Saudi Journal of Radiology
September 2024 3(1), 43–50
Original Article

DIAGNOSIS AND EVALUATING THE URGENT CT KUB AT KING FAHAD SPECIALIST HOSPITAL, BURAYDAH, SAUDI ARABIA 2022.

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ABSTRACT

PURPOSE: The aim of this research was to evaluate the diagnostic yield of urgent CT KUBs and assess the appropriateness of their use in the investigation of acute renal colic at King Fahad specialist hospital , Buraydah, Saudi Arabia 2022.

METHODS: All data were collected retrospectively from patient's records including all patients who presented to the emergency and inpatients undergo unenhanced CT KUB to rule out urinary tract stones . Follow-up requests of known urolithiasis and any scan done for other clinical indications were excluded ,representing 3.7% .

RESULTS:

This study reviewed 1671 patients, 24.9% were aged between 31 and 40 years old, with nearly 60% being males. Most patients were admitted to ER (98%) and referred by non-urology physicians (99%). The prevalence of patients who were diagnosed with renal stones was 38.7%. Among patients who were presented with acute renal colic and CT scan revealed no urolithiasis, there was 11% with incidental and other alternative diagnosis. The most common finding was genitourinary diseases (48.9%), followed by gastrointestinal diseases (27.2%).

CONCLUSION:

The significant percentage of negative CT KUB of the examined patients reflects the physicians misapplication with this technique with a subsequent reduction in the rate of renal calculi detection with unnecessary radiation exposure as well as increased the alternative/incidental of extraordinary findings, which may indicate further emergency abdominal CT studies. Therefore, urology opinion before CT-KUB requested for patients with atypical presentation is highly advised. Additionally , departmental ultrasound is suggested mainly for the young females prior to CT scan to rule out any gynecological conditions that can mimic renal stones.

Received 12 May 2024
Revised 3 June 2024
Accepted 28 July 2024
Published 30 July 2024

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DOI 10.55038/avhbpt13

eISSN: 1658-8959

الملخص

الغرض: كان هدف هذا البحث تقييم العائد التشخيصي لفحوصات الأشعة المقطعية للكلى والحالب والمثانة العاجلة وتقييم مدى ملاءمتها في التحقيق في حالات المغص الكلوي الحاد في مستشفى الملك فهد التخصصي في بريدة, المملكة العربية السعودية, في عام 2022.

الطرق و الأدوات: تم جمع جميع البيانات بشكل استعادي من سجلات المرضى, بما في ذلك جميع المرضى الذين قدموا إلى قسم الطوارئ والمرضى الذين أجروا فحص الأشعة المقطعية للكلى والحالب والمثانة غير المعزز لاستبعاد وجود حصى في المسالك البولية. تم استبعاد طلبات المتابعة للحالات المعروفة بالحصوات البولية والفحوص الأخرى لأسباب سريرية أخرى, والتي بلغت نسبتها 3.7%.

النتائج: قام البحث بمراجعة 1671 مريضًا, وكان ٪24.9 منهم في الفئة العمرية بين 31 و 40 عامًا, وكان نسبة تقريبية للذكور تبلغ حوالي ٪60. وكان معظم المرضى قد تم نقلهم إلى قسم الطوارئ (٪98) وتمت إحالتهم من قبل أطباء غير الأمراض البولية (٪99). كانت نسبة المرضى الذين تم تشخيصهم بحصوات كلوية تبلغ ٪38.7. ومن بين المرضى الذين قدموا بأعراض مغص كلوي حاد وأظهرت فحص الأشعة المقطعية عدم وجود حصى, كان هناك ٪11 مع تشخيصات عارضة أو بدائل. وكانت الاكتشافات الأكثر شيوعًا هي الأمراض التناسلية والبولية (٪48.9), تليها أمراض الجهاز الهضمي (٪27.2).

