



## HISTOPATHOLOGICAL ANALYSIS OF NEPHRECTOMY SPECIMENS WITH EMPHASIS ON NON-NEOPLASTIC LESIONS: A STUDY AT TERTIARY CARE HOSPITAL

### Medical Science

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### ABSTRACT

**BACKGROUND:** Nephrectomy is a common urological procedure and remains safe measure for various pathological lesions in the kidney, resulting from chronic infections, obstruction, calculus disease and tumors. The study also helps to determine the common underlying disorders leading to a non-functioning kidney and thus requiring a nephrectomy.

**AIMS & OBJECTIVES:** To outline the morphological patterns of lesions in nephrectomy specimens with emphasis on non-neoplastic lesions and common inflammatory lesions like chronic pyelonephritis.

**MATERIALS AND METHODS:** The present study was conducted in the Department of Pathology in collaboration with the Department of Surgery and urology, RajaRajeswari Medical College and included all nephrectomy specimens received in the department over a period of 2 years (Jan2016to Jan 2018). Descriptive analysis was done with clinical variables. A total of 39cases of nephrectomy specimen were studied during this period. Patient particulars were recorded in detail which included age, sex, clinical findings and investigations such as CT scan and USG. Nephrectomy specimens were examined grossly and the tissue was processed as per standard protocol and stained with routine stains.

**RESULTS:** A total of 39 cases of nephrectomy specimens were received, out of which 25 cases were non- neoplastic and 14 cases were neoplastic lesions with male to female ratio of 1.5:1. The oldest patient was 75yrs presenting with chronic pyelonephritis and youngest patient (4yrs) with wilm's tumor. Among the tumors, Benign neoplasms constituted 2 cases of Angiomyolipoma and among malignant tumors, RCCs with clear cell type was commonest followed by papillary RCC and other variants presented were chromophobe type, Multilocular cystic RCC and Wilm's tumor.

**CONCLUSION:** Open nephrectomy is still a choice for all neoplastic and non-neoplastic renal lesions. The detailed histological analysis helps in proper diagnosis and grading of tumors helps in deciding the treatment protocol and prognosis.

### KEYWORDS

Chronic pyelonephritis, Renal tumours, Hydronephrosis

### INTRODUCTION

Nephrectomies are an integral part of urological practice. In recent years, there is an increase in the number of nephrectomies done, as there is an extensive use of imaging techniques<sup>1</sup>. Simple nephrectomy is indicated in patients with an irreversibly damaged kidney owing to symptomatic chronic infection, obstruction, calculus disease or severe traumatic injury. Nephrectomy may also be indicated to treat renovascular hypertension or severe unilateral parenchymal damage from nephrocalcinosis, pyelonephritis, reflux or congenital dysplasia. Although radical nephrectomy is standard treatment with localized renal carcinoma with a normal contralateral kidney, there is growing interest in the use of nephron sparing surgery for selected patients<sup>2</sup>.

In recent years interest in nephrectomy by minimally invasive techniques has increased and these techniques were associated with fewer complications and shorter hospital stay<sup>2</sup>.

The aim of this study was to analyse the nephrectomy specimens and categorize non-neoplastic and neoplastic lesions and to study the frequency of chronic pyelonephritis and to compare our study with other studies.

### MATERIALS AND METHODS

The present study was a prospective study done in the Department of Pathology, Rajarajeshwari Medical college and Hospital with the nephrectomy specimens received from the Department of Surgery and Urology, during a period of 2yr, (Jan 2016to Jan 2018). Relevant clinical details including imaging findings were obtained. The specimen was sent in formalin for histopathological examination. Grossing of the formalin fixed nephrectomy specimens was done according to the standard procedure. Examination of gross features, like size and weight of the kidney, length of ureter, presence of capsule, external renal surface and on cut surface for cysts, nodules, calcification and abscess was observed. For tumours, size and shape, location, colour of the tumour, cut surface, tumour extension through the capsule, perinephric fat, calyces and pelvis, invasion of ureter and vessel, presence of normal kidney tissue and presence of lymph node metastases were noted in all the cases. Parallel slices were cut without mutilating the specimen and fixed in formalin overnight. Multiple

sections for histology were taken from the following sites. (a) Tumour: three to four sections (including one with adjacent normal kidney tissue), (b) Kidney not involved by tumour: two section, (c) pelvis: one section. Renal artery and vein, ureter, Lymph nodes were analysed if present. After routine paraffin processing, sections of 3 µm thickness were cut and routinely stained with haematoxylin and eosin stain. Detailed light microscopic features were studied and recorded. The final diagnosis was arrived at after correlating the clinical features, gross and microscopic findings.

