

Histopathological audit of nephrectomy specimens from a single center in North India

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Received - 06 July 2020

Initial Review - 18 July 2020

Accepted - 18 August 2020

ABSTRACT

Introduction: Nephrectomy is a common surgical procedure for wide variety of renal diseases, including both benign and malignant conditions. The causes of nephrectomy may vary with different geographical areas and institutions. A thorough histopathological analysis of nephrectomy specimens abets formulation of treatment guidelines specific to the geographic area. **Objective:** The objective of the study was to analyze trends and patterns of renal diseases requiring nephrectomy and to observe variations from the conventional pattern or geographic variation, if any. **Methods:** A hospital-based study was carried out to study and analyze histopathology of 38 nephrectomies done during the period of 2 years (January 2018–December 2019) at Mayo Super Specialty Hospital, Mohali, Punjab. **Results:** Out of 38 nephrectomies, 20 were benign and 18 were malignant. Malignant lesions were more prevalent in older age groups. Chronic pyelonephritis was most common cause of benign lesions. We observed loss of corticomedullary junction and dilatation of pelvicalyceal system in more than 80% of cases. Among malignant conditions, clear cell renal cell carcinoma was the most common histology. The World Health Organization/the International Society of Urological Pathology Grade 1 was the most common among the malignant lesions and only one case of sarcomatoid differentiation (Grade 4) was seen. **Conclusion:** The present study provides a detailed histopathological analysis of nephrectomies done at our institute and gives a reflection of the clinical spectrum in this part of India.

Key words: *Chronic pyelonephritis, Histopathology, Nephrectomy, Renal cell carcinoma*

The pathological spectrum of renal diseases is wide and varies from benign to malignant disorders. Nephrectomy is often needed in extensive involvement of benign diseases and most malignant conditions [1]. Indications of nephrectomy are varied and include irreversible damage by chronic infections, obstructive causes such as calculi and stricture, vesicoureteric reflux, congenital dysplasia, cystic disease, non-corrective renal artery disease, severe traumatic injury, and malignancy [2]. While chronic pyelonephritis with hydronephrosis and obstructive nephropathy leading to non-functioning kidney is the common benign lesion indicated for nephrectomy, renal cell carcinoma (RCC) is the most common indication among the malignant condition [3]. Nephrectomy is of two types – simple and radical nephrectomy. Benign lesions are excised with simple nephrectomy, where only the affected kidney is removed. Whereas radical nephrectomy is used for malignant tumors, wherein removal of entire kidney, ureter, perinephric tissues, lymph nodes and adrenal gland is performed. Nephrectomy is also rapidly being modified to allow partial removal of the kidney and is called as partial nephrectomy. It is indicated for small tumors or tumors involving solitary functioning kidney. Indications of nephrectomy may show geographic variation with different urological causes worldwide. Hence, the present study

was undertaken with an objective to analyze trends and patterns of renal diseases requiring nephrectomy, study the pathological findings and to observe variations from the conventional pattern or geographic variation, if any.

MATERIALS AND METHODS

A retrospective study was conducted at Mayo Super Specialty Hospital, Mohali, Punjab, to analyze and study the nephrectomy specimens. A total of 38 nephrectomy specimens obtained from simple, radical, and partial nephrectomy surgeries performed in the period of 2 years (from January 2018 to December 2019) were included in the study. Tumors of renal pelvis were also included as they required nephrectomy. Core needle biopsy specimens from renal masses were excluded. The specimens were fixed in 10% formal saline and processed into paraffin-embedded sections. All specimens were stained with hematoxylin and eosin, special stains such as periodic acid Schiff, Zeil–Nielson were used wherever required. Patient details such as age, sex, and gross findings were retrieved from the records. Gross morphology and microscopic details were recorded for each patient and the slides were reviewed by pathologists. The final diagnosis was made after correlating with clinical, gross, and microscopic findings. The diseases

were classified as benign and malignant. The benign conditions were further studied for periglomerular fibrosis, tubular atrophy, thyroidization of tubules, interstitial inflammation and fibrosis, necrosis, etc. Malignant conditions were graded according to the World Health Organization/the International Society of Urological Pathology (WHO/ISUP) system and staged according to tumor, node and metastasis (TNM) staging system. All the obtained data were entered into Excel sheet and descriptive statistics were performed.

