

ORIGINAL ARTICLE

NON-CONTRAST ENHANCED MULTI-SLICE CT-KUB IN RENAL COLIC: SPECTRUM OF ABNORMALITIES DETECTED ON CT KUB AND ASSESSMENT OF REFERRAL PATTERNS

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Background: Renal colic is a common problem and significant number of patients presenting to ER, ED are suffering from acute or chronic renal colic. The conventional methods of investigating patients with renal colic are urine routine examination, plain radiograph for KUB (kidneys, ureters and bladder) and ultrasound followed by intravenous urography. Now a days non contrast enhanced computed tomography of kidneys, ureters and bladder is the first line investigation in suspected upper urinary tract obstruction. Radiation dose is one of the major limitations of CT KUB. Other limitations are cost and availability. The sensitivity and specificity of CT KUB is extremely high in the diagnosis of stones. **Methods:** This cross-sectional descriptive study was conducted in the department of Radiology Ayub Medical Teaching Institution Abbottabad from 1st July 2017 to 30th May 2018. Information obtained from history, clinical examination and CT KUB, ultrasound were recorded in an approved and prescribed *pro forma*. **Results:** Among total 350 patients, majority were male 66% and the age of study population ranged from 20 to 60 years. Most of the patients presented with flank pain and microscopic hematuria. Calculi were detected in 52 %. Patients with non obstructing stones were 63 %, ureteric stones and hydronephrosis were 22 %, ureterovesicle junction stone 4%. Patients with stones and incidental findings made 12.8% of the study population having abnormal CT KUB. **Conclusion:** Non contrast enhanced CT KUB, performed in a suitable clinical scenario, is an excellent imaging investigation for patients having renal colic and the initial ultrasound is inconclusive. In majority of cases it identifies the cause of lumbar or pelvic pain. This modality has the added advantage of showing alternate causes for pain other than stones.

Keywords: Renal colic; CT KUB; Abnormalities; Renal stones; Ureteric stones

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INTRODUCTION

Renal colic due to urinary tract obstruction and underlying renal, ureteric stones is the common clinical problem encountered by ER, casualty doctors and urologists. The initial workup for such patients is urine routine examination for hematuria, ultrasound of kidneys, ureters and urinary bladder. The sensitivity and specificity of ultrasound for renal stones is 81% and 100% respectively. The ultrasound is 46% sensitive for ureteric stones which is low.¹ CT KUB has emerged as the best imaging modality for the evaluation of renal colic. CT KUB is preferred due to easy availability, non operator dependent nature, ease of image acquisition. There is no need for oral or intravenous contrast media administration. CT KUB has the added advantage and ability to detect extra-urinary pathologies such as appendicitis, diverticulitis or gynecological pathologies such as hemorrhagic cyst or ovarian torsion that may mimic the renal colic.²⁻⁵

One of the major limitations is the radiation dose which has been reduced from 4.5 to 1 mSVT by the

availability of multislice CT scan, modification in technique and technological innovations.

CT KUB protocol for the diagnosis of urinary stone disease varies from a routine non contrast abdominopelvic CT study and has different acquisition parameters. The area to be covered in stone protocol extends from the upper pole of both kidneys to the base of urinary bladder.^{6,7} Coronal and sagittal reformatted images of 3 mm thickness are routinely acquired and are indispensable part of stone CT protocol.

As acute renal colic is a common presenting problem to ER departments and there is a need that the cause of pain should be determined. In some of the cases the ultrasound does not give the final answer or there are limitations of ultrasound imaging, so CT KUB becomes of decisive importance. The sensitivity of this method makes it an ideal candidate to diagnose and consequent initiation of early treatment may prevent morbidity, mortality and disability. This study was conducted to find out the spectrum of abnormalities detected on CT KUB and

to develop protocols for the patients with acute renal colic/lumbar pain and adopt them for the best clinical practice.

MATERIAL AND METHODS

This descriptive cross-sectional study was conducted at the Department of Radiology Ayub Medical Teaching Institution from 1st July 2017 to 30th May 2018. A total of 350 patients referred from MTI OPD, urology ward and outside physician clinics were selected by non probability consecutive sampling and examined by CT KUB. No preparation was required for this study and only full urinary bladder was assured. The female patients with positive pregnancy test and children <16 years were excluded. After putting the patient in spine position on table, anteroposterior topogram was obtained from lower chest to thighs. Then scans were obtained extending from the dome of liver to the ischial tuberosities. Slice collimation was 1.5 mm and images reconstruction thickness was 1 mm keeping interval of 0.75 mm. The exposure factors were 130 KVp and 200 mAS. The data was collected in a an approved and prescribed proforma. Data was analyzed using SPSS-20. The results were described and compared.

