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Comparing role of USG and CT scan in Evaluation of Renal Masses.

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ABSTRACT

Renal masses can be detected on USG and CT scan with USG is usually the initial modality which picks up any mass in the kidney while CT scan is preferred imaging modality for renal tumours and its staging and it is also helpful in diagnosis of previously undetected masses and small masses. To evaluate the diagnostic accuracy of USG and CT scan for detection of renal masses. 50 patients were selected for the study for which they underwent USG and CT scan examination after explaining the entire procedure and the risks involved. In our study of 50 patients, simple renal cyst was the most common renal mass encountered while renal cell carcinoma was the commonest malignant renal mass encountered followed by Wilm's tumour. Renal cell carcinoma was the commonest primary renal parenchymal tumour in adults while Wilm's tumour was the commonest primary renal parenchymal tumour in the first decade of life. ADPKD, RCC, Wilm's tumor and renal lymphoma were common in males while renal abscess were common in females. All the cases of Wilm's tumor and squamous cell carcinoma had solitary lesions while most of the cases of renal abscess showed multiple lesions in the kidneys. Renal angiomyolipoma showed multiple intraparenchymal lesions in both kidneys as seen in cases of renal lymphoma and ADPKD. Renal angiomyolipomas were easily diagnosed due to presence of characteristic CT value of fat in these lesions. As imaging modality both USG and CT scan are equally accurate in most of the cases except in cases of angiomyolipoma, renal cell carcinoma and squamous cell carcinoma as in angiomyolipoma and renal cell carcinoma, CT is more accurate for diagnosis and for squamous cell carcinoma, both the modalities were not effective in diagnosis. CT is more accurate for detecting various features of renal cell carcinoma needed for preoperative staging like perinephric extension, invasion of adjacent organs, renal vein and IVC thrombosis.

Keywords: Renal masses, USG, CT scan

INTRODUCTION

Majority of renal masses can be detected by imaging modalities like USG and CT scan. The various mass lesions in kidney include benign lesions like simple cyst, angiomyolipoma, oncocytoma, cystic lesions in autosomal dominant polycystic kidney disease, cystic nephroma, inflammatory lesions like renal abscess and malignant lesions like renal cell carcinoma, Wilm's tumor, lymphoma, transitional cell carcinoma, squamous cell carcinoma etc. Fortunately, most of these are simple renal cysts that can be easily diagnosed and do not require treatment. However, solid and complex cystic renal masses are also discovered, many of which are clearly malignant and need to be surgically removed, while others may not require surgical intervention.[1]

The role of USG in cases of renal masses is unique as it is usually the first modality used which picks up any mass in kidney. USG describes mass lesions as solid, cystic, mixed, hyperechoic, hypoechoic and heterogenous. It also shows the vascularity within the lesion on colour Doppler. Dedicated investigations are done so as to characterize the mass lesion. The USG has an advantage over CT in delineating tumor extension into inferior vena cava and right atrium.[2]

The role of computed tomography (CT) in the evaluation of renal lesions is very well-known.[3] CT is widely accepted as the preferred imaging technique for suspected renal tumors and also has an important role in tumor staging. Benign renal processes, including cystic disease, renal infection, and benign tumors may simulate malignant renal tumors, and could be defined correctly by CT.[4] The improvements in CT technique and increased use of cross-sectional imaging have facilitated the detection of small or previously undiagnosed renal masses.[5]

It is important to detect fat, calcifications and vascularity within the lesion and features such as vascular invasion, invasion into other adjacent organs, lymph nodal involvement for characterization and staging of the mass lesion. For example, the Angiomyolipoma has fat, with attenuation values less than - 40 HU at the non-enhanced scan.[6]

MATERIALS AND METHOD

This study was conducted on 50 patients with suspected renal masses. All patients were scanned in the SIEMENS EMOTION 16, a sixteen slice CT scanner and Medium and High frequency transducer on GE Model LOGIQ P5 & Siemens ACUSON S3000 USG machine. The study was conducted in Department of Radiology of Gujarat Cancer Research Hospital and BJ medical college, Asarwa, Ahmedabad.