### RESULTS

A total of 39 nephrectomy specimens were received, out of which (92.9%) were Simple nephrectomy and radical nephrectomy accounted for 7.2%. From these 39 nephrectomy cases, 75% of the cases were non-neoplastic lesions and 25% of cases were neoplastic lesions as shown in [Table 1].

Among the 39 cases 25 (64.1%) were male patients and 14(35.89%) were female patients with a male to female ratio of 1.8:1. The oldest patient in our study was 75yrs presenting with chronic pyelonephritis and youngest patient presented with wilm's tumour (4yrs) as in (Table 2). The mean age of patients who underwent nephrectomy for non-neoplastic conditions was of 48.9 years when compared to the patients with neoplastic conditions where the mean age was 62.8 years. The symptoms presented by the patients were flank pain, haematuria, burningmicturition, fever, oligouria and mass. Flank pain was the most common clinical presenting complaints noted, followed by burning micturition, fever, hemoaturia, oligouria and mass which are depicted in (Table 3).

Among the nephrectomy cases, maximum number (21 cases) of cases presented with chronic pyelonephritis (CPN) on histology. Maximum number of cases was found to be associated with Nephrolithiasis followed by hydronephrosis and Pyonephrosis. Granulomas (Tuberculosis), Xanthogranulomatous nephritis and Hydatid cyst covers minimum number of cases each. Two cases of simple renal cyst were documented (Table 4, 5).

In Gross findings in pyelonephritis, predominant number of cases was

found to have loss of cortico-medullary junction (38.46%) followed by Dilatation of pelvi-calyceal system (35.89%) and impact calculi (10.25%) as shown in [Table 6].

In microscopic findings of chronic pyelonephritis cases, maximum cases showed Tubular atrophy and Thyroidisation of tubules (85.71% respectively) with interstitial fibrosis found in 11 cases (52.38%) as shown in [Table 7]. Glomerular sclerosis with hyalinization and periglomerular fibrosis were seen in 61.9% and 76.19% respectively.

Out of 39 cases 14 cases were neoplastic with 4 cases of RCC, Clear cell being the most common followed by Papillary RCC (3 cases) and Multilocular cystic RCC (2). Other tumors documented were 2 cases of Wilm's tumor, Chromophobe RCC (1 case) and 2 cases of Angiomyolipoma, (Table 8). Among the 14 renal neoplastic conditions 9 cases were males and 5 cases were females with a male to female ratio of 1.8:1, (Table 8).

The clear cell RCC was graded from 1 to 4 according to Fuhrman's nuclear grade. Nuclear Grade 2 tumors were most common followed by Grade 3 tumors.

**Table 1: Distribution of nephrectomy specimens according to gender, (n=39)**

Type of lesion	Male	Female	Total
Non-neoplastic	15	10	25
Neoplastic	9	5	14
Total	20	19	39

**Table 2: Distribution of nephrectomy specimens according to age, (n=39)**

Age	No.of.cases	Percentage
0-20yrs	8	20.52 %
21-40yrs	7	17.94 %
41-60yrs	13	33.34 %
>60yrs	11	28.21 %

**Table 3: Clinical presentation of nephrectomy specimens (n=39)**

Serial no	Symptoms	No of cases	Percentage
1	Flank pain	23	58.9 %
2	Burning micturition	22	56.41 %
3	Haematuria	10	25.64 %
4	Fever	16	41.02 %
5	Oligouria	3	7.69 %
6	Mass	3	7.69 %

**Table 4: Spectrum of histopathological lesions in nephrectomy specimen, (n=39)**

Lesion	No.of cases	Percentage
Chronic pyelonephritis	21	53.84%
Cystic lesions	2	5.13%
Benign neoplasms	2	5.13%
Malignant lesions	14	35.89%
Total	39	100%

