



HISTOMORPHOLOGICAL SPECTRUM OF KIDNEY LESIONS IN 93 NEPHRECTOMY SPECIMENS

Pathology

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ABSTRACT

Background: Renal diseases are an important cause of morbidity worldwide. Nephrectomy is a common surgical procedure done in neoplastic as well as many non-neoplastic conditions affecting the kidney. It is performed in a wide range of clinical conditions that leads to irreversible kidney damage like chronic infections, obstruction, calculus disease, severe traumatic injury, pyelonephritis, nephrosclerosis and renal cell carcinoma. In a developing country like ours chronic pyelonephritis and its variants still continue to be the leading cause of nephrectomies. **Objective :** To determine the frequency of occurrence of different histomorphological kidney lesions observed in Nephrectomy specimens over a period of five years in a tertiary care center. **Methods :** A hospital based five-year study (Jan 2017 to March 2022) that included 93 cases of Nephrectomy specimens received in the Department of Pathology, RIMS was taken into consideration. The gross and the microscopic findings were studied for determining the relative frequency and spectrum of different lesions affecting the kidney. **Results :** Out of 93 nephrectomy specimens, 83 (89.2%) were non neoplastic and 10 (10.8%) were neoplastic cases. Out of the 83 non neoplastic cases 75 (90.3%) were of chronic pyelonephritis and out of the 10 neoplastic cases 8 (80%) were of clear cell RCC and 2 (20%) were papillary urothelial carcinoma (renal pelvis). The neoplastic cases were seen equally in both the genders. The females (67.7%) were more commonly affected than the males (32.3%). The peak age range was between 51-60 (26.9%) years. Right sided (59.1%) lesions were more common than the left side (40.9%). 35 cases (46.7%) were associated with nephrolithiasis. **Conclusions:** Chronic pyelonephritis is the most common non neoplastic lesion affecting the kidney which in its early stage is a treatable cause for which nephrectomy could be prevented. Therefore, a better insight of the various etiologies needs to be further studied which will help in better patient management.

KEYWORDS

Nephrectomy, Chronic pyelonephritis, Renal cell carcinoma, papillary urothelial carcinoma

INTRODUCTION

The human kidneys converts more than 1700 liter of blood per day into about 1 liter of highly concentrated urine. It also excretes the waste products of metabolism, regulates the body's concentration of water, salt, calcium, phosphorus, and other anions and cations, and maintains the appropriate acid balance of plasma. The kidney also serves as an endocrine organ, secreting hormones such as erythropoietin, renin, and prostaglandins and regulating vitamin D metabolism. Therefore, renal diseases are responsible for a great deal of morbidity and mortality.¹

Nephrectomy is one of the commonest surgical procedure done in urology. It is a treatment that provides relief to patients from various chronic and life threatening diseases and in some cases makes way for renal transplant. It can be partial, simple or radical nephrectomy depending on the conditions. Simple nephrectomy is usually indicated for irreversibly damaged kidney from chronic infections, obstruction calculus disease, severe traumatic injury, unilateral parenchymal diseases-nephrosclerosis, pyelonephritis, vesicoureteric reflux, congenital dysplasia etc. Renal cell carcinoma is the most common malignant tumor of kidney and radical nephrectomy is the treatment of choice.^{2,3} According to GLOBOCON 2020, the five year prevalence of renal cell carcinoma among all ages is 2.84/100000.⁴

This study was carried out to know the various indications for nephrectomy specimens, to analyze the neoplastic and non-neoplastic lesions of kidney according to age, gender and site and to study the various histomorphological features.

OBJECTIVES

To determine the frequency of occurrence of different histomorphological kidney lesions observed in Nephrectomy specimens over a period of five years in a tertiary care center.

