

<div><div></div><div><div>Original Research Paper</div><div>Radiology</div></div></div>	
<div>ROLE OF MULTIDETECTOR CT UROGRAPHY IN EVALUATION OF PATIENTS WITH HAEMATURIA</div>	
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<div>ABSTRACT</div>	<div><div><b>INTRODUCTION :</b> Haematuria indicates significant underlying urinary tract pathologies and requires diagnostic workup. MDCT urography is an imaging modality of choice for evaluation of urinary tract pathologies because of its faster speed and multiplanar capabilities.</div><div><b>OBJECTIVES :</b> This study was done to evaluate the role of MDCT Urography in detecting urinary tract pathologies causing haematuria.</div><div><b>METHODS :</b> Study of 50 patients presenting with haematuria to the department Radio-diagnosis, MGM Hospital, Kamothe, Navi Mumbai was done using CECT scan during July 2016 TO DECEMBER 2016.</div><div><b>RESULTS :</b> Out of the 50 cases abnormal findings were present in 46 patients. Among the 46 patients, Major causes of haematuria in our study were urolithiasis, benign prostatic hyperplasia, bladder neoplasm, renal infection, carcinoma of prostate, trauma and renal neoplasm.</div><div><b>CONCLUSION :</b> MDCT Urography is the first line imaging modality for evaluation of haematuria and has potential to provide accurate evaluation of these patients.</div></div>
<div>KEYWORDS</div>	<div>MDCT Urography, Haematuria</div>
<div><div><div><div><div>INTRODUCTION</div><div>Haematuria is one of the most common manifestations of urinary tract pathologies like calculi, neoplasm, infection, trauma, medications, coagulopathy, developmental anomalies and renal parenchymal diseases and always warrants serious concern.<sup>4</sup></div><div>Until the beginning of the 21st century, intravenous urography (IVU) was the initial method for genitourinary imaging. But now a days MDCT urography is emerging as imaging modality of choice.<sup>2</sup> MDCT urography is defined as multidetector CT examination of the kidneys, ureters and bladder with at least one imaging series acquired during the excretory-phase following intravenous contrast administration<sup>3</sup> CT urography is rapidly becoming accepted as the preferred test for diagnosing urinary tract disease responsible for haematuria because of superior spatial resolution, higher speed, isotropic reconstruction capability, excellent 3D multiplanar reformats and depiction of entire urinary tract in single breath hold examination<sup>1</sup>. CT urography combines the benefits of excretory urography with those of cross sectional imaging into a single study which depicts the renal parenchyma, collecting system, ureters and bladder.</div><div>CT urography has high diagnostic accuracy compared with excretory urography but has the disadvantage of a higher radiation exposure. The improvement in diagnostic capabilities outweighs the use of increased radiation dose for CT urography.</div><div>This study was done to illustrate a variety of entities that are frequently associated with haematuria in the patients who were referred for CECT in the Radiology Department of MGM Hospital, Kamothe,Navi Mumbai.</div></div><div><div>AIM AND OBJECTIVES</div><div><ul style="list-style-type: none"><li>To study the accuracy of MDCT urography in evaluation of various pathologies of urinary tract causing haematuria.</li><li>To study the most common etiology of haematuria in Navi Mumbai.</li></ul></div></div><div><div>MATERIALS AND METHODS</div><div><div>Source of data:</div><div>Fifty patients presenting with haematuria within</div></div></div><div><div>the study period will be subjected to MDCT urography which includes out patients, inpatients, referral patients of MGM hospital, kamothe, Navi Mumbai</div><div><div>Method of collection of data:</div><div><div>a) Study design:</div><div>prospective study</div><div>b) Study Place:</div><div>Department of Radio diagnosis, MGM hospital, Kamothe, Navi Mumbai</div><div>c) Study duration:</div><div>July 2016 TO DECEMBER 2016.</div><div>d) Sample Size:</div><div>50</div><div>e) Inclusion criteria:</div><div><div>1. Patients presenting with macroscopic haematuria</div><div>2. Patients with documented microscopic haematuria</div><div>3. Patients with haematuria who were suspected to have urinary tract pathology on other modalities and were then referred for MDCT Urography.</div><div>4. Patients who were willing to take part in the study as well as follow up</div></div><div>f) Exclusion Criteria:</div><div><div>• Patients lost to follow-up.</div><div>• Pregnant and lactating patient</div><div>• Severe renal failure(serum creatinine value above 1.5 mg/dL )</div><div>• Cardiac failure</div><div>• Previous allergic reaction to contrast media</div><div>• Patients with non urologic causes of haematuria</div></div><div>g)Methodology:</div><div><div>• The patients will undergo CECT examination after obtaining detailed clinical history and informed consent in written form.</div><div>• Patient is advised to be nil by mouth six hours before the study.</div><div>• First phase is the non-contrast phase.</div><div>• Second phase is the corticomedullary phase, which will be acquired following a delay of 25-80 seconds after administration of 100 ml (2.5ml/sec) of intravenous non-ionic low osmolar contrast medium (Iohexol) to differentiate normal variants of renal parenchyma from renal masses and better</div></div></div></div></div></div></div></div>	

