

Unenhanced CT KUB for Urinary Colic: It's not just about the stones

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ABSTRACT

Aim: To demonstrate the use of non-contrast CT KUB in the detection of abdominal pathologies other than stones, whether or not simulating the clinical picture of urolithiasis, and its impact upon patient management.

Methodology: This was a cross sectional observational study carried out in Radiology department of Rehman Medical Institute Peshawar from Dec 2012 to May 2018. 2776 patients coming for CT KUB were included. Age range was 10 to 90 years and patients presented with persistent or recurrent pain in flanks. Data was collected from the hospital. CT KUB was performed for all patients on 128 slice Toshiba Multidetector computed tomography machine. Intravenous contrast was not given. The CT procedure used exposure factors set at 120 kVp. The radiology reports were reviewed retrospectively, and findings outside the urinary tract (kidneys, ureters, bladder, and urethra) were recorded and categorized by organ system. The encountered abdominal and pelvic pathologies other than stones were divided into two groups: incidental findings and acute pathologies.

Results: In 2776 patients who had CT KUB for suspected urolithiasis, 236 (8.5%) had alternative diagnoses non-GU findings, besides urolithiasis and obstruction, there were 63% males and 37% females. Majority patients were in the age group 21-40 years followed by age group of 41-60 years. The encountered acute abdominal non-renal pathologies were pancreatitis in 15, appendix related pathologies in 46, cholelithiasis in 108, cholecystitis in 1, epiploic appendagitis in 8 and hernia in 58 patients. Other non-KUB findings included psoas abscess (2), bowel perforation (2), Liver masses (1), Bone metastasis(2), Dermoid ovarian cysts (2, one of which had torsion), cervical stenosis with fluid distended uterine cavity (1), Prostate mass (2), uterine fibroids, adrenal adenomas(2) and many with degenerative bone changes, few with osteoporotic collapse. Significant findings were also observed as incidentally noted findings in visualized lower chest sections like pleural effusions, pulmonary nodules and a malignant looking basal lung mass in one case.

Conclusion: 8.5% patients were diagnosed with non-renal acute pathologies on non-contrast CT scan, which required immediate intervention. Non-contrast CT scan of the urinary tract (stone protocol) is a valuable tool in the detection of incidental findings which may simulate, or coincide with urolithiasis and it has a significant impact upon the management of the patients.

Key words: non-contrast CT KUB, urolithiasis, non-renal pathologies

INTRODUCTION:

When comparing X ray KUB, CT KUB has a higher sensitivity for detecting urolithiasis. By the addition of multidetector CT scanners, multiplanar reconstructions important information were added to the diagnostic findings, e.g. complications and secondary signs of obstruction, (perirenal and peri-ureteric fat stranding). CT KUB has overall lower cost and safer procedure without contrast material. One major benefit of CT KUB over plain radiography is to diagnose incidental findings or other causes of abdominal pain¹.

By the use of multidetector CT, CT image quality has improved. By this, there is an increase in the no. of detecting incidental findings, e.g. findings unrelated to the clinical indication for doing imaging examination.

In the present study, we aimed to evaluate the detection of incidental pathologies using 128-slice multidetector (MD) CT and presence of incidental findings

(those warranting immediate management) on patient's clinical outcome. Clinically unsuspected pathologies detection in abdomen and pelvis and those that require urgent treatment like acute appendicitis, cholecystitis etc, when diagnosed on CT done for ureteric colic, raises the bar high for MDCT scan. So, CT KUB has proven most advantageous in patients where clinical presentation is vague, overlapping more than one body system. In one study in 2010, who realized diagnostic ability of CT KUB for referring patients with different clinical histories other than urolithiasis².

In a study by Kirpalani and fellows³, there was no significant decrease in positive results in favor of renal colic or alternate diagnoses despite a definite trend of increased use of CT.

In another study by Katz and colleagues, it was found that a wide spectrum of significant alternate diagnoses including genitourinary (GU) and non-GU conditions was reliably established or suggested on MDCTs performed for suspected renal colic cases⁴.

