International Surgery Journal
Joshi A et al. Int Surg J. 2018 Mar;5(3):810-814
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20180445

Original Research Article

An observational study of incidence of urological intervention in patients of renal colic with normal and abnormal ultrasound study

Ankit Joshi, Shirish Srivastava*

Department of Surgery, Pramukhswami Medical College, Karamsad, Anand, Gujarat, India

Received: 24 December 2017
Accepted: 30 January 2018
Accepted: 02 Febuary 2018

***Correspondence:**
Dr. Shirish Srivastava,
E-mail: shirish@charutarhealth.org

ABSTRACT

Background: Renal colic is a common presentation that affects millions people annually. Although ultrasonography has lower sensitivity and specificity in diagnosing urolithiasis compared to CT, it is an alternative imaging modality that does not expose the patient to ionizing radiation. By this observational study an attempt has been made to know the incidence of urological intervention in suspected renal colic patients with normal USG findings, so as to decreasing the number of CT scans and associated ionizing radiation in patients with suspected renal colic.
Methods: This was an observational study involving adult patients presenting to the Trauma and Emergency Care Department in Shree Krishna Hospital with suspected renal colic over a 12-months period. Renal ultrasonography was performed in suspected renal colic patients, and the results were categorized into three mutually exclusive groups: normal, suggestive of ureterolithiasis, or visualized ureteric stone. Patients were followed up to see if patients received urological intervention.
Results: Of 132 patients enrolled, 16 (12.12%) were classified as normal; none of these patients underwent urologic intervention. 62 (46.92%) USG results were classified as suggestive of ureterolithiasis, and one (1.61%) patient received urologic intervention. A total of 54 (40.91%) USG results were classified as visualized ureteric stone, and 24 (44.45%) patients had urologic intervention. The rate of urologic intervention was significantly lower in those with normal USG results ($p < 0.001$) than in those with abnormal findings.
Conclusions: A normal renal ultrasonography predicts a low likelihood for urologic intervention for adult patients with suspected renal colic.

Keywords: Renal colic, Ultrasonography, Urolithiasis

INTRODUCTION

Renal stones, one of the most painful urologic disorders, have beset humans for centuries.[1] Each year, worldwide millions of people visit to health care providers and emergency department with urolithiasis.[2] Although ultrasonography (USG) has lower sensitivity and specificity in diagnosing urolithiasis compared to computed tomography (CT), it is an alternative imaging modality that does not expose the patient to ionizing radiation.[3-6] While acknowledging the superior diagnostic accuracy of CT, there is increasing concern about cumulative radiation exposure from imaging with CT, particularly since patients with renal colic are often young and undergo multiple diagnostic imaging tests over their lifetime.[7] An important limitation of non-enhanced CT is the fact that it does not permit functional evaluation of the kidney and the degree of obstruction. Despite a lower sensitivity for calculus detection than CT, USG is noninvasive, quick, portable, repeatable and relatively inexpensive. Moreover, the avoidance of ionizing radiation makes it attractive screening modality

in pregnancy.[8] By this study an attempt has been made to know the incidence of urological intervention in suspected renal colic patients with USG findings, so as to decrease the number of CT scans and associated ionizing radiation in patients with suspected renal colic.

Aims and objectives of the study was to know the incidence of urological intervention in patient with clinically suspected renal colic with normal and abnormal ultrasound study to determine if a normal renal ultrasonography could predict a low likelihood of urologic intervention in patients with suspected renal colic and to compare the incidence of urological intervention with other imaging modalities.

METHODS

This was an observational study over a 12 months period from July 2015 to July 2016. A total of 132 patients aged more than 18 years presenting to Trauma and Emergency Care Department, Shree Krishna Hospital with clinically suspected acute renal colic were included in the study. The study protocol was approved by the HREC HM Patel centre for medical care and education, Karamsad. The selection of the patients was confirmed by the presence of clinical symptoms of renal/ureteric colic and the patient underwent an ultrasonography of abdomen and pelvis.

The results of ultrasonography were divided into three mutually exclusive categories that were defined a priori as:

- Patients with definite evidence of ureterolithiasis on USG
- Patients with USG suggestive of ureterolithiasis, with no visible calculus.
- Patients with normal USG report

The suggestive of ureterolithiasis category included results where a stone was not seen in the ureter but hydronephrosis, perinephric fluid or periureteral stranding, intrarenal stones, or an abnormal or absent ureteric jet was present. All patients were followed up and any uro-surgical intervention requirements were noted.

All patients underwent an USG and further imaging investigations (x-ray, KUB, CT) were carried out as and when required by treating consultant.

