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COMPARISION OF ULTRASONOGRAPHY AND CONTRAST ENHANCED COMPUTED TOMOGRAPHY IN EVALUATION OF COMPLEX RENAL CYSTS

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ABSTRACT:

Backround-Complex renal cysts and masses occur in all age groups, right from WiIm's tumor that commonly occurs in children, renal cell carcinoma (RCC) in adults; to the rarer multilocular cystic nephroma (MLCN), which is found in both the age groups, although with different sex predilections.

Objectives- To evaluate imaging characteristic of complex renal cysts and the role of USG (including Doppler) and CECT.

Methods- The study was conducted on 42 patients in the Radiology department of Command Hospital Air Force, Bangalore from December 2014 to July 2016. Cases were included in the study after taking informed consent. All patients were examined by CECT and USG (including Colour Doppler) whenever required. USG studies were performed using real time equipment utilizing 3.5 MHz curvilinear electronic probes and Colour Doppler, whenever required. In paediatric patients, 7.5 MHz linear electronic probes were used. CT examinations were performed using an MDCT scanner (Volume Zoom; Philips, Somatom AR-HP I Somatom Hi-Q systems Forcheim, Germany) with a gantry rotation of 0.5 seconds. SPSS was used for analysis.

Results- there are 42 patients in our study, who on CT scan were seen to have cystic renal lesions of them, 33 (79%) patients were adults, with the oldest of our patients being 85 years old (mean age -40.3 years). 21(42%) were predominantly cystic masses and 28 (58%) were predominantly solid. Of the predominantly cystic masses 10 (20%) were unilocular cysts and 11 (22%) were multilocular cysts. we had 10 (20%) cases with unilocular cystic renal lesions. We excluded simple cysts less than 3 cm in diameter. Amongst these 10 patients with unilocular masses, 1(10%) patients had renal cell carcinomas and 9 (90%) had simple renal cysts (including complex benign cysts). Malignancy was seen in 1 patient, which though comprising only 10% of unilocular lesions is a significant number.

ISSN 2515-8260 Volume 10 Issue 04, 2023

Conclusion- a suspected renal mass should undergo a USG as the first line of imaging. A confident diagnosis of simple cyst should make one stop from further imaging.
Keywords- Renal mass, Ultrasosnography, simple renal cyst, multi-locular mass, CT scan

Introduction

Complex renal cysts and masses occur in all age groups, right from WiIm's tumor that commonly occurs in children, renal cell carcinoma (RCC) in adults; to the rarer multilocular cystic nephroma (MLCN), which is found in both the age groups, although with different sex predilections. Imaging plays a key role in characterizing & diagnosing these lesions.[1,2] While the commonest cystic renal lesion, a simple renal cyst, may be innocuous and is usually observed as an incidental finding, other cystic lesions such as renal cell carcinomas have a worse prognosis and thus need prompt management. Rare but important associations of some cystic renal lesions such as Von Hippel Lindau (VHL) and Tuberous sclerosis disease can be identified accurately on imaging and hence it is important to look for these associations.[3,4,5].

This study evaluates the imaging characteristics, the role of imaging modalities (USG including Doppler Vs CECT) and the usefulness of the Bosniak classification in 49 cystic renal lesions. An attempt was made to characterize cystic renal masses based upon their imaging appearance and correlate these findings with the pathological features and final diagnosis.

Materials and Methods

The study was conducted on 42 patients in the Radiology department of Command Hospital Air Force, Bangalore from December 2014 to July 2016. Cases were included in the study after taking informed consent.

Inclusion Criteria

a) Complex Renal cysts
b) Cystic Renal neoplasms
c) Renal masses with cystic components

Exclusion Criteria

a) Simple Renal Cysts
b) Congenital cystic diseases of kidney
c) Inherited cystic kidney disease

Method of Collection of Data:

All patients were examined by CECT and USG (including Colour Doppler) whenever required. USG studies were performed using real time equipment utilizing 3.5 MHz curvilinear electronic probes and Colour Doppler, whenever required. In paediatric patients, 7.5 MHz linear electronic probes were used. CT examinations were performed using an MDCT scanner (Volume Zoom; Philips, Somatom AR-HP I Somatom Hi-Q systems Forcheim, Germany) with a gantry rotation of 0.5 seconds.

In all patients, four phases was acquired (for CECT):

1. An **unenhanced (NCCT) scan** from the xiphisternum to the bladder to identify renal calcifications, hemorrhage and intratumoral fat;
2. An **arterial phase** (Corticomedullary) to evaluate the renal cortex, renal arteries and tumor vascularity; a parenchymal phase, which is more sensitive than the other phases.
3. A **venous phase** (Nephrographic phase) to detect small lesions and to assess renal venous drainage; and
4. An **excretory phase** (delayed phase) to evaluate the relationship between the tumor and the collecting system.

