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ORIGINAL ARTICLE

Utilization of Non-contrast Enhanced CT KUB in Patients with Suspected Renal Colic

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ABSTRACT

Objective: The purpose of this study was to compare the yield of non-contrast enhanced CT KUB in patients with suspected renal colic across different ordering specialties.

Materials and methods: We conducted a retrospective assessment of 130 consecutive CT KUB tests that were ordered for suspected renal colic at Bahria Town International Hospital Karachi in the previous year. The demographic parameters, referring clinician, and ultimate diagnosis of the participants were all examined in the data. We included only individuals who had CT scans as the first line of treatment for clinically suspected reno-ureteral colic. A total of three divisions of departments placed orders for these CT KUB examinations: urologists, emergency room (ER) physicians, and others.

Results: The inclusion criteria were met by 96 out of 130 CT KUB procedures done in the previous year. The mean age of the patients was 33 years and 11 months, and the vast majority (87 percent, or n=83) were male. Urologists ordered the greatest number of CT KUBs (59 percent), followed by emergency room physicians (23 percent), and others (18 percent). Almost 70% of patients complained of flank pain, which was followed by generalised stomach pain and LUTs in a few cases. 71 percent (n =68) of patients with urolithiasis had a positive result in the study. 65 percent of urologists (n=44) have a good yield, with others (n=13) coming in second and emergency room physicians (16 percent, n=11) coming in third, respectively; p = 0.05 A total of 96 CT KUB tests were performed, with 53 percent (n = 51) revealing secondary symptoms of blockage. Accidental finds accounted for 33 percent (n = 32) of all results, with the majority (n = 19) being genitourinary in nature, followed by extra-genitourinary in nature (n = 13).

Conclusion: Across specialties, there is a statistically significant variance in the amount of yield. In the case of suspected urolithiasis, a CT KUB scan should be performed as a first imaging modality in consultation with the urologists. A thorough history taking and physical examination have proven to be critical measures in ordering CT KUB, which can help to reduce needless radiation exposure to the patient.

INTRODUCION

A common clinical presentation in the accident and emergency department is acute flank pain caused by presumed renal colic. Intense renal colic is presumably one of the most unbearably agonizing occasion an individual can persevere. The frequency of an individual for having stone of urinary system is around 12 % [1]. This typically occurs in patients aged 30–60, and is around three times more frequent in male population [2]. However, it is important to remember that there could be related non-calculus and non-genitourinary conditions. CT KUB is currently solidly settled as the best imaging strategy in the assessment of intense renal colic and is supplanting intravenous urography (IVU) at an expanding number of clinics. There is no requirement for intravenous agents, the assessment time is impressively shorter, there is expanded affectability for the identification of calculi and different non urological reasons for pain can be distinguished which is an additional benefit as non-urological conditions like appendicitis and gynecological emergencies can diagnosed as well .[3-4] The optimal dose of CT KUB is measured to be between 3-5 mSv (millisievert) which is three fold greater than IVU but there is no need of any contrast agent and adverse effect due to contrast can be avoided.[5] however the introduction of low dose CT KUB have reduced the radiation dose to around 1 mSv.[6] CT KUB is an investigation of choice for evaluating the stone in urinary system specially having higher sensitivity and specificity in detecting ureteric stone than any other radiological modality .[7] The aim of our study to find the rationale of usage of CTKUB and it is justified in every acute flank patient visiting in emergency ,it can help us in modulating a treatment guidelines in the future.

MATERIALS AND METHODS

One hundred and thirty consecutive CT KUB exams were ordered between January 1st, 2019, and June 30th, 2019, for investigation of clinically suspected renal colic. CT KUB was used as a study description in the radiology information system to identify cases. There was either a resident reading the scans, followed by a consultant radiology, or a consultant radiology reading the images alone.

