Is Intravenous Urography Required When Ultrasonography and KUB Evidence a Ureteroscopy Plan?

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Purpose: To determine whether pre-ureteroscopic stone extraction (USE) evaluation by intravenous urography (IVU) can change the clinical decision made on the basis of a plain X-ray of the kidneys, ureters, and bladder (KUB) plus an ultrasonography in the case of ureteral calculi.

Materials and Methods: From October 2005 to November 2007, 139 USE candidates were selected based on ultrasonography and KUB, and were randomly divided into two groups. Each group was assessed by an expert urologist to decide about the treatment plans. Therewith, all the patients underwent an IVU pre-operatively and were evaluated for the second time by the other urologist considering IVU. Presence of a hydronephrotic kidney on the ultrasonography, existence of a density in the probable tract of the ureter on KUB, and previous episodes of renal colic were considered as inclusion criteria. Exclusion criteria were non-opaque stones on KUB, hypersensitivity to contrast media, and serum creatinine > 1.5 mg/dL.

Results: On the basis of ultrasonography and KUB assessment, all of the patients were identified candidate for USE. According to secondary IVU-based planning, of 139 patients, 127 (91.3%) required USE, 10 (7.1%) ureteroscopy, and 2 (1.4%) non-operative treatment. About 8.7% of treatment plans was changed by IVU, which was not statistically significant ($P = .35$). Positive predictive value of ultrasonography plus KUB to diagnose a ureteral stone which needed USE was 92.8% while IVU is the gold standard (95% confidence interval: 92.38 to 93.22).

Conclusion: Intravenous urography is not useful enough to be performed routinely before entire USEs.

Keywords: ultrasonography, ureteroscopy, hydronephrosis, ureteral obstruction, patient safety
INTRODUCTION

Ureteroscopic stone extraction (USE) is a commonly used endourological procedure in the treatment of ureteral calculi. Furthermore, it has been revealed that open surgery is necessary in a considerable portion of ureteral stones.\(^{(1-3)}\) Despite the high sensitivity of spiral computed tomography (CT) scan for detecting renal calculi, intravenous urography (IVU) is still considered as the gold standard imaging modality for evaluation of the ureteral calculi, but it carries the risk of X-ray exposure and has financial burden. Nowadays, the combination approach comprising of ultrasonography plus a plain abdominal X-ray, kidneys, ureters, and bladder (KUB) X-ray, is the first-line evaluating method for patients with renal colic in many countries.\(^{(1,4)}\)

This prospective study was designed to determine whether performing IVU as the routine pre-USE evaluation can significantly change the clinical decision made on the basis of KUB and ultrasonography or not.

MATERIALS AND METHODS

After receiving the approval from Tehran University of Medical Sciences’ medical ethics committee, the current study was conducted on a consecutive group of patients with renal colic who presented to the department of emergency of Sina Hospital from October 2005 to November 2007.

All the patients underwent ultrasonography, KUB, and urinalysis. Due to our limited accessibility to CT scan, we did not perform spiral CT scan for all the patients. Computed tomography was only done for diagnosing non-opaque stones. Existence of a hydronephrotic kidney on the ultrasonography, a density in the probable tract of the ureter on the KUB, and previous episodes of renal colic were considered as inclusion criteria. Exclusion criteria were non-opaque stones on KUB, hypersensitivity to contrast media, and serum creatinine > 1.5 mg/dL.

Most of the patients were managed conservatively with excessive fluid intake, analgesics, and physical activity. Patients who did not respond to this conservative treatment or those who had other definite indications for intervention were planned to undergo USE. One hundred and thirty-nine patients were identified definite candidate for USE, based on ultrasonography and KUB results. All of these patients were admitted to the department of urology and underwent IVU on the same day.

Patients were randomly divided into two groups. Group A consisted of 70 patients and group B composed of the rest 69 participants. The two groups were visited by two expert endourologists. While ultrasonography and KUB of patients in group A were reviewed by the first endourologist, the other group was assessed by the second endourologist. They made their decisions about patients’ treatments. Thereafter, the patients in each group underwent an IVU pre-operatively and were evaluated for the second time by the other urologist considering IVU. At last, we compared treatment plans of these patients that were once provided by ultrasonography plus KUB and another time by IVU.

Data were analyzed by SPSS software (the Statistical Package for the Social Sciences, Version 13.0, SPSS Inc, Chicago, Illinois, USA), and \(P\) values less than .05 were considered statistically significant.

RESULTS

Patients consisted of 84 (60.4%) men and 55 (39.6%) women, with the mean age of 43 years (range, 19 to 75 years). Mean serum level of creatinine was 1.3 mg/dL (range, 0.7 to 1.5 mg/dL). One hundred and thirty-two (94.9%) patients had hematuria.

Ultrasonography revealed mild hydronephrosis in 20 (14.3%), moderate hydronephrosis in 67 (48.2%), and severe hydronephrosis in 52 (37.4%) patients. All of these patients had one or more densities with a mean size of 10 mm (range, 4 to 20 mm) in the probable tract of the ureter on the KUB. Intravenous urography revealed mild, moderate, and severe hydronephrosis in 18 (12.9%), 67 (48.2%), and 52 (37.4%) patients, respectively. Intravenous urography was normal in 2 (1.4%) patients, while these patients had mild hydronephrosis on ultrasonography and a 5-mm density in the distal ureter on KUB, which resembled a stone. On the other hand, intravenous urography evidenced hydronephrosis in 10 (7.1%) patients, while those densities were not inside the ureter, but extrarenal. Due to IVU, these cases were selected for ureteroscopy and not for USE (Figure).

According to IVU, 127 (91.3%) patients were candidate for
USE. The indications for USE in these patients are shown in Table.
If we postulate that the acceptable limit of plan change with IVU is 10%, only 8.7% of plans was changed by IVU in our study, which was not statistically significant ($P = .35$). Positive predictive value of ultrasonography plus KUB to diagnose a ureteral stone which needed USE was 92.8% while IVU is the gold standard (95% confidence interval: 92.38 to 93.22).

**DISCUSSION**

Intravenous or excretory urography, firstly introduced in 1923,

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Laboratory quotes a maximum allowable reference dose of 6 MSV for an IVU.(11)

In the current study, all the patients who had hydronephrosis on ultrasonography and a density in favor of calculi in the course of the ureter on KUB were planned for USE. Thereafter, IVU was performed and based on its findings, only 2 (1.4%) patients did not need any endourologic procedure. This means, only the plan of two patients was changed significantly and they were not transferred to the operating room, but other 137 patients finally underwent an endourologic procedure (USE for 127 and ureteroscopy for 10 patients). Costs and complications of IVU make it more reasonable to conclude that performing IVU is a redundant test in these conditions. Consequently, IVU did not change the treatment plan of patients significantly and was an unnecessary procedure.

CONCLUSION
We concluded that IVU should not be performed routinely before the entire USEs.

CONFLICT OF INTEREST
None declared.

REFERENCES