



# Radiological Investigation in Acute Renal Colic

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Received: Jun 22, 2022

Accepted: Aug 16, 2022

Published Online: Aug 17, 2022

Journal: Journal of Radiology and Medical Imaging

Publisher: MedDocs Publishers LLC

Online edition: <http://meddocsonline.org/>

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## Abstract

**Objectives:** CT-KUB is the investigation of choice for acute renal colic. However, its use should be monitored to ensure that CT-KUBs have a reasonable diagnostic yield and are not being requested inappropriately.

**Methods:** A retrospective review of CT-KUBs performed in A&E in February 2022 at our centre. The requesting information was compared to the I-Refer criteria for appropriateness with a target of 100%. According to published studies, the recommended diagnostic yield is at least 44% for calculus and at least 6% as an alternative diagnosis.

**Results:** 119 patients met the inclusion criteria. 66% (n=78) of requests were deemed appropriate and included positive hematuria status and pain side.

The overall positive diagnosis of renal calculus was 43% (n=51), and an alternative diagnosis of 19% (n=23).

Of appropriate requests, 37% were positive for calculus, 22% showed alternative diagnoses, 4% had both alternative diagnoses and incidental findings, and 5% showed only incidental findings.

54% of incomplete requests were positive for renal calculus, 7% had alternative diagnoses, and 15% had incidental findings.

Females had a lower positive rate for renal calculus than males (10% vs 32%).

Females under the age of 40 had the lowest positive renal calculus yield (4.1%).

**Conclusion:** Both targets were narrowly missed. Better education and communication between Radiology and the Emergency department may lead to improvement in the quality of requests and the positive yield of the CT-KUB.



## Introduction

A Computerised Tomography (CT) scan of the Kidneys, Ureters, and Bladder (KUB) is referred to as a CT KUB. Since the first description of its role in 1995, as compared to IVU (Intravenous Urography), it was deemed to be more effective in precisely identifying ureteric stones and is equally effective as IVU in the determination of the presence or absence of ureteric obstruction [1], its usage has become more and more attractive over the years.

It became the investigation of choice for suspected renal calculus in adults (except for pregnant women [2]). In pregnancy, alternative imaging modalities, where possible, such as ultrasound or MRI, which do not expose the pregnant woman to ionising radiation, are preferred.

Over time, this rise in popularity of CTKUB has led to clinicians developing familiarity with this technique, and the indications for performance of unenhanced helical CT were expanded with a consequent reduction in the rate of detection of stone disease and identification of an increased number of extra urinary lesions, which suggests demand for emergency abdominal CT studies. This represents a widening from its intended original usage in suspected ureteric calculi to an investigation for non-specific abdominal pain [3].

Furthermore, CTKUB involves a higher radiation dosage than some other imaging modalities, which can cause damage to biological tissues and increase the susceptibility, although minor, of developing cancer in the future. As a result, raised concerns over the inappropriate use of CTKUB, especially in women of reproductive age, as the positive rate for stone disease in female patients is considerably lower [4].

All of this calls for more optimisation of its use. This article assesses whether CT KUB requested in our Centre meets the recommended standards in terms of requests made and the corresponding results.

## Methods

All non-contrast CTKUB reports were extracted from our radiology database from 1<sup>st</sup> February 2022 to 28<sup>th</sup> February 2022.

Data collected from CRIS manually looking at the day list for CT performed with the code CTKIDB at our Centre.

- Site -A&E.
  - Type of patients - adult  $\geq 18$  years old (except pregnant women).
1. Collected information compared against set national and international standards. The following clinical features must be detailed in the CT KUB request to aid reporting - age, side of symptoms, and presence/absence of haematuria (I-refer criteria). (Target - 100%).
  2. According to published studies, CT KUB conducted at regional centres should detect calculi in 44-64% of patients, with alternate diagnoses noted in a further 6-18%. [5-9].
  3. Extracted information included: demographics, the department ordering the investigation, and the presence of renal calculi. Any additional radiological findings were categorised as either alternative diagnoses that could account for the patients' symptoms or incidental findings that could not but were clinically significant.

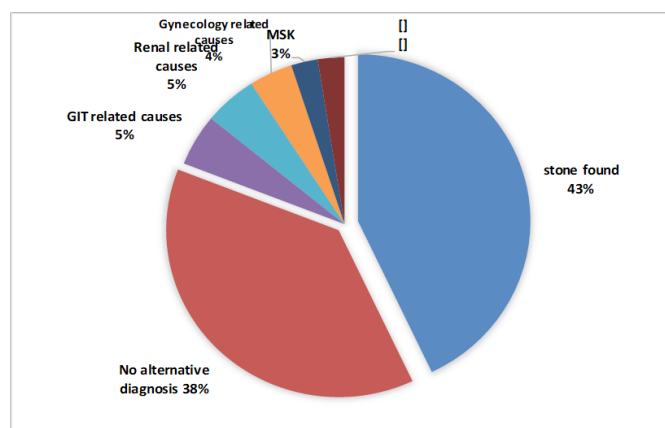
CT KUB with contrast exam and CTKUB requested from out-patients, GP direct access were excluded.

## Results

Of the CTKUB requests performed during the study period, 119 requests were included. 58.8 % (n=70) of the patients included were above 40 years of age, and 41.1 % (n=49) were aged 40 or younger.

45.3 % (n=54) of our patients were females compared to 54.6% (n=65) male patients.

