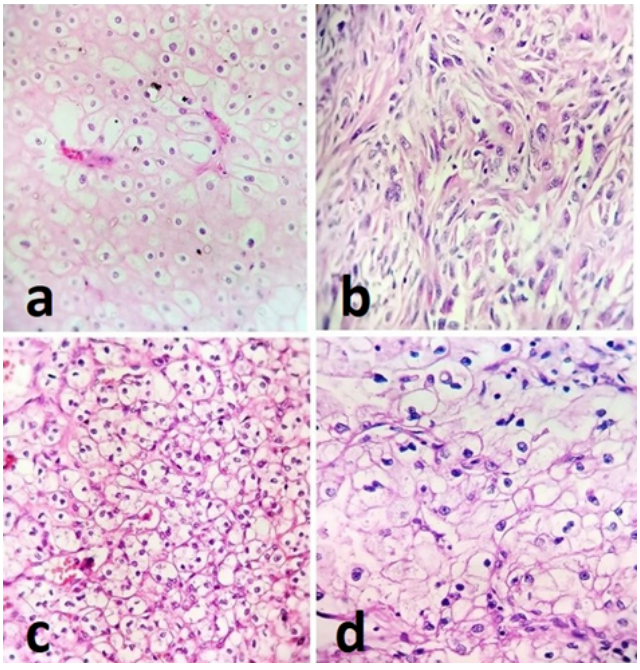

Fig. 5: (a) Chromophobe renal cell carcinoma (H and E x400). (b) Sarcomatoid renal cell carcinoma (H and E x400). (c and d) Grade1 and Grade 2 clear cell renal cell carcinoma (H and E x400).

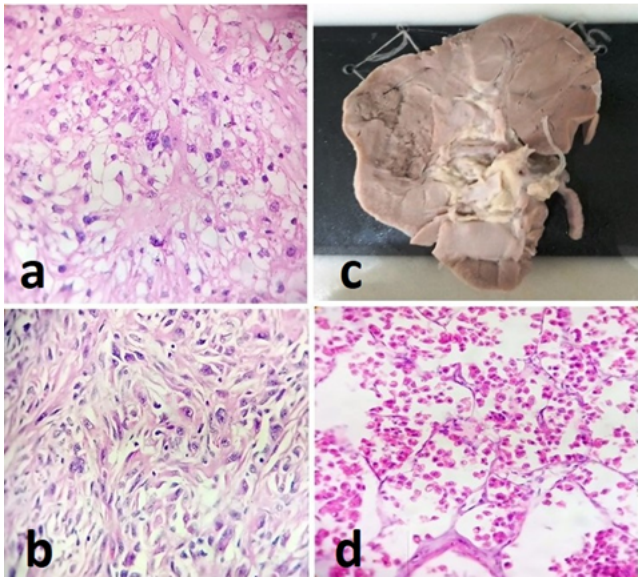

Fig. 6: (a and b) Grade 3 and 4 clear cell renal cell carcinoma (H and E x400). (c) Gross- oncocytoma. (d) Microscopy of oncocytoma (H and E x400).

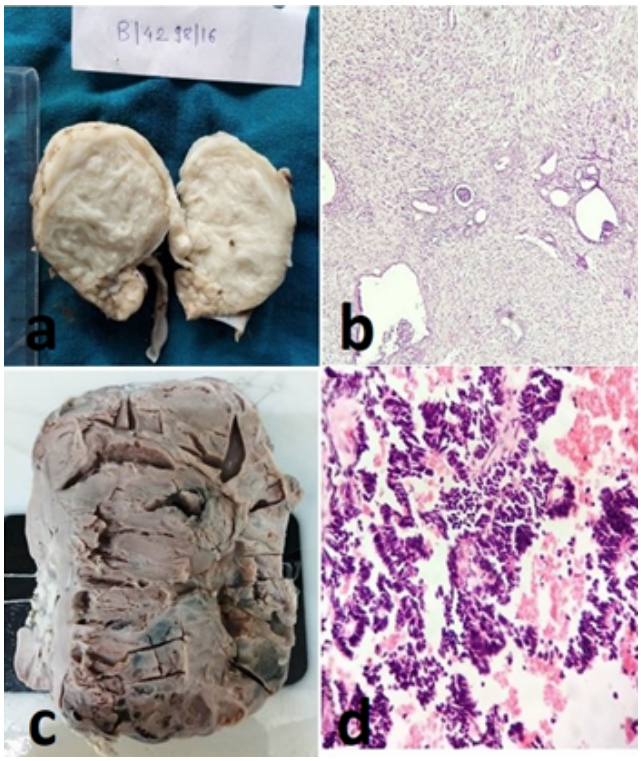

Fig. 7: (a) Gross- Nephroblastoma. (b) Microscopy nephroblastoma (H and E x400) (c) Gross Wilms tumor. (d) Microscopy wilms tumor (H and E x100).

disease. In this study clinical and morphological features of 50 complete nephrectomy specimens were studied. from July 2011 to June 2016.

