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HISTOPATHOLOGICAL SPECTRUM OF RENAL TUMORS IN NEPHRECTOMY SPECIMENS

Pathology

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ABSTRACT

Background- Kidneys are the vital organs of the human body performing various functions. Kidneys are involved in various benign and malignant pathological processes, most of which require nephrectomy **Objectives-** To study the Histopathological spectrum of various renal tumors in nephrectomy specimens **Material And Methods-** This was a prospective study done for a period of 3 years from April 2018 to March 2021 at Upgraded Department of Pathology in Osmania General Hospital **Results** Total of 30 Nephrectomy cases were studied. The mean age of presentation was 48 years, with a Male: Female ratio-1.7:1. Amongst the 30 cases studied 19 (63%) were Males and11(37%) were Females. The most common clinical presentation was flank pain in 50% of cases followed by flank pain with hematuria and mass per abdomen. Of the 30 cases , 22 (73.3%) were Malignant and 8(26.6%) were Benign. RCC formed the main bulk of malignant lesions constituting 20/22 (91%) cases, Among the Benign tumors there were 3/8(37.5%) cases of Renal Adenoma,2/8(25%) cases of Renal Oncocytoma and 3/8(37.5%) cases of Angiomyolipoma **Conclusion:** Malignant tumors were most common than the Benign tumors, with renal cell carcinoma being the most common tumor ,with clear cell RCC being the most common subtype of RCC and these findings were similar to other studies in the literature

KEYWORDS

Nephrectomy, Renal Cell Carcinoma, Histopathology

INTRODUCTION

Renal diseases are one of the important causes of morbidity worldwide. Renal tumors encompass a wide spectrum of Benign and Malignant entities both in adults and in children. RCC constitutes 85% of renal cancers in adults[1] These neoplasms can arise from the different components of the renal parenchyma like the tubular epithelium, interstitial tissue or from the primitive elements. Proper typing of renal tumors is not possible before surgery and Histopathological examination.

Nephrectomy stands out to be the main stay treatment for various neoplastic lesions. Simple nephrectomy is done to remove the irreversibly damaged, nonfunctioning kidneys involved by different benign pathological conditions. Radical nephrectomy is indicated to treat various malignant neoplastic conditions of the kidney[2,3,4]. Nephron sparing surgery is favoured for small, organ-confined tumors. Newer techniques, like cryoablation and radiofrequency ablation are minimally invasive, and have shown good results and the follow-up is still short[5].

There is also some amount of geographical variation in indications of nephrectomy, as certain urological diseases are more prevalent in some countries[6]

MATERIALAND METHODS

This is a prospective study conducted between the period April 2018-March 2021 at Upgraded department of Pathology, Osmania General Hospital, Koti, Hyderabad. This study included a total of 30 nephrectomy specimens from 30 adult patients.

Inclusion criteria:

Nephrectomies either total radical or partial, done for both benign and malignant tumours in adults above the age of 18 years.

Exclusion criteria:

Nephrectomies done for non-neoplastic conditions, needle biopsies for tumours .Important clinical findings like presenting features radiological findings were noted. The specimens were examined in detailed grossly. Adequate 3-4 mm sections were taken for microscopic examination as per the standard protocol. Tissues were formalin fixed and paraffin processed. Later a 3-4um thick sections were cut and stained by Hematoxylin and Eosin stains.

A detailed histological examination was done and lesions were broadly classified into Benign and Malignant neoplastic lesions. Tumor subtyping was done according to the WHO2016 classification and ISUP NUCLEAR grading was used and the histopathological features were correlated with the clinical features and the data was analysed

RESULTS:

In the present study 30 nephrectomy specimens were analyzed. Mean age of the patients was 47.5 years (range 24-78 years) as shown in (Table 1) (chart 1) 19 patients (63%)were males and 11(37%) were females.The Male:Female ratio was 1.7:1 Of the 30 renal tumors 16 (53%) involved the left kidney and 14(47%) involved the right kidney . The most common clinical presentation was flank pain in 50%of the cases followed by pain with hematuria20% in and mass per abdomen with flank pain and hematuria in 20% of cases. and as an incidental finding in 3 (10%)cases which were 2 Benign and one low grade Malignant tumor.

