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Histopathological Spectrum of Nephrectomies; a Single Centre Experience of over 14 Years

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Abstract

Nephrectomy is conducted either as an open or a laparoscopic procedure for a variety of clinical indications. These include both neoplastic and non-neoplastic conditions, such as the non-functioning kidney. In many patients the final diagnosis is established on the histopathology of the retrieved kidney. In this study, retrospective analysis of data of last 14 years was studied pertaining to the number and indications of nephrectomy at the present study centre. Demographic and clinical details were assessed. Gross and microscopic histopathological details were recorded. Diagnosis was established on the basis of clinical features and histopathology. A total of 638 total nephrectomy specimens were received. Of these, 280 cases were of neoplastic and 358 of non-neoplastic lesions, with a male-to-female ratio of 1.21:1. The age range varied widely according to clinical manifestations. The age range in the present study was 5–84 years. Patients operated for non-neoplastic disorders were younger (mean age: 38.1 years) than those operated for neoplastic disorders (mean age: 54.4 years). Clear *renal cell carcinoma* (RCC) was the commonest RCC type (150 patients) followed by papillary RCC (51 cases). Nephrectomy is done due to both benign and malignant clinical indications as observed in this study. The most common indication was chronic pyelonephritis with the non-functioning kidney.

Keywords: Nephrectomy, Pyelonephritis, RCC

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Introduction

Nephrectomy is conducted either as an open or a laparoscopic procedure for a variety of clinical indications. These include both neoplastic and non-neoplastic conditions such as the non-functioning kidneys due to severe hydronephrosis, pyonephrosis, polycystic kidneys, xanthogranulomatous pyelonephritis (XGP) etc. Although nephron sparing surgeries have become common, still a large number of conditions require radical nephrectomy (1–4). Suspected mass lesions on imaging and the non-functioning kidneys using scintigraphy more so in patients with chronic pyelonephritis and its variants with or without nephrolithiasis require nephrectomy. In many of these patients the final diagnosis is established on the histopathology of the retrieved kidney. Indications for nephrectomy also vary with age as does nature of the disease being either benign, infectious or malignant (5–7). Intraoperative and

post-operative complications following nephrectomy are also studied (7). The impact of nephrectomy on renal functions in the long run varies and largely depends on the indications of the procedure and underlying comorbidities (8–10).

Materials and Methods

In this study, retrospective analysis of data of last 14 years was made to look at the number and indications of nephrectomy at the present study centre. Demographic and clinical details were assessed. Gross and microscopic histopathological details were recorded. Grossing was done according to institutional protocol using formalin fixation of specimens. Paraffin-processed 3-µm-thick specimens were sectioned and stained with haematoxylin and eosin (H&E). Diagnosis was established on the basis of clinical features and histopathology. Special stains and immunohistochemistry were employed on case by case basis. Specimens were classified as benign, infectious, malignant or of other pathology. Histological typing of all neoplasms was performed according to the WHO classification and their histological prognostic factors.

Results

A total of 638 total nephrectomy specimens were received. Of these, 280 patients had neoplastic and 358 non-neoplastic lesions, with a male-to-female ratio of 1.21:1. The age range varied widely according to type of the disease.

The age range in the present study was 5–84 years. Patients operated for non-neoplastic disorders were younger (mean age: 38.1 years) than those operated for neoplastic disorders (mean age: 54.4 years). Non-neoplastic lesions constituted 358 cases, with chronic pyelonephritis being the commonest indication of nephrectomy in 318 (88.8%) patients. All these kidneys were enlarged and most had coarse depressed scars. The pelvicalyceal system was dilated and distorted. The microscopy indicated varying degrees of glomerular atrophy and hyalinization, periglomerular fibrosis, tubular atrophy and hyalinization along with interstitial inflammation, fibrosis and thickened blood vessels.

Xanthogranulomatous pyelonephritis was seen in 30 patients; it was diagnosed on the basis of the findings that included yellowish nodular gross foci, and microscopic examination revealed sheets of foamy microphages along with acute and chronic inflammatory cells. There was an associated history of diabetes in all the patients with XGP and females were more commonly affected. Three of the patients in the present study had hydatid kidney disease.