In all lesions, the following features were evaluated with CECT and USG. The size, margins, internal structure (i.e., solid, fluid or mixed), the presence of calcification, septal details (number, thickness, mural nodules and septal thickness at the site of attachment). On CECT, septae greater than 1mm were considered thick. The degree of enhancement of septae was quantified as moderate when the increase was below 30 HU and high when it was above 30 HU. (A change of > 10 HU before and after contrast studies was suggestive of vascularity). A search for metastases and coexistent abnormalities was also done. Finally, histopathological correlation was also one of those.

Statistical Analysis-

The statistical analysis was performed using SPSS for windows version 22.0 software (Mac, and Linux). The findings were present in number and percentage analyzed by frequency, percent, and Chi‑ squared test. Chi‑ squared test was used to find the association among variables. The critical value of *P* indicating the probability of significant difference was taken as <0.05 for comparison.

Results

Table 1- Age and sex distribution

	No. of patients	%	Location of lesion in patients	No	%
Adults	33	79	Right side	19	44
Children	9	21	Left side	16	40
			Bilateral	7	16
Total	42	100	Total ‘	42	100

As per table 1 there are 42 patients in our study, who on CT scan were seen to have cystic renal lesions of them, 33 (79%) patients were adults, with the oldest of our patients being 85 years old (mean age -40.3 years). 9 (21%) of our patients were children, the youngest being a 6 months

baby (mean age- 3.5 years). We had 22 (52%) male patients and 20 (48%) female patients. In our study, 19 (44%) patients had right sided lesions and 16 (40%) patients had left sided lesions. 7(16%) patients had lesions bilaterally. In all, we had 49 cystic renal lesions. In our study no sex predilection was seen, with near equal number of male and female patients (22- male patients; 20- female patients).We had nearly equal number of patients with right [19(53%)] and left [16 (47%)] sided lesions and most of the disease entities were equally common in both the kidneys.

Table 2 - Nature of the lesion

CYSTIC RENAL MASSES	NUMBER	%
Unilocular	10	20
Multilocular	11	22
Solid masses with cystic degeneration / necrosis	28	58
TOTAL	49	100

As per table 2 of the 49 cystic masses, 21(42%) were predominantly cystic masses and 28 (58%) were predominantly solid. Of the predominantly cystic masses 10 (20%) were unilocular cysts and 11 (22%) were multilocular cysts. Hence a majority of our patients [28 (58%)] had a solid lesion with cystic degeneration /necrosis. All of the solid lesions showed varying amounts of necrosis/ cystic degeneration. There was nearly same number of lesions, which were classified as unilocular and multilocular (unilocular masses -10; multilocular masses-11).

Table 3 -Unilocular lesions

UNILOCULAR MASSES	NUMBER	%
Simple renal cysts Including benign complicated cysts	9	90
Renal cell carcinoma	1	10
Total	10	100

As per table 3 we had 10 (20%) cases with unilocular cystic renal lesions. We excluded simple cysts less than 3 cm in diameter. Amongst these 10 patients with unilocular masses, 1(10%) patients had renal cell carcinomas and 9 (90%) had simple renal cysts (including complex benign cysts). Malignancy was seen in 1 patient, which though comprising only 10% of unilocular

ISSN 2515-8260 Volume 10 Issue 04, 2023

lesions is a significant number. Though the overwhelming majority of the patients (90%) with unilocular lesions are benign in this study it must be remembered that malignant lesions may have the appearance of simple cysts. Four (57%) of our patients with simple renal cysts were males and three (43%) were females. The ages of the patients varied from 37 to 78 years (average 46.8 years). One of our patients had bilateral simple cysts, one had tuberculosis affecting the other kidney and one was a case of Von Hippel Lindau (VHL) disease. Simple renal cysts showed all features of classic benign cysts. On CT they showed density values in the liquid range (-10 to + 20 HU). The wall was thin (hair line) and regular in all cases

Table 4 -Multilocular lesions

MULTILOCULAR MASSES	NUMBER	%
Hematoma	1	9.1
Hydatid cyst	1	9.1
Multilocular cystic nephroma	2	18.18
Renal cell carcinoma	5	45.44
WiIm's tumor	2	18.18
Total	11	100

We had a diverse group of pathological entities presenting as multilocular renal lesions. Totally we had 11 cases of multilocular cystic masses. 7 of these 11 lesions were malignant while 4 were benign lesions. Thus in multilocular lesion, 64% of the patients had a malignant disease and only 36% had a benign disease as a cause. Amongst the multilocular masses that were malignant 5 were cystic renal cell carcinomas and 2 were cystic Wilms' tumors. Amongst the benign lesions 2 were MLCN, I was a hydatid cyst, and 1 was a hematoma.