**Table 5: Chronic pyelonephritis (CPN) with associated Histological findings.**

Serial No	Associated findings	No.of cases	Percentage
1	Chronic pyelonephritis	16	41.02 %
2	CPN With PN and Nephrolithiasis	11	28.02%
3	CPN with Xanthogranulomatous nephritis	2	5.13%
4	Acute on CPN	3	7.69%
5	CPN with Lipomatous change	1	2.56%
6	CPN With Tuberculosis	2	5.13%
7	CPN with Hydatid cyst	1	2.56%

**Table 6: Gross Findings, (n=39)**

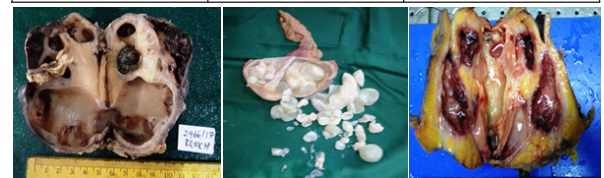
Serial. No	Gross findings	No.of. cases	Percentage
1	Enlarged kidney	4	10.25%
2	Shrunken kidney	2	7.69%
3	Loss of cortico-medullary junction	15	38.46%
4	Dilatation of pelvi-calyceal system	14	35.89%
5	Impact calculi	4	10.25%

**Table 7: Histopathological findings in Chronic Pyelonephritis**

Microscopic findings	No .of.cases	Percentage
Tubular atrophy	18	85.71%
Thyroidisation of tubules	18	85.71%
Peri-glomerular fibrosis	16	76.19%
Glomerular sclerosis with hyalinization	13	61.90%
Interstitial inflammation	3	14.28 %
Acute	16	76.16%
Chronic	4	19.04%
Granulomas	2	9.52%
Foamy macrophages		
Interstitial fibrosis	11	52.38%

**Table 8: Distribution of Neoplastic Lesions, (n=14)**

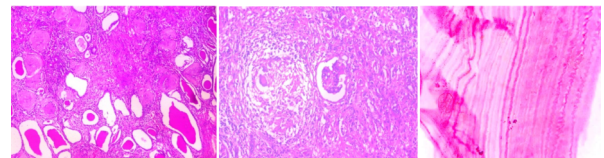
Tumors	No.of cases	Percentage
Angiomyolipoma	2	14.28 %
RCC-Clear cell type	4	28.57%
Papillary type	3	21.42%
MRCC	2	14.28%
Chromophobe	1	7.14%
Wilm's tumor	2	14.28%
Total	14	100 %



**FIG-1** Gross photograph shows

**FIG-2** Gross photograph shows Hydatid cyst

**Gross photograph shows Pyonephrosis**

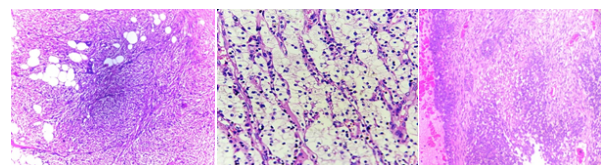


**FIG-4**

**FIG-5**

**FIG-6**

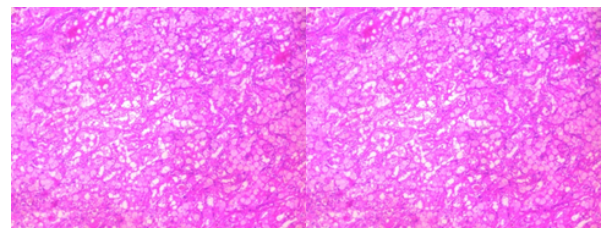
Photomicrograph (Fig-4) shows chronic pyelonephritis with periglomerular fibrosis and thyroidisation. (Fig-5) shows Tubercular Granulomas and laminated membranes of Hydatid cyst is seen in (Fig-6), 100X, H&E



**FIG-7**

**FIG-8**

**FIG-9**



**FIG-10**

**FIG-11**

Photomicrograph, (Fig-7) shows Angiomyolipoma, Fig-8, shows Clear Cell RCC, Fig-9 shows Wilm's tumour, Fig-(10) and Fig-(11) shows MRCC, H&E, 400X

**DISCUSSION**

Renal diseases are an important cause of morbidity worldwide. The most common procedure done for a non-functioning kidney is Nephrectomy – be it partial or total or radical. Malignancies are treated with a radical nephrectomy. In 1870 Simon was the first person to perform partial nephrectomy for hydro-nephrosis<sup>2,3</sup>.