Patient inclusion:

Following patients were selected,

- All patients referred for USG or CT abdomen showing renal mass in either of two modalities.
- Patients without clinical suspicion of renal masses but incidentally diagnosed on USG and/or CT.
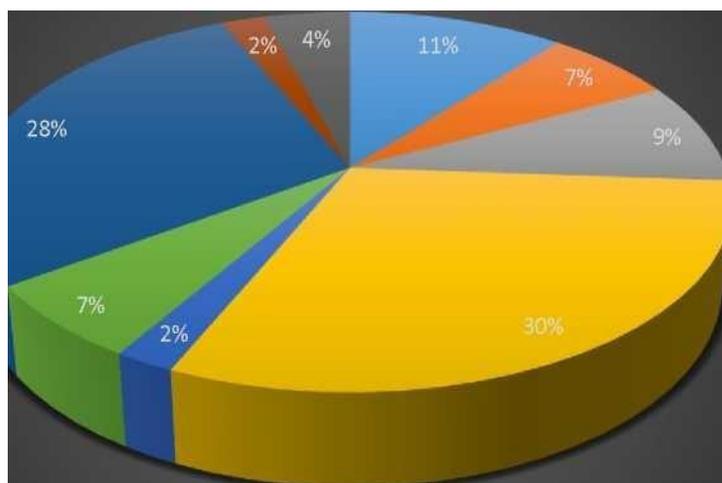
Exclusion criteria:

Following patients were excluded from the study

- Patients having allergy from contrast material used in CT.
- Patients not willing to participate in the study.
- Pregnant patients.

RESULTS AND DISCUSSION

Chart-1: Distribution of renal masses.

Distribution of Renal masses

■ ABSCESS ■ ADPKD "AML ■ SIMPLE CYST ■CYSTIC NEPHROMA ■ LYMPHOMA ■ RCC ■ SCC ■ TCC

Table 1: Sex distribution of renal masses

SR. No.	Diagnosis	Male	Female	Total
1	ABSCESS	02	03	05
2	ADPKD	01	02	03
3	AML	02	02	04
4	SIMPLE CYST	08	06	14
5	CYSTIC NEPHROMA	00	01	01
6	LYMPHOMA	02	01	03
7	RCC	08	05	13
8	SCC	01	00	01
9	TCC	02	00	02
10	WILMS	03	01	04
	Total	29	21	50

Table 2: Age-wise Distribution of Renal Masses

Sr. No	Diagnosis	Age groups in year.								Total
		0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	
1	ABSCESS	00	00	01	02	01	01	00	00	05
2	ADPKD	00	00	00	01	00	02	00	00	03
3	AML	00	00	01	02	01	00	00	00	04
4	SIMPLE CYST	00	00	00	01	08	04	00	01	14
5	CYSTIC NEPHROMA	00	00	00	00	01	00	00	00	01
6	LYMPHOMA	00	00	00	01	01	01	00	00	03
7	RCC	00	00	00	00	01	03	07	02	13
8	SCC	00	00	00	00	01	00	00	00	01
9	TCC	00	00	00	00	00	01	01	00	02
10	WILMs	04	00	00	00	00	00	00	00	04
	TOTAL	04	00	02	07	14	12	08	03	50

Table 3: Distribution of renal masses.

S. No.	Diagnosis	Multiple		Single		Total
		No.	(%)	No.	(%)	
1	ABSCESS	03	60.00%	02	40.00%	05
2	ADPKD	03	100.00%	00	0.00%	03
3	AML	02	50.00%	02	50.00%	04
4	SIMPLE CYST	09	64.28%	05	35.71%	14
5	CYSTIC NEPHROMA	01	100.00%	00	0.00%	01
6	LYMPHOMA	03	100.00%	00	0.00%	03
7	RCC	01	7.69%	12	92.30%	13
8	SCC	00	0.00%	01	100.00%	01
9	TCC	00	0.00%	02	100.00%	02
10	WILMS	00	0.00%	04	100.00%	04
	Total	22	44%	28	56%	50

Table 4: Accuracy of CT scan in diagnosis

S No	Diagnosis	No.of C	False Positive	False Negative	Sensitivity	Specificity	PPV	NPV	Accuracy
1	ABSCESS	05	00	00	100%	100%	100%	100%	100%
2	AML	04	00	00	100%	100%	100%	100%	100%
3	SIMPLE CYST	14	00	00	100%	100%	100%	100%	100%
4	CYSTIC NEPHROMA	01	00	00	100%	100%	100%	100%	100%
5	LYMPHOMA	03	00	00	100%	100%	100%	100%	100%
6	RCC	13	00	00	100%	100%	100%	100%	100%
7	SCC	01	00	01	00%	100%	00%	98.15%	98.04%
8	TCC	02	00	00	100%	100%	100%	100%	100%
9	WILMS	04	00	00	100%	100%	100%	100%	100%

Table 5: Accuracy of USG in diagnosis.