METHODS

A hospital based cross sectional study was conducted in the department of Pathology, Regional Institute of Medical Sciences, Imphal, Manipur for five years (Jan 2017 to March 2022). All elective nephrectomy cases received in the Pathology department during the study period were included in the study. Emergency nephrectomy for trauma cases were excluded. Relevant demographic and clinical data like age, sex, laterality of the specimen were obtained. All together 93 nephrectomy specimen were received. Detailed gross examination was done, all specimens were fixed in 10% formalin, various sections were given from representative sites following standard protocol. The blocks were then processed through increasing concentration of alcohol, cleared by xylene, embedded in paraffin wax, sections were cut at 3-4 micron thickness on a rotary microtome and stained with Haematoxylin and Eosin (H&E). Special stains such as periodic acid Schiff (PAS), Zeil-Nielsen and immunohistochemistry (IHC) were used wherever required. Microscopic features were studied and lesions were broadly categorized as non-neoplastic and neoplastic. Final histopathological diagnosis was made following standard textbooks and WHO 2016 Classification.⁵ Data were collected, recorded, analyzed and only descriptive statistics were carried out using IBM SPSS statistics version 21 Software. Ethical approval was obtained from the Research Ethics Board, RIMS, Imphal. Informed written consent was taken

before initiation of the study . Data collected were kept secured.

RESULTS

A total of 93 nephrectomy cases were included in the study, female constituted 63 (67.7%) cases and male 30 (32.3%) with male to female ratio of 1: 2.1. The age range was from 9-80 years (Mean $\pm$ SE, 49.75 $\pm$ 14.77) and nephrectomy was most common in the 51-60 (26.9%) age group. Right sided (59.1%) nephrectomy were more common than the left side (40.9%). Non neoplastic lesions 83 (89.2%) were more common than neoplastic cases 10 (10.8%). Out of the 83 non neoplastic cases, chronic pyelonephritis was the most common diagnosis 75 (90.3%), followed by xanthogranulomatous pyelonephritis (XPGN) (7.2%) and multicystic renal dysplasia (Figure 2). Eight (80%) out of the 10 neoplastic cases were clear cell RCC and 2 (20%) were papillary urothelial carcinoma (renal pelvis)(Figure 3,4). Overall neoplastic cases were seen equally in both the genders. And 35 (46.7%) of the chronic pyelonephritis cases were associated with nephrolithiasis. For one of the case of xanthogranulomatous pyelonephritis , IHC for CD 68 was done to rule out clear cell RCC.(Figure 4,5).

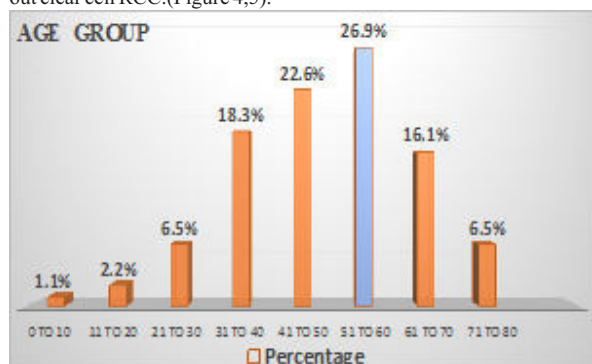


Figure 1: Distribution of cases according to age group

Table 1: Histopathological diagnosis of non-neoplastic lesions.

Non-neoplastic	Frequency	Percentage
Chronic pyelonephritis	75	80.6
Xanthogranulomatous pyelonephritis	6	6.5
Multicystic renal dysplasia	2	2.2
Total	83	100

Table 1: Histopathological diagnosis of neoplastic lesions.

Neoplastic	Frequency	Percentage
Clear cell Renal carcinoma	8	80
Papillary Urothelial Carcinoma	2	20
Total	10	100

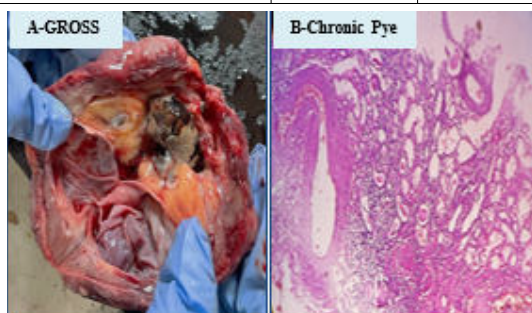


Figure 2- (A) Gross and (B) microscopic of chronic pyelonephritis (H&E stain, 10x).

