

Spectrum of Diseases in Nephrectomy Specimens

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Abstract: The first successful nephrectomy was performed by the German surgeon Gustav Simon on August 2, 1869 in Heidelberg. There are various indications for this procedure, such as renal cell carcinoma, a non-functioning kidney (which may cause high blood pressure) and a congenitally small kidney. Study period was between June 2014 and March 2018. Total nephrectomies done during this period were 146. Nephrectomies constituted 0.94 % of all the specimens received. Among them 94 were males and 52 were females constituting 64.4 % males and 35.6 % females respectively. In this study, among the 146 nephrectomies, majority was non-neoplastic lesions (114 cases) and 32 cases were neoplastic lesions. Among the 19 cases of renal cell carcinoma, majority cases were of clear cell pattern (8 cases), clear cell with papillary pattern, clear cells with anaplastic areas, chromophil type and chromophobe type, renal cell carcinoma –sarcomatoid variant. Occurrence of various pathological conditions such as infective, inflammatory and neoplastic lesions is common and incidental. Early diagnosis and treatment of the infective and inflammatory conditions will save the kidneys. In case of neoplastic lesions early identification of clinical features and proper usage of various diagnostic modalities will limit the Nephrectomies.

Keywords: Nephrectomy, Renal Cell Carcinoma, Pyelonephritis, Wilm’s Tumor, Congenital metaplastic nephroma, Hypoplastic kidney.

INTRODUCTION

Kidneys are essential for not only excretory function but also have additional functions such as maintaining water and salt metabolism along with acid base equilibrium, maintaining the blood pressure through renin-angiotensin mechanism and they also produce erythropoietin required for hematopoiesis. Various pathological processes damage kidneys and the damage range from mild to severe. Some of the kidney diseases or disorders require medical and some need surgical excision of the kidney (Nephrectomy). Nephrectomy is a relatively common procedure in surgical practice. Simple nephrectomy is indicated for patients with irreversibly damaged kidney resulting from symptomatic chronic infections, obstruction, calculous disease or severe traumatic injury. Nephrectomy is also done for treatment of renovascular hypertension, in severe parenchymal damage resulting from nephrosclerosis, pyelonephritis, vesicouretric reflux and congenital dysplasia. Nephrectomy is done for both benign and malignant lesions of the kidney. Simple nephrectomy is done for benign lesions and radical nephrectomy is done for malignant lesions. Under the benign category, nonfunctioning kidney is the most common reason for which

nephrectomy is done followed by hydronephrosis. Under malignant tumors, renal cell carcinoma in adults and Wilms tumor in children are most commonly encountered in the nephrectomy specimens [1].

AIM OF THE STUDY

To study the spectrum of diseases in the nephrectomy specimens

MATERIALS AND METHODS

This retrospective cum prospective study was done in department of pathology in collaboration with the department of urology, general surgery and pediatric surgery. Study period was between June 2014 and March 2018. Total Nephrectomies done during this period were 146. After the surgery, specimen was sent in a closed jar containing 10% buffered formalin along with the properly filled requisition form with the clinical details to the department of pathology for processing and reporting. The received sample was left for fixation over night and next day gross examination was done and the representative areas were selected and tissue was taken for processing. These tissues were put into processing capsules and loaded into automated tissue processing machine. Next day there processed

tissues were removed and made into blocks for section cutting and staining. Staining was done by Haematoxylin and Eosin stains. Each case and tissue bit was analyzed with respect to age, clinical presentation and clinical diagnosis. Special stains were used wherever required and final histopathological diagnosis was released.

RESULTS

During this study period total specimens received in the department of pathology were 15497

and among these 146 specimens were of excised kidneys (Nephrectomies). Nephrectomies constituted 0.94 % of all the specimens received. Among them 94 were males and 52 were females constituting 64.4 % males and 35.6 % females respectively. Male to female ratio 1.8:1. Youngest patient in this study was 10 days and the oldest 76 years. In this study, highest number of cases was noted in the age group 36 to 45 years and lowest in the pediatric age group below 5 years.

Table-1: Age and Gender Distribution of the Cases

AGE (Years)	< 5	6 to15	16 to 25	26 to 35	36 to 45	46 to 55	56 to 65	> 66	TOTAL (%)
MALE	03	09	12	11	23	14	12	10	94 (64.4)
FEMALE	02	05	07	08	11	07	06	06	52 (35.6)
TOTAL	05	14	19	19	34	21	18	16	146
PERCENTAGE	3.4	9.6	13	13	23.3	14.4	12.3	11	100

In this study, among the 146 nephrectomies, majority was non-neoplastic lesions (114 cases) and 32

cases were neoplastic lesions. Lesions are tabulated in Table-2.