Patients discharged were followed up on their next visit to Out Patient Department or via telephonic conversation for any urological intervention or readmission for similar complaints. The outcome was the occurrence of urologic intervention, defined as ESWL, ureteral stent insertion, or ureteric stone extraction, within 90 days of the initial presentation. Secondary outcomes included unplanned return visits for the same chief complaint. The outcomes in patients with normal Sonography findings were compared with outcome of patients with Sonography report with definite evidence of calculus and Sonography report suggestive of calculus.

Data was entered, digitized into a study-specific Microsoft Excel database and processed with the help of statistical software (Stata 14.0). Statistics were summarized using means and standard deviations or proportional differences where appropriate. Categorical outcomes were compared using a chi-square test, and continuous data were compared using an independent samples t-test.

RESULTS

Of the 132 patients enrolled in the study, 12% had a normal USG report, 47% had Sonography findings suggestive of ureterolithiasis and 41% had USG with evidence of urolithiasis. The incidence of urological intervention in patients with normal USG report was zero out of 16 patients. One (1.61%) out of 62 patients with USG suggestive of ureterolithiasis underwent urological intervention. 24 (44.45%) patients with USG evidence of ureterolithiasis underwent urological intervention (Table 1 and Figures 1 and 2).

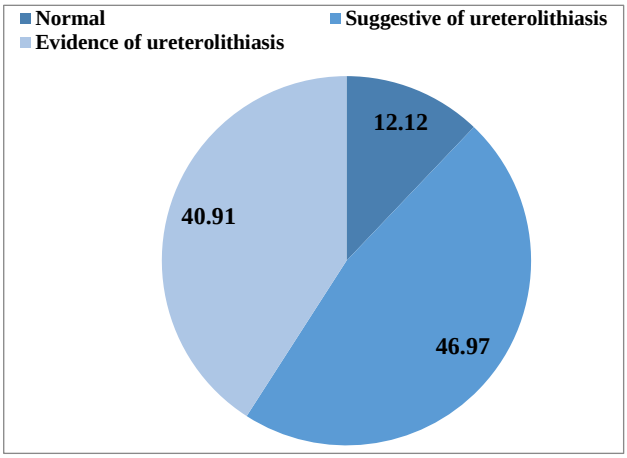

Figure 1: Incidence of categorical distribution of USG findings.

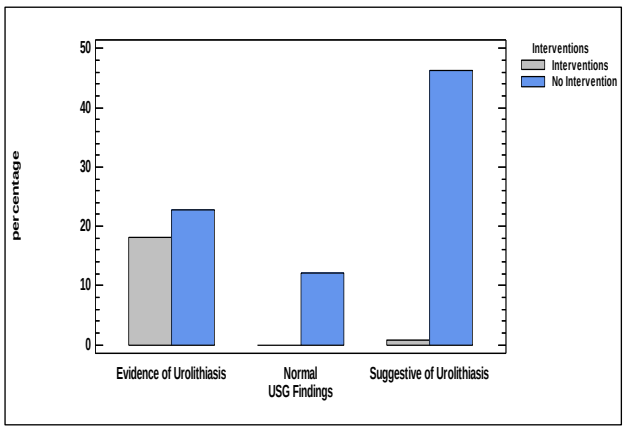

Figure 2: USG findings by intervention.

Table 1: Frequency table for USG category by urological intervention.

	No intervention	Intervention done	Row total
Evidence of stone	22.73% (n=30)	18.18% (n=24)	40.91% (n=54)
Normal	12.12% (n=16)	0.00% (n=0)	12.12% (n=16)
Suggestive of stone	46.21% (n=61)	0.76% (n=1)	46.97% (n=62)
Column total	81.06% (n=107)	18.94% (n=25)	100.00% (n=132)

Since the P-value is less than 0.05 at the 95.0% confidence level. Therefore, the observed value of USG Category for a particular case is related to its value for Urological intervention. Only one (11.11%) patient with normal X-ray KUB underwent urological intervention. 11 (73%) out of 15 with radiographic evidence of calculus underwent urological intervention.

Table 2: Incidence of urological intervention in patients with normal and abnormal X-ray KUB.

X-ray KUB	Urological intervention frequency	Urological intervention (%)	Total
Normal	1	11.11	9
Evidence of calculus	11	73.34	15
Total	12	50	24

Out of 12 patients who had a CT, one patient had normal CT scan finding and no urological intervention was carried. 10 (90%) out 11 patients with CT scan evidence of ureterolithiasis underwent urological intervention.

Table 3: Incidence of urological intervention in patients with normal and abnormal CT.