Neoplastic lesions constituted 280 patients. Clear *renal cell carcinoma* (RCC) was the commonest (150 cases) followed by papillary RCC (51 cases), chromophobe (13 cases), collecting duct (7 cases), sarcomatoid (10 cases), medullary (3 cases), leiomyosarcoma (4 cases) and deposits of squamous cell carcinoma (SCC; 2 cases). Benign tumours included in the study were oncocytoma (15 cases) and angiomyolipoma (10 cases). There were 15 cases of Wilms tumour. Considering age, distribution of RCC was wide from 11–80 years with a definite peak in 5th decade (40–49 years).

Nephroblastoma was diagnosed in first and second decade of life. Neoplasms were common on the left side (51.07%) as compared to the right side (48.92%). The tumour size ranged from 2 to 20 cm. The clear cell renal carcinoma was graded from 1 to 4 according to Fuhrman's nuclear grading system. Nuclear Grade 2 was the most common (53.3%) features, followed by nuclear Grade 3 (23.33%) . Capsular invasion was seen in eight, vascular invasion in five, adrenal invasion in one and renal sinus invasion in 10 cases. Figures 1–4 show gross nephrectomy specimens. Figure 5 shows computed tomography (CT) images of RCC, and Figures 6 and 7 show the microscopic appearance of nephrectomy specimens.

Discussion

Nephrectomy is a standard treatment for patients presenting with benign and malignant mass lesions in the kidney. The present study had a total of 638 nephrectomy specimens, out

Figure 1: Gross specimen of Renal Cell Carcinoma.

Figure 2: Gross Specimen of Wilms Tumour.

Figure 3: Gross specimen of sarcomatoid Renal Cell Carcinoma.

Figure 4: Hydatid Kidney.

Figure 5: CT image of Renal cell carcinoma.

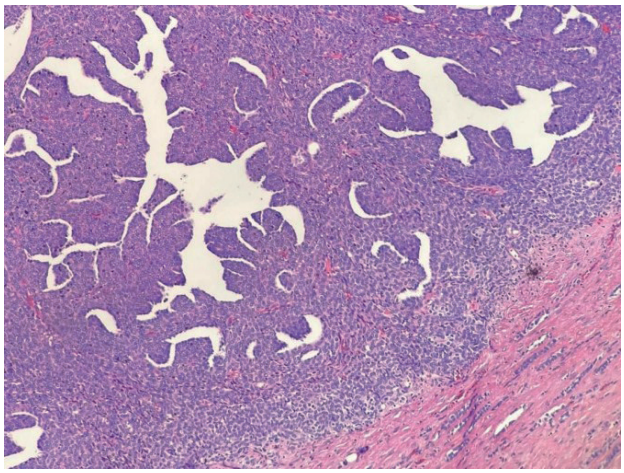

Figure 6: Microscopic picture of Wilm's tumour showing blastemal and mesenchymal components.

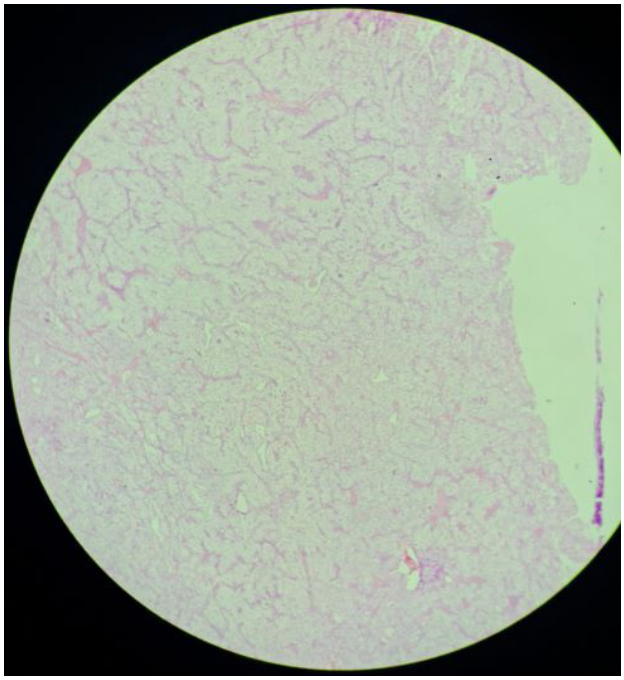

Figure 7: Microscopic picture showing clear cells and increase vascularity in Clear Cell RCC.

of which 280 were benign lesions and 358 were neoplastic. However, in a study conducted by Aiman et al. involving 140 nephrectomy specimens, 77.2% were benign lesions and 22.8% were malignant lesions (11).

