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Original Research Article

Characterization of Renal Tumours Using Computed Tomography at a Tertiary Facility

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Abstract

Background: Clinical decision-making can be aided by an accurate evaluation of the morphology of renal tumours, the perinephric space, local lymph nodes, supplying arteries, and surrounding organs.

Aims & objectives: In the current study, we evaluated the function of computed tomography in classifying renal masses at a tertiary facility.

Material and Methods: Patients of any age group with suspected renal masses on clinical examination, confirmed renal masses on USG examination, or incidental renal masses found on USG/CT examination were included in the current prospective, observational study.

Results: 86 patients with renal masses underwent radiological assessment for the duration of the research. Mean age was 51.3±11.2 years on average. The mean longest diameter of the renal mass was 5.35±1.45 cms, with a range of 3.4 to 8.35 cms, and there were 54 male and 32 female patients. While benign lesions were less common (13.16%), the majority of renal masses (86.84%) were cancerous. In the current study, the most frequent diagnosis of renal mass was renal cell carcinoma (74.42%). Other diagnoses were Bosniak II cyst (2.33%), transitional cell carcinoma (4.65%), Wilms tumour (4.65%), metastasis (4.65%), renal angiomyolipoma (9.3%). Out of 76 malignant lesions, the most frequent local extents were pelvicalyceal involvement (13.16%), perinephric extension (23.68%), and beyond perirenal fascia (28.95%). Regional lymphadenopathy (10.53%), renal vein thrombosis (10.53%), IVC thrombus (7.89%), and ipsilateral adrenal involvement (5.26%) were other less frequent local extents.

Conclusion: When evaluating renal masses, either for diagnostic or preoperative purposes, computed tomography is a crucial tool for accurate patient management.

Keywords: computed tomography, renal masses, renal carcinoma, contrast CT

Introduction

In clinical practice, several kidney lesions are regularly seen. The diagnosis and management of solid renal masses continue to be significantly impacted by advancements in imaging technologies [1]. Renal oncocytoma is the most prevalent type of solid tumour, and benign tumours make up around 20% of all solid renal cortical tumours. Non-neoplastic renal masses include replacement lipomatosis

with coexisting xanthogranulomatous pyelonephritis, renal infarct, inflammatory pseudotumors with and without abscess formation, and haematoma [2]. In all, up to 66% of tiny renal tumours under 4 cm are discovered by chance. Preoperative imaging should strive to distinguish benign from malignant tumours because up to 20% of solid small renal masses <4 cm are usually benign, necessitating cautious therapy [3]

Radiology tests include plain abdomen radiographs, excretory urography, ultrasonography, radionuclide imaging, angiography, CT, and MRI in the evaluation of renal abnormalities. Due to its portability, affordability, and ease of use, ultrasound is the most widely used method in the world, especially in operating rooms [4]. Correct preoperative evaluation of renal tumours is crucial for the many treatment methods for renal masses (surgery, interventional procedures such artery embolisation, chemotherapy, radiation, or combinations) [5]. Clinical decision-making can be aided by an accurate evaluation of the morphology of renal tumours, the perinephric space, local lymph nodes, supplying arteries, and surrounding organs [6].

Aims & Objectives : In the current study, we evaluated the function of computed tomography in classifying renal masses at a tertiary facility.

Material and Methods

A medical college in western India's Radiodiagnosis department at Zydus Medical College & Hospital, Dahod, Guajrat, India conducted the current prospective, observational investigation. The study lasted more than a half year (from January 2021 to September 2021) . The institutional ethical committee gave its approval to the current study.

Patients of any age group who are willing to participate in the study and who have a suspected renal mass on clinical examination, a confirmed renal mass on USG examination, or an incidental renal mass found on USG/CT examination are included.

Patients with recent renal surgery, expectant women, people with a history of intravenous contrast agent allergies, and people with abnormal kidney function tests were all excluded from the study. All patients were given written information about it and given the opportunity to give their written informed consent. Population information, medical history, examination results, and lab tests were recorded. [2]

Computed tomography was performed after ultrasonography using a SIEMENS 32 multislice CT SCAN. From the diaphragm to the pelvis, a simple tomogram was taken as a

reference and guide. In order to cover the area of interest in a single breath-hold, images were captured with1- to 3-mm collimation and up to a 2:1 pitch. Non-enhanced and contrast-enhanced CT scans of the kidneys are both performed according to the CT protocol in order to avoid motion artefacts. Oral and intravenous contrast were employed for the investigation after a plain CT scan. Iopamidol 300 or equivalent, or 300 mg of iodine per kilogramme of body weight contrast, was administered intravenously in adults as a bolus dose (about 80 ml) for intravenous contrast. Iopamidol 300 or equivalent contrast was administered intravenously to children at a dose of 1.6ml/kg body weight. oral contrast administered one to two hours before the CT scan. 1000 to 1500 cc of A flavoured, iodinated water-soluble contrast was administered orally, followed by 250 cc of a diluted solution. Oral administration of the same solution just prior to the CT scan.

