

Research Article

Ultrasound Evaluation in Patients with Renal Colic That Presented In Emergency Department

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ABSTRACT

Introduction: The renal colic episode mainly caused by stones or clots that create a severe pain from the acute renal stretch. Ultrasonography of the urinary tract remains a first imaging modality in the evaluation of a patient with a doubt of urinary tract obstruction. This study was intended to evaluate the value of US as first line in patient with renal colic that presented to emergency department.

Materials and methods: This study included 640 patient presented to our emergency department of Imam Hospital, Sari, Iran; complaining of acute renal colic during the period from February 2013 till July 2015. Patients underwent a physical examination and laboratory and ultrasound evaluations.

Results: Among 640 patient presented in emergency departments, 131 cases had urinary calculi. Of 292 patients with hydronephrosis identified with US, 203 cases [69.5%] had mild to moderate and 89 cases [30.5%] had moderate to severe hydronephrosis. Urinoma was detected in 24 patients. There was a meaningful correlation between some US finding (urinoma) and lower urinary tract symptoms (Dysuria). The correlation of a history of renal colic and US findings (stone, hydronephrosis and urinoma) was significant ($P \leq 0.05$). The correlation of a history of renal calculi with US findings was no statically significant ($P > 0.05$).

Conclusions: Ultrasonography can perform as a primary imaging modality in patient with acute renal colic since it is inexpensive, safe and noninvasive. Ultrasonography allows us to identifying stones located in renal calyces and pelvis, at the ureteropelvic junction an ureterovesical junction. Accuracy of ultrasonography is low in detection of ureteral stone but combination of lower urinary tract symptoms, tenderness in examination and past history taking can significantly improve its accuracy.

Key words: Renal Colics, Urinary Stone, Ultrasound Imaging, Lower Urinary Tract Symptoms

INTRODUCTION

Hippocrates first time described the symptom of renal colic "An acute pain is felt in the kidney, the loin, the flank and the testis of the affected side; the patient passes urine frequently; gradually the urine is suppressed. With the urine, sand is passed"(1).The renal colic episode mainly caused

by stones or clots that create a severe pain from the acute renal stretch. Increasing of the pressure in collecting system is more likely to be the main cause of renal colic. Relieving pain is the first approach for the patient with acute renal colic; it can be achieved by NSAID and opioid (2-4). The

next step is evaluation of the patient with acute renal colic by imaging modalities.

Although the Non Contrast Helical Computed Tomography (NCHCT) is the best modality for renal colic, it has some limitation like high cost and ionizing radiation(5). In other hand, CT scan is not available at all hospitals especially in developing countries.

Ultrasound (US) is a low cost and available modality with no ionizing radiation. Then, US of the urinary tract remain first imaging modality in the evaluation of a patient with a doubt of urinary tract obstruction(6).

In this study, we improve the ability of the detection of urinary calculi by using new ultrasound equipment in emergency department.

Then, this study was intended to evaluate the value of US as first line in patient with renal colic that presented to emergency department.

MATERIALS AND METHODS

This study included 640 patient presented to our emergency department of Imam Hospital, Sari, Iran; complaining of acute renal colic during the period from February 2013 till July 2015. Inclusion criteria include any patient with acute flank pain, cost vertebral angle tenderness on physical examination and hematuria on urinalysis. Exclusion criteria were pediatric age group patient below 19 years age, pregnant female, complicated urinary lithiasis and patients with other urinary disease.

Human ethics committee approval was obtain from Mazandaran University of medical sciences ethics committee. All patients underwent a physical examination and laboratory evaluations consist of complete blood count and urinalysis. Patients received narcotic or Nonsteroidal anti-inflammatory drug before referred to the radiology department for ultrasound evaluation. Then, all of them underwent US.

US machine was ClearVue850, Philips medical system, Nederland B.V with 2–5 curved array transducer using abdominal setting. US performed by three experienced radiologist.

For kidney evaluation, patients were in supine position and presence of hydronephrosis, urinoma and renal calculi was explored. Ureter, ureteropelvic junction (UPJ) and ureterovesical junction (UVJ) was examined for hydroureter and urinary calculi.

