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A Retrospective Study of Role of Computed Tomography in the Evaluation of Malignant Renal Masses

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Abstract
Introduction: *Computed Tomography (CT) has been found to be extremely useful in the diagnosis and treatment of renal masses. It provides an accurate morphologic picture of the renal mass. The precise contrast resolution makes identification of the characteristic attenuation values possible. Renal Cell Carcinoma (RCC) is the most common malignant tumour of the kidney, accounting for 85% -90% of adult renal malignancies, and 1% -2% of all malignancies. Although radical surgery remains the only efficient and curative treatment both in localized and advanced RCC, surgical techniques have evolved over the years.*
Materials and Methods: *This study was carried out in the Department of Radiology, Bhaskar Medical College and Hospital. The study period was January 2015 - January 2018 renal mass, who had undergone computed tomographic evaluation during this period, were studied irrespective of age and sex. . This study was carried out on Toshiba 16 Slice CT scan machine. A total number of 70 patients with suspected renal mass, who had undergone computed tomographic evaluation during this period, were studied irrespective of age and sex. Both plain and contrast studies were performed.*
Results: *Computed tomography was a very useful investigation for malignant renal masses, because it has got the ability to better characterise the lesions and it is accurate for pre-operative staging.*
Conclusion: *This can be concluded from our study that contrast CT scan is investigation of choice for pre-operative staging of malignant renal masses due to its ability in demonstrating perinephric extension, invasion of renal fascia, evaluation of retroperitoneum and detection of distant metastases.*
Key Words: *Computed Tomography, renal masses, RCC*

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I. Introduction

In recent years, Computed Tomography (CT) has been found to be extremely useful in the diagnosis and treatment of renal masses. It provides an accurate morphologic picture of the renal mass. The precise contrast resolution makes identification of the characteristic attenuation values possible.[1] Renal Cell Carcinoma (RCC) is the most common malignant tumor of the kidney, accounting for 85% -90% of adult renal malignancies, and 1% -2% of all malignancies. Although radical surgery remains the only efficient and curative treatment both in localized and advanced RCC, surgical techniques have evolved over the years.[2]

Currently, less invasive surgical techniques such as laparoscopic and nephron-sparing surgery are used in the treatment of renal tumours. Therefore, detailed preoperative imaging and exact renal tumour staging are important for planning the surgical approach and strategy and for providing accurate prognostic information for the patient. The evolution of CT technology and the introduction of Multi-Detector Computed Tomography (MDCT) have provided a higher spatial resolution and faster acquisition.[3,4]

II. Materials And Methods

This study was carried out in the Department of Radiology, Bhaskar Medical College and Hospital Yenkapally, Telangana. This study was carried out on Toshiba 16- Slice CT scan machine. A total number of 70 patients with suspected renal mass, who had undergone computed tomographic evaluation during the period of January 2015 to January 2018, were studied irrespective of age and sex. Both plain and contrast studies were performed.

Preparation: All adult patients were routinely made to fast, except for water from night prior to the CT scan; 20 ml of 76% Urografin was dissolved in 750 ml of water; 250 ml was given to the patient to be taken at the bedtime. Patient was asked to take another 250 ml in the morning before procedure. Another 250 ml oral Urografin was given 1 hour prior to scan for total bowel opacification. Continuous 1 mm slices were taken. Thin

sections of 0.5 mm were necessary in few patients with smaller lesions. Pre-contrast scans were obtained to detect any parenchymal calcification or renal or perirenal haemorrhage. At the time of scan, a rapid bolus of intravenous injection of non-ionic water-soluble contrast medium, Omnipaque/iohexol was administered. The main indication of intravenous use of contrast is to differentiate normal from abnormal vascular structure, to define pathological vessels, to estimate the vascularity of a mass and to detect thrombus in the vein.

Study Population: 70 patients of all age-groups, both male and female with history of loin pain, lump abdomen or haematuria, with suspected renal mass who underwent plain and contrast CT evaluation during the said period were included in this study.

III. Results

Type of lesions	Number of cases	Percentage
Renal cell carcinoma	**50**	**80**
Wilms Tumour	**20**	**20**
Total	**70**	**100**

Table 1: Type of renal masses studied

Type	Male	Female	Total
Renal cell carcinoma	**33**	**23**	**56**
Wilms Tumour	**6**	**8**	**14**
Total	**39**	**31**	**70**

Table 2: Sex distribution of Patients

After histopathological correlation, it was found that 80% cases were those of renal cell carcinoma and rest were those of Wilms' tumour. The youngest patient in our study was a 10-month-old child and the oldest was an 80 years old woman. This wide range had two peaks- one in the age group of 0-10 years and the other in the age group of 41-60 years; 100% of Wilms' tumour cases were below 10 years of age.