After reviewing the CT scans, the authors concluded that the presence of urinary tract stones or secondary obstructions such as perinephric stranding, perureteral stranding, hydronephrosis, and hydroureter were "diagnostic" for urinary tract stones. There were four types of CT KUB: 'diagnostic' CTs that showed urinary tract calculi or secondary symptoms of blockage, 'alternate' CTs that showed the aetiology of flank pain, 'accidental' CTs that showed no clinically significant findings, and 'negative'

CTs that showed no findings at all. An additional classification was made for CT KUB tests that yielded both genitourinary and extra-genitourinary abnormalities (EGU).

Primary imaging to evaluate acute flank discomfort was only included in the study, whereas examinations used to refine a diagnostic or to further a diagnosis of a stone and blockage were exclusions from the data. It was separated into three groups: (I) urologists/and senior urology residents (ii) ER physicians (iii) and others, such as general surgery, medicine, and family medicine (iv) referring clinicians.

As required clinical information was not available, CT KUB examinations requested by outside physicians were excluded, as well as individuals who had recently been diagnosed with urolithiasis or had positive urological imaging in the past six months. All patients were excluded if they had any missing data at any time in the study

An SPSS version of 24 was used for the data analysis. Chi-square tests and analyses of variance were performed to evaluate rates of positive, negative and incidental findings as well as yield among specialties. The results of the tests were compared.

RESULTS

Out of 130 CT KUB examinations done during the study period, 96 met the inclusion criteria. 83 (86.5%) CT KUB examinations were of males while 13 (13.5%) were of females. Mean age (± Standard deviation) of the patients was 33.8 ± 11.03 years. Highest number of CT KUB exam

inations were ordered by urologists 57 (59.4%) followed by ER physician 22 (22.9%) and others 17 (17.7%) (Fig 1). Around three quarter of patients 67 (69.8%) presented with flank pain while 15 (15.6%) had Generalized abdominal pain, 7 (7.3%) had LUTs and rest of 7 (7.3%) visited for pain with LUTs (Fig 2). The overall positive yield of CT KUB for urolithiasis was 68 (70.8%) (Fig 3). Urologist has the highest positive yield of 44 (64.7%) followed by others 13 (19.1%) and ER physicians 11 (16.2%); $p < 0.05$. (Fig 4). Out of 96 CT KUB 51 (53%) showed secondary signs of obstruction.

Almost one third of CT examinations 32 (33.3%) showed incidental findings with or without stones and majority of them were genitourinary 19 (19.8%) followed by extra-genitourinary 13 (13.5%) (Fig 5).

