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Original Research Article

Study of histomorphological spectrum of lesions in nephrectomy specimen in a tertiary care hospital in South Gujarat

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ABSTRACT

Background: Nephrectomy is a standard surgical procedure in urology indicated in patients with organ confined renal malignancies and irreversible kidney damage resulting from chronic infection, trauma, obstruction and congenital malformation. This study aims to study the histomorphological features of lesions in nephrectomy specimens in a tertiary care hospital, to analyse the neoplastic and non-neoplastic lesions of kidney according to age, gender and site and observe any variation from the conventional pattern.
Methods: The present study was conducted in department of pathology, Tertiary care hospital over a period of 5 years and 7 months (1 Jan 2013 to July 31, 2018). This included 4 years retrospective and 1 year 7 months prospective. A total of 73 cases of were studied.
Results: Males constituted 65.73% and females constituted 35.27% of all nephrectomy cases. Right kidney was more commonly affected. Highest percentage of patients belonged to 41-50 years age group. 45 cases were of non-neoplastic lesions and 28 cases were of neoplastic lesions. Among neoplastic lesions, one case was benign while remaining 27 cases were malignant. Chronic Pyelonephritis was the most common indication overall and also amongst non-neoplastic lesions with stone identified in 55% cases. Most common neoplastic lesion in nephrectomy specimen was Renal Cell carcinoma (71.4.1%) followed by Wilms tumour (14%).
Conclusions: This study gives a fair insight of the current state of incidence of neoplastic and non-neoplastic lesions of kidney requiring surgical intervention.

Keywords: Chronic pyelonephritis, Nephrectomy, Renal cell carcinoma

INTRODUCTION

The kidneys are a pair of structurally complex organs which not only remove waste products of metabolism in the form of urine but also play an important role in regulation of maintenance of acid balance, secretion of a variety of hormones like Erythropoietin, renin and prostaglandins and regulation of Vitamin D synthesis. The functional reserve of the kidney is large hence generally renal diseases progress silently with much damage occurring before renal dysfunction becomes clinically evident.[1]

Nephrectomy is the standard surgical procedure in urology. An indication of nephrectomy depends on a number of factors like type of lesion, extent of damage, health of the patient and condition of the contralateral kidney.[2] Simple nephrectomy is indicated in patients with irreversibly damaged non-functioning kidney resulting from different benign pathological conditions including severe traumatic injury, obstruction due to stone impacted in kidney or ureter, symptomatic renal infections, renovascular hypertension due to non-correctable renal artery abnormalities or severe unilateral parenchymal damage caused by nephrosclerosis, pyelonephritis, reflux or congenital cystic dysplasia of the kidney.[3]

Pyelonephritis, an inflammatory process involving both

collecting system and renal parenchyma peaks with different age groups- infancy and early childhood, women of childbearing age, and both men and women older than 60 years of age. They are commonly associated with congenital or acquired obstructive lesions of the lower urinary tract or are associated with conditions which cause residual retention of urine in the bladder. Congenital lesions are often the cause of pyelonephritis in infancy and early childhood. In older adults, obstruction by nodular hyperplasia of the prostate gland in men and the development of cystocele in women, cancer of the cervix and nephrolithiasis are important causes.[4]

Xanthogranulomatous pyelonephritis is an uncommon inflammatory condition of kidney which simulates renal cell carcinoma at clinical, gross examination and microscopic level. It is twice as common in women as in men and predominantly affects fifth and seventh decades.[5]

Hydronephrosis is a common indication for nephrectomy and is caused by urine outflow obstruction present at any level of the urinary tract which can be congenital or acquired (calculi, benign prostatic hyperplasia, malignancy, neurogenic).[1]

Multicystic renal dysplasia is the most common form of cystic renal disease in children and the most common cause of abdominal masses in newborns.[4]

Both benign and malignant neoplastic tumours can be seen in kidney: Most of the tumours being are malignant (99%). Renal cell carcinoma being most common in adults and Wilms tumour being most common in children.[4,6] Incidence of renal cell carcinoma is increasing in Asia including India.[7] Most cases are seen in fifth and sixth decade. Male to female ratio is approximately 2:1. Nephrectomy is the mainstay treatment for organ confined renal malignancies. Partial nephrectomy is done in cases of bilateral renal cell carcinoma or renal cell carcinoma involving solitary functioning kidney or localized renal tumours (less than 7cm). It is increasing being performed using robotic techniques.