Lesions of kidney can occur at any. The youngest patient in our study was 1-month old who had mesoblastic nephroma and the oldest patient was of 82 years of age who had renal cell carcinoma. In studies by with Ashima et al[19] (2015), Shila et al[1] (2015) and Shikha et al[20] (2016), Vinay et al[21] (2018) the highest number of kidney lesions were found in age group of 41-60 years of age group which was in concordance of our study. In contrast by Aiffa et al[2] in their study observed younger age group 21-40 in which nephrectomy was the commonest (40.71%). We found 18% cases in the age group of 0-20 years [Table 1] which was in concordance with other studies by Shila et al[1] 2016 with 17.92%. While Shikha et al[20] showed a low percentage 6.12% of cases in that age group. Variations in the age group with other studies possibly can be due to geographical variation and the stage of disease at which patients were diagnosed in our set up.

Our study gave us a male predominance with 32 cases (64%) and M: F was 1.7:1. Ashima et al[19] and Vinay et al[21] also had a male predominance with a sex ratio M: F as 1.3:1 and 1.15:1 respectively. While other studies Aiffa et al[2], Shila et al[1] and Shika et al[20] had a female predominance with a M: F ratio 0.94:1, 0.73:1 and 0.73:1 respectively.

Our study showed a equal distribution right and left kidney of lesions of kidney. Ashima et al[19] and Shikha et al[20] had a right kidney involvement common in their study.

In our study ratio of non-neoplastic lesions to neoplastic lesion was 2.3:1. Similar observations were made by Aiffa et al[2], Ashima et al[19], Shila et al[1], Shikha et al[20] and Vinay et al.

In our study urinary tract infection was the most common clinical presentation. In contrast most other studies including Aiffa et al.[2] observed flank pain as the most common clinical presentation. Variation in the presenting symptoms can be attributed to duration of the disease and the time at which the disease is diagnosed.

The most common cause of nephrectomy in our case was chronic pyelonephritis with renal stones (n=25). Majority specimens of chronic pyelonephritis showed classic gross features such as atrophic cortex and medulla blunting and calacyes partially adherent capsule. [Figure 1 a &b]. Microscopy showed tubular destruction, interstitial fibrosis, lymphocytic infiltration of interstitium with formation of lymphoid follicles in 15 cases. The tubules were atrophic and dilated and lined by flattened to cuboidal epithelium and filled with hyaline casts (Thyroidisation). Variable number of histiocytes, and plasma cells were present [Figure 1 1c &d]. The glomerulus was preserved in (n=15) cases but 17 cases showed hyalinization reflecting later stage of the disease. Ashima et al[19] also observed

chronic pyelonephritis as the most common indication for nephrectomy.

The only case of xanthogranulomatous pyelonephritis grossly showed yellowish lobulated renal mass on external surface. Cut section showed dilated pelvis, calyces and cortical atrophy, thick purulent material was also seen. [Figure 2a] Histological examination showed diffuse chronic interstitial inflammatory infiltrate which included large numbers of histiocytes with foamy cytoplasm (xanthoma cells) and few multinucleated giant cells [Figure 2 b]. Some studies showed large number of cases of xanthogranulomatous pyelonephritis. Possible variation can be due to geographical variations and type of etiological agent responsible in urinary tract infection .[19–21]

The only case of t uberculous pyelonephritis in our study showed on cut section dilated pelvicalacyeal system and ares of cheesy white material [Figure 2c]. Histological examination showed well- formed epithelioid granulomas, langhans gaint cells mixed with lymphocytes with areas of caseous necrosis [Figure 2d]. ZN stain did not reveal AFB bacilli. It known that caseous necrosis is diagnostic of tuberculosis. The only case of Autosomal Dominant kidney disease in our study grossly showed multiple cysts of variable sizes on the external and internal surface [Figure 3a]. Microscopy showed the cysts lined by flattened epithelium with serous fluid in the cysts with tubular atrophy [Figure 3b].