Table-2: Various Lesions Leading To Nephrectomies

LESION	TOTAL CASES
Chronic Pyelonephritis	66
Tuberculous pyelonephritis	18
Xanthogranulomatous pyelonephritis	05
Traumatic rupture of the kidney	04
Hypoplastic kidney	03
Adult Polycystic Kidney disease	05
Multisystem nephroma	02
Oncocytoma	03
Renal cell Carcinoma	19
Congenital metablatic nephroma	02
Wilm’s tumor	09
Clear cell sarcoma	04
Transitional cell carcinoma	06
TOTAL	146

In this study, most common clinical presentation was loin pain in 70 % of the cases, followed by Hematuria in 14 % cases, fever in 14 % cases and other non specific complaints in 2 % cases. All pediatric cases presented with abdomen mass and fullness.

In this study, 87 kidneys removed were right sided and 59 were left sided one. Out of the 66 chronic pyelonephritis cases, 48 cases were calculus pyelonephritis which showed gross enlargement in size with dilated pelvi-calyceal system and thinned out cortex. Renal cell carcinoma was most common among the neoplastic conditions encountered followed by Wilm’s tumor, transitional cell carcinoma, clear cell sarcoma and congenital metablatic nephroma.

Among the 19 cases of renal cell carcinoma, majority cases were of clear cell pattern (8 cases), clear cell with papillary pattern, clear cells with anaplastic

areas, chromophil type and chromophobe type, renal cell carcinoma –sarcomatoid variant (Table-3).

DISCUSSION

Total 146 nephrectomies were included in this study, majorities were non-neoplastic lesions (114 cases) and 32 cases were neoplastic lesions. Among the non-neoplastic lesions most common pathological entity was chronic pyelonephritis followed by tuberculous nephritis and among the neoplastic lesion; it was renal cell carcinoma (RCC).

Pyelonephritis is inflammation of the kidney, typically due to a bacterial infection [2]. Symptoms of pyelonephritis include fever and flank tenderness and other symptoms like nausea, burning with urination, and frequent urination [3]. Complications may include pus around the kidney, sepsis, or kidney failure [2].

Table-3: Histological Subtypes of Renal Cell Carcinoma

TYPE	No. of Cases	Percentage
Clear Cell variant	12	63 %
Clear cell variant with papillary pattern	02	10.5 %
Clear Cell variant with anaplastic areas	02	10.5 %
Chromophil type	01	5.35 %
Chromophobe type	01	5.35%
Renal cell carcinoma- sarcomatoid variant	01	5.35 %
TOTAL	19	100

Pyelonephritis is typically due to bacteria- *Escherichia coli*. Predisposing factors include metabolic disorders such as diabetes, congenital anomalies of the urinary tract, poor personal hygiene and spermicidal use [2, 3]. The spread of infection is upwards through the epithelial lining and lymphatics and less commonly by hematogenous route [3]. Less often infection occurs through the bloodstream. Diagnosis is typically based on symptoms, clinical features and supported by urinalysis [3]. If there is no improvement with treatment, medical imaging may be recommended [3]. Pyelonephritis usually responds to treatment with antibiotics, such as ciprofloxacin or cephalosporins like ceftriaxone [4, 5]. Those with severe disease may require treatment in hospital [3]. In those with anomalies of the urinary tract or kidney stones, corrective surgeries may be required [2].

Pyelonephritis is not uncommon. About 1 to 2 per 1,000 women are affected a year and just under 0.5 per 1,000 males [6]. Young females are most often affected as the urethral length is short when compared to men, followed by the very young and older individuals. With treatment, outcomes are generally good in young adults. Among people over the age of 65 the risk of death is about 40%.

Acute pyelonephritis is an exudative purulent localized inflammation of the renal pelvis of the kidney. Due to the bacterial proliferation and by the action of the enzymes released by both bacterial and immune system of the body leads to the formation of abscess consisting of purulent exudate (pus): neutrophils, fibrin, cell debris and central bacterial colonies. Tubules are damaged by exudate and may contain neutrophilic casts. In the initial stages of infection, the glomerulus and vessels are normal. Later as the disease process progresses gross pathology often reveals pathognomonic radiations of bleeding and suppuration through the renal pelvis to the renal cortex. Chronic pyelonephritis is recurrent pyelonephritis occurring frequently and can result in permanent scarring of the renal parenchyma and decreased physiological function of the kidney, especially in the setting of obstruction. A peri-nephric abscess (infection around the kidney) and/or pyonephrosis occur due to the spread of infection along the epithelial lining, vascular and lymphatic channels which usually develops in severe cases of pyelonephritis [7].