CT	Urological intervention frequency	Urological intervention (%)	Total
Normal	0	0	1
Evidence of calculus	10	90.90	11
Total	10	83.34	12

Out of 132 patients enrolled, 104 (78%) had USG alone as imaging, 20 (15%) had USG and x-ray KUB done, 8 (6%) had USG and CT as imaging and 4 (3%) had USG, CT and X ray KUB as imaging (Figure 3).

The ureteric calculus was most common in the VUJ (43%) and lower ureter (24%), followed by the upper ureter (18%) and least common in mid ureter (13%). In the present study 12 (9%) patients had readmission with similar complaints. One (6.25%) out of 16 with normal USG report had readmission, 4 (6.45%) and 7 (12.9%) with USG suggestive and evidence of ureterolithiasis respectively had readmissions with similar complaints.

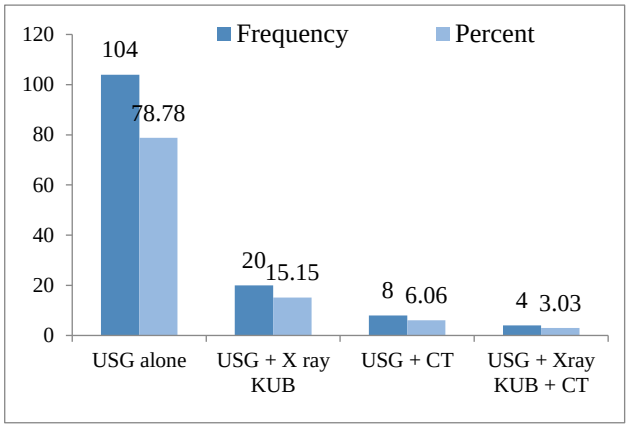

Figure 3: Incidence of diagnostic imaging tests performed.

DISCUSSION

The current study shows that the incidence of ureteric calculus is higher in males as compared to females (2:1). This is higher than most of the studies done previously, Yan et al (1.55:1), Edmonds et al (1.14:1) and Kobayashi et al (1.68:1).9-11 Microscopic hematuria was seen in only 31% of the patients in the current study, which is much lower as compared to Yan et al (78.5%), Edmonds et al (60.3%), and Kobayashi et al (44.2%).[9-11] The mean age of presentation is lower in the current study (40.2), though the findings are similar to studies conducted by Edmonds at al where the age of presentation is 41.6 years of age. However, Kobayashi et al observed higher mean age (47.1).[9-11] The ureteric calculus was most common in the VUJ (43%) and lower ureter (24%), and least common in mid ureter (13%) as observed on USG. The mean ureteric stone size was 7.2mm and serum creatinine levels were 0.85mg/dl which are similar to findings in other studies (Table 4).

Table 4: Incidence of urological intervention in patient with suspected renal colic and normal USG.

Study	Urological intervention in patient with suspected renal colic and normal USG
Yan et al	0% (0/105)
Edmonds et al	0.6% (2/352)
Kobayashi et al	2.5% (6/238)
Current study	0% (0/16)

The study shows that there is low risk ($p<0.001$) of urological intervention in patients with normal USG. The findings are similar to studies conducted by Yan et al and Edmonds at al. However, Kobayashi et al observed a slightly higher incidence.[9-11] The results of this study confirm that a normal ultrasound predicts a low risk of

urologic intervention for patients with suspected renal colic.

When a stone cannot be visualized with USG, other findings suggestive of obstruction, such as hydronephrosis, abnormal ureteric jets, or perinephric fluid, can aid in establishing the diagnosis. In this study, 1.61% of patients who had US findings suggestive of ureterolithiasis received urologic intervention. This is lower than the intervention rate (6.8%) reported by Edmonds al and 10% by Yan et al patients with suggestive findings on renal USG. However, the urologic intervention rate for patients where a stone was visualized on USG was much higher in the present study (44.5%) compared to (6.2%) reported by Edmonds al and 24% by Yan et al (Tables 5 and 6).[9-11]

Table 5: Incidence of urological intervention in patient with suspected renal colic and USG suggestive of ureterolithiasis.

Study	Urological intervention in patient with suspected renal colic and USG suggestive of ureterolithiasis
Yan et al	10%
Edmonds et al	6.8%
Current study	1.61%

Table 6: Incidence of urological intervention in patient with suspected renal colic and USG evidence of ureterolithiasis.