In another study conducted by Rafique, benign lesions were 76.6% and malignant were 23.4% (3). The present study had 350 females and 288 males, with a male-to-female ratio of 1:1.21. This ratio was similar to the male-to-female ratio of 1:1.05 observed by Rafique (3).

Most of the patients in the current study presented with pain in the abdomen followed by haematuria. Similar results were observed in a study conducted by Aiman et al., in which most of the patients (92) presented with pain in the abdomen (11). This was followed by haematuria

(30 patients), fever (25 patients) and lump in the abdomen (22 patients). In the present study, the majority of patients who presented with haematuria had malignant lesions. These observations were comparable to those determined in the studies conducted by El Malik et al. (12) and Popat et al. (13). In adults, the most common malignant tumour is RCC, while Wilms tumour is common in children.

In the present study, RCC was the commonest malignant lesion (224 cases) similar to the observations made by Aiman et al. (11) and Rafique et al. (3). Among infectious causes chronic pyelonephritis was the commonest cause examined in 318 patients. Chronic pyelonephritis has been reported as the most common clinical indication in the studies conducted by El Malik et al. (12), Popat et al. (13) and Adamson et al. (14).

The present study had 30 (4.7%) patients of XGP. However, in a study conducted by Aiman et al., 8 (5.7%) patients of XGP were discovered (11), whereas Popat et al. stated just 2 patients (2.5%) of XGP (13). In another observation, the present study had 126 (19.7%) patients of concomitant nephrolithiasis whereas it was discovered in 73 (17.2%) patients in a study conducted by Ghalayini et al. (15).

The present study had 150 patients of clear RCC, which was the commonest malignant lesion among adults, followed by papillary RCC (51 patients). Chromophobe RCC was observed in 13 patients, collecting duct RCC in 7, sarcomatoid in 10, medullary RCC in 3, leiomyosarcoma in 4 and deposits of SCC in (2 patients. This was similar to results of the study conducted by Aiman A et al(11), where the clear

Table 1: Comparison of the present study with other studies.

	Ghalayini et al. (15)	Aiman A et al. (11)	Rafique (3)	Present study
N	423	140	154	638
Male-to-female ratio	1.29:1	0.94:1	1:1.05	1.21:1
Chronic pyelonephritis	117 (27.6%)	88 (62.8%)	43 (27%)	318 (49.8%)
Renal cell carcinoma (RCC)	91 (14%)	25 (17.8%)	36 (23.3%)	216 (35.10%)
Xanthogranulomatous pyelonephritis (XGP)	13 (2.96%)	8 (5.7%)	2 (1.29%)	30 (4.70%)
Pyonephrosis	17 (4.01%)	5 (3.5%)	17 (11.03%)	
Wilms tumour	21 (4.96%)	5 (3.5%)		15 (2.35%)
Trauma	12 (2.8%)	4 (2.8%)		10 (1.56%)
Cystic disease		2 (1.4%)		
Squamous cell carcinoma (SCC)		1 (0.7%)		2 (0.31%)
Angiomyolipoma		1(0.7%)		10(1.56%)
Renal sarcoma		1 (0.7%)		10 (1.56%)
UV junction abnormality	18 (4.25%)		19 (12.35%)	
Renal tuberculosis	9 (2.1%)		9 (5.84%)	5 (0.78%)
Hydatid	4 (0.94%)			3 (0.47%)
Emphysematous pyelonephritis	1 (0.23%)			
Iatrogenic			3 (1.9%)	
Oncocytoma				15 (2.35%)
Leiomyosarcoma				4 (0.62%)
Urothelial tumour	6 (1.41%)			
Other malignancies	7 (1.65%)			

cell type of renal carcinoma was the predominant tumour observed microscopically in 20 (80%) patients.

In the present study, Fuhrman nuclear grading system was used and it was observed that Grade 2 nuclear features were most common (53.3%), followed by nuclear grade 3 in 23.33% cases. In a study conducted by Aiman et al., Fuhrman grading revealed 13 (52%) patients with Grade 2 nuclear features, and 6 (24%) having Grade 3 nuclear features (11). Thus, the majority of patients (76%) demonstrated Grades 2 and 3 nuclear features. This was similar to the findings of Popat et al. (13), who observed that all cases of conventional RCC demonstrated Grades 2 and 3 nuclear features.

Conclusion

Nephrectomy is conducted due to both benign and malignant indications as observed in the present study. The most common indication was chronic pyelonephritis with the non-functioning kidney.

Conflict of interest

The authors declared no potential conflicts of interest with respect to research, authorship and/or publication of this study.

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