RESULTS

During the study period, a total of 38 nephrectomies were performed for various conditions. The study cohort consisted of 23 males and 15 females. Most of the patients belonged to fifth and sixth decade of life (Table 1). Four nephrectomies done in patients younger than 30 years for benign reasons. In our study cohort, 20 specimens were non-neoplastic in nature and 18 were neoplastic. Among benign lesions, chronic pyelonephritis (85%) was most common etiology for nephrectomy among which 25% had hydronephrosis and 10% had nephrolithiasis. Other benign lesions such as non-functioning kidney due to tuberculosis (10%) and xanthogranulomatous pyelonephritis (5%) were also observed (Table 2). There was loss of corticomedullary junction and dilatation of pelvicalyceal system in more than 80% of cases. Cortical scarring was seen in 60% of cases. The microscopic findings revealed tubular atrophy and thyroidization of tubules in all cases of pyelonephritis, interstitial fibrosis, and glomerular

sclerosis in 95% of cases. Almost all patients (90%) had mucinous metaplasia, squamous metaplasia and fat necrosis were seen in 1 (5%) specimen each (Fig. 1).

Among the malignant lesions, clear cell RCC was the most common histological type seen in 13/18 (72.2%) cases. Transitional cell carcinoma of renal pelvis was seen in 2 (11.1%) patients, papillary RCC, chromophobic RCC, and sarcomatoid RCC were seen in 1 (5.5%) patient each (Fig. 2). The left-sided renal tumor (72.2%) was more common than the right side. Upper and mid pole of the kidney was more commonly affected than lower pole (58.8%). All patients had unifocal tumors with the tumor size ranging from 3.5 cm to 11 cm. On microscopy, tumor necrosis was absent in all but two cases, margins were negative in all and lymphovascular invasion was seen in three cases. Tumor was limited to the kidney in nine patients, extension to perinephric tissues in five patients, and extension to renal hilum in four patients. Lymph nodes were positive in four patients. Half of patients (50%) belonged to Grade 1 of the WHO/ISUP grading system, followed by Grade 2 in 33.3% of patients, 11.5% had Grade 3 nuclear features, and only 5.5% of patients had sarcomatoid (Grade 4) features. According to the TNM staging, 8 patients (44.4%) were in stage T1bNoMx (Stage I) and

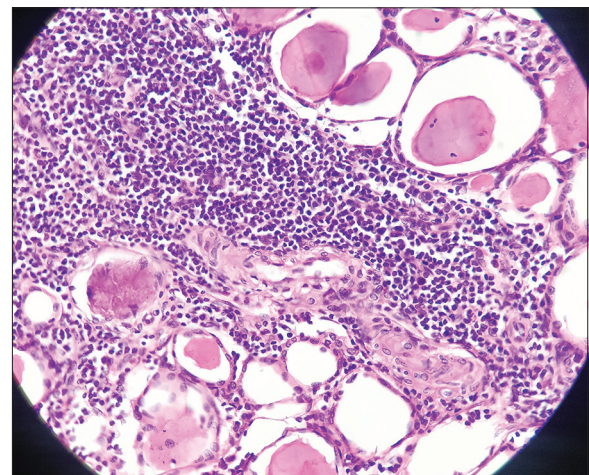


Figure 1: Chronic pyelonephritis. Microphotograph showing thyroidization of tubules (hematoxylin and eosin, ×400)