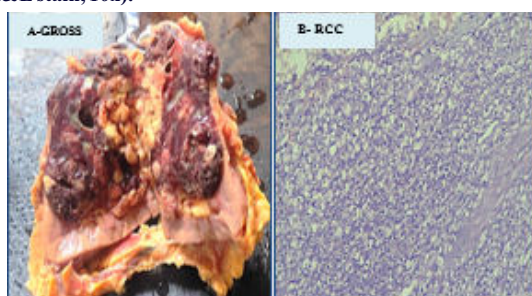


Figure 3. (A)- Gross and (B)- microscopic image showing clear cell renal cell carcinoma (H&E stain, 10x).

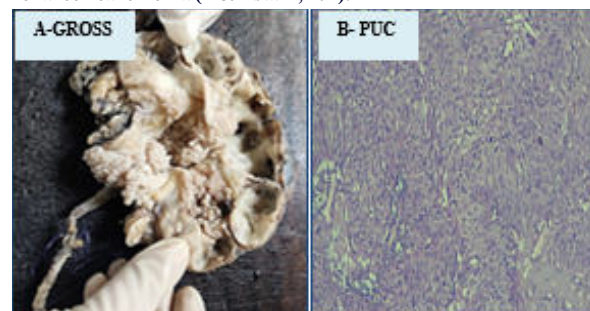


Figure 4. (A)- Gross and (B)- microscopic image showing papillary urothelial carcinoma (PUC)(H&E stain, 10x).

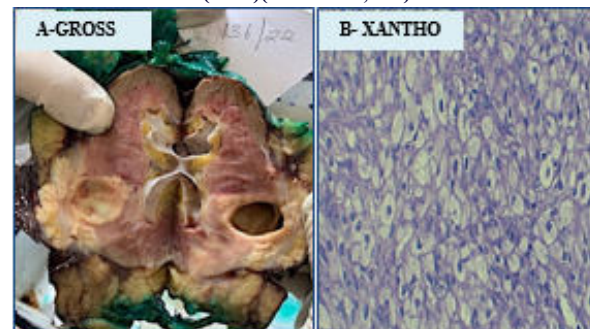


Figure 5- (A)- Gross and (B) microscopy of xanthogranulomatous pyelonephritis (H&E stain, 40x).

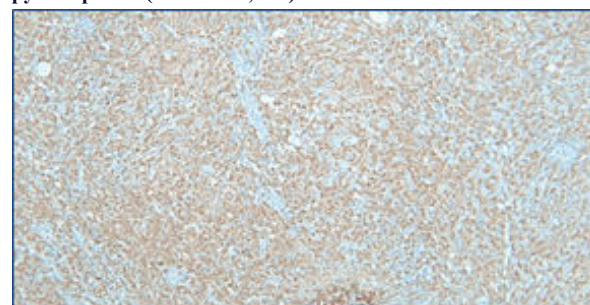


Figure 6- IHC positive for CD 68 in xanthogranulomatous pyelonephritis (IHC stain, 10x).

DISCUSSION

In the present study, 93 nephrectomy specimen were received of which 63 (67.7%) were female cases and 30 (32.3%) male , with male to female ratio of 1: 2.1. This was similar to the observations by Aiman A et al⁶ and Rafique M⁷ both where M:F ratio was 1:1.05. This could be attributed to the anatomical position and length of urethra in female compared to male which predisposes female gender to more urinary tract infection (UTI) , subsequently more pyelonephritis and higher rate of nephrectomy in female. However, El Malik et al⁸ reported 61% nephrectomy specimens in males and 39% in females with M:F = 1.9:1, Suryawanshi et al⁹, Amin et al¹⁰, Bajaj et al¹¹ and Vinay et al¹² also reported male predominance. Age ranged was from 9-80 years with a mean of 49.75 years and nephrectomy was mostly seen in the 51-60 (26.9%) years age group which is in concordance with the observations made by Chandanwale et al¹³ and Ajmera et al¹⁴ where the most common age group was 41-60 years and 51-60 years respectively. In the study by Aiman et al⁶ nephrectomy cases was more common in the younger age group (21-30 years). Right sided nephrectomy (59.1%) was more common than the left side (40.9%) in this study similar to the studies done by Bajaj et al, Kulkarni et al and Kumar et al.^{11,15,16} Non-neoplastic lesions, 83 (89.2%) were the most common cause for nephrectomy in our study of which majority were chronic pyelonephritis, 75 (90.3%). In the study done by Shaila et al¹⁷ and Madhukumar R et al¹⁸ , non-neoplastic lesions were the most common cause for nephrectomy with 77.66% and 72% each. Chronic pyelonephritis was also the most common indication for nephrectomy in other studies.^{6,13,15,17,18} In contrast, malignant lesions were the most common indications in the studies done by Beisland C et al¹⁹ and Badmus TA et al²⁰ with 68% and 57.12% each. There is definitely a