Of the 30 cases, 22 (73.3%) were Malignant and 8 cases (26.6%)were Benign as shown in(Table 2 and 3) .RCC formed the main bulk of Malignant lesions constituting 20/22 cases (91%). Of these 20 RCC, 17/20(85%) were Clear/Conventional type of Renal cell carcinoma,2/20(10%) were Chromophobe RCC and 1/20(5%) Papillary RCC. Other Malignant tumors were 1/22(4.5%) Squamous cell carcinoma and 1/22 (4.5%)Transisitonal cell carcinoma(Table 4). Among the Benign tumors there were 3/8(37.5%) cases of Renal Adenoma2/8(25%) cases of Renal Oncocytoma and 3/8(37.5%) cases of Angiomyolipoma.

Histologically Renal adenoma showed tumor tissue arranged in tubular pattern(figure-1) renal oncocytoma grossly showing central stellate scar and microscopically showing round to polygonal cells with granular eosinophilic cytoplasm round nuclei and single central nucleoli(figure-2a&2b)Angiomyolipoma grossly seen as nodular irregular masses with cut section showing grey white to grey yellow nodules, microscopy showed tumor tissue composed of three components-adipose tissue,hyalinised blood vessels surrounded by smooth muscle cells.(FIGURE 3a &3b)

Among the RCC the tumor occupied more or less entire kidney in 9 cases (45%),involved the upper pole in 6 cases (30%),mid zone in 3 cases(15%) lower pole was involved in 2(10%)cases. Grossly 70% of the RCC had a variegated appearance with areas of hemorrhage and necrosis.

Histological examination of clear cell RCC showed tumor cells arranged in solid sheets ,nests ,acinar patterns. tumor cells were large

with clear cytoplasm and some tumor cells showed granular eosinophilic cytoplasm with centrally placed nucleus. Intervening stroma showed thin walled blood vessels(figure-4a&4b) chromophobe RCC tumors cells showed abundant eosinophilic cytoplasm with perinuclear halo with few cells showing binucleation(figure-5) transitional cell carcinoma the neoplastic cells are arranged in irregular nests with high N:C ratio and mitotic figures(figure-6) squamous cell carcinoma showing characteristic keratin pearls,intercellular bridges ,keratotic debris similar to scc elsewhere(figure-7).

WHO/ISUP nuclear grading system was used only for 17 Clear cell RCC and 1 Papillary RCC only and not for Chromophobe RCC. Among the 17 cases of Clear cell RCC 4 cases showed grade 1(23.5%), 8 cases showed grade 2(47%), 3 cases showed grade 3(17.6%) and 2 cases showed grade 4(11.7%)(shown in Table-5). It is evident that majority of the Clear cell RCC showed nuclear grade 2 and higher grade (grade 3 and 4) were seen in one third of the cases approximately. There was one case of papillary RCC which exhibited low nuclear grade (grade 1).

The pathological staging was done for 20 cases rest 12 cases staging was not applicable (Benign tumors, Partial Nephrectomies) ,stage pT1 was most common with 55% cases followed by stage PT2 with 35% cases and 10%Cases belonged to stage pT3.

Table:1 Demographic Details

Total number of cases	30
Males	19(63%)
Females	11(37%)
Male:female ratio	1.7:1
Age range	24-78 years
Mean age	47.5 years

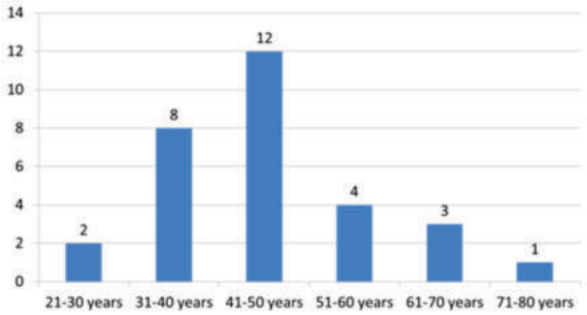

Chart-1 - Age Distribution

Table-2 Benign Lesions studied

Benign lesions	No .of cases(N=8)	Percentage
Renal adenoma	3	37.5%
Oncocytoma	2	25%
Angiomyolipoma	3	37.5%
Total	8	100