Excel was used to collect and enter the data. Descriptive statistics were used in the statistical analysis.

Results

86 patients with renal masses underwent radiological assessment for the duration of the research. It was 51.3 ± 11.2 years on average. The mean longest diameter of the renal mass was 5.35± 1.45 cms, with a range of 3.4 to 8.35 cms, and there were 54 male and 32 female patients.

Table 1: General characteristic

Variable	Present study
No. of patients	**86**
Age range (years)	**16 – 71**
Mean age (years)	**51.3 ± 11.2**
Male/female	**54 / 32**
Longest diameter of renal mass (mean in cms)	**5.35 ± 1.45**
Range (in cms)	**3.4– 8.35**

In the current study, the most frequent diagnosis of renal mass was renal cell carcinoma (74.42%). Other diagnoses were Bosniak II cyst (2.33%), transitional cell carcinoma (4.65%), Wilms tumour (4.65%), metastasis (4.65%), renal angiomyolipoma (9.3%).

Table 2: Diagnosis of renal mass

Diagnosis on CT	Number of cases (n=86)	Percentage
Renal cell carcinoma	64	74.42
Renal Angiomyolipoma	8	9.3
Transitional cell Carcinoma	4	4.65
Wilms tumor	4	4.65
Metastasis	4	4.65
Bosniak II cyst	2	2.33

While benign lesions were less common (13.16%), the majority of renal masses (86.84%) were cancerous.

Table 3: Benign Vs Malignant renal mass

Diagnosis on CT	Number of cases (n = 86)	Percentage
Malignant lesions	76	86.84
Benign lesions	10	13.16

Out of 76 malignant lesions, the most frequent local extents were pelvicalyceal involvement (13.16%), perinephric extension (23.68%), and beyond perirenal fascia (28.95%). Regional lymphadenopathy (10.536%), renal vein thrombosis (10.53%), IVC thrombus (7.89%), and ipsilateral adrenal involvement (5.26%) were other less frequent local extents.

Table 4: Evaluation of local extent

Local Extent	Number of cases (n=76)	Percentage
Beyond perirenal fascia	**22**	**28.95**
Perinephric extension	**18**	**23.68**
Pelvicalyceal involvement	**10**	**13.16**
Regional Lymphadenopathy	**8**	**10.53**
Renal vein thrombus	**8**	**10.53**
IVC thrombus	**6**	**7.89**
Ipsilateral adrenal involvement	**4**	**5.26**

Discussion

Out of all the current imaging modalities, CT has the greatest impact on diagnostic uroradiology. It has shown to be effective for imaging the full range of renal and ureteral diseases [11]. It permits research on patients with renal calcification that is thick or in whom USG is technically challenging. The diagnosis and staging of

renal masses can be done with great accuracy using helical CT. For benign disorders such angiomyolipoma and abscess evaluation, unenhanced and single-phase post contrast in portovenous phase is sufficient.

CT is performed in four phases, namely unenhanced, corticomedullary, nephrographic, and excretory phase. Tumor enhancement is measured using the corticomedullary phase (CMP; 25–40 seconds after injection). The tumor contrast washout becomes obvious during the nephrogenic phase (NP; 100–200 seconds after injection) and offers details on any potential tumor thrombus in the renal and caval vein [10]. Ultrasound typically cannot identify tumor invasion of the perinephric fat and surrounding muscles, but CT scan does. While venous and retroperitoneal tumor extension can be seen on both CT and ultrasonography, CT is more trustworthy. Swarupa Rani examined 33 cases of renal tumors in people ranging in age from 22 to 82. 13 females and 20 guys were present. Hematuria was present in 16 patients, along with loin pain in 11, weight loss in 4, fever in 1, and asymptomatic status in 1. 33 patients had 33 lesions found, totaling 33. [7] 30 of these lesions were cancerous lesions, the majority of which were renal cell carcinoma (22 cases), transitional cell carcinoma (3 cases), angiomyolipoma (1), renal oncocytoma (1), renal metastasis (1), renal abscess (1), and 3 cystic lesions. Similar results were seen in the current investigation.