Nephron sparing surgery or partial nephrectomy is the new emerging modalities in to treatment of selected cases of localized renal cell carcinoma (RCC) by open or laparoscopic approach. While laproscopic techniques have already replaced open nephrectomy in developed nations however open technique is still the main modality for nephrectomy in most centres in India. This is mainly due to lack of resources and trained urologists in peripheral hospital. In our hospital too open nephrectomy is being performed.[8]

This study aims to study the histomorphological features of lesions in nephrectomy specimens in a tertiary care hospital, to analyse the neoplastic and non-neoplastic lesions of kidney according to age, gender, site and observe any variation if any from the conventional pattern.

METHODS

The present study is an observational (Prospective and retrospective) type of study conducted in the department of Pathology, Tertiary Care Hospital in South Gujarat. The ethical committee clearance was obtained at the commencement of the study. Nephrectomy specimens were received in the department over a period of 5 years and 7 months. (1 Jan 2013 to July 31, 2018). The study included a retrospective 4 years and prospective 1 year and 7 months. A total of 73 cases were studied.

Inclusion criteria

- Full/partial nephrectomy specimen received in histopathology department in the tertiary hospital.

Exclusion criteria

- Autolyzed nephrectomy specimen.

For the retrospective period (January 2013 to December 2016), slides and forms of all nephrectomy cases were taken out from the records of the department of histopathology. All Clinically relevant findings were noted and sections were reviewed. Blocks were retrieved when required. In the prospective period (January 2017 to July 2018), all resected nephrectomy specimens received in the department were followed up. Patient particulars were recorded in detail from the Performa sent by the clinician, which included age, sex, signs and symptoms. Findings from radiological investigations like CT scan, Ultrasound and other relevant investigations were also noted. The specimens were fixed in 10% formalin. Gross examination was done meticulously and various sections were given from representative sites following standard protocol. Minimum three sections were given in case of renal malignancies.

The blocks were then processed through increasing concentration of alcohol, cleared by xylene, embedded in paraffin wax and cut at 4 micron thickness on a rotary microtome. Sections from each block were stained conventionally by haematoxylin and Eosin and examined microscopically. Special stains (Periodic Acid Schiff stain and Ziehl Neelsen stain) and immunohistochemistry were utilized wherever required. A final histopathological diagnosis was made after radiological and clinical correlation. Tumours were classified according to WHO 2016 Classification.

RESULTS

Out of 73 specimens received, males constituted 65.73% and females constituted 35.27% of all nephrectomy cases. Male: Female ratio was 1.9:1. Highest percentage of patients undergoing nephrectomy belonged to 40-50 yr

age group (21.9%) followed by 50-60 years age group. The oldest patient was aged 79 Years and youngest patient was aged 1 day old. The right kidney was more commonly affected (57.5%) than left kidney (42.4%). Most common clinical presentation was found to be flank pain seen in 52 cases out of 73 cases followed by difficulty in micturition (20 cases) and hematuria (18 cases). Other presenting complaints included abdominal lump/fullness (11 cases), burning micturition (7 cases), fever (3 cases), vomiting (4 cases) while 3 cases had incidental findings. 45 cases (61.6%) were of non-neoplastic lesions and 28 cases (40.8%) were of neoplastic lesions. Hence non-neoplastic lesions were a more common indication for nephrectomy in the present study. Overall non-neoplastic lesions were more common in males and most common age group affected in non-neoplastic lesions was 40-60 years. Out of 45 cases of non-neoplastic lesions, infective pathology formed a predominant subgroup of 41 cases (91%). The most common non-neoplastic indication of nephrectomy was found to be Chronic Pyelonephritis (including Chronic Pyelonephritis with Hydronephrosis and Chronic Pyelonephritis with end stage renal disease) constituting 80% (36 cases) of cases (Figure 1). Xanthogranulomatous Pyelonephritis was reported in 3 cases (6.67%) and was more common in females (Male: female ratio=1:2). Out of 36 cases of Chronic Pyelonephritis, renal stone was found in 18 cases and ureteric stone 2 cases on basis of clinical history, radiological and gross findings. Traumatic Injury was found in 1 case (2.2%) cases. Multicystic Dysplasia (Figure 2) was the only congenital lesion in our study and constituted 6.67% (3 cases) of non-neoplastic lesions and all cases belonged to 0-19 age group (Table 1 and 2).