الاستنتاج: نسبة نتائج الأشعة المقطعية للكلى والحالب والمثانة السلبية الكبيرة في المرضى محل الدراسة تعكس سوء توجيه الأطباء باستخدام هذه التقنية, مما يؤدي إلى تقليل نسبة اكتشاف حصى الكلى مع تعريض غير ضروري للإشعاع وزيادة الاكتشافات البديلة/العارضة للأوضاع الاستثنائية, مما قد يشير إلى ضرورة إجراء مزيد من فحوص ال_أشعة المقطعية الطارئة للبطن. لذا, يُفضل بشدة استشارة أخصائي المسالك البولية قبل طلب الأشعة المقطعية للكلى والحالب والمثانة للمرضى ذوي العروض غير النمطية. بالإضافة إلى ذلك, يُقترح إجراء فحص الأمواج فوق الصوتية في القسم بشكل رئيسي للإناث الشابات قبل إجراء ال_أشعة المقطعية لاستبعاد أي حالات خاصة بأمراض النساء تشبه حصى الكلى

Keywords: Computed Tomography, Stone, KUB

1. INTRODUCTION

Renal stones are a common condition affecting the urinary tract system across different age groups and genders, often manifesting as sudden flank pain associated with vomiting. However, some cases can be asymptomatic. [1, 2] The prevalence of urolithiasis has increased in the Saudi Arabian population over the past 15 years due to environmental, nutritional, and genetic factors, with prevalence rates ranging from 6.2% to 11.2%. Additionally, a study reported a 25% lifetime incidence of urolithiasis in the Middle East. [2]

Patients presenting to the hospital with suspected renal stones should be assessed using non-contrast computed tomography (NCCT) for further evaluation of ureteric stones. [2] Studies have shown that NCCT has a sensitivity of 94% to 100% and a specificity of 97%. [2, 3] Other diagnostic modalities may be considered if CT is contraindicated, such as ultrasound, which has a sensitivity of 88% and a specificity of 45% for kidney stones. Kidney, ureters, and bladder (KUB) x-rays, while having low sensitivity, can identify radiopaque

stones larger than 3 mm and are often used to follow up with patients known to have calcium stones. [2]

The aim of this research is to evaluate the diagnostic yield of urgent CT KUBs and assess the appropriateness of their use in investigating acute renal colic at King Fahad Specialist Hospital, Buraydah, Saudi Arabia, in 2022.

2. METHODOLOGY

This retrospective study will involve collecting data from the medical records of patients treated at King Fahad Specialist Hospital in Qassim, Buraydah, during 2022. The study will include all patients who presented to the emergency department or were admitted to inpatient wards and underwent unenhanced CT KUB to rule out urinary tract stones. The target population consists of patients who were examined for suspected urinary stones, and data will be extracted from their medical records.

The inclusion criteria for the study are patients presenting with symptoms such as severe flank pain, radiating flank pain, gross hematuria, or signs of acute renal injury, for whom an unenhanced CT KUB was ordered urgently or emergently to exclude urinary stones. Patients will be excluded if the unenhanced CT KUB was ordered for other diagnoses unrelated to urinary stones, performed in an outpatient setting, or if the patient had a known history of renal stones. Data will include patient demographics, clinical presentation, the ordering physician's department, and any history of urinary stones. Patient consent is not required as all personal information will remain confidential. In total, 1671 patients were included.

3. STATISTICAL ANALYSIS

Statistical analysis was performed with categorical variables presented as counts and proportions (%), while continuous variables were described using mean and standard deviation. The relationship between gender and the demographic and clinical characteristics of the patients was assessed using the Chi-square test. All data analyses were conducted using the Statistical Package for the Social Sciences (SPSS) software, version 26 (Armonk, New York: IBM Corporation).

Table 1 Patient demographic and clinical characteristics (n=1671).

Study variables	N (%)
Age group	
· ≤20 years	90 (05.4%)
· 21 - 30 years	359 (21.5%)
· 31 - 40 years	416 (24.9%)
· 41 - 50 years	283 (16.9%)
· 51 - 60 years	247 (14.8%)
· 61 - 70 years	127 (07.6%)
· >70 years	149 (08.9%)
Gender	
· Male	997 (59.7%)
· Female	674 (40.3%)
Patient location	
· Emergency	1638 (98.0%)
· Inpatient	27 (01.6%)
· Other location	06 (0.40%)
Ordering physician	
· Urology physician	17 (01.0%)
· Non-urology physician	1654 (99.0%)
Stone	
· No	991 (59.3%)
· Yes	646 (38.7%)
· Indeterminate	34 (02.0%)

