

Flank Pain: Is Intravenous Urogram Necessary?

H S Teh, M B K Lin, T K Khoo

ABSTRACT

Aims: To determine the diagnostic yield of Intravenous Urogram (IVU) and the values of plain radiograph of kidney, ureter and bladder (KUB) and urinalysis as screening tests, with the objective to improve the cost effectiveness, in the management of patients presenting with flank pain due to urinary lithiasis.

Patients and methods: All Intravenous Urogram (IVU) request forms and reports for the month of February 1998 were audited. The case notes, urinalysis, KUB and IVU films were traced and reviewed.

Results: There were 110 patients investigated, 61.8% (68) had normal IVU, 38.2% (42) had abnormal IVU. The sensitivity and specificity of KUB alone was 79.4% and 90%. The sensitivity using urinalysis alone was 90.9% and its specificity 33.8%. The sensitivity of combined KUB and urinalysis was 100% and its specificity 26%, with a negative predictive value of 100%. All the patients with both negative KUB and urinalysis in our study were found to have negative IVU.

Conclusion: Our study shows that in patients with both negative KUB and urinalysis, the yield of IVU is very low and may not be necessary. This is important, as an IVU examination is not without risk. A combination of KUB with urinary analysis and careful evaluation of clinical symptoms will improve the cost-effectiveness of patient management.

Keywords: Flank pain, Intravenous Urogram, Plain radiograph of kidney, ureter and bladder (KUB), Urinalysis

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INTRODUCTION

Patients with flank pain are commonly seen at emergency departments and the urology clinic of our hospital. The diagnosis of ureteric colic requires proper history taking, physical examination and radiological investigations. Intravenous urography

(IVU) is a commonly performed radiological investigation since the 1930s⁽¹⁾. It is commonly performed for patients presenting with flank pain to evaluate for any urinary calculi or pathology. However, IVU is not without risk⁽²⁻⁵⁾ and may be costly⁽⁶⁾. We aimed to determine the diagnostic yield of Intravenous Urogram (IVU) and to study the values of plain radiograph of kidney, ureter and bladder (KUB) and urinalysis as screening tests, with the objective to improve the cost effectiveness, in the management of patients presenting with flank pain due to urinary lithiasis.

MATERIALS AND METHODS

All IVU request forms and reports for the month of February 1998 were audited. The case notes, urinalysis, KUB and IVU films were traced from the Medical Records Office and reviewed. The presenting symptoms and all the available investigations results were noted. IVU was used as the gold standard for the detection of urinary lithiasis. Results of the investigations were considered to be positive when:

1. Urinalysis:
Urine microscopy: RBC>5/high power field for male and RBC>10/high power field for female or, dipstick>1+,
2. KUB:
When there was any suspicious opacity projected over the renal outline and along the collecting system, and
3. IVU:
When IVU showed evidence of urinary calculi or signs of urinary tract obstruction such as hydronephrosis and hydroureter.

RESULTS

One hundred and ninety-six patients had IVU done in February 1998. One hundred and ten of these presented with flank pain. There were 78.2% (86) male and 21.8% (24) female. Of these, 54.5% (60) were Chinese, 11.8% (13) Indians, 30.9% (34) Malays and 2.7% (3) of other races. The mean age was 43.5 years. The age range was 18 to 80 years old.

Department of
Radiology
Changi General
Hospital
2 Simei Street 3
Singapore 529889

H S Teh, FRCR
Associate Consultant
Radiologist

M B K Lin, FRCR,
MMed (Diagnostic
Radiology)
Consultant Radiologist

T K Khoo, FRCR,
DMRD
Senior Consultant
Radiologist and
Chief

Correspondence to:
Dr Teh Hui Seong
Tel: (65) 850 4849
Fax: (65) 260 1703
Email: cyber_xray@
yahoo.com

Table I. KUB and IVU results of patients referred to our department with renal colic.

KUB	Changi General Hospital IVU		Total
	Abnormal	Normal	
+ve	27	5	32
-ve	7	45	52
Total	34	50	84

Sensitivity = 79.4%

Specificity = 90.0%

Table II. Urinalysis and IVU results of patients referred to our department with renal colic.

Urinalysis	Changi General Hospital IVU		Total
	Abnormal	Normal	
+ve	30	43	73
-ve	3	22	25
Total	33	65	98

Sensitivity = 90.9%

Specificity = 33.8%

Table III. IVU results of patients with renal colic who had both urinalysis and KUB performed.

KUB & urinalysis	Changi General Hospital IVU		Total
	Abnormal	Normal	
+ve	28	37	65
-ve	0	13	13
Total	28	50	78

Sensitivity = 100.0%

Specificity = 26.0%

Negative predictive value = 100%

Among these 110 patients, 68 (61.8%) had negative and 42 (38.2%) had positive IVU.

Eighty-four of the 110 patients who presented with flank pain had KUB done before IVU. Thirty-two (38.1%) had stone on KUB, and of these 84.4% (27) had abnormal IVU. Fifty-two (61.9%) were found to have no evidence of stone on KUB. Of these, 13.5% (7) had abnormal IVU, and 86.5% (45) had IVU showing no evidence of stone or obstruction. The sensitivity was 79.4% and specificity 90% (Table I).