Table-3 Malignant Lesions

Malignant lesions	No of cases(N=22)	Percentage
Renal cell carcinoma	20	91%
Squamous cell carcinoma	1	4.5%
Transitional cell carcinoma	1	4.5%
Total	22	100

Table-4 Types of Renal cell carcinoma

Renal cell carcinoma	No of cases	Percentage
Conventional/Clear cell	17	85%
Papillary RCC	1	5%
Chromophobe RCC	2	10%
Total	20	100

Table-5 Nuclear grade

WHO/ISUP nuclear grade	No.of CASES
Grade I	4(23.5%)
Grade II	8(47%)
Grade III	3(17.6%)
Grade IV	2(11.7%)

Gross And Microscopic Images

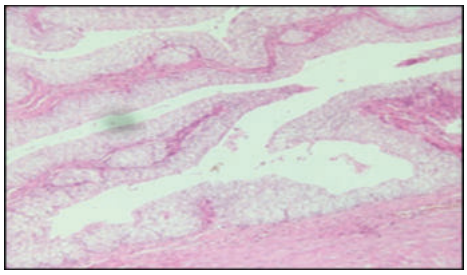

Figure 1)- Renal Adenoma H&E 10 X

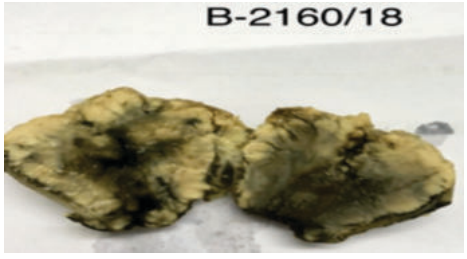

Figure 2a)- Renal Oncocytoma Gross

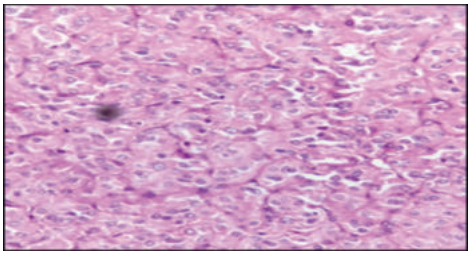

Figure 2b)- Renal Oncocytoma H&E 40x

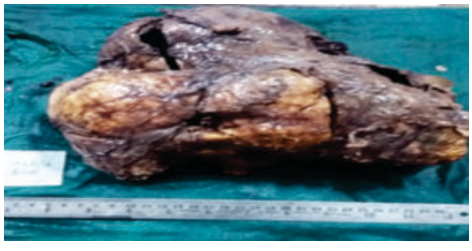

Figure 3a)- Renal Angiomyolipoma -gross

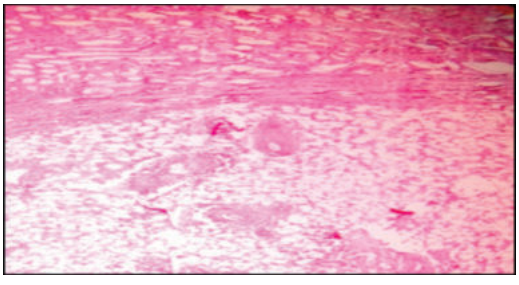

Figure 3b)- Renal Angiomyolipoma H &E-10x

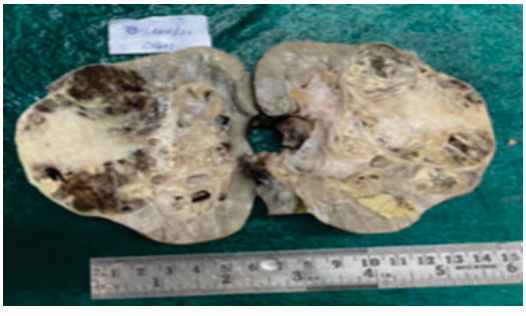

Figure 4a)- Renal Cell Carcinoma-gross

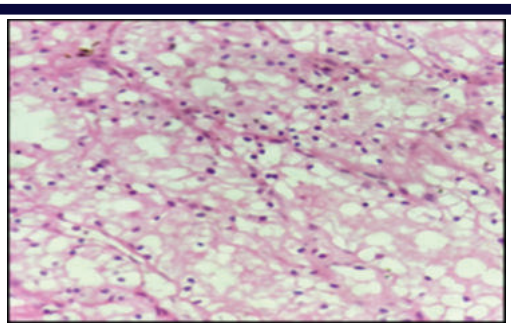

Figure 4b)- Rcc- Clear Cell Carcinoma H&E -40x

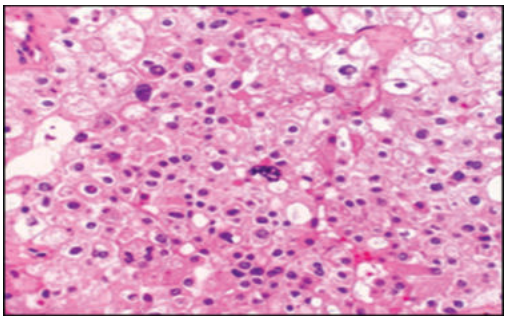

Figure 5)-Rcc-Chromophobe- H&E-40x

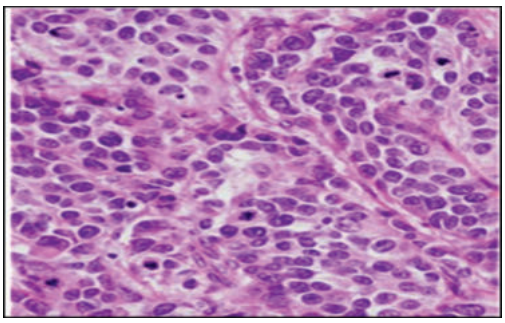

Figure 6) Transitional Cell Carcinoma –kidney 40X

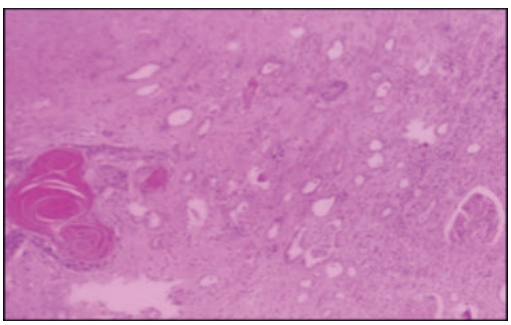

Figure 7)-SCC Kidney H & E 40X

DISCUSSION

The incidence of renal tumors is on a increasing trend throughout the world partly as a result of widespread use of radiological imaging techniques, like ultrasound, MRI etc.

RCC is the most common primary malignant tumor of the kidney Most common age group affected was 5th decade with a mean age of 47.5 years and the age range was between 24-78 years. These findings were similar to the studies done by Vinay et al[7],and Basavaraj et al[8] and Fauzia et al[9].