In the following, patients underwent bladder ultrasound evaluation while they were in supine position with full bladder. SPSS statics software [V.21.0, IBM Corp., USA. 2012] were utilized for data analysis. Chi-square, correlation coefficient and Measures of Central Tendency were used for this study. The probability of error at 0.05 was considered significant.

RESULTS

Among 640 patient presented in emergency department with acute renal colic 464 were males [72.5%] and 176 were females [27.5%]. Two hundred and six cases [32.17%] had right flank pain and 190 cases [29.68%] had left flank pain. Thirty five of patients [5.47%] had bilateral flank pain and contemporary abdominal tenderness were revealed in most of them [table 1]. Among 131 patient with urolithiasis who diagnosed by US, 87 cases [66.4%] had flank tenderness and others [33.6%] had no tenderness ($P = 0.028$).

The age range of patients with urinary calculi were from 19 to 73 years old [mean age of 35.7 years]. Other cases mean age were 37.6 ($P = 0.798$). Location of urinary calculi was detected by US [Table 2].

Of 292 patients with hydronephrosis identified with US, 203 cases [69.5%] had mild to moderate and 89 cases [30.5%] had moderate to severe hydronephrosis. Urinoma was detected in 24 patients.

There was a meaningful correlation between some US finding (urinoma) and lower urinary tract symptoms (Dysuria) ($P = 0.048$) [Table 3]. The correlation of a history of renal colic and US findings are shown also in Table 4 ($P \leq 0.05$).

The correlation of a history of renal calculi with US findings was not significant ($P > 0.05$) [table 4].

Table 1- Location of abdominal tenderness in patient with renal colic

Location of tenderness	Number (%)
Right upper quadrant	67 (10.5%)
Right lower quadrant	129 (20.2%)
Left upper quadrant	53 (8.3%)
Left lower quadrant	99 (15.5%)
Suprapubic	54 (8.4%)
others	12 (3.4%)

Table 2- Locations of urinary calculi

Location	Right side stones, n (%)	Left side stones, n (%)
Renal calyces	39 (29.8%)	28 (21.4%)
Ureteropelvic junction	7 (5.3%)	6 (4.6%)
Proximal ureter	5 (3.8%)	3 (2.2%)
Mid ureter	3 (2.2%)	1 (0.8%)
Distal ureter	17 (12.9%)	15 (11.4%)
Urinary bladder	7 (5.3%)	
Total	131 (100%)	

Table 3-Correlation of ultrasonography findings and urinary tract symptoms.

Urinary tract symptoms	Ultrasonography finding	Number, n (%)			P value	Significances
		Male	Female	Total		
Dysuria	Stone	19 (2.9%)	7 (1.1%)	26 (4.1%)	0.714	NS
	Hydronephrosis	42 (6.6%)	17 (2.6%)	59 (9.2%)	0.754	NS
	Urinoma	5 (0.8%)	4 (0.6%)	9 (1.4%)	0.048	S
Nausea and vomiting	Stone	34 (0.5%)	11 (1.7%)	45 (7%)	0.40	NS
	Hydronephrosis	95 (14.8%)	27 (4.2%)	122 (19.1%)	0.935	NS
	Urinoma	7 (1.1%)	3 (0.5%)	10 (1.6%)	0.895	NS
anorexia	Stone	8 (1.2%)	2 (0.3%)	10 (1.6%)	0.583	NS
	Hydronephrosis	15 (25.9%)	2 (0.3%)	17 (2.6%)	0.80	NS
	Urinoma	0	0	0	0.108	NS
frequency	Stone	17 (2.6%)	7 (1.1%)	24 (3.7%)	0.795	NS
	Hydronephrosis	41 (6.4%)	17 (2.6%)	58 (9.1%)	0.459	NS
	Urinoma	3 (0.5%)	0	3 (0.5%)	0.396	NS
Fever	Stone	1 (0.2%)	0	1 (0.2%)	0.621	NS
	Hydronephrosis	5 (0.8%)	2 (0.3%)	7 (1.1%)	0.607	NS
	Urinoma	0	0	0	0.401	NS