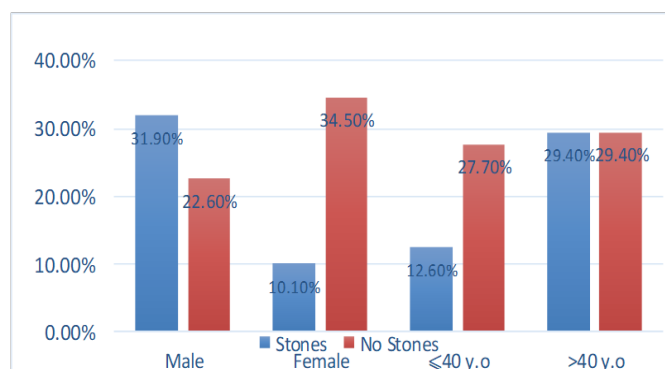
Overall, a diagnosis of renal calculus was made in 43 % (n=51) of patients. An alternative diagnosis was detected in 19 % (n=23). The distribution of different categories of alternative diagnoses is outlined in figure 1.



**Figure 1:** Patients aged 40 or younger showed a lower positive yield for renal calculus than those aged  $>40$  (12.6% vs 29.4%).

Females had a lower positive rate for renal calculus than males (10% vs 32%).

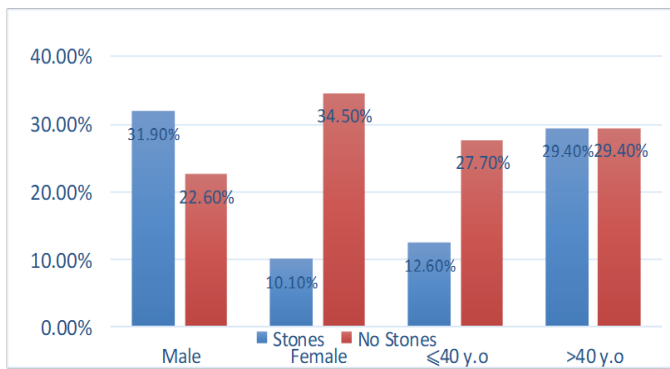
Of 119 patients, 23.3% were 40 years old, or younger females and only 4.1% had a positive diagnosis of calculus. This means females aged 40 years or younger had the lowest yield of positive renal calculus-figure 2.



**Figure 2:** 64% of patients with a positive diagnosis of renal calculus had hydronephrosis.

66% (n=78) of requests were deemed appropriate and included positive hematuria status and the side of pain.

Of appropriate requests, 37% (n=29) were positive for calculus, 22% (n=17) showed alternative diagnoses, 4% had both alternative diagnoses and incidental findings, and 5% showed only incidental findings Figure 3.



**Figure 3:** 54% (n=22) of incomplete requests were positive for renal calculus, 7% had alternative diagnoses, and 15% had incidental findings.

The requesting information for CTKUB has also been analysed; we have found that while most of the requests did include the necessary information, there were considerable numbers of requests in which important information was omitted, like the side of pain and presence /absence of haematuria.

Clinicians should be vigilant when requesting CTKUB, as information in the request form are of great value to guide the radiologist's reports. Also, failing to mention this critical information may lead to an alternative diagnosis being missed, with an alternative, more suitable tool for the investigation being ignored as a result.

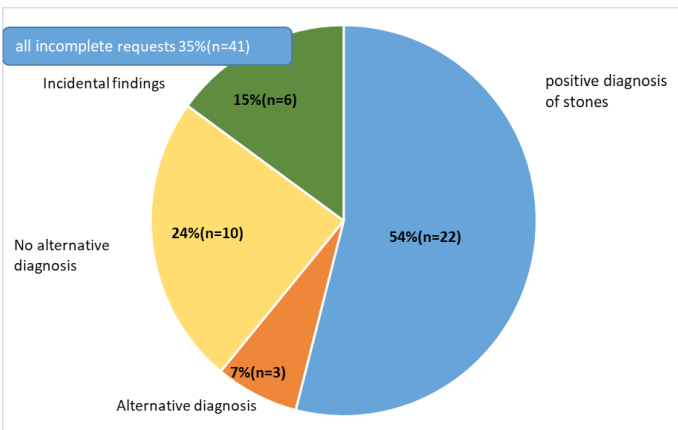
Communication with the requesting departments has taken place, and where the results of this study have been explained, we believe this will inevitably lead to better outcomes when requesting CTKUB.

**Conflict of interest**

The authors declare that there are no conflicts of interest

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**Figure 4**

**Discussion**

Our results show that the diagnostic yield of renal calculi is slightly lower than the recommended guidelines. This, in turn, meant that alternative diagnoses were potentially more common.

An assessment of the most appropriate first-line investigation for the alternative findings showed that most of such findings may have been better diagnosed with USS or a contrast CT scan. When interpreting the significance of incidental diagnoses on CTKUB, we must bear in mind its specific limitations, such as a reduced ability, compared to enhanced CT, to differentiate visceral ischaemia, infarction, and mass lesions, for example.

When CTKUB is used in a centre as the first-line investigation in a renal colic pathway, it should be done when a renal calculus is the most likely diagnosis and not to help assess non-specific flank pain. Centres should regularly review their practice to avoid such trends. Furthermore, the use of CTKUB in women of childbearing age needs to be further addressed.