

Intravenous urogram as a first line investigation in comparison with ultrasound

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Objective: The objective of was to evaluate the usefulness and efficacy of intravenous urogram in patients with urinary tract pathology detected on ultrasound and X-ray KUB.

Methodology: The duration of the study was from September 2007 to August 2009 and a total of 250 patients were included in this cross-sectional study by non probability purposive sampling technique. Ultrasound scans and intravenous urograms were conducted by/under direct supervision of consultant radiologist.

Results: Out of 254 patients, four were unable to complete the intravenous urogram due to reaction to the contrast medium; hence a total of 250 patients were included in the final study. There were 66 male and 184 female patients. Calculi (renal, ureteric and vesical) were seen in 139 patients, pelviureteric junction obstruction in 9,

double collecting system and/or ureter in 6, neurogenic bladder in 13, horseshoe/pancake kidney in 2, ectopic kidney in 1, ureterocele in 2, cystocele in 1 and bladder mass in 7 patients. In 14 patients, the tests conducted were inconclusive and further investigations were advised. 28 patients had no detectable urinary tract pathology on any of the diagnostic modality.

Conclusions: Intravenous urogram should not be performed routinely as a first line investigation in every patient presenting with flank pain. However, in congenital anomalies, intravenous urograms are needed and should be performed after a preliminary ultrasound. (Rawal Med J 2013;38:44-47).

Key Words: Intravenous urogram, ultrasound, X-ray KUB, urolithiasis.

INTRODUCTION

Intravenous urogram (IVU) has long been considered the mainstay of diagnosis in the evaluation of urinary tract pathology.¹⁻³ However, given the advancements in ultrasound of the urinary tract, the routine use of IVU should be curtailed due to the high radiation exposure it entails.⁴ Also, of increasing concern are the significant risks associated with the administration of contrast media.⁵ This is especially relevant in certain patients likely to have compromised renal function. Nevertheless, IVU is considered to be the gold standard,^{1,6} even if it involves substantial radiation exposure.

IVU entails the injection of iodinated contrast media,⁷ which significant risk of reaction. This risk can be lowered if non ionic low osmolar contrast media are used.⁸ However, this is not possible as a routine because of economic constraints and is recommended in high risk patients like the very young and the very old, diabetics and those with

renal or cardiac disease.⁹

Another issue that relates to the routine first line use of IVU as an imaging tool in urinary tract pathology is the cost associated with it. USG and X-ray KUB give adequate information in many cases, and hence obviate the need for an IVU in every case. Rising costs of medical care worldwide stress the importance of continuous re-evaluation of diagnostic protocols to get the best results with the least expenditure.¹⁰ Hence, this study was conducted to evaluate the usefulness and efficacy of USG and X-ray KUB in patients presenting with possible urinary tract pathology, and to assess the need for the routine use of IVUs.

METHODOLOGY

This cross sectional study was conducted at Department of Radiology, Fauji Foundation Hospital, Rawalpindi, Pakistan from September 2007 to August 2009. It included a total of 250 patients and were selected by non probability purposive sampling technique. All patients

undergoing IVU were included irrespective of their age or the presence or absence of systemic diseases or risk factors. Prior patient preparation with laxatives was undertaken to cleanse the bowel and ensure good quality radiographs.

Ultrasound was done on Toshiba machines using probes of 3.5 MHz. As operator experience plays a major role, all the ultrasounds were performed by a consultant radiologist. All patients then had a plain X-ray KUB as well as an IVU. X-ray KUB was seen for the presence of any calculi in the urinary tract. IVU was performed on every patient and assessed for renal pathology. Data was analyzed to determine the significance of IVU in the diagnosis of urinary tract pathology that was not already diagnosed on ultrasound of the urinary tract and plain X-ray KUB.

RESULTS

A total of 254 patients were initially included in the study. Four of these patients experienced reaction to contrast media requiring observation in the emergency room, and hence were unable to complete the IVU. A total of 250 patients were therefore included in the final analysis.

Table 1: Diagnosis in different patients.

Diagnosis	Number of patients
Renal calculi only	88
Ureteric calculi only	32
Renal & ureteric calculi	15
Renal & vesical calculi	3
Vesical calculus only	1
PUJ obstruction	9
Double system/double ureter	6
Neurogenic bladder	13
Horseshoe/pancake kidney	2
Ectopic kidney	1
Ureterocele	2
Cystocele	1
Bladder mass	7
Inconclusive on all 3 modalities	14
No abnormality on USG, X-ray KUB, IVU	28

Out of 250 patients, there were 66 (26%) male and 184 (74%) females. The preponderance of female patients was expected, as the majority of our patients are female, as this is a tertiary referral hospital for the families of retired army personnel.

