PATHOLOGICAL SPECTRUM OF LESIONS IN NEPHRECTOMY SPECIMENS IN A TERTIARY HOSPITAL

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ABSTRACT: Kidneys are involved in various pathological processes, some of which may require nephrectomy. Simple nephrectomy is done to remove the nonfunctioning kidney involved by different non-neoplastic conditions. Radical nephrectomies is a standard treatment for localized malignant neoplasms of kidney.

OBJECTIVES: To study the pathological spectrum of various lesions in the nephrectomy specimens and to study the indications of nephrectomy.

MATERIAL AND METHODS: This is a three years retrospective analysis of patients who underwent nephrectomy in a tertiary hospital from Aug. 2012 to Aug. 2015

RESULTS: Of the total 49 nephrectomy specimens 81.63% (40 cases) had nonneoplastic lesions and 18.36% (09 cases) were neoplastic. Amongst the non –neoplastic conditions, majority had nonfunctioning kidney due to chronic pyelonephritis and renal calculi. Most of the patients were in 4th to 6th decade and M: F was 0.88:1. Histopathologically all the malignant tumors found were of Renal cell carcinoma and clear cell was the commonest variant noted.

CONCLUSION: Among the conditions that necessitate Nephrectomy are the non-neoplastic lesions like chronic pyelonephritis due to renal calculi.

KEYWORDS: Nephrectomy, Chronic Pyelonephritis.

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INTRODUCTION: Kidneys are the vital organs essential for the excretory function. They also have endocrine function by producing renin –angiotensin to control blood pressure and secretion of erythropoietin required for hemopoiesis.⁽¹⁾ They can be involved in various pathological processes. Renal diseases are responsible for great deal of morbidity. In conditions like ESRD and malignant neoplasms surgical removal of kidney [Nephrectomy] is required.⁽²⁾ Simple nephrectomy is done to remove the irreversibly damaged, nonfunctioning kidneys involved by different benign pathological conditions like extensive renal stone disease, neglected PUJ obstruction. Radical nephrectomy is indicated to treat different malignant neoplastic conditions of the kidney.

In the last few years ,there has been growing interest in nephron –sparing surgery or partial nephrectomy to treat the selected cases of localized renal cell carcinoma by open or laparoscopic approach.^(2,3,4) The history of partial nephrectomy is a timely story settling important precedents for understanding current and future strategies to treat changing patterns of renal neoplasms.⁽⁵⁾ The local disease recurrence is the major drawback of nephron –sparing surgery mostly due to incomplete resection of primary tumor. In this due, radical nephrectomy still remains the gold standard for the treatment of renal neoplasms.⁽⁴⁾

The surgical pathologists should be aware that the non-neoplastic renal lesions are common and often overlooked in tumor nephrectomy. This can be an independent risk factor for developing chronic renal insufficiency in partial nephrectomies.⁽⁶⁾

In developing countries like India in many centers, in rural or semi -urban setup the nephrectomies are still being performed by open surgical techniques.^(7,8) In our institute also, laparoscopic urological procedure has not been performed.

There are geographical variations in indications of nephrectomy. The cause of loss of renal function which lead to nephrectomy, also differ between pediatric and adult patients.VUR is the leading cause of nephrectomy, whereas malignancies of kidney and upper urinary tract are the important indications in adults.^(9,10)

Renal tumors comprise a diverse spectrum of neoplastic lesions that are distinct for children and adults. Accurate diagnosis of most renal tumors is possible only after histopathological evaluation in view of tumor size, histologic subtype, nucleus grade and stage, in case of malignant renal neoplasms.^(11,12)

The present study was done with the following objectives- To study the histopathological features of various renal lesions in nephrectomy specimens, to differentiate the non –neoplastic and neoplastic lesions and correlate them with demographic and clinical features and to determine the indications of Nephrectomy.

MATERIAL AND METHODS: A retrospective study carried out in the Department of Pathology in a tertiary hospital. 49 nephrectomy specimens received in the period of August 2012 to August 2015 were studied.

The histopathological reports of these cases were collected from the records of histopathology section.

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The clinical details, radiological findings and provisional diagnosis procured from the medical record department. Corresponding slides were collected and reevaluated for confirmation of the diagnosis.

RESULTS: 49 cases of the Nephrectomy specimens studied were distributed as per the histopathological diagnosis into Non neoplastic lesions, Benign neoplasms and Malignant neoplasms and as per the gender. Majority of the cases were of the nonneoplastic category 40(81.63%), and neoplastic lesions were 09 (18.37%) of which malignant lesions were 08 (16.33%) and a single case of benign neoplasm (2.04%). There was a slight female preponderance with 26 cases in all the studied cases (Table 1).