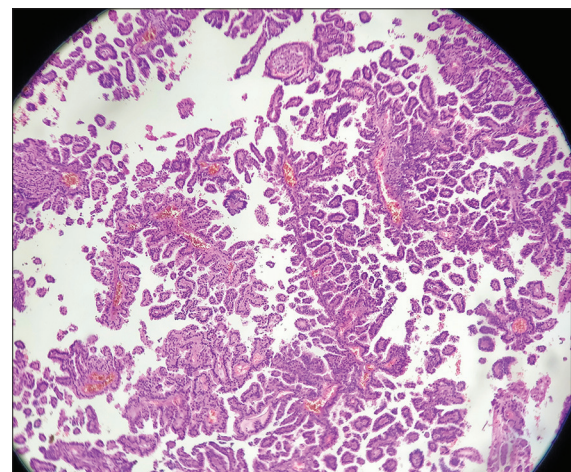


Figure 2: Papillary renal cell carcinoma (hematoxylin and eosin, ×400)

Table 1: Age distribution of patients

Age	No. of cases (%)
0–20	1 (2.6)
21–30	4 (10.5)
31–40	6 (15.7)
41–50	5 (13.1)
51–60	7 (18.4)
61–70	9 (23.6)
71–80	6 (15.7)
Total	38 (100)

Table 2: Histopathological spectrum of nephrectomy specimens

Non-neoplastic		Neoplastic	
Acute on chronic CPN	5 (25%)	Clear cell RCC	13 (72.2%)
CPN	5 (25%)	Papillary RCC	1 (5.5%)
CPN with hydronephrosis	5 (25%)	Chromophobic RCC	1 (5.5%)
CPN with nephrolithiasis	2 (10%)	Sarcomatoid RCC	1 (5.5%)
Non-functioning kidney with tuberculosis	2 (10%)	Transitional cell renal pelvis	2 (11.1%)
Xanthogranulomatous CPN	1 (5%)		
Total	20	Total	18

RCC: Renal cell carcinoma, CPN: Chronic pyelonephritis

5 patients (27.7%) were in stage T3aNoMx (Stage III). Only one patient belonged to Stage IV (Table 3).

DISCUSSION

Nephrectomy is the standard procedure for irreversible benign and malignant conditions affecting the kidneys. Mayo hospital is a Super Specialty hospital in Mohali, Punjab, which is also a referral center with patients coming from nearby states such as Himachal Pradesh, Haryana, and Jammu and Kashmir. Therefore, this study is a reflection of the clinical spectrum of nephrectomies performed in North India. In our study, out of 38 nephrectomies, 20 (52.6%) specimens were benign and 18 (47.3%) specimens were malignant, suggesting higher frequency of benign conditions which require nephrectomy. The findings are in concordance with majority of Indian studies [4-6]. On the contrary, Narang *et al.* and Swarnlata *et al.*, in their studies, have reported higher incidence of malignant lesions around 52.9% and 58.46%, respectively [1,7]. This may be due to expertise of the institute in oncology services or geographical variation. Age-wise, malignant conditions showed higher preponderance in the fifth and sixth decade of life. There was no childhood tumor in our study. Whereas nephrectomies for benign conditions showed no age predilection and 4 cases were younger than 30 years of age. A higher male-to-female ratio was observed in neoplastic as well non-neoplastic conditions which was similar to that seen by Shaila *et al.* and Aiman *et al.* [6,8].

Chronic pyelonephritis is the most common indication for nephrectomy as seen in majority of studies [6,9]. Similarly, in our study, most common indication for nephrectomy was chronic pyelonephritis followed by RCC. Chronic pyelonephritis is continuing pyogenic infection of the kidney that occurs exclusively in patients with major anatomic abnormalities. Most common cause is obstructive uropathy due to stricture or calculi, which leads to reflux of the infected urine into the renal pelvis. Calcium oxalate stones are the most common renal calculi seen which occurs due to consumption of hard water and supersaturation of calcium oxalate in the urine [10]. In our study, renal stones were present in two cases and two patients

had underlying disseminated tuberculosis. Pathologically, atrophy, calyceal deformity, parenchymal scarring, loss of corticomedullary junction, and dilatation of pelvicalyceal system were observed. The findings were in accordance with the previous studies. [11]. We found that xanthogranulomatous pyelonephritis is an unusual variant of chronic pyelonephritis in middle-aged women. It represents an abnormal inflammatory response to infection, is characterized by giant cells, lipid-laden macrophages, and cholesterol clefts which accounts for its yellow color [6].