Figure- 1, MLCN-CT showing a multilocular mass with multiple thin septae

ISSN 2515-8260 Volume 10 Issue 04, 2023

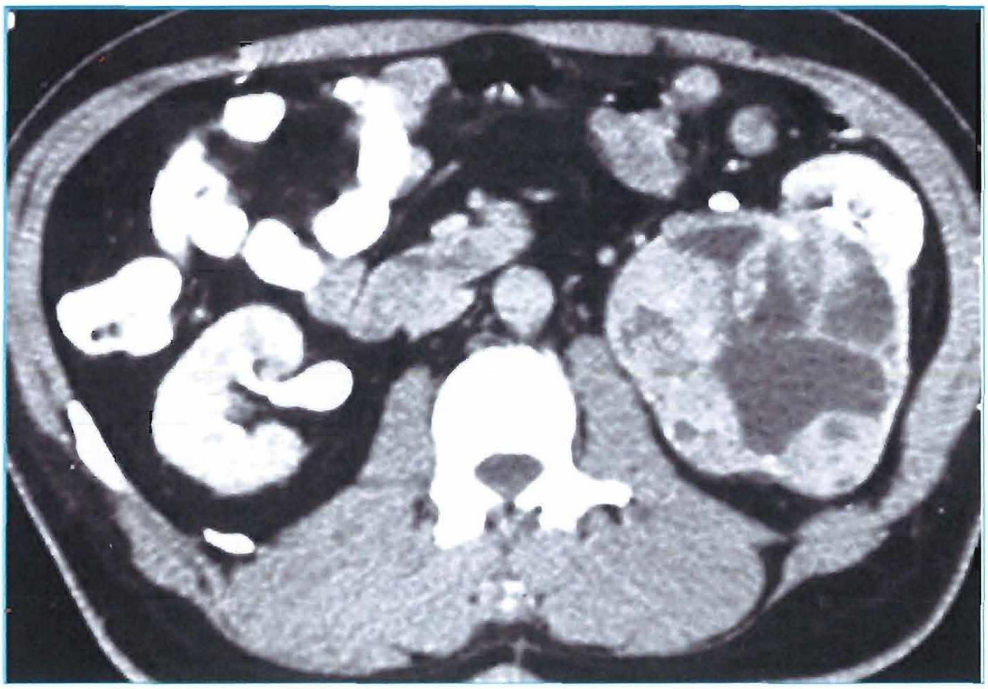

Figure- 2, CT shows cystic masses with multiple thick septae and large mural nodule- Multilocular Wilms.

Figure 1 and 2 MLCN in both the patients were seen as multilocular lesions. MLCN on CT showed contrast enhancement of the septa and walls. The attenuation of the fluid within the cystic components was higher than water. Calcifications were noted in one of the MLCN cases. On USG the MLCN appeared moderately complicated with multiple thin septa within. No solid nodules or vegetations were noted. One of our patients with MLCN underwent MRI, which showed water containing cystic mass lesion. MRI confirmed the absence of blood within. Both the cases of cystic Wilm's tumors on CT revealed predominantly cystic masses with multiple, thick septae with large mural nodules attached to the septae. On USG they appeared as complex predominantly cystic lesions with multiple thick irregular septae. No calcification was noted in either of them.

Table 5 – Solid Masses with Cystic Lesions

SOLID MASSES WITH CYSTIC DEGENERATION	**NUMBER**	**%**
Renal cell carcinoma	18	64.2
Wilms' tumor	4	14.3

Abscesses	1	3.57
Atypical mesoblastic nephroma	1	3.57
Clear cell sarcoma	1	3.57
Invasive ductal papilloma	1	3.57
Tuberculosis (TB)	1	3.57
Angiomyolipoma(AML)	1	3.57
Total	28	100

Amongst the 28 solid masses with cystic degeneration 18 (64.2%) of them were renal cell carcinomas, 4 (14.3%) were Wilms' tumors, 1 (3.5%) was an AML, 1 (3.5%) was a clear cell sarcoma, 1 (3.5%) was an invasive ductal papilloma, 1 (3.5%) was a case of renal tuberculosis, 1(3.5%) were renal abscesses and 1 (3.5%) was a case of atypical mesoblastic nephroma. Virtually every predominantly solid renal lesion was malignant barring 4 patients of whom one each had TB and AML and 1 had renal abscess. The overwhelming majority of our adult patients with solid lesions turned out to have renal cell carcinomas, which formed 64.2% of these predominantly solid lesions. The lesion was enhancing in all 18 cases. Mural nodules and few septations with nodules were noted in 9 (53%) cases. Metastasis, renal vein or IVC thrombosis was seen in 10 (60%) cases. Of the patients with lesions more than 7 cms in diameter, every patient showed a necrosis of more than 40%