S No	Laboratory diagnosis	No. of Cases	False Positive	False Negative	Sensitivity	Specificity	PPV	NPV	Accuracy
1	ABSCESS	05	00	00	100%	100%	100%	100%	100%
2	AML	04	00	00	100%	100%	100%	100%	100%
3	SIMPLE CYST	14	00	00	100%	100%	100%	100%	100%

4	CYSTIC NEPHROMA	01	00	01	00%	00%	00%	00%	00%
5	LYMPHOMA	03	00	00	100%	100%	100%	100%	100%
6	RCC	13	03	00	100%	91.89%	81.25%	100%	94.00%
7	SCC	01	00	01	00%	100%	00%	98.15%	98.04%
8	TCC	02	01	01	50%	100%	100%	97.96%	98%
9	WILMS	04	00	00	100%	100%	100%	100%	100%

Chart-2:
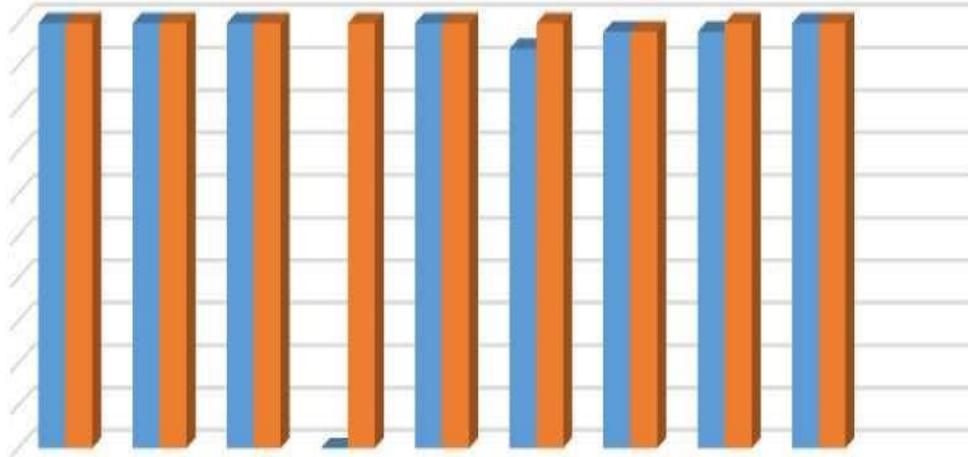
Comparison of accuracy of USG and CT.

Accuracy comparison of USG and CT

IMAGES

Case 1: Renal Abscess

Well-defined cystic lesion with internal echoes in midpole of right kidney which on CT scan showing a well-defined peripherally enhancing lesion in mid-pole of right kidney.
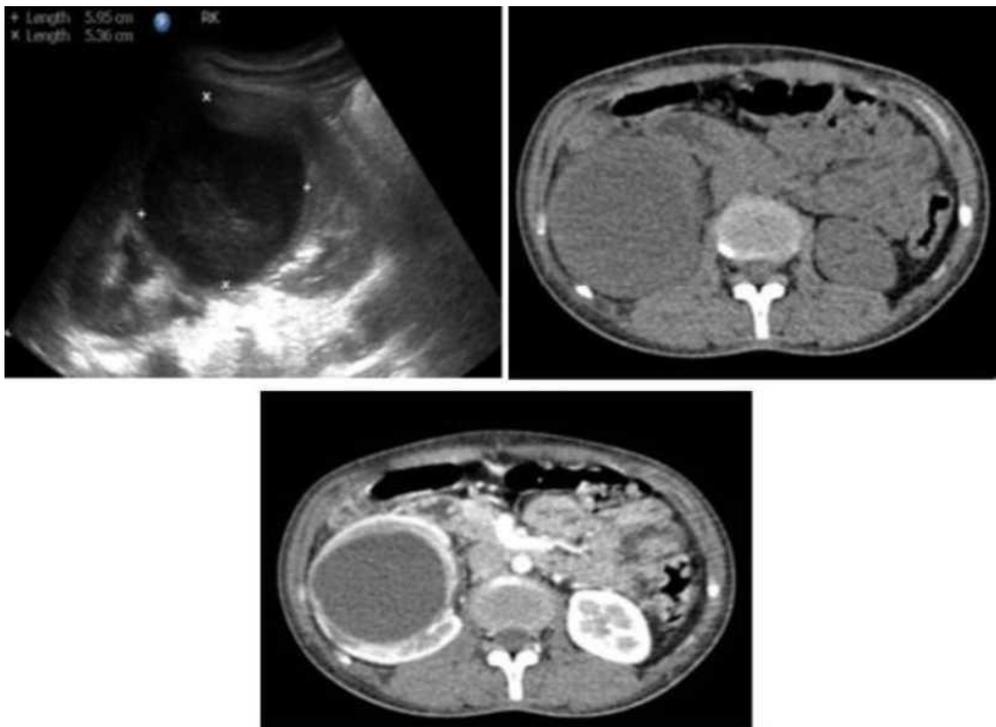
Case 2: ADPKD