Study	Urological intervention in patient with suspected renal colic and USG evidence of ureterolithiasis
Yan et al	24%
Edmonds et al	6.2%
Current study	44.45%

In the current study, the incidence of readmission for similar complaints for three USG categories were compared, it shows that there is no statistically significant difference ($p>0.05$) in readmission between patients with normal and abnormal USG findings (Figure 4).

A few limitations of this study, patients who underwent primary CT or those who did not undergo any imaging would not have been captured in our study. USG is operator dependent; its diagnostic accuracy varies between institutions. In the present study, the final diagnosis of ureterolithiasis was based on a clinical decision and not necessarily confirmed by imaging. It is possible that some patients with this final diagnosis did not have stones at all. When imaging results were normal, patients may have had undetected small stones (i.e., not visualized) and passed without intervention or complication. The decision of whether and when to perform intervention for ureterolithiasis may depend in part on the urologist and the specific clinical indication for intervening was not captured as part of this study.

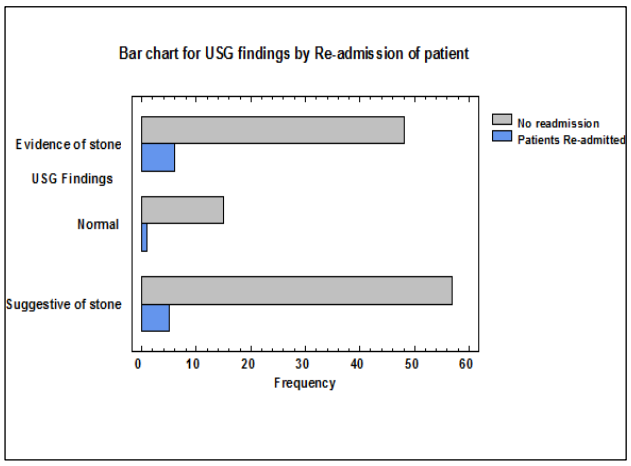

Figure 4: USG findings by readmissions.

CONCLUSION

According to the current study, patients with a clinical diagnosis of renal colic and a normal ultrasonography are unlikely to require urologic intervention and can confidently be managed conservatively with appropriate analgesic and clinical follow-up. In combination with clinical assessment, an ultrasonography can accurately identify this low-risk group, decreasing the number of CT scans and associated ionizing radiation in patients with suspected renal colic.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Prien E, Frondel C. Studies in Urolithiasis-I. The Composition of Urinary Calculi. J Urol. 1947;57(6):949-91.
2. Nephrolithiasis: Practice Essentials, Background, Anatomy. Emedicine.medscape.com, 2017. Available at: http://emedicine.medscape.com/article/437096-overview. Accessed 22 June 2017.
3. Brenner D, Hall E. Computed Tomography- An Increasing Source of Radiation Exposure. New England J Med. 2007;357(22):2277-84.
4. Ripolles T, Agramunt M, Errando J, Martinez M, Coronel B, Morales M. Suspected ureteral colic: plain film and sonography vs unenhanced helical CT. A prospective study in 66 patients. European Radiol. 2004;14(1):129-36.
5. Teichman J. Acute Renal Colic from Ureteral Calculus. New England J Med. 2004;350(7):684-93.
6. Patlas M, Farkas A, Fisher D, Zaghal I, Hadas-Halpern I. Ultrasoundvs CT for the detection of

ureteric stones in patients with renal colic. The Br J Radiol. 2001;74(886):901-4.
7. Broder J, Bowen J, Lohr J, Babcock A, Yoon J. Cumulative CT Exposures in Emergency Department Patients Evaluated for Suspected Renal Colic. J Emerg Med. 2007;33(2):161-8.
8. Shokeir A. Renal colic: new concepts related to pathophysiology, diagnosis and treatment. Current Opinion Urol. 2002;12(4):263-9.
9. Edmonds M, Yan J, Sedran R, McLeod S, Theakston K. The utility of renal ultrasonography in the diagnosis of renal colic in emergency department patients. CJEM. 2010;12(03):201-6.
10. Kobayashi T, Nishizawa K, Watanabe J, Ogura K. Clinical Characteristics of Ureteral Calculi Detected by Nonenhanced Computerized Tomography After Unclear Results of Plain Radiography and Ultrasonography. J Urol. 2003;170(3):799-802.
11. Yan J, McLeod S, Edmonds M, Sedran R, Theakston K. Normal renal sonogram identifies renal colic patients at low risk for urologic intervention: a prospective cohort study. CJEM. 2015;17(01):38-45.

Cite this article as: Joshi A, Srivastava S. An observational study of incidence of urological intervention in patients of renal colic with normal and abnormal ultrasound study. Int Surg J 2018;5:810-4.