In the present study male patients were more affected than female patients with a male to female ratio of 1.7:1. This findings is similar to other studies done by Basavaraj et al[8], Bashir et al[10], ,Datta et al[11] ,.where the authors reported males being more affected than females with male to female ratio of 2.19:1,1.7:1, and 1.9:1 respectively. In the study conducted by Vinay et al [7] Male to Female ratio was slightly lower ie 1.2:1 .

The most common Clinical presentation in this study was flank pain in about 50% of cases followed by flank pain with hematuria this was similar to other studies [8,10,11]

In present study left kidney tumors were slightly more common (53%) than right sided tumors(47%) with upper pole being the most common tumor location. This was similar to study done by Fauzia et al[9] where they had 54% left sided tumors In the study done by Amin et al[12] and Vinay et al[7] right sided tumors were slightly more common than left sided tumors(53%)and (55)%respectively. Vinay et al [7] Bashir et al[8] and Basavaraj et al[10] studies also had upper pole involvement was more common than the other poles.

In the present study malignant tumors(73%) vastly outnumbered the benign tumors (26%).this is in concordance with most of the studies including study findings by Vinay et al ,Basavaraj y et al and Fauzia et al[7-9] where malignant tumors were most common about 69%,87.5%,and 94% of total cases.

Most common Malignant tumor in this study was RCC accounting to 91% of all the Malignant tumors. The most common histological subtype was clear cell RCC. This was in concordance with Fauzia et al, Vinay et al, and Basavaraj et al[7-9] where RCC was seen in 87.2% 75% and 65.6% of renal tumors of which the most common histological subtype was Clear cell RCC constituting 73.1%, 44.8% and 46.9%.