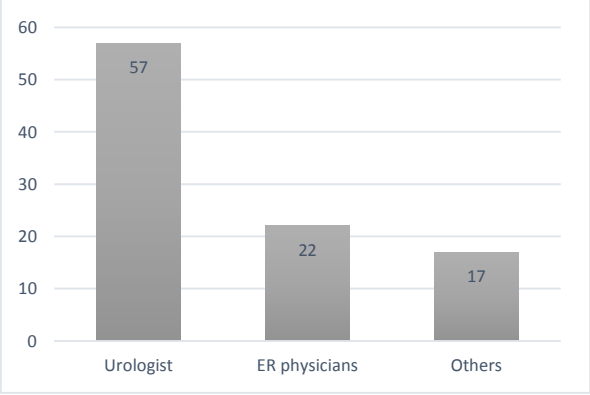

Figure 1: Distribution of ordering specialities

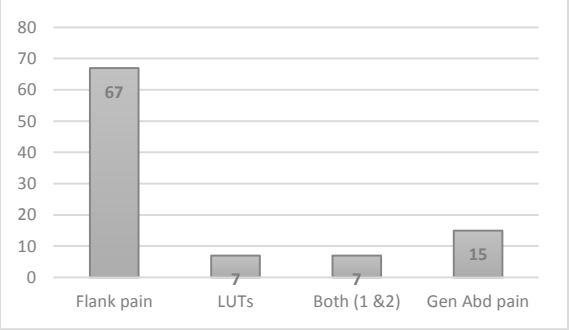

Figure 2: Clinical presentation

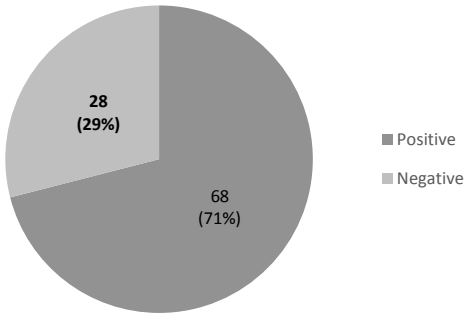

Figure 3: Overall positive yield of CT KUB

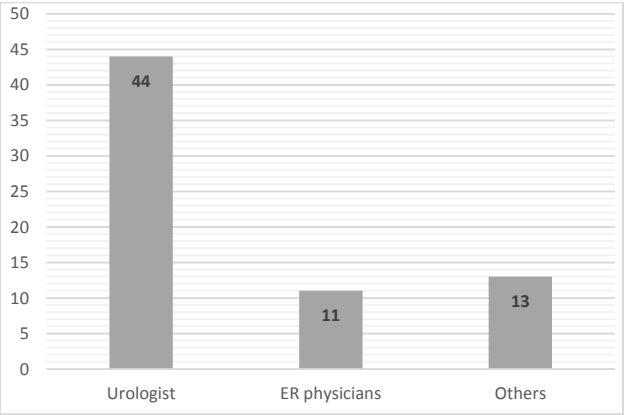

Figure 4: Yield of CT KUB among different specialities

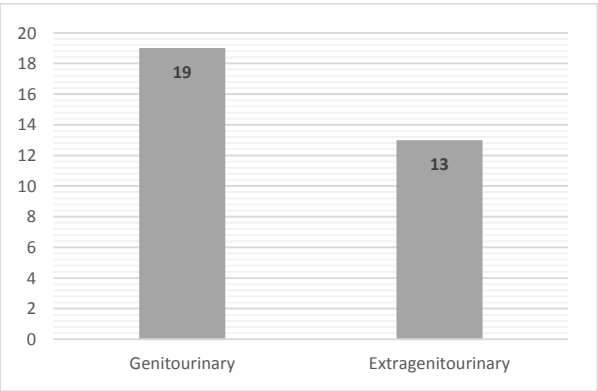

Figure 5: Incidental findings in patients undergoing NCCT

DISCUSSION

The use of an unenhanced CT scan for patients presenting with renal colic has been routine practise over the last ten years. The prevalence of urolithiasis has increased significantly in the United States of America during the last three decades, according to recent data. [9] In the general population of the United States, the risk of developing an episode of urolithiasis is roughly 10 percent to 15 percent over one's lifetime, with a recurrence rate as high as 50 percent. [23,24] The age of presentation is between 30 and 60 years, and males are three times more likely than females to present with the condition. [18] Because asymptomatic stones may never come to the emergency department or out-patient department, it is impossible to determine the actual incidence.

One of the most typical presentations in the emergency room is a patient who has acute flank discomfort due to renal colic. When a patient presents with suspected acute renal colic, radiological imaging is critical in determining the cause of the problem. [15] Our study found that the most prevalent symptoms with which the patient presents are flank pain (which occurred in 67 out of 96 patients, or 69.8 percent) followed by abdominal pain (15.6 percent) and LUTs (which occurred in 5.2 percent of patients) (7.3 percent).

The selection of radiological imaging is critical not only for the diagnosis of urolithiasis but also for the development of an effective care strategy for individuals who present with the condition. The accuracy, availability, safety, cost-effectiveness, and ease of interpretation of the imaging modality should all be considered when selecting an imaging modality. There are a variety of modalities available, including plain radiograph KUB, IVU, CT KUB, US, and more sophisticated MR urography (magnetic resonance urography). [11] In recent years, CT KUB has emerged as the preferred imaging modality for the diagnosis and follow-up of urolithiasis. It has a high sensitivity and specificity (96-100 percent, respectively), and it has the added advantage of being able to distinguish renal colic from other causes of flank pain, which is not always the case.