geographic disparity regarding the indications of nephrectomy. In our study, there is a much higher rate of nephrectomy performed for non-neoplastic conditions of the kidney compared to developed country where malignant lesion is the most common cause. This could be due to the less available health care, late diagnosis and treatment for benign treatable conditions in developing countries. Chronic pyelonephritis is a consequence of repeated or untreated acute pyelonephritis. The underlying etiology is typically due to a bacterial infection, most commonly *E. coli* (70–80%) and *Enterococcus faecalis*. Hospital-acquired infections may be due to coliform bacteria and enterococci, as well as other organisms uncommon in the community (e.g., *Pseudomonas aeruginosa* and various species of *Klebsiella*). Other risk factors include structural abnormalities such as congenital abnormalities of the kidney and urinary tract, acquired obstruction (stones, prostatic hypertrophy, lymphadenopathy or retroperitoneal fibrosis, or neurogenic bladder).^{21,22,23}

Thirty five (46.7%) of our chronic pyelonephritis cases were associated with nephrolithiasis similar to the study by Chandanwale et al¹³ where 50% cases were associated. The second most common indication of nephrectomy seen in our study as well as others was renal cell carcinoma.²⁴ Renal Cell Carcinoma (80% of neoplastic lesions) was the most common neoplastic lesion in the present study followed by papillary urothelial carcinoma (20%) which is consistent with studies done by Aiman et al⁶, Suryawanshi et al⁹, Bajaj et al¹¹, Kumar et al¹⁶ and Shaila et al.¹⁷ Popat et al¹⁹ also found that 70% of malignant lesions were accounted for by renal cell carcinomas.

One of our nephrectomy case was given final diagnosis of Xanthogranulomatous pyelonephritis after IHC stain of CD68 to rule out clear cell RCC. This disease has been called as the “great imitator” because the clinical and radiological findings closely resemble other pathological entities such as renal cell carcinoma, other inflammatory and neoplastic renal pathologies such as leiomyosarcoma, malakoplakia and megalocytic interstitial nephritis.²⁵ The preoperative distinction between XPGN and malignant kidney tumors is often difficult. Microscopic pathological examination shows a large number of lipid-laden macrophages (foam cells, xanthoma cells) with extensive areas of inflammation and fibrosis.^{26,27} Misinterpretation of “foam cells”, “xanthoma cells” as “clear cells”, consistent with renal adenocarcinoma, is the most important diagnostic challenge at histology.^{28,29} The xanthomatous cells and macrophages in XGP show positive cytoplasmic staining for lysozyme, diffuse positivity for CD68, and vimentin. Therefore the use of IHC is extremely useful in cases which causes a diagnostic dilemma.³⁰

CONCLUSION

Nephrectomy is the mainstay treatment for various pathological disease processes that leads to permanent damage to kidney. In this study, nephrectomy was mostly seen in the fifth decade of life and right sided nephrectomy was most frequent. We can also conclude from this study and various other similar studies that chronic pyelonephritis is the most common condition leading to nephrectomy and nephrolithiasis being a common etiology especially in a developing country. Since chronic pyelonephritis is a treatable lesion if identified in its early stage, a better insight into the various etiologies needs further study. Therefore, better treatment modalities of inflammatory lesions of kidney will reduce the rate of nephrectomies.

CONFLICT OF INTEREST

There are no conflicts of interest.

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