Ninety-eight had urinary analysis documented. Of these 74.5% (73) had abnormal while 25.5% (25) had negative urine microscopy or dipstick. The sensitivity was 90.9% and specificity 33.8% (Table II).

Seventy-eight of these patients had both KUB and urinalysis obtained. The KUB and urinalysis were considered together as a single test in these patients. Patients were classified as having positive results when

one or both of the tests were found to be abnormal. Positive results were noted in 65 (83.3%) of these patients. Of these, 28 (43.1%) had positive while 37 (56.9%) had negative IVU. In 13 (16.7%) patients, both tests showed negative results. All these patients had normal IVU, giving a negative predictive value of 100%. The sensitivity was 100% and specificity 26% (Table III).

DISCUSSION

The initial work-up of patients presenting with flank pain remains controversial⁽⁷⁾. Over-investigation may not be cost-effective and may lead to unnecessary side effects while under-investigation may lead to medico-legal implications⁽⁶⁾. Despite the fact that KUB and urinalysis are readily available, easily performed, and inexpensive, IVU remains the primary radiologic study for the diagnostic work-up of patients with flank pain due to urinary lithiasis. It is able to demonstrate the anatomy of the entire urinary tract. Eighty to ninety percent of the urinary stones are radio-opaque and may be visualised on IVU⁽⁶⁾. IVU can also localise the site and level of obstruction. It also provides a gross assessment of the renal function, which may assist clinicians in the management of the patient^(4,5). Reported sensitivity ranges from 64 to 90% and specificity 92 to 100%^(8,9). However it is not without risk with potential danger of adverse side effects including anaphylactic reactions. The prevalence of all reaction was 3.13% with the use of non-ionic water-soluble contrast. Severe and very severe reactions may occur in 0.04 to 0.004% of patients respectively^(2,3). There is also the hazard of contrast-induced nephropathy especially in patients with pre-existing renal impairment. Serum creatinine elevation is detected between one to three days after contrast injection and peaks by three to seven days⁽²⁾. Further, the typical effective dose (mSv) to the patient is approximately 2.5 mSv for an "average" IVU. This is equivalent to 125 chest X-rays or 14 months of background radiation exposure⁽¹⁰⁾. The approximate lifetime risk of fatal cancers predicted for patients to result from the radiation dose at IVU is estimated to be 1:8000, compared to one in a million for a single frontal chest radiograph⁽¹⁰⁾. It is also costly (S\$130 in our hospital).

Of the 110 patients investigated, 42 were found to have abnormal IVU, giving a positive diagnostic yield of 38.2%. This is comparable to the results of the study done by Chia et al who had 39% (114) with abnormal IVU⁽⁶⁾.

Urinary stones may be seen on a KUB as an opacity projected along the urinary tract or the renal outlines. Our result shows a sensitivity of 79.4%. (Table I) This is again comparable to the result reported by Chia et al

(82%). Haddad et al (53%) and Mutgi et al (58%) reported even lower sensitivity^(6,11,12). The data suggests that KUB by itself is not a good screening test. Although 80-90% of urinary calculi are radio-opaque, they may not be seen on the KUB. The stones may be too small or obscured by adjacent structures⁽⁶⁾. KUB may also yield false positive result, such as due to phlebolith or vascular calcification⁽⁵⁾. KUB alone is of limited value as an initial investigation of ureteric colic and it cannot be regarded as the sole investigation to determine the subsequent evaluation.

Urinary analysis mainly examines urine microscopically to detect the presence of red and/or white blood cells, protein and crystals. It is not specific and may be abnormal in patients with simple urinary tract infection⁽¹³⁾. Women who are menstruating at the time of urinalysis will also give an erroneous result⁽¹⁴⁾. False positive may also occur if urine sample is left too long before analysis is done⁽¹⁵⁾. It is important that these are excluded as the cause of haematuria before embarking on urinary tract imaging for an underlying cause for haematuria. The low specificity is reflected in our study (33.8%) (Table II). This is comparable to that reported by Press and Smith (35.2%)⁽¹⁵⁾. On the other hand, it is also important to note that absence of hematuria alone in the setting of acute flank pain cannot exclude a diagnosis of ureterolithiasis. In a study by Bova et al 14% of their patients with ureterolithiasis had a negative dipstick test and 1 RBC or less per high power field⁽¹⁶⁾.

A significant finding in our study was that all the 13 patients who had negative KUB and urinalysis in the initial assessment were found to have negative IVU (100% negative predictive value) (Table III). Similar finding was also reported in the study by SJ Chia⁽⁶⁾. While one cannot assume the absence of a urological pathology in the presence of a negative IVU alone, however, in a patient, with normal KUB and urinalysis, who is asymptomatic in the subsequent follow-up, it is likely that IVU would not be useful. IVU is therefore not recommended for these patients. Close monitoring and follow-up and if necessary other non-invasive procedures may be preferred instead.

CONCLUSION

KUB and urinalysis are useful initial investigating tools in patients presenting with flank pain due to urinary lithiasis. In patients who have negative KUB as well as urinalysis, the yield of IVU will be very low and may not be necessary. Thus it is not recommended to subject every patient to an IVU in the initial evaluation of renal colic. This is important, as IVU is not without risk. The selective use of IVU will go a long way in achieving a cost-effective patient care.

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