According to prior literature, non-contrast CT KUB has an effective radiation dose ranging between 2.8 and 9.2 mSv[16,21], which is equivalent to 1.2 – 2.2 years of radiation time, assuming a natural background radiation dose of 2.4 mSv/year (2.4 mSv/year).[12] According to a paper published in the New England Journal of Medicine, around one-third of all CT scans are unnecessary and that as many as 1.5 – 2 percent of all cancers in the United States may be caused by radiation. [14]

Because urolithiasis is a recurrent disorder, patients are more likely to undergo repeat imaging, with the likelihood of repeat imaging exceeding 35% in some cases, and some patients undergoing repeat imaging for more than 10 times during a 10-year period in others.[17]

It is much more critical to identify those individuals who may benefit from this method as a first line of defence in the investigational process. The benefits of ionising radiation must always be weighed against the hazards of cancer and other secondary effects that may result from exposure to the radiation. [19]

Physicians should be aware of the dangers of potential hazardous ionising radiation exposure and should make every effort to decrease the lifetime risk of negative effects from radiation exposure. It has been documented in the literature that a significant reduction in CT radiation dosage can be obtained by an education and training programme for radiological institutes and hospitals. [10] When the stone is larger than 3mm in size, the dose reduction may be appropriate, as in patients who have had large stones removed by endourology or lithotripsy, or when small calculi of 3 mm or less with high likelihood of spontaneous passage are encountered. [13]

Female patients have a reduced rate of urolithiasis, according to Chowdhury et al., as compared to male patients (27.5 vs 57.5 percent). Women were less likely than men to develop kidney stones in our study as well (7.4 percent compared to 92.6 percent), and this was confirmed in other studies. Females are substantially less likely to be affected than has been described in the literature. [15] Extra-peritoneal or other causes of flank discomfort were found in 13.5 percent of our participants, which is similar to the rate reported in the literature (15.1 percent). [8]

32 patients (33.3 percent) of those who participated in our study reported having received an unexpected alternative discovery as a result of their normal medical care.

During our investigation, urolithiasis was discovered in 70.8 percent of the patients, with 45.5 percent of those patients having stones in both the kidney and the ureter, and 29.4 percent and 25 percent of those patients having stones in only the kidney and ureter. The findings of the study also revealed that 46.9 percent of the patients did not have any secondary indicators of blockage, and 53.1 percent of the patients did not have any signs of obstruction.

The findings of Nadeem and colleagues show that the yield of patients with urolithiasis differs according on their medical specialty. While our findings differed from those previously published in the literature, they were consistent with the fact that urologists (77.19 percent vs. 67.35 percent) and other specialties (76.47 percent vs. 42.5 percent) had higher positive yields when compared to emergency department visits (50 percent vs 66.9 percent). [8]

Clinical suspicion of urolithiasis and blockage is increased by clinical evaluation, which includes taking a medical history and doing a physical examination in conjunction with a urinalysis. Even while the presence of red blood cells excludes the possibility of urolithiasis in the presence of acute flank pain and microscopic hematuria, the presence of red blood cells is suggestive of renal colic. According to a study published in the literature by Lallas et al., the size and placement of the stone are crucial factors in predicting the occurrence of microscopic hematuria. Comparatively, pelvic and ureteric stones, or stones less than 8mm in size, are more likely to cause microscopic hematuria than are calyceal stones. [9]

CONCLUSION

Non-contrast CT KUB is rapidly becoming a preferred imaging technique since it is quick, sensitive, and requires no preparation, making it particularly beneficial for triaging

patients in a crowded emergency department. On the other hand, it is leading to an increase in the number of negative CT scans, which is increasing the amount of radiation exposure. When comparing urologists to emergency room physicians and other specialties, our study found that more than half of non-contrast CT KUBs were ordered by urologists. Because urologists had a significantly higher positive rate when compared to the other categories, it is recommended that CT scans be ordered by urologists and by others in doubtful instances if possible. Ultrasound is a non-invasive alternative that has the advantages of not exposing the patient to radiation, being cost-effective, and having a high sensitivity and specificity for renal, proximal ureter, ureterovesical area, and bladder imaging. Ultrasound with x-ray KUB has a sensitivity that is virtually as good as CT in some cases.

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