- depiction of tumor hypervascularity.
- This is followed by nephrographic phase, after delay of 90- 100 seconds following contrast administration to evaluate the renal parenchyma.
  - Last phase is pyelographic phase which will be taken 8-10 minutes following administration, to evaluate the urothelium from the pelvicaliceal system to the bladder.
  - This will be performed with a Multidetector row CT scanner (64 slice Toshiba Aquilion CT machine).
  - CT scans will be obtained from the diaphragm to the bladder with the following technique: a collimator of 5 mm, a pitch of 1.5/2, and with 150- 200 mA, KV 120. Images will be reconstructed at a thickness of 0.5 mm. The axial as well as reformatted coronal and sagittal images were viewed on a workstation for evaluation.
  - The follow up diagnosis will be established on the basis of histopathologic findings or the findings at a urologic procedure (cystoscopy, ureteroscopy and retrograde pyelography) wherever possible.

OBSERVATIONS AND RESULTS

In our study out of 50 patients 38(76%) patients were male and 12(24%) were female.

MDCT urography findings were reported as normal in 4(3male and 1female) cases (8%) and abnormal findings were seen in 46(35 male and 11 female) cases (92%). Among the 46 patients included in the study the various pathologies causing haematuria are tabulated below-

PATHOLOGIES ON MDCTU	MALE	FEMALE	TOTAL
Normal	3	1	4(8%)
Urolithiasis	12	8	20(40%)
Benign prostatic hyperplasia	7	-	7(14%)
Carcinoma of bladder	5	1	6(12%)
Renal infection	4	2	6(12%)
CA prostate	3	-	3(6%)
Renal neoplasm	2	-	2(4%)
Trauma	2	-	2(4%)

Table 1: gender wise distribution of pathologies among 46 patients on MDCT urography

ILLUSTRATIVE CASES

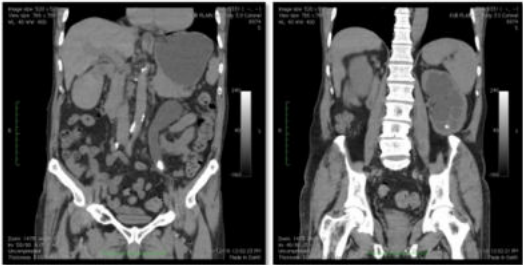


FIGURE 1: Left Ureteric Calculus, causing Upstream Obstructive Hydronephroureterosis along with left renal calculus at lower pole.

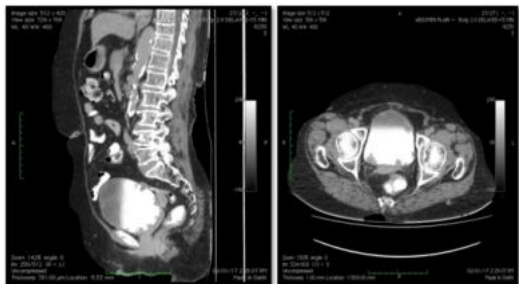


FIGURE 2: multiple Nodular Hypodense Lesions at the posterior and left lateral wall of Bladder. Multifocal Papillary TCC(Transitional cell carcinoma)



FIGURE 3: Emphysematous pyelonephritis affecting left kidney

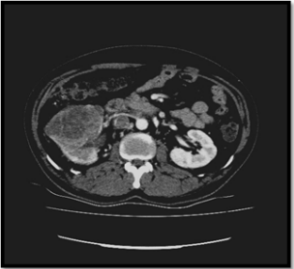


FIGURE 4: Renal cell carcinoma affecting right kidney with extension into renal vein and IVC