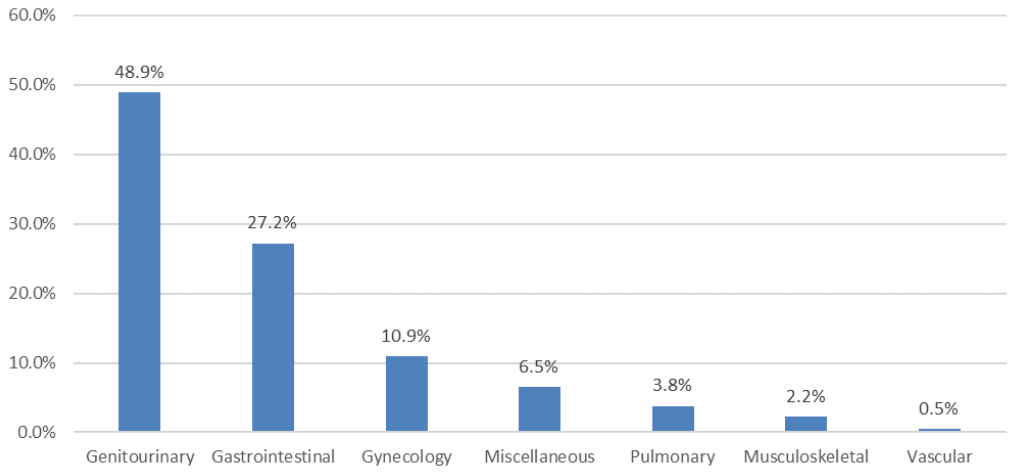

Figure 1 Clinical indications for patients presented with acute renal colic.

4. RESULTS:

As shown in Table 1 , 24.9% of the patients were aged between 31 and 40 years, with nearly 60% being male. The majority of patients (98%) were admitted through the emergency department, and 99% were referred by non-urology physicians. The prevalence of patients diagnosed with renal stones was 38.7%.

Table 2 Gender comparison in relation to demographic and clinical characteristics$^{(n=1671)}$

Factor	MaleN (%)$^{(n=997)}$	Female N (%)$^{(n=674)}$	P-value §
Age group			
· ≤40 years	556 (55.8%)	309 (45.8%)	<0.001 **
· >40 years	441 (44.2%)	365 (54.2%)	
Patient location			
· Non-ER	20 (02.0%)	13 (01.9%)	0.911
· ER	977 (98.0%)	661 (98.1%)	
Ordering physician			
· Urology physician	11 (01.1%)	06 (0.90%)	0.670
· Non-urology physician	986 (98.9%)	668 (99.1%)	
Presence of stone			
· No	465 (46.6%)	526 (78.0%)	
· Yes	512 (51.4%)	134 (19.9%)	
· Indeterminate	20 (02.0%)	14 (02.1%)	

§ P-value has been calculated using Chi-square test.

** Significant at $p<0.05$ level.

In Figure 1, among patients who presented with acute renal colic but whose CT scans revealed no urolithiasis, 11% had incidental or alternative diagnoses. The most common findings were genitourinary diseases (48.9%), followed by gastrointestinal diseases (27.2%). In Table 2, it was observed that females with suspected renal colic were more likely to be older than 40 years, while males were more likely to be 40 years or younger ($p=0.029$). Additionally, male patients were more likely to be diagnosed with renal stones compared to female patients ($p<0.001$). No significant differences were found between genders regarding patient location or the ordering physician ($p>0.05$).