In our study out of 12 cases of renal cell carcinoma 6 were in the age group of 41-60 years. While substantial number of cases (n=4) were in the older age group 61-18 years [Table 4]. Male to female ratio in our study was quite high (5:1). In our study possible reason for male dominance might be due to history of cigarette smoking and high blood pressure in our patients. It is known that these factors have been implicated as a risk factor for developing in renal cell carcinoma.[22]

Maximum cases showed cut surface with a very prominent well circumscribed lesion measuring between 6-8 cm diameter in the upper pole of the kidneys (n=6) One case showed lesion on the lower pole which was multicystic and measured 4 cm in diameter, two cases showed a well circumscribed lesion in the upper pole of kidney with cystic changes and few papillary structures. Two kidney specimens showed a very large mass which was infiltrating the whole kidney and obstructing the p elviureteic junction [Figure 3 c&d]

Out of 12 cases of RCC, 6 were clear cell RCC, 4 were papillary RCC and 1 each was chromophobe and sarcomatoid RCC. The case s of clear cell RCC (n=6) had solid pattern with acinar and alveolar components, tumor cells were separated by a stroma that is characteristically endowed with a prominent network of small, thin-walled blood vessels. Tumor cells were large with clear cytoplasm (n=2) slightly eosinophilic and granular cytoplasm (n=4) [Figure 4 a &c].

The 4 cases of papillary RCC showed a thick fibrous capsule. Complex papillary formations filled the intra - cystic spaces were seen. The papillae were lined by a single layer of cuboidal epithelium, with slightly eosinophilic granular cytoplasm with nucleoli. P sammoma bodies were not seen in all cases [Figure 4b &d].

One case of chromophobe RCC showed characteristic broad alveolar arrangement of the tumor cells at low magnification. The neoplastic cells have sharply defined borders and abundant cytoplasm with very prominent cell membranes [Figure 5 a]. The only case of sarcomatoid RCC showed tumor cells with the varying degrees of pleormophism and bipolar spindle sarcomatoid cells with prominent nucleoli present in few cells. [Figure 5b]

Nuclear grading by WHO/ISUP for papillary and clear cell RCC was done in 11 cases. The 6 cases were grade 2, 2 cases were grade 1 and grade 3 each and a single case was grade 4 [Figure 5 c&d, &Figure 6 a&b]. In Chromophobe RCC, ISUP grading has no prognostic value so was not done in the present study.

Aiffa et al[2] in their study observed high frequency of cases(n=20) of clear cell RCC out of 25 cases of RCC. Ashima et al[19] observed 9 cases of clear cell RCC out of 17 and Shila et al[1] observed 7 cases of clear cell RCC out of 12 cases of RCC. Second most common lesion of renal cell carcinoma in our study was papillary RCC with 4 out of 12 cases of RCC. Similar observations were made by Shila et al[1] and Ashima et al.[19]

I n the present study grade 2 nuclear grading was the most common one with 6 out 11 cases of renal cell carcinoma. Aiffa et al[2] also showed grade 2 as the most common with 13 out of 25 cases renal cell carcinoma [Figure 7 a,b,c,d]. In contrast with our study Ashima et al[19] showed grade 1 as the predominant one with 4 out of 9 cases of renal cell carcinoma.

In present study the only case of Renal Oncocytoma which on cut surface showed well circumscribed, unencapsulated, solid, homogenous, mahogany lesion of about 3 cm with a central scar [Figure 6 c]. Histology examination showed cells with abundant acidophilic granular cytoplasm which were growing in a nesting alveolar pattern [Figure 6d].

Meroblastic nephroma (n=1) in our study was a well circumscribed, white whorled mass measuring 7x4x4 cm involv ing whole of kidney [Figure 7 a]. Microscopy showed intersecting fascicles of bland, elongated spindle cells. Tubules and glomeruli were seen entrapped by the spindle tumor cells [Figure 7].

One case of Wilms tumour on gross showed large, partially circumscribed mass measuring 10x7x5 cm. It was soft, homogenous and tan gray, few foci of hemorrhage and necrosis were seen [Figure 7c]. Histology examination showed all the three major components

with undifferentiated blastema, mesenchymal tissue, and epithelial tubul es. The *blastomatous* areas in our case were cellular and composed of small round-to-oval primitive cells; with scanty cytoplasm. The *mesenchymal* elements had spindle cells with loose arrangement. The *epithelial* component was seen as tubular structures. [Figure 7d]. Study by Ashima et al[19] found a high frequency Wilms tumor in their study.

5. Conclusion

Ne phrectomy is commonly done for neoplastic lesions in some western countries. But in developing country like India chronic pyelonephritis remain to be the commonest cause of nephrectomy. Maximum patients have stone related problem which lead to nonfunctioning of kidney. It occurs in younger age group than malignant lesions. Better treatment modalities of inflammatory lesions of kidney in the developing countries will reduce the rate of nephrectomies

5.1. Acknowledgement

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6. Source of Support

None.

7. Conflict of Interest

None.

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