Table 1: Histomophological spectrum and sex distribution in non-neoplastic lesions.

Non-neoplastic lesion	Number of cases	Male	Female
1. Congenital • Multicystic dysplastic kidney	3	3	0
2. Traumatic Injury	1	1	0
3. Inflammatory	26		
• Chronic Glomerulonephritis	2	2	0
• Chronic Pyelonephritis(including Chronic Pyelonephritis with hydronephrosis, Chronic Pyelonephritis with end stage renal Disease)	36	23	13
• Xanthogranulomatous pyelonephritis	3	1	2
Total	45	30	15

Table 2: Age distribution in non-neoplastic lesions.

Non-neoplastic lesion	0-19 years	20-39 years	40-59 years	60-79 years
1.Congenital • Multicystic dysplastic kidney	3	0	0	0
2. Traumatic Injury	0	1	0	0
3. Inflammatory				
• Chronic Glomerulonephritis	0	0	1	1
• Chronic Pyelonephritis(including Chronic Pyelonephritis with hydronephrosis, Chronic Pyelonephritis with end stage renal Disease)	7	6	16	10
• Xanthogranulomatous pyelonephritis	0	0	1	2
Total	10	07	17	11

Table 3: Histomorphological spectrum and gender wise distribution of neoplastic lesions.

Name of tumour	Male	Female	Number of cases	Percentage (n=28)
Benign Tumours				
• Angiomyolipoma	0	1	1	3.6%
Malignant Tumours	18	9	27	96.4%
• Renal Cell Carcinoma	16	4	20	71.4%
• Transitional Cell Carcinoma	0	2	2	07.1%
• Leiomyosarcoma	0	1	1	3.6%
• Wilms Tumour	2	2	4	14.3%

Table 4: age wise distribution of neoplastic lesions.

Neoplastic lesion	0-20 years		20-40 Years	40-60 years	60-80 Years
	0-5 years	5-20 years			
Angiomyolipoma	0	0	0	0	01
Renal Cell Carcinoma	0	0	3	11	6
Transitional Cell Carcinoma	0	0	0	00	2
Leiomyosarcoma	0	0	0	1	0
Wilms Tumour	3	1	0	0	0

Figure 1: Gross appearance of chronic pyelonephritis with hydronephrosis.

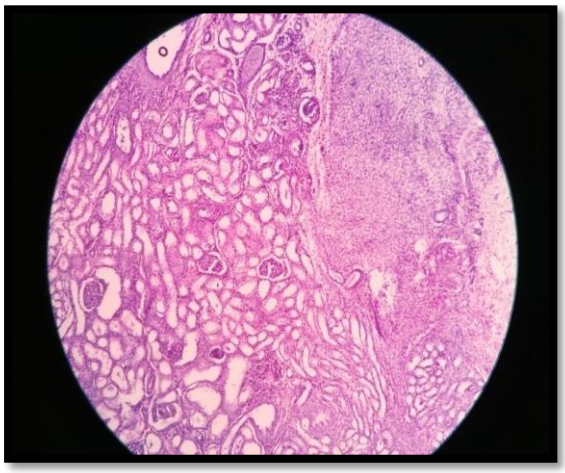

Figure 2: Microscopic appearance of multicystic dysplasia (H and E stain 10x view).