Out of 40 cases in the study by NVK Sundeep et al., 70% were determined to be malignant, and 30% to be benign. [8] Renal cell carcinoma, which made up 60% of all renal masses and 85% of malignant renal masses, was the most prevalent renal mass. The ratio of male to female population was 1.85:1. With Sensitivity of 100%, Specificity of 85.71%, Positive Predictive Value of 92.85%, and Negative Predictive Value of 100%, MDCT was able to distinguish between benign and malignant lesions. MDCT with different reconstructions may precisely identify the characteristics of malignant renal masses, such as perinephric extension, invasion of Gerotas fascia, renal vein/IVC, lymph node extension, spread to surrounding organs, and distant metastases, which is highly helpful for staging lesions. Attenuation values and enhancement patterns of renal masses during the unenhanced, corticomedullary, and nephrographic phases were analyzed in a study by Satish Patil [9]. When the corticomedullary and nephrographic phases were contrasted, no statistically significant differences ($p > 0.05$) in enhancement were found for the radiologically benign cysts. When compared to the corticomedullary phase (mean-122$\pm$15 HU), the normal renal cortex showed stronger amplification in the nephrographic phase (mean -137$\pm$9 HU). They came to the conclusion that an unenhanced, corticomedullary, and nephrographic phase should be included in the MDCT procedure for the evaluation of renal masses in order to improve renal mass identification and characterization.

Due to the low soft-tissue contrast of non-enhanced CT, differentiation of renal lesions is limited [12]. The detection and differentiation of various RCC subtypes by multiphasic CT and magnetic resonance imaging are improved by the use of contrast agents (MRI). The most popular diagnostic tool, computed tomography (CT), can distinguish between benign and malignant entities and the most typical type of angiomyolipoma. Larger tumors are typically clear cell renal cell carcinomas (ccRCC), and papillary RCC and ccRCC can be distinguished when they present as typical lesions. [13] The identification, characterisation, and staging of renal masses can be done with excellent sensitivity and specificity using MDCT and effective reformatting techniques. [14]

Conclusion

For the characterization of renal malignancies and to make treatment

planning easier, specialized diagnostic imaging of the kidney is essential. When evaluating renal masses, either for diagnostic or preoperative purposes, computed tomography is a crucial tool. Ionizing radiation and nephrotoxic iodine contrast chemicals are the general limitations of CT; however, a recently published meta-analysis reveals that additional patient- and illness-level characteristics may also play a role in the development of acute kidney injury (AKI) after CT rather than the delivery of contrast agents.

References

1. O'Connor SD, Pickhardt PJ, Kim DH, Oliva MR, Silverman SG. Incidental finding of renal masses at unenhanced CT: Prevalence and analysis of features for guiding management. Am J Roentgenol. 2011;197(1):139-45.
2. Nguyen MM, Gill IS, Ellison LM. The evolving presentation of renal carcinoma in the United States: Trends from the surveillance, epidemiology, and end results program. J Urology. 2006;176(6):2397-400.
3. Frank I, Blute ML, Cheville JC, Lohse CM, Weaver AL, Zincke H. Solid renal tumors: An analysis of pathological features related to tumor size. J Urology. 2003;170(6):2217-20.
4. Sankineni S, Brown A, Cieciera M, Choyke PL, Turkbey B. Imaging of renal cell carcinoma. Urol Oncol. 2016 Mar; 34(3):147-55.
5. Karthikeyan MA, Vohra P. Role of multi detector computed tomography (MDCT) in evaluation of renal masses. Int J Res Med Sci 2018; 6:974-80.
6. Mohi J.K., Kajal S., Singh J. Imaging evaluation of renal masses. Int J Med Res Rev 2017;5(06):635-643.
7. K. Swarupa Rani, N. Giridhar Gopal, Multidetector Computed Tomographic Evaluation of Renal Masses, International Journal of Science and Research (IJSR). December 2019; 8 (12).
8. NVK Sundeep, M Venkatesh, P Suneetha. Role of computed tomography (plain and contrast) in the evaluation of renal masses. International Journal of Contemporary Medicine Surgery and Radiology. 2018; 3(3):C39-C43.
9. Satish Patil, Shivanand Patil, Vishal Nimbal. Role of CT in assessment and characterization of renal masses. International Journal of Contemporary Medicine Surgery and Radiology. 2018; 3(2): B174-B179.
10. Young, J. R. et al. Clear cell renal cell carcinoma: discrimination from other renal cell carcinoma subtypes and oncocytoma at multiphasic multidetector CT. Radiology 2013; 267: 444–453.
11. Sun M. R. et al. Renal cell carcinoma: dynamic contrast-enhanced MR imaging for differentiation of tumor subtypes–correlation with pathologic findings. Radiology 2009; 250: 793–802.
12. Tim J. van Oostenbruggea, Jurgen J. F¨uttererb and Peter F.A. Muldersa, Diagnostic Imaging for Solid Renal Tumors: A Pictorial Review, Kidney Cancer. 2018; 2: 79–93
13. Aycock RD, Westafer LM, Boxen JL, Majlesi N, Schoenfeld EM, Bannuru RR. Acute kidney injury after computed tomography: A meta-analysis. Ann Emerg Med. 2018;71(1):44-53 e4.
14. Demir H., & Bozyel E. Investigation of the Relationship between Mindful Eating Behavior and Anthropometric Measurements of Individuals Applying to a Nutrition And Diet Policlinic. Journal of Medical Research and Health Sciences, 2022; 5(1): 1636–1646.