DISCUSSION

Haematuria, symptomatic and incidental, that involves more than three red blood cells per high-power field on two of three properly collected urinalysis specimens warrants some type of imaging to evaluate the urinary tracts. It can originate from any site along the urinary tract<sup>6</sup>

Causes of haematuria are<sup>7</sup>

Renal: stone, tumor (benign & malignant), trauma, infections, infarctions, structural kidney disease, vascular malformations, glomerulonephritis

Ureteric: trauma, tuberculosis, stone, neoplasm

Bladder: trauma, tuberculosis, stone, neoplasm, cystitis, recent instrumentation, radiation

Urethra: trauma, stone, foreign body, urethritis

Prostate: prostatitis, neoplasm (benign & malignant)

Early and accurate diagnosis of etiological factor helps in early and effective management. Conventional diagnostic test like IVU is complicated, long and less sensitive and specific compared to MDCT urography for detection of small tumor and calculi. Although ultrasound is very effective in detecting renal cystic lesions, this modality also has poor sensitivity for detecting solid renal lesions less than 3 cm<sup>9</sup>. MRI has been recently used to evaluate the urinary system. However, the inability of MRI to pick up calcification is an inherent drawback of this modality in its utility in diagnosing urinary pathologies. Also the cost and lack of easy availability restricts its use. At present the use of MR urography is limited to children, pregnant women, in renal insufficiency and in patients with contrast allergy<sup>8</sup>.

The ability of CT urography to evaluate the renal parenchyma as well as the urothelium in a single investigation has prompted many authors to moot it as a potential one stop investigation for the spectrum of urinary tract disorder with haematuria<sup>1</sup>.

In a study conducted by Mahmoud, M.A., Mahmoud, M.Z., Omer, M.A.A., Garalnabi, M.E.M., Abukonna, A. and Fagiri, M.A.(2015) Multi-Detector Row Computed Tomography Urography (MDCTU) in the Evaluation of Microscopic Haematuria in Adults. Open

Journal of Radiology, 5, 20-27 it was found that MDCTU established the correct cause of microscopic haematuria in (44; 88%) of participants. In (6; 12%) of participants, no cause of haematuria was identified. The cause of haematuria in (41; 82%) participants were diseases in the upper urinary tract as inflammatory kidney lesions (2; 4%); renal neoplasms (16; 32%); calculous disease (12; 24%); renal lesions with abnormal vascular patterns (6; 12%); miscellaneous renal diseases (4; 8%) and ureteral lesions (1; 2%). Urinary bladder neoplasms (2; 4%) and diverticulum (1; 2%) were the causes of hematuria (3; 6%) in the lower urinary tract.

Another study by A. Moreno<sup>1</sup>, C. Pozuelo Segura<sup>2</sup>, L. Monés Jiménez<sup>1</sup>, M. Romero Barrio<sup>1</sup>, X. Mallol Badelino<sup>1</sup>, J. Alvarez Fernandez<sup>1</sup>, D. Mulattieri Suarez<sup>1</sup>; <sup>1</sup>Badalona/ES, <sup>2</sup>Barcelona/ES concluded that MDCT urography is a technique that allows a full assessment of the urinary tract with high spatial and temporal resolution. One advantage to the IVU and ultrasound is three-dimensional nature of MDCT urography that allows reconstructions in all planes of space.

It also provides morphological and functional urinary system. It is very sensitive for the detection of calcifications (stones) and is the technique of choice in the diagnosis and monitoring of tumors of the urinary system. We can optimize protocols according to the clinical suspicion to reduce radiation exposure in selected cases.

In our study out of the 50 patients referred for MDCT Urography, 46 were found to have positive findings on MDCT urography concerning the high percentage of identifying pathological findings (Sensitivity 92%, positive predictive value 100%) among the patients with haematuria. Male: female ratio was found to be almost 3:1. Most common cause of haematuria found in both male and female was urolithiasis(20;40%) followed by Benign prostatic hyperplasia(7;14%), carcinoma of bladder(6;12%), renal infection(6;12%), carcinoma prostate(3;6%), renal neoplasm(2;4%) and trauma(2;4%).

## CONCLUSION

- Multidetector CT urography detects the entire spectrum of urinary tract pathologies causing haematuria with high accuracy.
- Multidetector CT urography has the potential to become a one stop shop for evaluation of urinary tract, especially in cases of haematuria

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