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Original Article

Radiology Section

Role of Computed Tomography in Diagnosis of Urological Lesions: Hospital Based Study

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ABSTRACT

Introduction: Computed Tomography (CT) of the suspected urological lesions by multidetector CT machine can give us a rapid image of the entire urinary tract over a single breath-hold. It is considered to be a very good modality for detection of urinary tract lesions like anomalies, inflammation, calculi as well as neoplasm.

Aim: To assess the role of multidetector CT in evaluation of suspected urological lesions in patients referred to Radiology Department of a tertiary care Mumbai Hospital.

Materials and Methods: It is an observational and descriptive study. It was done during January 2006 to December 2008 in the Department of Radiodiagnosis & Imaging at BYL Nair Hospital, Mumbai in Maharashtra state of India. About 100 patients who were referred to the department for CT with suspected urinary tract lesions were included in the study. A follow-up of patients was maintained for any surgery or laparoscopic examinations that were carried out. A histopathological diagnosis was obtained wherever feasible. Findings on CT were classified as diagnostic, contributory, false negative and false positive.

Results: Out of 100 patients, 58 were male and 42 were females. All the lesions were classified based on their organ of origin, 67 were of kidney origin, 11 were of combined kidney and ureteral origin, 4 were of ureteral origin and 18 were of urinary bladder origin. Of all the above lesions, 20 were found to be tumours, 6 were found to be masses, 15 were found to be inflammatory/infective, 46 were found to be calculus disease, 7 were found to be congenital, 2 were found to be traumatic and 4 were categorised as others which included cysts. Overall CT was diagnostic in 96 cases and contributory in 4 cases. There were no false positive or false negative cases.

Conclusion: From the study results, CT was found to be diagnostic in a large majority of cases across various pathological lesions of the urinary tract.

Keywords: Plain radiography, Renal Colic, Urinary tumours

INTRODUCTION

Computed Tomography (CT) of the suspected urological lesions by multidetector CT machine can give us a rapid image of the entire urinary tract over a single breath-hold with appropriate opacification by contrast medium and decreased partial-volume effect so that volumetric data can be used to select appropriate slices. Also better two dimensional as well as three dimensional reformations can be obtained by taking multiple and thin overlapping slices which also facilitate virtual cystoscopy [1-3]. Maher et al., [2] mentioned that 'multidetector CT urography (MDCTU) is a versatile imaging test, which can clearly demonstrate urinary tract anomalies, inflammatory processes, calculus diseases, and benign and malignant neoplasms'. Present study describes role of multidetector CT in evaluation of suspected urological lesions in patients referred to Radiology Department of a tertiary care Mumbai hospital.

MATERIALS AND METHODS

It was an observational and descriptive study. It was done in the Department of Radiodiagnosis & Imaging at BYL Nair Hospital, Mumbai in Maharashtra, India. Study duration was between January 2006 to December 2008. Total 100 patients who were referred to the department with suspected urinary tract lesions for CT were included in the study. Patients with other than urological lesions, patients not willing to give consent for inclusion in study and patients in whom follow-up was not possible were excluded from the study. Ethics Committee of the institute approved the study protocol. Detailed history was taken and physical examination was carried out. Informed written consent was taken from the subjects or legal guardian for examination and contrast administration prior to enrolment in the study. Consent for sedation was also taken wherever required. CT was done using standard instrumentation and technique in supine position with scanner settings as KVP

120 and mAS 165, Slice Thickness 8 mm, Feed/Rotation 12.5 mm, Slice Collimation 5 × 2.5 mm, Rotation time 0.5 seconds, Kernel B30S, Increment 8mm, Helical exposure time 16 to 18 seconds, Reconstruction interval 2.5, Superior extent as dome of diaphragm and Inferior extent as inferior border of pubic symphysis.

Contrast Administration

1) Oral: 750 ml diluted iodinated contrast (containing sodium and meglumine ditriazoate) was given orally 45 minutes prior to the scan to opacify and distend the bowel loops. 500 mLof oral contrast was given just prior to taking the patient for CT scan to distend the stomach in adults. In children, 500 mLof diluted iodinated contrast was used 45 minutes prior to CT examination and 200 mL oral contrast given for stomach distension just prior to CT scanning.

2) Intravenous: A Medrad Vistron CT pressure injector was used for intravenous contrast injection at the rate of 2.5 cc/second. Dynamic intravenous administration of 80 cc of 75% ionic contrast medium containing a combination of sodium and meglumine ditriazoate (each mL containing 370 mg iodine) was used in adult patients. In children, intravenous non ionic contrast medium containing pure meglumine (each ml containing 300 mg iodine) was used. The scan was completed in a single breath hold. Delayed scans were taken after 10 to 15 minutes to achieve optimum bladder opacification. Retrospective reconstruction of overlapping slices, coronal and sagittal multiplanar reconstruction images were obtained using the raw data. Abdomen and pelvis were always scanned together. A follow-up of patients was maintained for any surgery or laparoscopic examinations that were carried out. A histopathological diagnosis was obtained wherever feasible. The CT findings were correlated with clinical and intraoperative finding, in patients who were operated. In patients who were not operated (like patients with non resectable lesions or distant metastasis), correlation was obtained with the histopathological and clinical as well as laboratory findings. Results were classified as follows:

1) CT studies were considered DIAGNOSTIC when the imaging technique resulted in a specific histological diagnosis or when a malignant tumour and its organ site were correctly identified.