USG image showing multiple cysts of varying sizes and no communication with renal pelvis in the right kidney and CECT images shows non-enhancing cysts in both kidneys.

Angiomyolipoma

USG image of left kidney showing echogenic lesion in upper pole and NECT images shows fat containing areas in both kidneys.
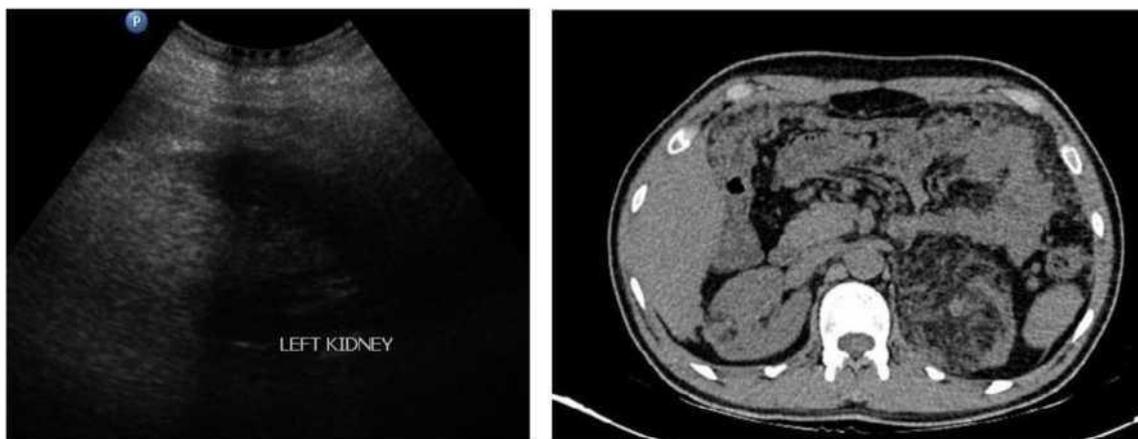

Case 4: Renal Lymphoma

USG image showing multiple ill-defined hypoechoic lesion in the kidney and NECT and CECT images showing multiple minimally enhancing lesions in both kidneys.
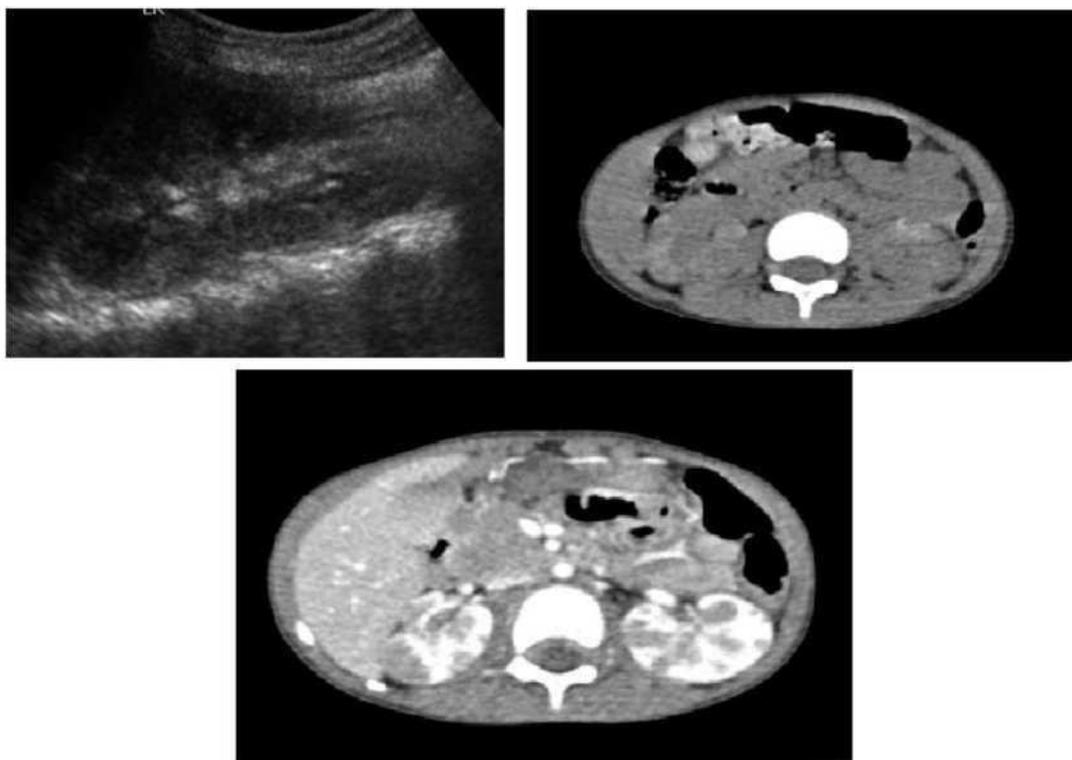
Renal cell carcinoma-