Further the age and sex wise distribution of the lesions with the percentage was done and overall the kidneys were affected in the age group of 4-6th decade (Table 2) The nonneoplastic lesions were further classified as various types of Chronic pyelonephritis associated with hydronephrosis due to renal stones, Acute pyelonephritis and perinephric abscess, PUJ obstruction, Adult polycystic kidneys and Multicystic dysplastic kidney (Table 3) Majority of the nonneoplastic lesions were in the category of chronic pyelonephritis with hydronephrosis due to renal stones (32.5%). These nonneoplastic conditions were common in the males in the age group of 4-5th decade (Table 4)

A single case of benign neoplasm was found and eight cases were of malignant neoplasms. The malignant lesions were common in the age group of 5-6th decade (Table 5).

Female preponderance was noted in the neoplastic lesions 66.6% (Table 6) Patients of nonneoplastic lesions presented with flank pain as the common symptom (85.%) followed by fever (76.955) and burning micturition (65.55%) (Table 7).

Painless hematuria was the common (71.40%) symptom in patients with neoplastic conditions (Table 8) and the location of the neoplasms was in the upper pole (Table 9). The malignant neoplasms were further classified on histopathological basis and 50% of renal cell carcinomas were of clear cell type and a single case of high grade urothelial carcinoma of renal pelvis was found (Table 10).

DISCUSSION: From the literature we have found that there is definitely a geographic variation regarding the indications of nephrectomy.⁽⁹⁾ In spite of the introduction of minimal invasive techniques in urology partial nephrectomies and development of better medical facilities, the total number of nephrectomies performed in every decade in large European centre does not seem to have changed much over last 3 decades from 1960-1990.⁽¹⁰⁾ The reported rates of nephrectomies for malignant conditions from studies in Nigeria and Ghana is 67.31 % and 54.6% respectively.^(12,13)

Two studies from India, Kashmir and Bijapur show that the malignant conditions are the major indication of nephrectomy and that is 89.13 % and 54.5% respectively.^(14,15) The percentage of nephrectomies performed in non – neoplastic conditions is still high in the 3rd world countries because of the non availability of free health services and of course lack of awareness of the gravity of the disease which results in late presentation.⁽⁹⁾

So in our study of 49 cases of nephrectomy specimens 40(81.63%) were nonneoplastic conditions and 9 (18.37%) were the cases of malignant neoplasms. Chronic pyelonephritis was the major (61%) indication of nephrectomy amongst the nonneoplastic conditions.

Our findings are similar to the studies of 85 nephrectomies studied in Saudi Arabia.⁽¹⁶⁾ a study of 88 nephrectomies studied in a tertiary hospital in Darjeeling.⁽⁷⁾ 70 nephrectomies studied in a hospital in Mangalore.⁽⁸⁾ a study of 116 nephrectomies studied in a hospital in Bengaluru.⁽¹⁷⁾ 140 cases studied in a tertiary hospital at Srinagar.⁽¹⁸⁾ a study of 73 nephrectomies studied in Addis Ababa University.⁽⁹⁾ and 161 cases studied in Iraq.⁽¹⁹⁾

CONCLUSION: There is high rate of nephrectomy performed for nonneoplastic lesions. Obstructive uropathy due to renal stones, leading to hydronephrosis and chronic pyelonephritis is a common finding in our study. Considering the results of the studies in other developing countries, it is concluded that non-neoplastic conditions of the kidney are still the leading cause for nephrectomy in developing countries. All nephrectomy specimens should be subjected to histopathology examination. Open nephrectomy, which is practiced in our hospital, is safe.

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Study and the study period	Benign %	Malignant %
Present (2012 – 2015)-3 years	81.63	18.37
El Fadil MA, EL Malik et al. ⁽¹⁶⁾ (1987-1995)- 8 years	78	22
Bisawajit Datta et al. ⁽⁷⁾ (2002-2009)- 7 years	62.5	37.5
Ashima Amin et al (2003-2012)- 9 years	54.2	45.7
Divyashri BN et al. ⁽¹⁷⁾ (2004-2014)- 10 years	74.41	27.59
Aiffa Aiman et al. ⁽¹⁸⁾ (2005-2010)-5 years	77.2	22.8
D. Andualem et al. ⁽⁹⁾ (2009-2011)-2 years	63	37
Abdulgafoor et al. ⁽¹⁹⁾ (2012-2014) -2 years	77.36	22.64
Various studies comparing the percentage of Nonneoplastic & Neoplastic lesions		

In our study the patients were in the age group of 4-6th decade. Similar were the findings of Badmus TA et al.⁽¹²⁾ who found the patients with the nonneoplastic lesions in 4th decade, Mathew et al.⁽¹³⁾ and Bashir N et al.⁽¹⁴⁾ had majority patients of overall renal lesions in the 5th decade, D Andualem et al.⁽⁹⁾ and Aiffa Aiman et al.⁽¹⁸⁾ had the patients in 4th-5th decade.

