



Role of Multidetector Computed Tomography in Evaluation of Hematuria and Loin or Supra Pubic Pain

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Abstract

Introduction

Hematuria is characterised by sudden or gradual onset of blood, macroscopic or microscopic in urine with or without severe loin or suprapubic pain. Hematuria has causes like calculi, neoplasm, infection, coagulopathy and renal parenchymal disease and can originate from any site along the urinary tract. Excretory urography has been replaced by Multidetector computed tomography (MDCT) as the first imaging test in many institutions.

Aims

To evaluate the usefulness of Multidetector Computed Tomography (MDCT) in detection of causes of hematuria and loin, supra pubic pain. To further evaluate pathologies causing hematuria.

Objectives

Main objective is to facilitate early discharge or OPD follow up if MDCT scans are negative or shows simple pathology.

Methodology

A prospective co-relational study was conducted over a period of two years (December 2018 to December 2020) on 100 patients with loin pain, supra pubic pain and haematuria in a tertiary care hospital in Navi Mumbai. They were evaluated with Multidetector Computed Tomography and findings were correlated with surgical findings wherever applicable. The data was analysed using appropriate statistical tests.

Results

In our study most common cause of Hematuria was Calculi accounting for 66%,second common cause of Hematuria was Urinary tract infection accounting for 11%,third common cause of Hematuria was Renal mass accounting for 6%.

Conclusion

Multidetector computed tomography is highly accurate and specific in detecting the cause of Hematuria by using its multiplanar and 3D capabilities. The exact site of involvement can be demonstrated by MDCT.

Keywords- Hematuria, Multidetector Computed Tomography, Loin, Supra pubic pain

Introduction

Hematuria is a clinical syndrome characterized by sudden or gradual onset of blood, macroscopic or microscopic in urine with or without severe loin or suprapubic pain. Hematuria has a wide range of causes like calculi, neoplasm, infection, coagulopathy

and renal parenchymal disease and it can originate from any site along the urinary tract. [1-3]

Excretory urography has been replaced by Multidetector computed tomography(MDCT) Urography(MDCTU) as the first imaging test in

many institutions. For detection of renal masses CT is the most sensitive imaging modality, in characterising renal masses as solid lesions, simple cysts or complex cysts CT plays an effective role. Over conventional axial CT Helical CT has many potential advantages. Entire sequence has to be obtained during a single breath hold by rapid and continuous scanning. Most kidneys can be scanned using narrow(5mm) image collimation in less than 30 seconds, the most commonly used pitch(ratio of table speed to image collimation) of 1:1.the chance that portions of the kidneys(and therefore renal masses) might not be imaged can be eliminated and mis-registration can be prevented by scanning during a single breath hold. The major advantage of helical CT is ability to retrospectively shift the level of reconstruction. At the time scans are acquired collimation and pitch must be determined, raw data can be reconstructed at any level. This helps the technologist to reconstruct an axial image at that level which precisely includes the center of a detected renal mass.The rapid scanning time of helical CT also permits renal imaging during any of the three phases of renal parenchymal contrast material enhancement: the cortical phase, nephrogenic phase or excretory phase. Since the introduction of Multi Detector CT Scan in last 5 years in our tertiary care hospital in Navi Mumbai, there is increase in the use of CT scan in cases of Hematuria, Loin or Suprapubic pain. In this way CT is highly suitable for work up of patients with hematuria and loin and suprapubic pain.it provides rapid, minimally invasive high resolution imaging that can quickly direct the 4 patients for further treatment when results are positive and provide reassurance to practitioners(from clinical and legal prospective) when results are negative.

Materials & Methods-

Source of data:

Data for the study will be collected from patients with Loin pain,Supra pubic pain and Haematuria attended/referred to Tertiary care hospital in Navi Mumbai.

Method of collection of data:

A prospective co-relational study was conducted over a period of two years (December 2018 to December 2020) on 100 patients with loin pain, supra pubic

pain and haematuria in a tertiary care hospital in Navi Mumbai. Written informed consent of all the participants was obtained before the study. They were evaluated with Multidetector Computed Tomography (Toshiba 16 slice CT) and findings will be correlated with surgical findings wherever applicable. Axial thick cuts 5x5 mm and thin cuts 1x1mm were taken from domes of diaphragm to pubic symphysis. Intravenous contrast Omnipaque 350mg% (Ioxehol) 70ml was injected by pressure injector through venous cannula. Flow rate- 4ml/sec. 4 phases were taken:- 1.Plain with water as negative contrast to distend pelvi calyceal system, ureter and bladder. 2. Corticomedullary phase – 20 sec scan delay 3. Nephographic phase – 60sec scan delay 4. Excretory phase – 5-10mins scan delay Reconstructions were done in coronal and sagittal planes on CT machine or work station. Maximum Intensity Projection and Volume Render Imaging was done on work station.

Inclusion criteria:

1. Haemodynamically stable patient.
2. Patients with hematuria.
3. Patients with loin or supra pubic pain.
4. Patients with negative KUB report- Suspected radiolucent calculi.
5. A positive ultrasonography study – to look for cause of hydronephrosis and hydro ureter. Or further investigate in detail tumor or vascular pathology.

Exclusion criteria:

1. All haemodynamically unstable patients.
2. All cases of abdominal trauma.
3. Pregnant woman and cases of suspected gynecological case.
4. When cause of loin or supra pubic pain is non urological on CT
5. Patients not willing for examination/study.

Statistical Analysis:

Data will be analysed using appropriate statistical tests.