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METHODOLOGY

This was a cross sectional analytical study carried out in Radiology department of Rehman Medical Institute Peshawar from Dec 2012 to May, 2018. 2776 patients coming for CT KUB in the duration were included. All patients who were referred from the emergency department, from hospital clinics and those who were inpatients were included in the study. The patients with previous surgery for renal or ureteric stones were excluded. Age range was 10 to 90 years. Data was collected from the hospital. The CT KUB reports of the 2776 patients finally included in the study were reviewed retrospectively after the final official report was available on our radiology information system. The final report is then generated after a consultation between the radiology team. Data was entered and analyzed using Microsoft excel.

CT KUB was performed for all patients on 128 slice Toshiba Multidetector computed tomography machine without contrast.

The abdominal and pelvic abnormalities other than stones were divided into two groups: incidental findings and acute pathologies. The incidental findings were also divided into genitourinary (GU) findings and non-GU findings. All relevant radiological examinations and laboratory analyses were analysed for the confirmation of patient's incidental/additional findings.

Appendicitis, Bowel perforation, Abscess, Fluid collections, Cholecystitis, Bowel obstruction, Torsion of masses etc. were given high importance. Urgent surgical referral was suggested and conveyed via phone call too. Tumours, enlarged lymph nodes (>1 cm), chronic inflammatory disease, Bone metastases were defined as findings requiring deferred treatment. Further workup was suggested in such cases with contrast enhanced studies or MRI, depending on the finding and suspected clinical picture. Benign lesions that would require treatment later were defined as findings of little clinical importance e.g. complicated cyst, adrenal adenoma, haemangioma, hernia without incarcerated bowel, cholelithiasis, marked organ enlargement or atrophy (uterus, prostate, liver, spleen or kidney). Findings of no clinical importance were those considered to be benign and unlikely to require any future treatment or additional assessment e.g. anatomical variants, uncomplicated cysts, benign calcifications, Old healed or non-healed fractures and congenital anomalies.

RESULTS:

In 2776 patients who had CT KUB for suspected urolithiasis, 236 (8.5%) had alternative diagnoses non- GU findings, besides urolithiasis and obstruction, there were 63% males and 37% females. Majority patients were in the age group 21-40 years followed by age group of 41-60 years. The incidental findings were also divided into KUB and non-urological findings. The encountered acute abdominal non-renal pathologies were overall seen in 236 patients (8.5%). These were pancreatitis in 15, appendix related pathologies in 46, cholelithiasis in 108, cholecystitis in 1, epiploic appendagitis in 8 and hernia in 58 patients. Other non-KUB findings included psoas abscess (2), bowel perforation (2), Liver masses (1), Bone metastasis(2), Dermoid ovarian cysts (2, one of which had torsion),

cervical stenosis with fluid distended uterine cavity (1), Prostate mass (2), uterine fibroids, adrenal adenomas(2) and many with degenerative bone changes, few with osteoporotic collapse. Significant findings were also observed as incidentally noted findings in visualized lower chest sections like pleural effusions, pulmonary nodules and a malignant looking basal lung mass in one case.

Fig 1: CT KUB in a patient with right flank pain. Axial and reformatted images showing features of acute Appendicitis (Arrows). Fluid filled distended appendix is seen in right iliac fossa with periappendiceal fat stranding (better appreciated on sagittal image) and minimal free fluid (better seen on axial image). It is important to compare both iliac fossa, when in doubt. The clue here is the increased diameter of appendix alongwith surrounding soft tissue haze.



Fig 2: Subhepatic Appendicitis diagnosed on CT KUB in a patient with pain in right hypochondrium. Coronal reformatted images showing thick walled appendix located at subhepatic level along lateral perinephric fascia with associated fat stranding, inflammatory reaction in right perinephric fascia and mild free fluid. Cropped magnified image showing curved blind ending loop. Here, the marked right perinephric fat stranding could have been misleading towards pyelonephritis but careful identification of high located appendix and that too with abnormal features confirmed the diagnosis.

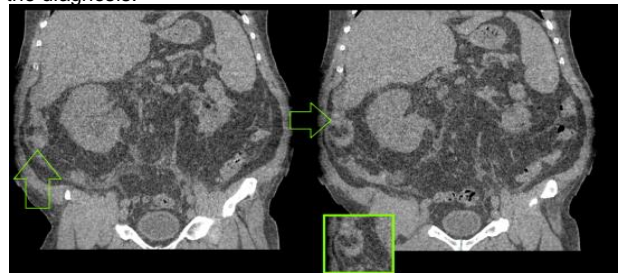


Fig 3 Ovarian Dermoid with possible Torsion diagnosed on CT KUB in an elderly female with pain in left flank and left iliac fossa. Arrow points to fat containing well defined lesion, located in cul de sac and left adnexal bed. Surrounding free fluid and fat stranding raises concern for Torsion.