Type of lesions	0-10	10-20	21-30	31-40	41-50	51-60	61-70	71-80
Renal cell carcinoma (50)	-	-	-	9	12	15	10	4
Wilms tumour (20)	11	-	-	4	3	-	-	2
Total 70	11	-	-	13	15	15	10	6

Table 3: Computed Tomography- CT Characteristics of Renal Masses

Characteristics	RCC	Wilms tumour
Size (Kidney)		
Less than 3 cm	-	-
3-5 cms	6	
5-10 cms	30	8
>10 cms	4	12
Density		
Predominantly solid	10	
Predominantly Cystic	-	
Solid with necrosis	30	20
Texture		
Homogenous	10	6
Non Homogenous	30	14
Margins		
Smooth	10	12
Irregular	30	8

Table 4: *CT Finding- Contrast Enhancement in Renal Masses*

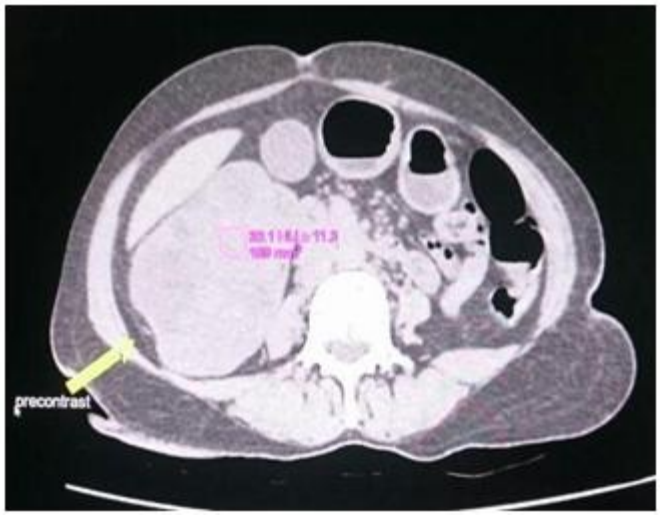

Figure 1: Pre Contrast

Figure 2: Post Contrast

Figure 3: Metastatic Lymph Nodes

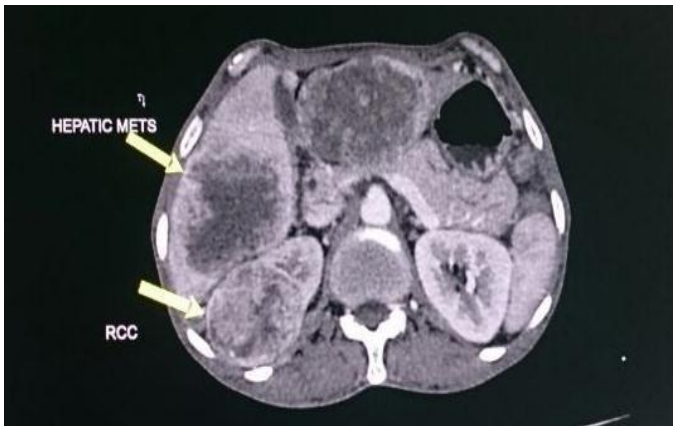

Figure 4: Hepatic Mets

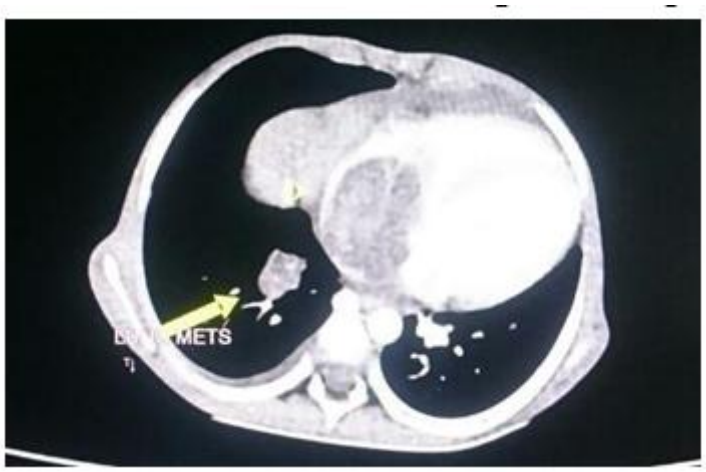

Figure 5: Lung mets

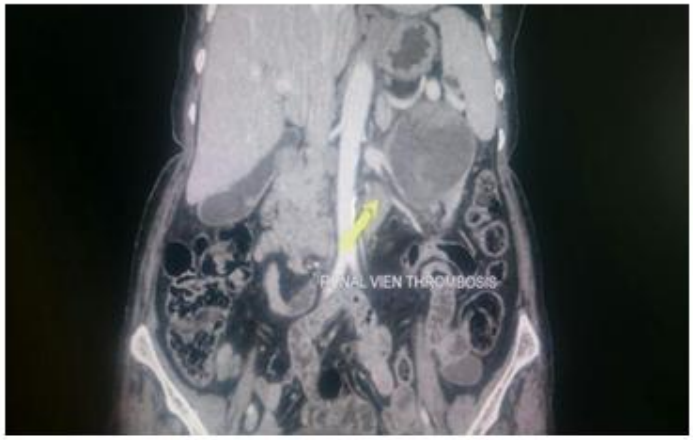

Figure 6: Renal vein thrombosis

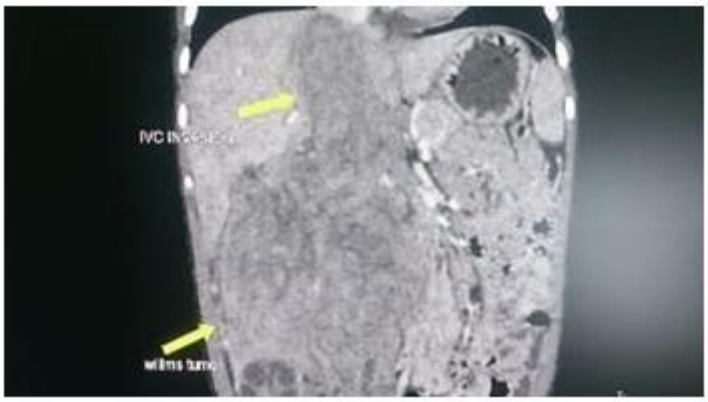

Figure 7: IVC Thrombosis

IV. Discussion

In the present study, 70 cases of renal masses were investigated using CT scan. The role of CT was specifically studied in relation to renal mass density, site, size, margins and presence of any calculus or calcification and knowing the regional or distant spread. This study was an attempt to understand and know the role of CT in diagnosis of renal masses.

Amendola et al in 1988, reported discovery of occult small renal cell carcinoma with increasing frequency in patient referred for abdominal CT scanning. [6]

A solid mass is identified on CT as an irregular ill-defined mass, the appearance of which is enhanced by contrast, but not to the extent of renal parenchyma. [7]

On pre-contrast CT scan, renal cell carcinomas often appear heterogeneous, demonstrating one or more low density central areas. The attenuation values range from 15 to 50 HU. If the attenuation value is 50 or more than 50, lesions are more likely to be renal cell carcinoma [Neesha S Patel et al 2008].[8]

After bolus injection, there is a rapid increase in the attenuation value of both the mass and normal parenchyma.