Flank pain is the most common presenting symptom (85.5%) in our study followed by fever (76.95%), burning micturition (65.55%), hematuria and mass in loin (34.2%). Comparison with other studies having similar findings.

Symptoms	Present	D.Andualem. ⁹	Kyei MY. ¹³	Aiman A. ¹⁸	Divyashri. ¹⁷
Flank mass	85.5%	100%	67.9%	92%	98%
Fever	76.95%	17%		25%	67%
Burning micturition	65.55%	-	-	48%	-
Hematuria	34.2%	43.5%	24.5%	30%	37%
Flank mass	34.2%	35.6%	50.9%	22%	-

Amongst the various renal lesions studied, the major indication of nephrectomy is the nonneoplastic lesions and amongst them variants of Chronic pyelonephritis and Chronic pyelonephritis and hydronephrosis due to renal stones forms the major group (62.5%). The other variants of chronic pyelonephritis noted are Xanthogranulomatous pyelonephritis and Tuberculous pyelonephritis.

Types of CPN	Present	Aiffa A et al. ⁽⁸⁾	Amin A et al. ⁽¹⁸⁾	D. Andualem et al. ⁽⁹⁾	Abdulgafoor et al. ⁽¹⁹⁾
Nonspecific CPN with Renal calculi	50%	62.8%	44.3%	51.2%	47.82%
Xanthogranulomatous Pyelonephritis	10%	5.7%	1.4%	-	8%
Tuberculous Pyelonephritis	2.5%	-	4.3%	4.1%	0.62%
The comparison of percentage of Chronic Pyelonephritic lesions in various studies					

In the present study 2(5%) of MCDK are noted. Similarly Amin A.(8) had noted 10% cases of MCDK.

03(7.5%) cases of Emphysematous pyelonephritis are noted in our study.

6(15%) cases of PUJO are noted in our study. Datta B et al.⁽⁷⁾ found 25% cases of PUJO and it was the leading cause of nephrectomy in their study.

Neoplastic lesions constituted 9(18.37%) of all the renal lesions with M:F of 0.5:1. We had a single case (11.1%) of benign lesion of Angiomyolipoma. 08 cases (88.1%) of renal cell carcinoma are noted.

In our study Upper pole is found to be commonly involved 4 in 9 cases (44.4%). These findings are similar to the study of Aiffa A et al.(18) (52%) and Bashir N et al.(14) (50.5%).

In the malignant neoplasms of Renal cell carcinomas the common histological type is the clear cell variant in the present study. Almost all the neoplastic conditions are diagnosed on CT scan or MRI.

Urothelial carcinomas of the the upper urinary tract are similar to those of the bladder. 5-10% of urothelial carcinomas arise in the upper tract; they are twice as common as tumors of ureters. 50% tumors are associated with bladder tumors. These are often misdiagnosed as Pyelonephritis, pyonephrosis. Most invasive carcinomas are high grade.(20) Ours is a urothelial carcinoma of the renal pelvis with squamous differentiation. This case was misdiagnosed as a case of CPN on CT scan.

Variant of RCC	Present	Kammi J Henriksen et al.(6)	Abdulgafoor et al.(19)	Ashima A et al.(18)	Bashir N et al.(14)
Clear cell	44.4%	50%	65.38%	52.9%	60.8%
Chromophobe	22.2%	1.6%	15.38%	11.8%	1.1%
Papillary	11.1%	12%	15.38%	17.6%	8.2%
Urothelial carcinoma of renal pelvis	11.1%	4.1%	11.36%	2.9%	-
The comparison of various malignant lesions in various studies					

Diagnosis	Male	Female	Total	Percentage
Nonneoplastic	21	19	40	81.63
Benign Tumors	0	1	1	2.04
Malignant tumors	2	6	8	16.32
Total	23	26	49	100
Table 1: Distribution as per histopathological diagnosis and Gender				