USG image showing ill-defined heterogenous lesion involving right kidney with color Doppler showing internal vascularity and NECT and CECT images showing heterogeneously enhancing lesion in right kidney showing areas of necrosis.
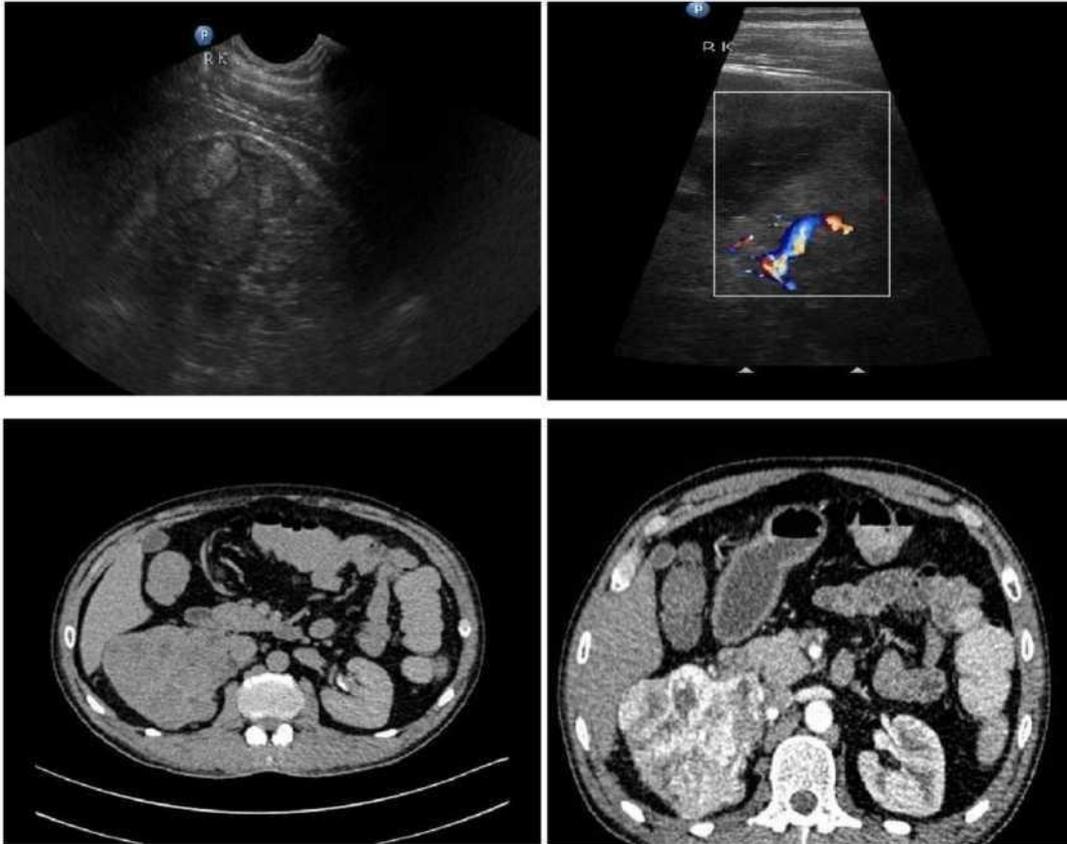