Most of the neoplastic lesions requiring nephrectomy were malignant (96.4%) while only one case (3.6%) was benign. Most common neoplastic lesion in nephrectomy specimen was Renal Cell carcinoma (71.4%) followed by Wilms tumour (14%). Other neoplastic indications in our study were angiomyolipoma which is the only benign renal tumour in our study and transitional cell carcinoma. Rare cases seen were Leiomyosarcoma and Multilocular Renal Cell Carcinoma.

Renal Cell Carcinoma was most commonly seen in the age group 40-60 years and showed male predominance (80% male). Wilms tumour was the most common paediatric renal tumour with 75% cases diagnosed before 5 years of age. It was found equally in both genders (Table 3 and 4). Clear cell carcinoma (75%)

(Figure 3 and 4) was the most common type of renal cell carcinoma followed by papillary cell carcinoma (20%) (Table 5). Fuhrman nuclear grade II was the most common (68%) nuclear grade while grade I was the least common (10%) nuclear grade observed (Table 6).

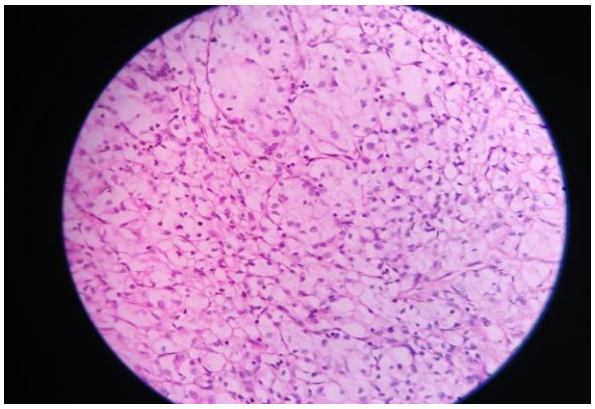

Figure 3: Clear cell renal cell carcinoma fuhrman nuclear grade II (H and E stain 10x view).

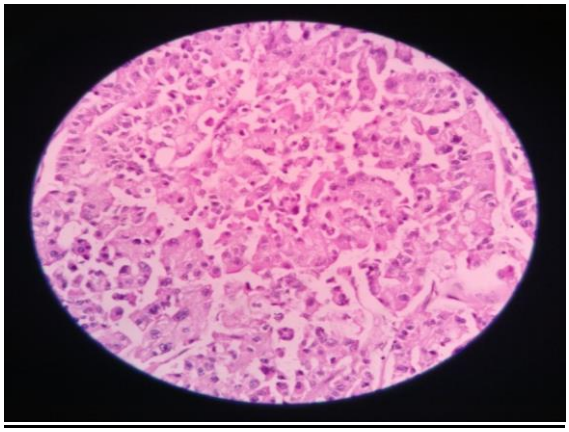

Figure 4: Clear cell renal cell carcinoma fuhrman nuclear grade 4 (H and E stain 10x view).

Table 5: Frequency of histological subtypes of renal cell carcinoma.

Type of renal cell carcinoma	Number of cases	Percentage
Clear cell carcinoma	15	75%
Papillary cell carcinoma	4	20%
Multilocular renal cell carcinoma	1	5%
Total	20	100%

Table 6: Fuhrman nuclear grade of renal cell carcinoma (n=20).

Nuclear grade	Number of cases	Percentage
Grade I	2	10%
Grade II	12	60%
Grade III	4	20%
Grade IV	2	10%
Total	16	100%

DISCUSSION

In the present study of 73 nephrectomy specimen, Male predominance was seen in received nephrectomy specimens with overall Male: Female ratio 1.9:1. This is in concordance with other studies like K Shanmugasamy et al, (Male: Female ratio=2:1), El Malik et al, Fauzia et al, (1.9:1) and Mehra et al, (1.7:1).[2,9-11] Highest percentage of patients undergoing nephrectomy belonged to 40-50 yr age group (21.9%). This is consistent with other studies done by Shaila et al, Vinay et al, Suryavanshi et al, Rafique et al, and Reddy et al.[12-16]