Age (years)	M	F	Total	Percentage
1 -10	2	1	3	6.24
11- 20	-	1	1	2.08
21 -30	2	-	2	4.16
31- 40	3	3	6	12.24
41 -50	4	6	10	20.8
51- 60	5	4	9	18.72
61- 70	4	7	11	22.88
71- 80	3	4	7	14.56
Total	23	26	49	
Table 2: Age and sex wise distribution of the lesions				

Lesion	1 -10	11- 20	21 -30	31 -40	41- 50	51- 60	61- 70	71 -80	
Chronic nonspecific pyelonephritis			1	2	2	2	1		
Chronic pyelonephritis with hydronephrosis and renal stones			1	4	3	3	1		
Xanthogranulomatous Pyelonephritis							3	1	
Tuberculous pyelonephritis					1				
PUJ obstruction	1	1	1	2	1				
Emphysematous pyelonephritis					2	1			
Perinephric abscess and Pyonephrosis				1	1		1		
Adult Polycystic kidney disease				1					
Multicystic kidney disease	2								
Total	3	1	3	10	10	6	6	1	40
Table 3: Age (yrs) wise distribution of non-neoplastic lesions									

Lesion	M	F	Total	Percentage %
Chronic nonspecific pyelonephritis	5	3	8	20
Chronic pyelonephritis with hydronephrosis and renal stones	8	5	13	32.5
Xanthogranulomatous Pyelonephritis	1	3	4	10
Tuberculous pyelonephritis	-	1	1	2.5
PUJ obstruction	4	1	5	12.5
Emphysematous Pyelonephritis	-	3	3	7.5
Perinephric abscess and Pyonephrosis	2	1	3	7.5
Adult Polycystic kidney disease	-	1	1	2.5
Multicystic kidney disease	1	1	2	5.0
Total	21	19	40	

Table 4: Sex wise distribution of non-neoplastic lesions

Lesion	31-40	41- 50	51 -60	61 -70	71 -80
Benign neoplasm	1				
Malignant neoplasm		1	3	3	1

Table 5: Age (yrs) wise distribution of neoplastic lesions

Lesion	M	F
Benign neoplasm	-	1
Malignant neoplasm	3	5
Total	3	6
Percentage	33.4 %	66.6 %

Table 6: Sex wise distribution of neoplastic lesions

Clinical symptom	Number of Cases	Percentage %
Flank Pain	30	85.5
Hematuria	12	34.2
Fever	27	76.95
Lump in abdomen	12	34.2
Burning Maturation	23	65.55
Vomiting	13	37.05

Table 7: Clinical symptoms of patients with nonneoplastic lesions

Clinical symptom	Number of cases	Percentage %
Painless Hematuria	5	71.40
Fever	4	57.14
Lump in abdomen	2	28.57

Table 8: Clinical symptoms of patients with neoplastic lesions

Location	Number of cases
Entire kidney	3
Upper pole	5
Lower pole	-
Mid region	1

Table 9: Location of tumour in kidney in neoplastic lesions

Type	Number of Cases	Percentage
Clear cell	4	50 %
Papillary	1	12.5 %
Chromophobe	2	25 %
Urothelial carcinoma of the renal pelvis	1	12.5 %
Total	8	

Table 10: Frequency of Histopathological types of RCC

Figure 1: Chronic pyelonephritis: Loss of corticomedullary junction & multiple renal stones.

Figure 2: (10X, H&E) - Chronic Pyelonephritis with diffuse mononuclear Cell infiltration, sclerosed glomeruli and thyroidisation of the tubules.

Figure 3: (10X, H&E) - Xanthogranulomatous Pyelonephritis with collection of foamy macrophages in the interstitium.

Figure 4: (10X, H&E) -Tuberculous pyelonephritis with a caseating granuloma & Langhans giant cell in the inset.

Figure 5: Adult Polycystic Kidney - Cut section shows multiple cysts.

Figure 6: Multicystic kidney disease - Cut section shows multiple cysts having no interconnections.

Figure 7: Cut section of Angiomyolipoma located in the upper pole with a grey-white mass with areas of hemorrhage.
 Figure 8: (10 X H & E) Angiomyolipoma showing mixture of fat cells, large blood vessels and whorls of smooth muscles.
 Figure 9: Cut section of Renal cell carcinoma- Huge renal mass with a variegated appearance.
 Figure 10: (40X, H&E) Renal Cell Carcinoma- Clear Cell Type.
 Figure 11: (10X, H&E) Renal Cell Carcinoma – Chromophobe Type.
 Figure 12: (10X, H&E) Renal cell carcinoma- Invasive Urothelial carcinoma with large areas of necrosis.