The second most common indication of nephrectomy seen in our study as well as others is RCC [5,9]. RCC is a group of malignancies arising from the epithelium of renal tubules and comprises 90% of all renal malignancies, normally seen in the fifth decade of life [12,13]. In our study, majority (58.8%) of tumors affected the upper and mid pole of kidney which was similar to findings by Popat *et al.* who observed 57% tumors involving upper pole of kidney. According to literature, clear cell variant accounts for 80–90% of all RCC. Other less common types are papillary, chromophobic, and Bellini duct tumors [2,6,8,14]. Similarly, clear cell type of RCC was the predominant histological variant in our study. We also had one case each of chromophobic, papillary, and sarcomatoid variants. In our study, 55.5% had localized disease and four patients 23% had regional disease which is in near approximation to the previous studies. Urothelial carcinoma of the upper urinary tract accounts for 7% of all kidney tumors and 5% of all urothelial malignancies [15]. Renal pelvis tumors are found 2–3 times more commonly in men than women and the peak incidence is in the fifth and sixth decades of life and tends to be multifocal. We also observed two cases of transitional cell carcinoma of renal pelvis, one patient had multifocal tumor in the renal pelvis and bladder.

Tumor stage and nuclear grade remain the prognostic markers of RCC. Fuhrman developed a four-tier grading system based on nuclear and nucleolar size, shape, and content [16]. Higher nuclear grade is associated with increased incidence of advanced tumor stage, regional, and distant metastasis [17]. However, due to inconsistency in applying four grades uniformly, a new grading system was proposed by the WHO/ISUP [18,19]. In our study, 50% of patients had Grade 1 tumor having absent or inconspicuous nucleoli which was basophilic at $\times 400$, and 6 cases had Grade 2 features, that is, nucleoli conspicuous and eosinophilic at $\times 400$, visible but not prominent at $100\times$. One patient had Grade 4 features showing extreme nuclear pleomorphism and/or multinuclear giant cells and/or rhabdoid and/or sarcomatoid differentiation. Higher grade of tumor is associated with poor prognosis. Our study was a retrospective study with limited sample size having no correlation with the clinical outcome of the patients in terms of prognosis, treatment strategies, and survival. The detailed histopathological analysis of nephrectomies performed in our study, can help in accurate diagnosis, defining proper treatment, and bringing us at par with the other centers in India.

CONCLUSION

The present study provides a detailed histopathological examination of the nephrectomy specimens done in our institution

Table 3: The World Health Organization/the International Society of Urological Pathology grading and TNM staging of renal cell carcinoma

Grading and staging of tumor	Grade	Number of cases (%)
World Health Organization/the International Society of Urological Pathology grading	G1	9 (50)
	G2	6 (33.3)
	G3	2 (11.1)
	G4	1 (5.5)
	Total	18 (100)
TNM staging	T1aN0	2 (11.1)
	T1bN0	8 (44.4)
	T2aN0	2 (11.1)
	T3aN1	5 (27.7)
	T4N1	1 (5.5)
	Total	18 (100)

and reflects the spectrum of lesions in patients of North India, in comparison with studies in different parts of India and worldwide. Nephrectomy is the standard procedure for varied benign and malignant conditions of kidney. Among the benign conditions, chronic pyelonephritis is the most common cause and RCC is the most common malignant cause of nephrectomy. A detailed histopathological examination of nephrectomy specimens is necessary for establishing accurate diagnosis and implementing proper treatment.