In the present study, out of the 39 Nephrectomy specimens studied, 64.2% constituted non-neoplastic lesions and 35.9% had malignant lesions. A similar predominance of lesions was observed in other studies of Shanmugasamy et al, and EL Malik et al<sup>5</sup>.

**Table 9: Comparative Studies for Benign and Malignant Lesions**

Study	Benign lesions	Malignant lesions
Shanmugasamy et al	75%	25%
EL Malik et al	77.2%	22.8%
Aimen et al	62.8%	22.8%
Present study	64.2%	35.9%

In the present study majority of nephrectomy procedure was done in Fifth decade (29.5%) followed by sixth decade (26%). Among nephrectomy specimens, 51.3% were of females and 48.71% of males, with M: F=1.8:1. This ratio is inconcordance, observed by El Malik et al and Mohammad Rafique, (M: F = 1.9:1)<sup>5,6</sup>.

In the present study, most of the cases presented with flank pain followed by urinary symptoms, fever and most of the cases with malignancy presented with haematuria. These findings were in concordance with shanmugasamy et al and the study conducted by A Aiman. Few cases presented with oligouria.

In our study the most common lesion observed was chronic pyelonephritis, which is followed by renal cell carcinoma as studied by shanmugasamy et al<sup>5</sup>.

Chronic pyelonephritis associated with hydronephrosis was the most common type of lesion for non-neoplastic conditions due to increase in the incidence of pelvi-ureteric junction obstruction by ureteric calculi. Most of the patients with chronic pyelonephritis lead to permanent and progressive damage to the renal parenchyma ending up with Non-functioning kidney. Calculi are due to various factors like dietary, genetic and sedentary life styles. Commonest calculi is calcium oxalate stones which occurs due to consumption of hard water, super saturation of calcium oxalate and lower urinary citrate concentration. Other risk factors for chronic pyelonephritis are vesico-ureteral reflux, benign prostatic hyperplasia and urinary tract infection in pregnancy. In the present study, two cystic lesions of simple cyst were documented<sup>7,8</sup>.

11 cases were diagnosed to CPN with nephrolithiasis in our study.

Among 21 cases of chronic pyelonephritis (CPN), grossly majority of cases showed dilatation of pelvi-calyceal system ( 13 cases) and loss of cortico-medullary junction (14 cases), which is concordance with study conducted by shanmugasamy et al<sup>5</sup>.

Xanthogranulomatous pyelonephritis is an uncommon chronic destructive granulomatous process of renal parenchyma which mimics RCC. It is associated with long-term urinary tract obstruction and infection. Globally the incidence of xanthogranulomatous pyelonephritis is 5.1% with female preponderance<sup>8</sup>. In our study 2 cases showed histology of Xanthogranulomatous changes<sup>8</sup>.

Tuberculosis of renal parenchyma can be part of a disseminated infection or a localized genitourinary disease. In the kidneys, colonization of *M. tuberculosis* occurs in the medullary region, where granulomatous lesions occur, with caseous necrosis, leading to local tissue destruction. Later changes of pyonephrosis occur. In our study 2 cases showed tubercular changes<sup>9,10</sup>. Other associated findings of renal parenchyma in our study included acute on chronic pyelonephritis, lipomatous change, Pyonephrosis and hydatid cyst as similar to study done by Shanmugasamy et al and study conducted by Ajay kumar.

In the present study nephrectomy was done for 14 tumour cases, out of which 11 cases were renal cell carcinoma, 2 cases of MRCC, 1 case of Chromophobe rcc and 2 cases of angiomyolipoma, which is in concordance with study conducted by Sridhar VV et al and El Malik EM et al<sup>5</sup>.

## CONCLUSION:

Our study reveals that nephrectomy was done most commonly for non-neoplastic lesions when compared to neoplastic lesions. Chronic pyelonephritis (CPN) was the most common chronic inflammatory change among the series of lesions like pyonephrosis, calculi, malignancies etc. Hence it is mandatory to study each chronic

pyelonephritis case in detail along with clinical and radiological findings.

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