Clear cell RCC is a renal cortical tumor typically characterized by malignant epithelial cells with clear cytoplasm and distinct cell membrane arranged in nests(alveolar),sheets, acinar pattern admixed with arborizing thin walled blood vessels. Papillary RCC are composed of papillae formed by thin fibro vascular cores that may contain foamy macrophages, hemosiderin, and psammoma bodies. Chromophobe RCC shows tumor cells arranged in solid sheet like pattern separated by incomplete septae Nuclear grading was done in Clear cell RCC and Papillary RCC using WHO/ISUP nuclear grading system. Grade II was the most common followed by grade I, these findings were in concordance with other studies done by Vinay et al ,Basavaraj et al,[7,8] Narang et al and Nilay shah et al [13,14].In another study done by Amin et al[12] grade I was more commonly reported.

In the present study pathological tumor staging (pT) was applied. most of the RCC were in pT1(55%) followed by pT2(35%).this was in comparison with Vinay et al [7]who reported 45% pT1 followed by 12% pT2 and 20% pT3 and 10% pT4.various other studies done by Basavaraj et al ,Fauzia et al[8,9] had reported varying distribution of cases in different stages.

Squamous cell carcinoma is a very rare tumor of kidney accounting for 0.5%-15% of all the urothelial malignancies[15].In the present study we also had 1 case of Squamous cell carcinoma of kidney in 45 year old female who had a large renal calculus in the renal pelvis Renal transitional cell carcinoma is a malignant tumor arising from the transitional (urothelial) epithelial cells lining the urinary tract from the renal calyces to the ureteral orifice. The incidence of Transitional cell carcinoma in these location is about 5% of all urothelial cancers and 7% of all primary renal carcinomas [16]. It is most commonly found in the bladder and ureters. In the present study we had 1 cases of transitional cell carcinoma Fauzia et al [9]have also reported 2 cases of urothelial carcinomas.

Angiomyolipomas (AMLs) are benign renal tumors, with a prevalence varying between 0.2% and 0.6% and a strong female predilection. They occur as sporadic, isolated entities in 80% of cases. The remaining 20% of AMLs develop in association with tuberous sclerosis complex (TSC) or pulmonary lymphangioleiomyomatosis (LAM) [17,18] .In the present study 3 cases of angiomyolipoma (37.5%%)were noted and .all the cases were seen in females and one was in a 36 year old female with tuberous sclerosis who presented with flank pain and hematuria In studies done by Bashir et al and Nilay shah et al authors reported 5.9%. and 4.05% of total cases of Angiomyolipoma cases.

Papillary renal adenomas are the commonest neoplasms of the renal tubular epithelium, occurring in up to 40% of adults. If these criteria are met, the diagnosis of adenoma can be made with confidence: (1) papillary, tubular, or tubulopapillary architecture; (2) diameter less than or equal to 5 mm; and (3) does not histologically resemble clear

cell, chromophobe, or collecting duct renal cell carcinomas. Metanephric adenoma have a morphological resemblance to Wilms' tumor, there is some genetic evidence relating them to papillary adenoma and papillary renal cell carcinoma. Metanephric adenoma occur at all ages, have a 2:1 predominance of female patients, and are associated with polycythemia.[19]

In our study we encountered 3 cases of renal adenomas (37.5%) all the 3 were papillary adenomas Oncocytoma is a benign epithelial cell tumor accounting for about 3-7% of all primary renal neoplasms. Microscopically ,it is composed of tumor cells arranged in nests,cords,and tubules.individual cells have abundant dense eosinophilic cytoplasm with monomorphic round vesicular nucleus and prominent central nucleoli [20].In the present study we observed 2 cases of oncocytoma(25%.)and they presented with flank pain . In a study done by Vinay et al ,Bashir et al and Basavaraj et al,1(3.4%),2 cases(1.1%),and 3 cases(9.4%)of oncocytomas were reported.

CONCLUSION

Malignant lesions were more common than benign lesion. Renal cell carcinoma constituted 91% of the total malignant lesions followed by one case of SCC and transitional cell carcinoma Nuclear grade and stage of the tumor play an essential role in therapeutic decisions and prognostication of the tumors, thus necessitating the need for a detailed and systematic examination of gross as well as histopathological examination of nephrectomy specimens.

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