2) CT studies were considered CONTRIBUTORY when a malignant tumour without organ site was detected or the correct organ site was detected without histological diagnosis.

3) A false negative was scored when the lesion was not detected.

4) A false positive was scored when the predicted pathology by CT was not present at the time of surgery.

STATISTICAL ANALYSIS

Data was described in the form of numbers and percentages.

RESULTS

Out of 100 patients, 58 were male and 42 were females. [Table/Fig-1] describes the age distribution of patients. [Table/Fig-2] describes the lesions based on underlying pathology. [Table/Fig-3] describes the lesions based on organ involved.

Age (years)	Number	Percentage
0-10	9	9%
11-20	10	10%
21-30	15	15%
31-40	15	15%
41-50	17	17%
51-60	25	25%
61-70	5	5%
> 70	4	4%
Total	100	100%

[Table/Fig-1]: Age wise distribution of patients.

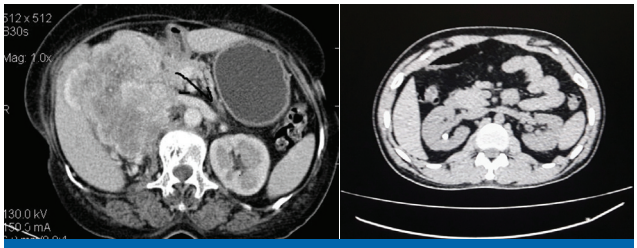
Lesion	n (%)
Calculus disease	46 (46%)
Tumours	20 (20%)
Inflammatory/Infective	15 (15%)
Congenital	7 (7%)
Masses	6 (6%)
Traumatic	2 (2%)
Others (including cysts)	4 (4%)
Total	100 (100%)

[Table/Fig-2]: Classification of lesions based on underlying pathology.

Organ involved	n (%)
Kidney	67 (67%)
Kidney & Ureter	11 (20%)
Ureter	4 (15%)
Urinary Bladder	18 (18%)
Total	100 (100%)

[Table/Fig-3]: Classification of lesions based on organ involved.

Overall CT was diagnostic in 96 cases and contributory in 4 cases. There were no false positive or false negative cases. Of the 67 cases which were of kidney origin, CT was diagnostic in 63 cases and contributory in 4 cases. CT was diagnostic in all 11 cases of combined kidney and ureteral origin, 4 cases of ureteral origin and 18 cases of urinary bladder origin. CT images of renal cell carcinoma and renal calculi are shown in [Table/Fig-4,5].



[Table/Fig-4]: Renal cell carcinoma. **[Table/Fig-5]:** Renal calculi.

DISCUSSION

CT was found to be diagnostic in 96% cases and contributory in 4% cases. Various researchers have studied the role of multidetector CT in evaluation of urinary tract lesions and most of them have reported various advantages of use of multidetector CT as a diagnostic option for the assessment of urological lesions. Levine et al., [4] studied role of plain radiography and unenhanced CT in assessment of flank pain and reported that plain radiography is not needed to be done and helical CT can be done directly for evaluating flank pain. Chowdhury FU et al., [5] studied unenhanced multidetector CT KUB in renal colic patients and concluded that CT KUB can replace IV urography. They also mentioned that CT can not only rapidly diagnose urolithiasis but also help in diagnosis of various pathological lesions of urinary tract. Elaine M et al., [6] reported their initial experiences with multidetector CT in 65 patients for evaluation of urinary tract abnormalities. They summarised that transverse as well as 3D images from multidetector CT are very useful for studying urinary system structure and pathology especially in patients with suspected urinary tract lesions. They further mentioned that it can detect even smaller abnormalities of collecting system as well as identify and describe renal, urothelial and bladder masses and lesions. Based on their experiences and available literature they concluded that multidetector CT urography can become a single and comprehensive modality for genitourinary system evaluation. Lang EK et al., [7] studied 57 patients for early detection of papillary and medullary necrosis by multiphasic helical CT and concluded that it was able to identify papillary and medullary necrosis at an earlier stage where it was still feasible to effectively intervene therapeutically so as to treat the cause and reverse the process of loss of blood supply which will prevent the sloughing of tissues.

LIMITATIONS

Limitations of our study are its a hospital based and observational study design. The sample of patients was relatively small as well as non representative.

CONCLUSION

Based on the study results and available literature we can conclude that CT is diagnostic in a large majority of cases across various pathological lesions of the urinary tract.

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