Discussion

Our study comprised of 42 patients with 49 cystic renal masses who underwent USG and abdominal CT scans for renal lesions and were noted to have cystic / necrotic lesions. 21 (42%) were predominantly cystic lesion and 28 (58%) were predominantly solid lesions with areas of cystic degeneration / necrosis. Many studies shows the similar results with our study while simple uncomplicated cysts are easy to diagnose and pose no problem, complicated cystic lesions can create considerable difficulty in diagnosis and can lead to a difference of opinion concerning the proper diagnostic and therapeutic approach. [6-9] many factors are involved in the decision about the management of each individual case, including the clinical status of the patient, the availability and quality of the equipment, and the radiologist and the urologist. The overwhelming majority of patients with renal cysts are found by chance, while imaging is being done for urinary or other abdominal or pelvic processes. Only on rare occasions does the cyst call attention to itself by producing symptoms (pain) or signs (mass). [10,11,12,13]

Of the 7 patients who had simple renal cysts on our study, only one had a palpable mass per abdomen. The remaining 6 patients were asymptomatic. (The study included only those patients

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whose images were archived during the course of the study though the incidence of simple cysts outrages that of any other cystic lesions of the kidney: (approx 65%-70% of all cystic renal masses)

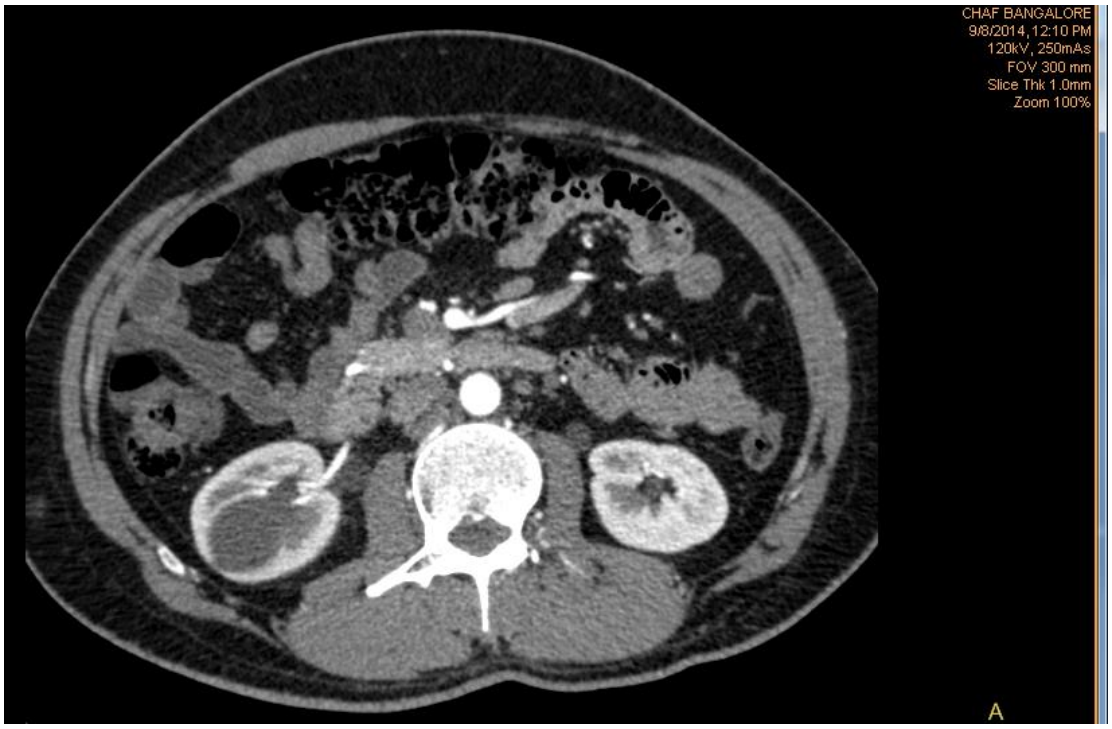

Figure- 3, CECT showing complex cyst with wall enhancement [14]

Figure-22, CECT showing Left Renal oncocytoma [15]

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Conclusion

In conclusion a suspected renal mass should undergo a USG as the first line of imaging. A confident diagnosis of simple cyst should make one stop from further imaging. A solid or indeterminate mass should be further evaluated on CT, which is able to sort out the problem in the majority of cases and is also able to provide a complete staging of malignant tumors. Category I and II lesions are usually benign and category IV usually malignant. Category Ill could represent either malignant or benign lesions.

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