In the present study slight right side predominance (57.4%) was seen among nephrectomy specimen. This was in concordance with studies by Ashima N Amin (51.6%) and Madhu Kumar et al, (58.33%) and Kulkarni et al.[17-19] The most common clinical presentation in patients undergoing nephrectomy was found to be flank pain which is consistent with other studies like Aiman et al, Shanmugasamy et al, Shaila et al, Mehra et al, Rafique et al, and Mehra et al.[2,11,12,15,20] 45 cases (61.6%) had non neoplastic lesions and 28 cases (38.4%) cases had neoplastic lesions. Hence non-neoplastic conditions were a more common indication for nephrectomy in this study. This is in concordance with studies done by Meena et al, datta et al, Ghalayani et al, Divyashree et al, Shanmugasamy et al, Aiffa Aiman et al.[20]

The Present study found Chronic Pyelonephritis including Chronic Pyelonephritis with hydronephrosis and Chronic Pyelonephritis with end stage renal disease as the most common non-neoplastic indication of nephrectomy. Trauma is an uncommon cause of nephrectomy This is consistent with other studies done by Shaila et al, Aiman et al, and Ajay et al.[12,20,24] The incidence of stone(renal and ureteric) was 55% which was much higher as compared to studies done by shanmugasamy.[2]

Non neoplastic lesions requiring nephrectomy were more common were males (2:1). This was consistent with studies done by Shanmugasamy et al, Suryawanshi et al.[2,14] However some cases of Xanthogranulomatous Pyelonephritis showed a slight female preponderance(1:2) which was similar to studies done by Aiman et al, (1:1.6), Sreedhar et al (1:3), Shaila (100% female).[12,20,25]

Malignant tumours (96.4%) compromised most of the renal neoplastic lesions requiring nephrectomy. This is in concordance with studies done by Sujata J et al, Meena et al, Ashima et al, Bashir et al, Fauzia et al, and Mehra et al, (Table 7).[10,11,17,21,26,27]

Table 7: Comparative analysis of distribution of benign and malignant tumours.

Name of study	Benign	Malignant
Present study (n=73)	3.6%	96.4%
Sujata j et al (n=76)	5.8%	94.12%
Meena et al (n=100)	5.8%	94.1%
Ashima et al (n=70)	6.2%	93.8%
Fauzia et al (n=50)	6%	94%
Nusrat bashir et al(n=184)	10%	89.13%
Mehra et al (n=53)	9.4%	90.6%

Renal Cell Carcinoma (71.4% of neoplastic lesions) was the most common neoplastic lesion in the present study followed by Wilms tumour (14%). This is consistent with studies done by Aiffa et al, Meena et al, Bashir et al, Datta et al, and Shaila et al.[8,12,20,21,27] Multilocular Renal Cell Carcinoma and Leiomyosarcoma were the rare types of renal neoplasms in the present study. Clear Cell carcinoma is the most common type of renal cell carcinoma in the present study. This is in concordance with studies done by Bashir et al, Meena et al, Shaila et al, Ashima et al, and Sujata et al.[12,17,21,26,27] A rare case of Multilocular renal cell carcinoma was reported at our centre.

Fuhrman Nuclear Grade 2 is the most common grade reported in renal cell carcinoma in the present study. This is in concordance with studies done by Aiman et al, and Shanmugasamy et al, and Bashir et al.[2,20,27] Most common age group affected in Wilms tumour is 0-5 years (75%). This is consistent with studies done by Aiman et al, Barrantes et al, Bjelke and Ezomike et al.[20,28-30]

CONCLUSION

The present study (prospective and retrospective) provided a fair insight into the morphological pattern of lesions in nephrectomy specimen in our studies. The nephrectomy specimen received in our institute represented a wide variety of histological spectrum.

Frequency in distribution of neoplasms was similar to the reports in literature. The main strength of this study is that it gives a fair insight of the current state of incidence of neoplastic and non-neoplastic lesions of kidney requiring surgical intervention. Renal lithiasis appears to be an important causative factor in Chronic Pyelonephritis.

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.

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