REFERENCES

1. Narang V, Garg B, Walia A, *et al.* Histomorphological spectrum of nephrectomy specimens-a tertiary care centre experience. *Natl J Lab Med* 2016;5:51-4.
2. Padmanabhan A, Sachdeva P, Gadgil NM. Clinico-pathological study of adult renal tumours. *Indian J Pathol Oncol* 2016;3:202-11.
3. Ngairangnam S, Konjengbam R. Histopathological spectrum of non-neoplastic and neoplastic lesions in nephrectomy specimens. *J Evid Based Med Healthc* 2016;3:627-9.
4. Ghalayini IF. Pathological spectrum of nephrectomies in a general hospital. *Asian J Surg* 2002;25:163-9.
5. Rafique N. Nephrectomy: Indications, complications and mortality in 154 consecutive patients. *J Pak Med Assoc* 2007;57:308-11.
6. Aiman A, Singh K, Yasir M. Histopathological spectrum of lesions in nephrectomy specimens: A five-year experience in a tertiary care hospital. *J Sci Soc* 2013;40:148-54.
7. Ajmera S, Ajmera R. Histopathological spectrum of lesions in nephrectomies-a five year study. *Int J Sci Res* 2017;6:44-6.
8. Shaila S, Nityananda BS, Arasi T. Spectrum of lesions in nephrectomy specimens in tertiary care hospital. *J Evol Med Dent Sci* 2015;4:12714-27.
9. Popat VC, Kumar MP, Udani D, *et al.* A study on culprit factors ultimately demanding nephrectomy. *Internet J Urol* 2010;7:1-8.
10. Kathirvelu S, Rajvaithy A, Venkatraman K. Histopathological spectrum of nephrectomy specimen in a tertiary care centre: With an emphasis on chronic pyelonephritis. *Ann Pathol Lab Med* 2017;4:A573-8.
11. Datta B, Moitra T, Chaudhury DN, *et al.* Analysis of 88 nephrectomies in a rural tertiary care center of India. *Saudi J Kidney Dis Transpl* 2012;23:409-13.
12. World Health Organization Classification of Tumours. Pathology and Genetics of Tumours of the Urinary System and Male Genital Organs. Lyon, France: IARC Press; 2014.
13. Suryawanshi KH, Damle RP, Dravid NV, *et al.* Histomorphological analysis of lesions in nephrectomy specimens: A 4 years study in a rural hospital in India-our experience. *Ann Pathol Lab Med* 2017;4:230-5.
14. Lipworth L, Morgans AK, Edwards TL, *et al.* Renal cell cancer histological subtype distribution differs by race and sex. *BJU Int* 2016;117:260-5.
15. Reitelman C, Sawczuk IS, Olsson CA, *et al.* Prognostic variables in patients with transitional cell carcinoma of the renal pelvis and proximal ureter. *J Urol* 1987;138:1144-5.
16. Fuhrman SA, Lasky LC, Limas C. Prognostic significance of morphologic parameters in renal cell carcinoma. *Am J Surg Pathol* 1982;6:655-63.
17. Bretheau D, Lechevallier E, de Fromont M, *et al.* Prognostic value of nuclear grade of renal cell carcinoma. *Cancer* 1995;76:2543-9.
18. International Agency for Research on Cancer. WHO Classification of Tumours of the Urinary System and Male Genital Organs (IARC WHO Classification of Tumours). 4th ed. Lyon: WHO, IARC Press; 2016.
19. Delahunt B, Chevilly JC, Martignoni G, *et al.* The international society of urological pathology (ISUP) grading system for renal cell carcinoma and other prognostic parameters. *Am J Surg Pathol* 2013;37:1490-1504.

Funding: None; Conflicts of Interest: None Stated.

How to cite this article: Bansal M, Jindal A, Gupta S. Histopathological audit of nephrectomy specimens from a single center in North India. *East J Med Sci.* 2020;5(3):57-60.

Doi: 10.32677/EJMS.2020.v05.i03.003