Case 6 Simple Cyst

USG image showing a well-defined thin walled anechoic lesion involving upper pole of left kidney and CECT images showing non enhancing thin walled fluid density lesion in left kidney.
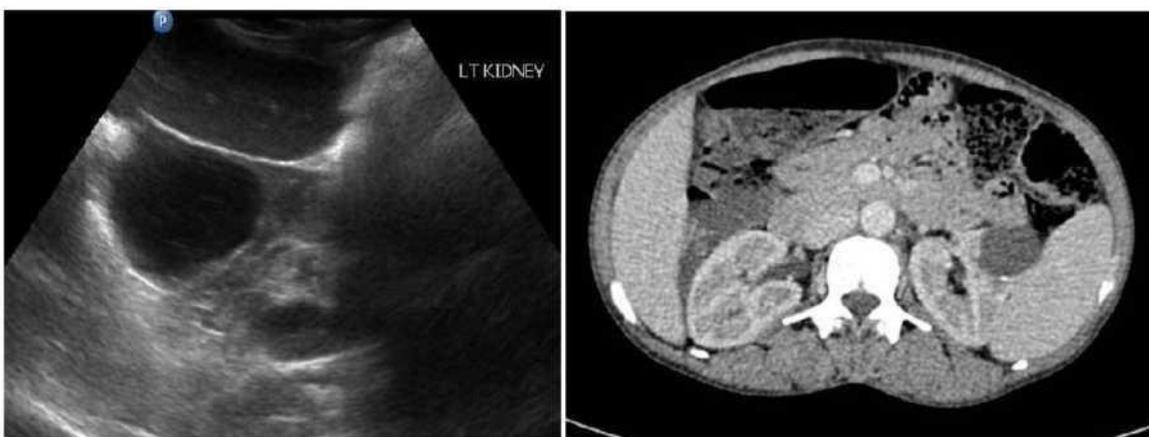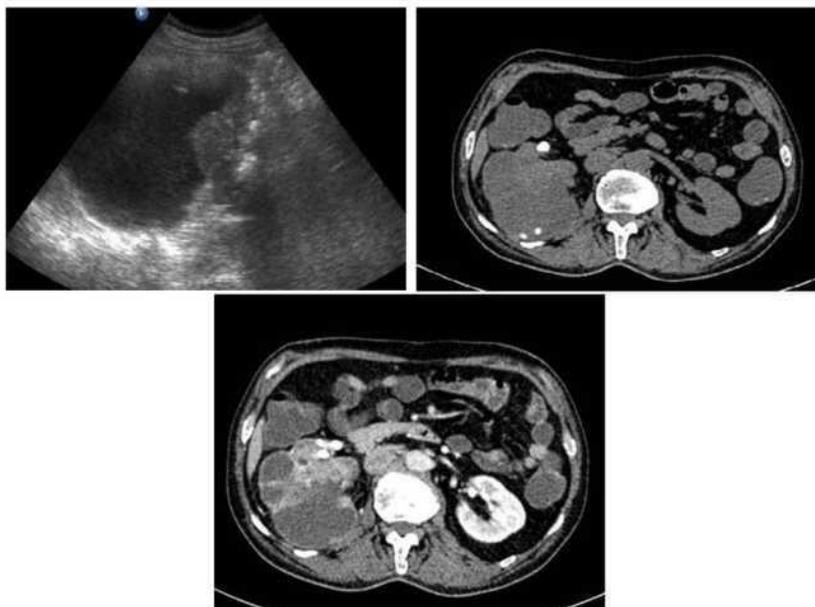
Wilm's tumour