Xanthogranulomatous pyelonephritis is an peculiar form of chronic pyelonephritis characterized by granulomatous abscess formation, severe kidney impairment/damage, and gives a clinical picture which nearly resemble renal cell carcinoma and other inflammatory kidney parenchyma diseases. Bacterial cultures of kidney tissue are almost always positive [8]. Microscopically; there are granulomas and lipid-laden macrophages. It is found in roughly 20% of specimens from surgically managed cases of pyelonephritis [9].

In people suspected of having pyelonephritis, a urine culture and antibiotic sensitivity test is performed, so therapy can eventually be tailored on the basis of the infecting organism. Treatment of xanthogranulomatous pyelonephritis involves antibiotics as well as surgery. Removal of the kidney is the best surgical treatment in the overwhelming majority of cases, although polar resection (partial nephrectomy) has been effective for some people with localized disease [9, 10].

Renal cell carcinoma (RCC) is a kidney malignancy that originates in the epithelial lining of the proximal convoluted tubule (PCT), and sometimes from the other tubular structure of the kidney. RCC is the most common type of kidney cancer in adults, responsible for approximately 90–95% of cases [11]. Initial treatment is most commonly either partial or complete removal of the affected kidney(s) [12]. Where the cancer has not metastasized (spread to other organs) or burrowed deeper into the tissues of the kidney, the five-year survival rate is 65–90%, but this is lowered considerably when the cancer has spread [13].

The body is remarkably good at hiding the symptoms and as a result people with RCC often have advanced disease by the time it is discovered [14]. The initial symptoms of RCC often include blood in the urine (occurring in 40% of affected persons at the time they first seek medical attention), flank pain (40%), a mass in the abdomen or flank (25%), weight loss (33%), fever (20%), high blood pressure (20%), night sweats and generally feeling unwell. When renal cell carcinoma metastasizes, it spreads to the lymph nodes, lungs, liver, adrenal glands, brain or bones via the hematogenous route [15]. Immunotherapy and targeted therapy have improved the outlook for metastatic RCC [16, 17].

RCC is also associated with a number of paraneoplastic syndromes (PNS) which are conditions caused by either the hormones produced by the tumour or by the body's attack on the tumour and are present in about 20% of those with RCC. These syndromes most commonly affect tissues which have not been invaded by the cancer. The most common PNSs seen in people with RCC are: high blood calcium

levels, high red blood cell count, high platelet count and secondary amyloidosis [15].

In our study, among the 146 nephrectomies, majorities were benign lesions (70.5 %) and 43 cases (29.5 %) were malignant lesions. This study is in correlation with the other studies as tabulated in the table 4 below.

Table-4: Comparative Studies of Benign and Malignant Lesions

Study	Benign	Malignant
Ghalayini <i>et al.</i> , [18]	70.44	29.56
Rafique [19]	76.60	23.40
Aiffa Aiman <i>et al.</i> , [20]	77.20	22.80
Shaila <i>et al.</i> , [21]	81.13	18.87
Present Study	70.50	29.50

Total 146 nephrectomies were included in this study, majorities were non-neoplastic lesions (114 cases-78%) and 32 (22 %) cases were neoplastic lesions. This observation is in near correlation with the study conducted by Divyasree B. N. *et al.*, where non-neoplastic were 72.41% & neoplastic were 27.59% cases [22].

In this study, most common clinical presentation was loin pain in 70 % of the cases, followed by Hematuria in 14 % cases, fever in 14 % cases and other non specific complaints in 2 % cases. All pediatric cases presented with abdomen mass and fullness. This observation is more or less comparable with study conducted by Aiffa Aimann et al and Shaila *et al.*, [20, 21].

In this study, 87 kidneys (59.5 %) removed were right sided and 59 (40.5%) were left sided one which is in correlation with the study done by Shaila *et al.*, [21].

In this study, most common type of renal cell carcinoma was clear cell type followed by other variants, this incidence is in correlation with the studies conducted by Shifa *et al.*, Shaila *et al.*, and Bharti Devi *et al.*, [21, 23, 24]. The other malignant neoplasms we came across were congenital metablasic nephroma, Wilm's tumor, Clear cell sarcoma, Transitional cell carcinoma and oncocytoma.

CONCLUSION

Occurrence of various pathological conditions such as infective, inflammatory and neoplastic lesions is common and incidental. Early diagnosis and treatment of the infective and inflammatory conditions will save the kidneys. In case of neoplastic lesions early identification of clinical features and proper usage of various diagnostic modalities will limit the Nephrectomies. In our study Chronic pyelonephritis was the most common cause for Nephrectomies under

the non-neoplastic group and renal cell carcinoma under the neoplastic group.

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