Fig 4: Large left Psoas abscess. Axial and reformatted sections of CT KUB showing large fluid collection in left psoas muscle

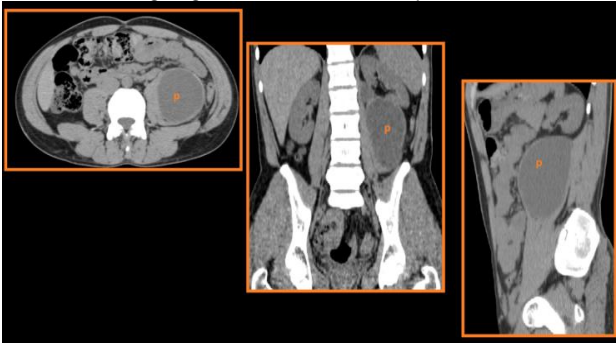
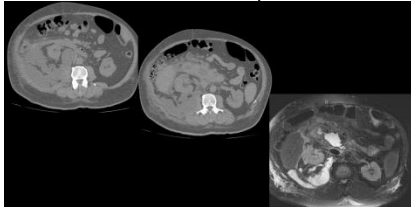


Fig 5: Duodenal Perforation. Axial CT KUB images (upper two images) showing multiple retroperitoneal fluid collections along right perinephric fascia, pancreatic head and duodenum. The possible differentials here included pancreatitis with pseudocysts and retroperitoneal perforation of bowel. Latter was confirmed with MRI seen in the lower most image, where a defect is clearly visualized in the medial wall of second part of duodenum.



DISCUSSION

The incidental findings in the present study was 8.5%, which is comparable to those reported in some studies^{1,4,5}. This is also comparable to past studies that have reported incidental findings of 7–27%⁶⁻¹⁰.

These reports studied by CT colonography literature by Xiong et al.¹¹ with a total of 3488 patients. In which incidental findings were 10.5%. This is not only noted for CT KUB but also for CT used for other reasons.

In another study by Naidu et al¹² it is noted that, unlike conventional angiography, CT angiography can detect pathologies outside the vascular system. The clinical significance of these findings can range from trivial and of no clinical importance to highly important findings requiring further evaluation or treatment. The definition of “important,” however, varies among studies, likely accounting for the wide range reported.

This may be due to higher resolution of MDCT and greater awareness among radiologists to see other causes. There has been no direct comparison of MDCT and 16-slice scanners; therefore it is difficult to ascertain whether the higher detection rate is related directly to the quality of the scanner or the disease pattern at different times. A recent report from the American College of Radiology¹³ on managing incidental findings noted that most of the incidental findings are probably benign and often have little or no clinical significance. As some of the incidental findings can have serious consequences, there should be clearer guidelines on when and how to evaluate them. However, there are other conditions which are important to recognize, although they might not be life-threatening.

Alternative diagnoses and incidental findings on unenhanced CT for suspected urolithiasis and obstruction are a recognized advantage over other methods. Awareness of the incidence and clinical significance of these findings at CT is important for many reasons. Most importantly, it calls attention to the many findings that lie outside the GU system and underscores the importance of careful interpretation of the entire CT findings. Also, these studies are often referred to radiologists from the urologists. When important incidental GU and extra-GU findings are reported, appropriate follow-up or referrals can be made.

Review of literature reveals relatively little research devoted to understanding incidental findings. A White paper published in 2010 by ACR¹³ states that the most common reason to pursue incidental findings is to differentiate benign from potentially serious (including malignant) lesions. Most incidental findings prove to be benign, their discovery often leads to a cascade of testing that is costly, provokes anxiety, exposes patients to radiation unnecessarily, and may even cause morbidity. However, the detection of important incidental findings that require urgent management, should be reported in a manner that patient gets referred to the concerned specialty as soon as possible.

CONCLUSION

8.5% patients were diagnosed with non-renal acute pathologies on non-contrast CT scan, which required immediate intervention. Non-contrast CT scan of the urinary tract (stone protocol) is a valuable tool in the detection of incidental findings which may simulate, or coincide with urolithiasis and it has a significant impact upon the management of the patients.

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