USG image showing a well-defined solid cystic lesion involving lower pole of right kidney and NECT and CECT showing heterogeneously enhancing lesion in lower pole of right kidney with areas of necrosis.
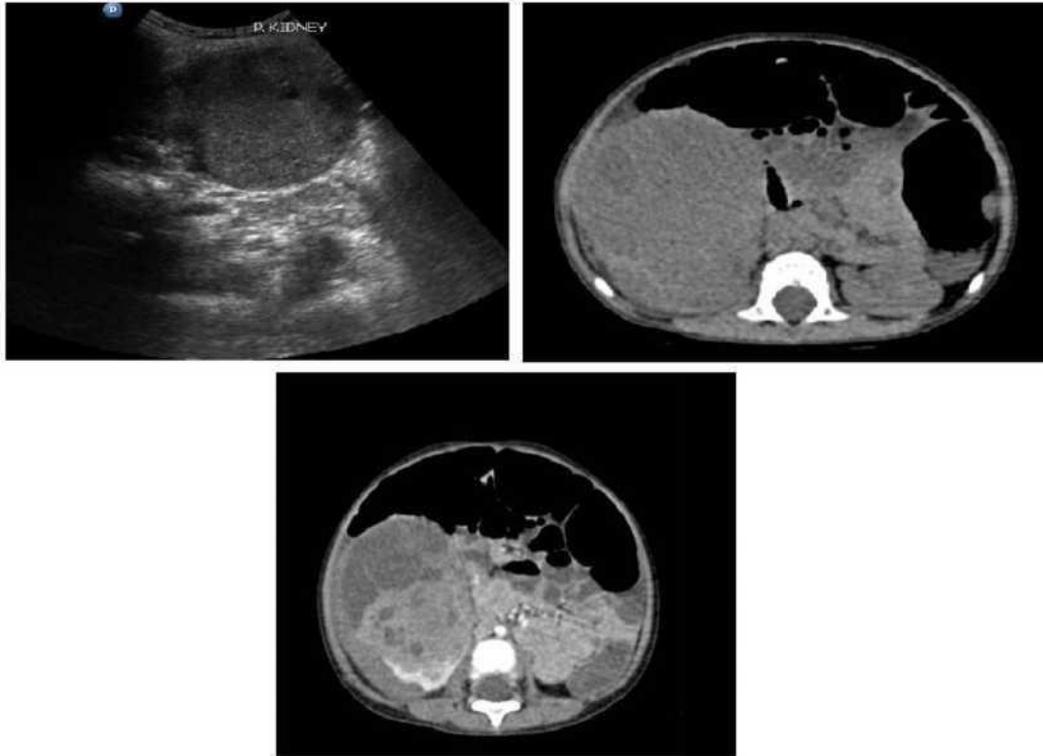
Case 8: TCC

USG image showing well- defined isoechoic lesion in renal pelvis extending into the upper ureter and NECT and CECT showing heterogeneously enhancing lesion in right renal pelvis. Calcifications are also seen in the lesion.

Simple renal cyst was the most common renal mass encountered in this study.

DISCUSSION AND CONCLUSION

Renal cell carcinoma was the commonest malignant renal mass encountered in this study, followed by Wilm's tumour, renal lymphoma, renal pelvis transitional cell carcinoma and squamous cell carcinoma in the decreasing order of frequency. Renal cell carcinoma was common between 60-69 year age group. All the cases of Wilm's tumour were in first decade.

Renal pelvis transitional cell carcinoma and squamous cell carcinoma were seen in the age groups of 50-59 year age group and 40-49 year age group respectively. Renal cell carcinoma was the commonest primary renal parenchymal tumour in adults. Wilm's tumour was the commonest primary renal parenchymal tumour in the first decade of life.

ADPKD, RCC, Wilm's tumor and renal lymphoma were common in males while renal abscess were common in females. All the cases of transitional cell carcinoma and squamous cell carcinoma were male and the case of cystic nephroma was a female. All the cases of Wilm's tumor and squamous cell carcinoma had solitary lesions. Most of the cases of renal abscess showed multiple lesions in the kidneys. Renal angiomyolipoma showed multiple intraparenchymal lesions in both kidneys. Multiple lesions involving both kidneys were also seen in cases of renal lymphoma and ADPKD. Renal angiomyolipomas were easily diagnosed due to presence of characteristic CT value of fat in these lesions.

As imaging modality for diagnosing various renal masses, both USG and CT scan are equally accurate in most of the cases except in cases of angiomyolipoma, renal cell carcinoma and squamous cell carcinoma.

In angiomyolipoma and renal cell carcinoma, CT is more accurate for diagnosis. In cases of squamous cell carcinoma, both the modalities were not effective in diagnosis.

CT is more accurate for detecting various features of renal cell carcinoma needed for preoperative staging like perinephric extension, invasion of adjacent organs, renal vein and IVC thrombosis. On the basis of imaging features of various renal masses on USG and CT scan, it is possible to differentiate and diagnose most of the renal masses thus aiding in their management.

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