

Diagnostic Accuracy of Multi-Detector CT for Evaluation of Renal Masses

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ABSTRACT

Objective: To determine the accuracy of multi-detector computed tomography (MDCT) in differentiation of renal masses taking histopathology as gold standard.

Methods: This cross-validation study was conducted from March 2021 to August 2021 at Al Hussain Diagnostic & Medical center Nishtar Road Multan. We included 100 patients presenting with renal masses on clinical and ultrasonography. All patients underwent MDCT for evaluation of renal masses. After MDCT, biopsy specimens were obtained for histopathological diagnosis of renal masses. The MDCT findings were correlated with histopathology diagnosis to determine the accuracy of MDCT.

Results: Mean age was 45.8±12.36 years, 67% patients were male and 33% were female. Malignancy was diagnosed in 83% patients and remaining 17% patients were diagnosed of having benign lesions. Out of malignant lesions, 65% patients had RCC, 07% Wilm's tumor, 6% lymphoma, meta-stasis was diagnosed 04% patients and 01% renal pelvic TCC. Among the benign lesions 11% patients had Angiomyolipoma and oncocytoma was diagnosed in 6.0% patients. The overall sensitivity of CT scan was 97.6%, specificity was 100%, PPV was 100% and NPV was 89.5%.

Conclusion: MDCT can be used as the imaging method of choice for initial evaluation and diagnosis of RCC as it is associated with high sensitivity and specificity for differentiating malignant from benign lesions.

Keywords: Diagnostic Accuracy, Histopathology, Multi detector CT, Renal Masses.

INTRODUCTION

Kidneys are paired organ located at T12 to L3 vertebral area. Renal masses are common presentation in routine clinical radiological investigation.^{1, 2} Several diagnostic radiological parameters are used for evaluation of renal masses.³ The differentiation of malignant and benign lesions is one of the main focus of radiological investigations for evaluation of these imaging modalities.⁴ Majority of masses are discovered during routine clinical evaluation of patients presenting with non-specific symptoms. This differentiation is necessary because neo-plastic lesions require immediate treatment such as nephron sparing surgery, radio-frequency ablation and radical resection to provide better prognosis and survival.^{5, 6}

The emergence of multi-detector computed tomography (MDCT) has made several improvements in detection and characterization of renal masses and is labelled as state of the art for evaluation of acute abdomen. Advancements in CT have brought improvement in imaging quality as well as speed of imaging acquisition. CT has the ability to differentiate solid masses from simple cystic and complex cystic lesions.^{7, 8} Therefore, CT images provide aid to radiologists to recommend surgeons either to move for surgery or the mass can be ignored.

Despite these benefits for usage of CT imaging in renal masses the accuracy of CT scan is not always 100% and in several patient's histopathology investigations are needed to confirm the diagnosis.^{9, 10} Therefore, in this present study we determined the accuracy of MDCT in differentiation of renal masses taking histopathology as gold standard.

MATERIAL AND METHODS

This cross-validation study was conducted from March 2021 to August 2021 at Al Hussain Diagnostic & Medical center Nishtar Road Multan. We included 100 patients presenting with renal masses on clinical and ultrasonography. Patients with extra-renal masses, allergic to contrast medium, with chronic kidney disease (creatinine >1.5 mg/dL) and pregnant women were excluded. Approval from hospital ethical committee was obtained.

In all patients, CT scan was done using 128 slices MDCT in supine position. Patients were informed regarding possible complications of CT. The patients were kept nil by mouth for 4 hours before CT scan. First, routine anteroposterior plain imaging

was obtained by asking the patients to hold breath. After that axial section images were obtained. Finally, intra-venous contrast was given and sections were obtained in cranio-caudal direction, excretory phase and nephron-graphic phase from upper pole to lower pole of kidney. After that imaging reconstructions were done to determine the nature of lesions. Scans were viewed at multiple magnification modules for detailed evaluation.

RESULTS

Mean age was 45.8±12.36 years, 67% patients were male and 33% were female. Regarding clinical spectrum, 52% patients presented with hematuria, 36% with abdominal pain, 23% patients were having palpable renal mass, 3% patients presented with high grade fever.