Results

In our study most of the patients were males accounting 68% and females were 32% with male to female ratio of 2.1. Most of the patients were in third and fourth decade of life,third decade accounting for

27% and fourth decade accounting for 24%. Loin pain was seen in 64% of cases, Supra pubic pain was seen in 62% of cases. Burning micturition, frequency and fever with chill is mainly seen in urinary tract infections, prostatitis and in some calculi, burning micturition accounting for 30%, frequency accounting for 28%, fever with chill accounting for 15%. Most common cause of Hematuria is Calculi accounting for 66% (Fig1). Second most common cause of Hematuria is Urinary tract infection accounting for 11% (Fig2). Third common cause of Hematuria is Renal mass accounting for 6% (Fig3). 4% of cases were Acute Glomerulonephritis. (Fig4) (Table 1)

5% of cases were Benign Prostatic Hyperplasia. 3% of cases were Prostatitis. 2% of cases were Sickle cell disease. Bladder mass, Renal TB, Renal papillary necrosis each accounting for 1%. Most of the Calculi are seen on Left side (38.3%), on Right side (21%) and on bilateral side (26.6%). Renal cell carcinoma is the most common renal mass in our study. Calcification seen in 4 out of 6 cases of Renal mass accounting for 66.6%. Necrosis seen in 4 out of 6 cases of Renal mass accounting for 66.6%. Enhancement seen in 6 out of 6 cases of Renal mass accounting for 100%. Hydronephrosis seen in 50% of cases. Due to renal mass the contour of kidney is abnormal in all 6 cases. (Table 2)

Discussion

Regarding Gender and Age distribution In our study out of total 100 cases studied, 68 were males and 32 females (age range from 9 to 68 years). The youngest patient was 9 years old and the oldest 68. Maximum number of patients are from 21 to 40 years (51%). The results of our study were comparable to the study done by Song et al (1). The gender distribution of patients presenting with Hematuria analysed, it was found that there were more males (68%) than females (32%) with a ratio of 2.1:1. Hence, our study is in accordance with the studies conducted by Song JH et al [4], and Maheshwari E [5] et al, where male: female ratio were 1.17:1 and 1.47:1. In our study there were 66 cases of calculi. Renal calculi was in 27.2%, ureteric calculi in 33.3%, both renal and ureteric calculi in 30.3%, bladder calculi in 9.1%. Most of the calculi were on left side (38.3%), right side (35.0%) and bilateral side (26.6%). The result of our study were comparable to the study done by R Peter Lokken et al [6]. MDCT is increasingly used as

initial imaging test in patients with Hematuria. In our study most common cause of Hematuria was renal and ureteric calculi. Hence, our study is similar with study conducted by R Peter Lokken et al [6], where renal and ureteric calculi is the most common clinical significant finding. The study conducted by Jia-Hwia Wang et al [7], this study showed that CT has replaced the intravenous urography (IVU) as first line diagnostic for acute renal colic. The sensitivity for 71 detecting ureteral stone was 98.5% for unenhanced CT and 59.1% for IVU. In our study the sensitivity for detecting ureteral stone was 99%. Hence our study is similar to study conducted by Jia-Hwia Wang et al.

Conclusion

Multidetector computed tomography is highly accurate and specific in detecting the cause of Haematuria by using its multiplanar and 3D capabilities. The exact site of involvement can be demonstrated by MDCT. Various associated and incidental findings can be detected by MDCT which may not be suspected clinically. MDCT is helpful in detection of causes of haematuria, loin pain and suprapubic pain. It is helpful in detecting simple causes like calculi to most dangerous cause like malignancy. MDCT helpful in determining the choice of management for clinician and aid in prognostic evaluation. MDCT facilitate early discharge of patient.

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TABLES**Table 1: Distribution of causes of Haematuria of patients studied**

Causes of Haematuria	No of Patients	Percentage
Calculi	66	66%
Urinary tract infection	11	11%
Renal Mass	6	6%
Bladder Mass	1	1%
Acute Glomerulonephritis	4	4%
Benign Prostatic Hyperplasia	5	5%

Table 2 : CT findings of Renal mass

CT findings of Renal Mass	seen	Percentage
Calcification	4	66.6%
Necrosis	4	66.6%
Enhancement	6	100%
Hydronephrosis	3	50%
Contour Changes	6	100%

Figures



Figure 1 - Left Renal Calculus

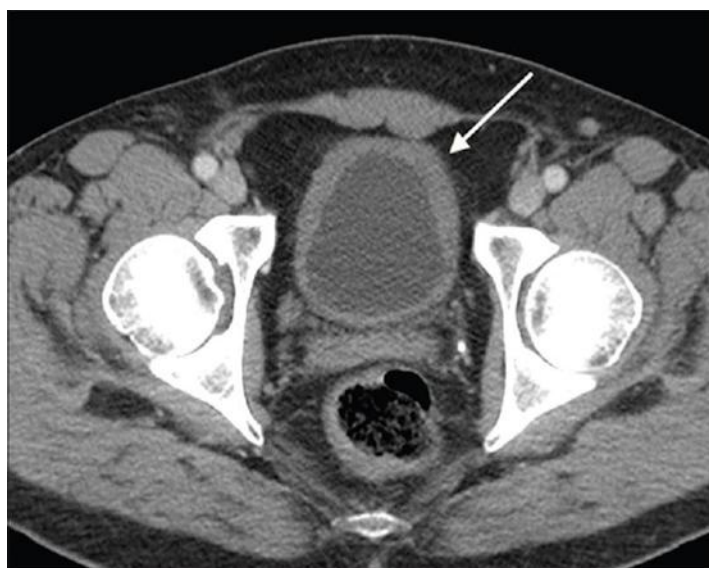


Fig 2: Cystitis-The urinary bladder is distended showing abnormal irregular wall thickening



Figure 3. Renal cell carcinoma- CECT showing soft tissue exophytic mass in left kidney esion with enhancement on contrast administration



Figure 4 : Bulky kidney with peri-nephric fat stranding in acute glomerulonephritis