5. DISCUSSION:

Acute renal colic is a common complaint in emergency departments and urology clinics. Clinical presentations vary and may include abdominal pain, back pain, nausea, vomiting, fever, and dysuria. Radiological imaging plays a crucial role in managing patients with suspected acute renal colic. Traditionally, imaging approaches involved a combination of

plain radiography, IVU, and ultrasound. The use of unenhanced CT to make a rapid and accurate diagnosis with high sensitivity (95-100%) and specificity (94-96%) in patients presenting with acute flank pain was first documented in 1995. [4, 5]

The data from our study can assist clinicians in decision-making and explaining management options to patients with acute flank pain. It can also help reduce the number of unnecessary CT KUB scans ordered during on-call hours. In recent years, the number of CT KUB scans has increased significantly, with a total of 1,736 scans performed on patients presenting to the emergency department with acute flank pain, excluding follow-up requests for known urolithiasis and other clinical indications (3.7%, n=65). Our study showed that 96.3% (n=1,671) of patients underwent CT KUB for suspected acute renal colic, of which 38.7% (n=646) were diagnosed with renal stones, 59.3% (n=991) had negative results, and 2.0% (n=34) had intermediate findings suggestive of recently passed stones. In contrast, another study found a higher overall prevalence of positive renal stones. [6] (Table 1)

A higher proportion of males (59.7%, n=997) presented with acute renal colic compared to females (40.3%, n=674). Among these, 512 males and 134 females were diagnosed with renal stones. No significant difference was found between age groups over 40 years and those 40 years or younger who presented with renal colic symptoms. In our institution, emergency physicians are allowed to request CT KUB for suspected renal stones without radiology approval or urology consultation. As a result, most requests (98%, n=1,638) came from the emergency department, while non-ER requests accounted for only 2% (n=33). Emergency physicians placed the highest number of orders, followed by internal medicine and general surgery (99.0%, n=1,654), with urology contributing only 1.0% (n=17), a trend contrary to other studies where urologists placed the majority of orders. [7]

Patients under urological care typically undergo CT KUB for unexplained acute abdominopelvic pain, recurrent renal colic with a history of renal stones, or to follow up radiolucent stones after treatment. Urological management is based on criteria such as stone size, location, hydronephrosis, and renal function, which guide decisions on intervention versus conservative management. In our study, 69.9% (n=404) of stones were $\leq$5 mm in size, while 30.1% (n=174) were larger than 5 mm.

Our research focused on patients presenting to the emergency department with acute renal colic who had no prior history of renal stones. We documented a wide variety of significant or potentially significant diagnoses that can be identified on CT KUB in patients with suspected renal stones. Attention to non-urinary tract structures, such as the abdominal and pelvic organs and bones, is critical during the assessment of unenhanced CT scans, which are more challenging to interpret than contrast-enhanced studies.

Previous studies have reported 10-13% of incidental or alternative findings in CT scans done for suspected renal stones. [8, 9] Our study found similar results, with 11% (n=184) of cases showing incidental or alternative diagnoses ($p<0.002$). (Figure 1) Conditions such as pyelonephritis, appendicitis, diverticulitis, adnexal lesions, and other acute gastrointestinal and gynecological pathologies were commonly detected. Some less frequent findings included lung infection, mesenteric panniculitis, and epiploic appendagitis. Therefore, an appropriate clinical assessment, including physical examination, laboratory results, and bedside ultrasound, is crucial to ordering the correct diagnostic test and reducing unnecessary radiation exposure, especially in younger patients.

Several limitations of this study must be addressed. These include the lack of detailed clinical presentation in the patient records, insufficient clinical data such as signs, symptoms, urine dipstick, and laboratory results, and the absence of subsequent urology impressions or interventions. Additionally, information on stone density, location, and the degree of hydronephrosis, which could add significant value to our research, was not available but could be explored in future studies.

The lower diagnostic yield in females may reflect the wide differential diagnosis in this demographic. Therefore, obtaining a urology consultation before requesting CT KUB in patients with atypical presentations is highly advised. Additionally, a departmental ultrasound is recommended for young female patients before considering a CT scan to rule out gynecological conditions that may mimic renal stones. Finally, relevant clinical and laboratory results should be clearly stated in each request to minimize unnecessary radiation exposure.

6. CONCLUSION:

The significant percentage of negative CT KUB scans in the examined patients reflects the misapplication of this technique, leading to a reduced detection rate of renal calculi, unnecessary radiation exposure, and an increase in incidental or alternative findings, which may require further emergency abdominal CT studies. Therefore, appropriate clinical assessment, followed by a urology consultation, especially for patients with atypical presentations, is highly advised before ordering CT KUB. Additionally, a departmental ultrasound is recommended, particularly for young female patients, to rule out gynecological conditions that can mimic renal stones.

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