Table 4- Correlation of ultrasonography findings and past history

Past history	Ultrasonography finding	Number, n (%)			P value	Significances
		Male	Female	Total		
Previous history of renal colic	Stone	14 (2.2%)	0	14 (2.2%)	0.046	S
	Hydronephrosis	31 (4.8%)	8 (1.2%)	39 (6.1%)	0.044	S
	Urinoma	3 (0.5%)	0	3 (0.5%)	0.023	S
Previous history of renal calculi	Stone	40 (6.2%)	8 (1.3%)	48 (7.5%)	0.707	NS
	Hydronephrosis	77 (12%)	22 (3.4%)	99 (15.4%)	0.262	NS
	Urinoma	6 (0.9%)	6 (0.9%)	12 (1.8%)	0.937	NS

DISCUSSION

Renal colic is a severe pain majorly caused by urinary calculi(7). Treatment of urinary stone is unnecessary unless suspected in the context of stone emergency. A complicated renal stone consist of ureteral stone in a single kidney patient, bilateral ureteral stones, uremic status, present of urinary tract infection and fever and intractable pain require emergency treatment(8). Life threatening condition should be evaluated by diagnostic modalities and intervention should be done as soon as possible(9). The choice of ureteral stone in emergency condition is resolve of obstruction by nephrostomy tube or double J stent and the first imaging modality is NCHCT scan(10, 11). Emergency physicians should understand and ruling out the life threatening condition while making an accurate diagnosis of more common disease of lesser emergencies.

Straightforward renal colic is less important and alternative diagnosis and conservative treatment can be used for this condition(12). Pain killer like NSAID and narcotics plays important roles in pain relief in renal colic patients that was used in our study(3, 4). The first line modality for diagnosis of ureteral stone in patient with renal colic is NCHCT scan(13). Over 99% of stones will be seen on NCHCT scan(9).

All cases with complicated renal colic and patients with uncomplicated renal colic that US did not show stones underwent NCHCT scan(9, 14). US have an important role in diagnosis of urinary calculi(15). Moreover, safety and ease of US is undeniable but its accuracy is modest. We used US for straightforward renal colic. Of 640 patients entered the study, 131 cases had urinary stones and 57 cases had ureteral stones.

Furthermore, 292 patients with hydronephrosis identified with ultrasonography. When 292 patients had hydronephrosis but only 57 cases had ureteral stone, we would propose that obstruction of ureter is due to stone or other potential etiologies. Reported sensitivities range for the detection of acute obstruction by US was from 37

to 64 percent (16-18). The specificity of 90 percent recently was reported by Fowler et al(19). Although, stones located in ureter are very difficult to diagnose, combination of physical examination (tenderness) can improve the accuracy of US. Lower urinary tract symptoms (LUTS) are the complex of obstructive and irritative urinary symptoms that caused by urinary system diseases.

Ureteral calculi are one of most common etiology of irritative urinary symptoms. In this study, there is a meaningful correlation between some US finding (urinoma) Dysuria. On the other hand, there is not a significant correlation between US findings and frequency, anorexia, fever and N/V. In past studies, some urinary symptoms like hematuria used for the detection of urinary calculi in patient with renal colic(20).

Therefore, combination of US and symptoms helps physicians for better detection of urinary tract calculi. Although past history of urinary calculi in patient with acute renal pain creates a high suspicious of ureteral stones, its correlation with US findings were non-significant(21). The patient with a history of renal colic has experienced the passage of stone during the ureter. In other word, taking a complete urogenital history will help physicians for diagnosis of ureteral stones(15). History of renal colic will help radiologist to detect stone, hydronephrosis and urinoma in US.

CONCLUSIONS

US can perform as a primary imaging modality in patient with acute renal colic since it is inexpensive, safe and noninvasive. US allow us to identifying stones located in renal calyces and pelvis, at the UPJ and UVJ. Accuracy of US is low in detection of ureteral stone but combination of lower urinary tract symptoms, tenderness in examination and past history taking can significantly improve its accuracy.

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