The absolute attenuation value of the solid tumour may be equal to more than or less than that of normal parenchyma depending on the vascularity of the tumour.

Hattery et al in their study in 1987 had discussed the significant advantage of CT in visualisation of the extent of the neoplasm. They observed secondary sign of a solid malignant mass (usually renal cell carcinoma) on CT done primarily to differentiate between a benign cyst and a solid tumour. These secondary signs may include detection of classification within the mass, invasion of adjacent tissues, involvement of renal vein or inferior vena cava and metastases to lymph glands, liver, lungs or bone.[9]

The classification of stages of neoplasms according to Robson and Churchill (1968, 69)method is based on identification of direct extension to adjacent structure, distant metastases, regional lymphatic involvement and renal vein invasion and histopathological grading of the tumour.[10]

In the present study, CT demonstrated inferior vena caval invasion in 4 cases.

In the present study, renal vein invasion was seen in 8 cases, where the diameter of vein was more than 2 cms on CT. IVC was dilated in three cases, where it measured more than 3 cm. In one case, IVC diameter was within normal limits but a thrombus was seen in it.

Intracaval filling defects may be due to bland thrombus or tumoural thrombus. CT can differentiate the two since tumour thrombus shows contrast enhancement, whereas bland thrombus shows no enhancement. CT detected regional lymph node involvement in two patients.

Lymph nodes measuring between 1 and 2 cm in known cases of malignancy, especially if they are multiple and enhancing, are usually metastatic. Nodes exceeding 2 cm in diameter with post-contrast enhancement are almost always metastatic.

V. Conclusion

This can be concluded from our study that contrast CT scan is the investigation of choice for pre-operative staging of malignant renal masses due to its ability in demonstrating perinephric extension, invasion of renal fascia, evaluation of retroperitoneum and detection of distant metastases.

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