RESULTS

The total number patients included in this study is 350. Majority of the patients were male (66% n=231) and 34% female (n=119). The age ranged from 20 to 60 years. Most of the patients (66%, n=231) were referred from ED and urology department. The rest of the patients were referred from medical and surgical consultants. The most common presenting clinical complaints were flank pain and microscopic hematuria (80%, n=280). Calculi were detected in 182 patients (52%). Patients with renal stones without hydronephrosis were 63 (18%), patients with proximal, mid ureteric stones and resultant hydronephrosis were 77 (22%).

Ureterovesicle junction stones were visualized in 14 patients (4%). Patients with stones and incidental findings were 45 (12.8%). The incidental findings were renal cysts, duplication of collecting system, scoliosis, ovarian cysts. The patients with incidental findings without renal or ureteric calculi constituted 30.8% of the study population (n=108). CT KUB was unremarkable in 15 patients (4.2%). The patients with incidental findings and without stones were further categorized into patients having incidental findings related to urinary tract (n=63 18%) and incidental findings not related to urinary tract (n=45 12.8%). These findings were liver cirrhosis, gall stones,

bone deposits, fatty liver, hydrosalpinx and appendicitis.

Table-1: Distribution of all cases

Category based on CT findings	number of patients out of total	Percentage
Patients with stones only	182	52%
Patients with stones and incidental findings	45	12.8%
Patients with incidental findings and without stones	108	30.8%
Patients with unremarkable study	15	4.2%
Total	350	99.8%

DISCUSSION

Flank pain and hematuria due to renal stone disease is a common problem encountered by urologist, ER physician and general practitioners. There is sufficient literature available regarding CT KUB and renal stone disease. These studies are about the different aspect of renal stone disease.

The common presentations of urinary tract calculi in our study are flank pain and hematuria. The age of patients was between 20–60 years. The study conducted by Shaaban M Samir and colleague also showed flank pain and hematuria as the commonest presentations and patients age ranged 15–68 years.⁸

CT KUB in our study showed stones in majority of patients, incidental findings and confidently excluded significant abdominal surgical abnormality in 15 patients. This was also proved in a study conducted by Ather MH et al, who claimed the added advantage of CT KUB over other radiological modalities in distinguishing the renal from other alternate causes of flank pain.⁹ In a study conducted by Hoppe *et al*, unenhanced CT KUB of 1500 patients was performed who presented with acute flank pain. He found 69% patients having urinary tract calculi. This is in accordance to our study, patients with stones, stones and other incidental findings are 64.8%.¹⁰

Multidetector CT KUB is superior to ultrasound, plain radiograph and conventional intravenous urography because this offer the additional advantage of more precise anatomic localization of stones in the kidneys and specially in the ureters where stones are usually obscured by colon gases.¹¹

Majority of patients were male and the age was between 20 and 60 years. These findings are in accordance to the study conducted by Kirpalani A and colleagues in which they found that renal stones were three times more common in males with common age of presentation between 30 and 60 years.¹²

In a study conducted by J Dyer and colleagues, they found the rate of ureteric calculi 33.7%.¹³ This result almost close to our study result,

we also found ureteric and vesicoureteric calculi in 26% of patients.

In a study conducted by Marcella M and colleagues, they found stone disease in 32.7% patients.¹⁴ This is in contradiction to our finding of 52% stone disease. This difference is most likely due to effective primary and secondary level health services in their country and their small sample size.

CT KUB for the detection of urinary tract calculi is now considered to be the modality of choice as compared to conventional intravenous urography (IVU) because it is more sensitive and specific in calculi detection, rapid, does not use intravenous contrast and allows other pathologies to be detected.¹⁵ However a pre test thorough clinical assessment must be done and a suitable patient should be referred.

CONCLUSION

Non contrast enhanced CT KUB, performed in a suitable clinical scenario, is an excellent imaging investigation for patients having renal colic and the initial ultrasound is inconclusive. This modality has the added advantage of showing alternate causes for pain other than stones.

AUTHORS' CONTRIBUTION

AA, supervision, data collection, analysis and article writing, FA, literature review, data compilation, analysis, SH, Data compilation, ZJ, literature review and analysis.

Conflict of interest: The authors declared that there is no conflict of interest

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