Table 1: Diagnosis of Renal Masses

Malignant Lesions	83
RCC	65
Wilm's Tumor	07
Lymphoma	06
Metastasis	04
Renal Pelvic TCC	01
Benign Lesions	17
Angiomyolipoma	11
Oncocytoma	06

Table 2: Accuracy of MDCT in Diagnosis of Renal Masses.

	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
Malignant Lesions				
RCC	88%	100%	100%	86.3%
Wilm's Tumor	100%	100%	100%	100%
Lymphoma	100%	100%	100%	100%
Metastasis	100%	100%	100%	100%
Renal Pelvic TCC	100%	100%	100%	100%
Benign Lesions				
Angiomyolipoma	100%	100%	100%	100%
Oncocytoma	100%	100%	100%	100%
Overall Accuracy	97.6%	100%	100%	89.5%

Malignancy was diagnosed in 83% patients and remaining 17% patients were diagnosed of having benign lesions. Out of malignant lesions, 65% patients had RCC, 07% Wilm's tumor, 6%

lymphoma, meta-stasis was diagnosed 04% patients and 01% renal pelvic TCC. Among the benign lesions 11% patients had Angiomyolipoma and oncocytoma was diagnosed in 6.0% patients (Table 1).

Regarding diagnostic accuracy, MDCT was 100% accurate in diagnosis of all types of renal masses including benign and malignant except RCC where the sensitivity of MDCT was 98%, specificity was 93%, PPV was 91% and NPV was 96%. The overall sensitivity of CT scan was 97.6%, specificity was 100%, PPV was 100% and NPV was 89.5% (Table 2).

DISCUSSION

MDCT has emerged as the most accurate imaging modality for evaluation and diagnosis of disease involving different organs. The accuracy of it in evaluation of renal masses has also been established.¹¹⁻¹³ Advancements in spatial resolution and availability of multi-planner imaging and 3D reconstruction of CT images has greatly enhanced the accuracy of MDCT.¹² In this study, we included the data of 100 patients having evidence of renal mass on clinical examination and ultrasonography. We evaluated the patients for benign and malignant lesions and then determined the individual type of lesions using MDCT and findings were then correlated with histopathological examination of tumor specimens.

In this study, malignant lesions were diagnosed in 83% patients and benign in only 17% patients. A study by Yadav et al. including 48 patients of suspected renal masses reported malignant lesions in 92% cases and benign in only 8.0% cases diagnosed using MDCT.¹⁴ While a similar study by Karthikeyan et al. et al. reported malignant lesions in 63.0% patients presenting with renal masses.¹⁵

Regarding detailed clinical spectrum, the commonest lesion encountered in this study was RCC diagnosed in 65% cases, Wilm's tumor in 07% patients, lymphoma in 6%, meta-stasis in 4% and renal pelvic TCC in 15 patients, angiomyolipoma was diagnosed in 11% and oncocytoma in 6% patients.

Wahba et al. in their study of 61 cases of renal masses reported malignancy in 88.5% lesions and benign masses in 11.5% lesions. they reported Wilm's tumor in 4.9%, RCC in 64% cases, TCC in 4.9% cases, angiomyolipoma in 11.5% cases, lymphoma in 9.8% cases, and metastasis in 1.6% cases.¹⁶

Adke et al. reported RCC in 84% cases, angiomyolipoma in 3.2% cases, TCC in 3.2% cases, Wilm's tumor in 3.2% cases, cyst in 3.2% cases and metastasis in 3.2% cases.¹⁷

In this study, the sensitivity of MDCT was 97.6%, specificity 100%, PPV 100% and NPV 89.5%. While a study by Yadav et al. reported 100% sensitivity and 88% specificity of MDCT for diagnosis of malignancy in renal masses.¹⁴ A recent study by Munir et al. on the role of MDCT for diagnosis of renal masses reported that MDCT has 89.47% sensitivity, 90.91% specificity, 94.44% PPV and 83.33% NPV.¹⁸ Another analysis by Kunchal et al. reported that MDCT is 95.8% sensitive and 96.15% specific for differentiation of malignant renal lesions from benign lesions.¹⁹

The major drawback of MDCT imaging is that some of the benign lesions such as oncocytoma may show solid enhancement just like RCC and therefore can create confusion in diagnosis.

CONCLUSION

MDCT can be used as the imaging method of choice for initial evaluation and diagnosis of RCC as it is associated with high sensitivity and specificity for differentiating malignant from benign lesions.

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