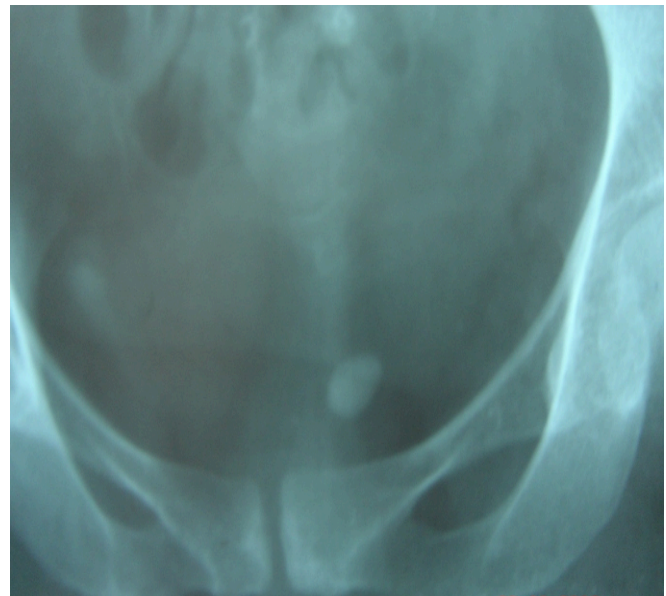
The ages of the patients ranged from 4-82 years.

A total of 139 (56%) patients had calculi. Several other renal conditions were seen and in 14 (5.6%) patients, the tests conducted were inconclusive (Table 1). 28 (11%) patients had no detectable urinary tract pathology on any of the diagnostic modalities employed viz. USG, X-ray KUB and IVU. This group included those patients who had adnexal or pelvic masses or had complaints of vesico-vaginal fistula.

DISCUSSION

Out of the total 250 patients included in this study, in 151 (60%) patients, no new information was added on the IVU; it complemented but did not add to the information already obtained by the USG and X-ray KUB. These were mostly patients who had only renal calculi, with or without hydronephrosis.

Fig 1: Plain radiograph showing calculus in left hemipelvis.



In 69 (28%) patients, IVU gave new information that was not forthcoming from both USG and X-ray KUB combined together. These included two broad groups of patients:

those with ureteric calculi and those with developmental malformations. In the group showing ureteric calculi, the presence of the calculus was suspected even before the IVU was performed, on the basis of USG and X-ray KUB findings. IVU was instrumental in the

demonstration of the calculi within the ureter. This finding agrees with the opinion expressed by others.²

The developmental malformations detected included double collecting systems and double ureters, PUJ obstruction, horseshoe kidney, ureterocele and ectopic kidney. Out of these, PUJ obstruction, horseshoe and ectopic kidneys, and ureterocele (Fig 1 and 2) were suspected on the basis of USG findings; however, IVU complemented and confirmed this information. Hence, it can safely be said that IVU is an integral diagnostic tool for the evaluation of congenital urinary tract anomalies.

Fig 2: IVU of the same patient showing left sided ureterocele with calculus.



We had 7 cases of bladder masses. In 6 of these patients, IVU showed filling defects in the urinary bladder, only one case failing to show anything on the IVU. However, IVU is not optimal in the identification of bladder tumors, even though it continues to be used.² Cystoscopy is a much better option, as it does not involve ionizing radiation, and a biopsy and ablation can be undertaken.

A normal USG, X-ray KUB and IVU were seen in 11% patients. In the presence of a negative X-ray KUB and negative urinalysis, an IVU may not be indicated as its yield is very low.¹⁰ This correlates

well with our own observations. Furthermore, we found that in the majority of our patients (60%), IVU did not add to the information already obtained from X-ray KUB and USG, as noted by others.¹² However, Devoe et al¹ and Gallagher et al² are of the opinion that IVU is still an essential component of the radiological work up of upper urinary tract calculi and acute obstruction.

USG gave more information in 16 (6.4%) patients as compared to the other two modalities together. This was seen to be the case in patients presenting with very small renal calculi which did not show up on the X-ray KUB or the IVU; and one patient with a radiolucent renal pelvic stone. 14 (5.6%) Patients had inconclusive results even after testing with all the three modalities. Further tests like micturating cystourethrogram for vesicoureteric reflux, DTPA or MAG³ for assessment of renal function, and DMSA for locating an ectopic kidney are advised.

CONCLUSIONS

IVU should not be done routinely as a first line investigation in every patient presenting with flank pain. It should be performed only after assessment of the information obtained on a preliminary USG and an X-ray KUB. It will be required in patients suspected of having congenital renal anomalies like PUJ obstruction, ectopic kidney, horseshoe or pancake kidney, ureterocele, etc.

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Conception and design: Dr Nuwayrah

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