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Bioscience Research

Print ISSN: 1811-9506 Online ISSN: 2218-3973

Journal by Innovative Scientific Information & Services Network



RESEARCH ARTICLE

BIOSCIENCE RESEARCH, 2019 16(4): 3686-3690.

OPEN ACCESS

Ultrasound findings in renal colic patients referring to the emergency department

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Renal colic is an emergency situation that commonly caused by kidney stones and it should be confirmed by clinical studies. This study aimed to evaluate the results of ultrasound of the kidneys in the assessment of patients with renal colic. In a prospective cross-sectional study, medical records of patients admitted to the emergency department with renal colic, included demographic data and information of the history, clinical and paraclinical findings (laboratory and ultrasound) were recorded and analyzed. 640 people, including 464 (72.5%) male and 176 (27.5%) female were studied. Ultrasound was observed stone in 131 patients (20.7 percent) that were in 29% of cases in right kidney, 23% in ureter and 20% in left kidney. 24.6% of men and 20.9% of women had urinary stones that difference between the two groups was not significant. 68% of patients had flank pain that was observed stone in 24.8% of them ($P=0.017$). Also stones were also higher in patients with pain radiation ($P=0.005$) and tenderness ($P=0.028$). Most symptoms were nausea and vomiting in 42.7%, dysuria in 20.9% and urinary frequency in 19.2% of patients. Most kidney stones are in men, but there's no difference in the results of ultrasound in both genders. Flank pain with pain radiation, tenderness and urinary symptoms and also a history of kidney stones are important factors for choosing ultrasound.

Keywords: renal colic, ultrasound, emergency, urinary tract stone

INTRODUCTION

Renal colic is one of the most common Urology emergencies due to severe pain and for the patient is very painful. Renal colic including sudden severe pain, nausea and sometimes vomiting that requires accurate diagnosis and fast treatment. The pain is often due to stone passage of the collecting system of the kidneys (Travaglini

et al.,2004, Bindman et al.,2014, Fwu et al.,2013). Renal colic pain typically begins with an attack of acute pain and will decrease at intervals and may be discontinued, and patient switches to reduced pain (Tanagho et al.,2004) Prostaglandin E2 and increased blood pressure and enhancing diuresis are the causes of pain But the main reason for the development of pain are distension (Dellabella et

al.,2005). Pain intensity based on stone size, location, severity of obstruction, will differ (Dellabella et al., 2005). The main causes of colic pain are urinary stones. Urinary stones are a common problem of human societies and Diseases of urinary tract infections and prostate (McAninch et al., 2012).

The sensitivity of ultrasound in finding kidney stones has been reported between 12 and 98% (Sheafor et al., 2000). Ultrasound in showing stones with more than 5 mm size is very accurate, but in findings smaller stones less than the mm 3 is not very accurate (Fowler et al., 2002 and Patlas et al., 2001) Ultrasound is capable of showing stones in the hip, pelvis, and ureter junction, the junction of the bladder, ureter and upper urinary system (Fwu et al., 2013).

The aim of current paper was to evaluate the Ultrasound findings in patients with renal colic for diagnosis of nephrolithiasis and to find out if using Ultrasound can help the physicians in emergency departments for management of these patients or not .

MATERIALS AND METHODS

This study was prospective, cross-sectional and analytical study that included all patients with renal colic chief complaint whom referred to the emergency department of Imam Khomeini hospital between July 1, 2015 and June 30, 2016was selected randomly.

Inclusion criteria

All patients admitted to hospital with complaints of colic (Patients aged 18 or older who had an ED visit with a principal or secondary diagnosis for renal colic)

Exclusion criteria

No request of ultrasound for the patient
Patients with diagnoses other than colic

Ultrasound

Then, all of them underwent US. US machine was ClearVue 850, 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 ureterovesival 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.

Ethical Approval

All patients provided informed consent to inclusion in the study. This study was approved by the Ethics Committee of the Mazandaran University of Medical Sciences, Sari, IRAN.

Statistical Analysis

Results were shown as median, mean and standard deviation. The chi square, student t test and Fischer exact test was used for analysis of data. The procedures included were transcription, preliminary data inspection, content analysis and finally interpretation. Statistical analysis was performed with SPSS software (version 20, Chicago, IL, USA). P values less than 0.05 were considered statistically significant.

RESULTS

640 people, including 464 patients (72.5 percent) were male and 176 (27.5%) women were enrolled, of whom 415 patients (65.6 percent) living in the city and 218 (34.4 percent) in rural areas.

Ultrasound results indicated, 131 patients (20.7 percent), 136 patients had stone (5 patients in the two areas) at 28.7% of cases the right kidney, 23.6 % at end of ureter and 20.6 of the left kidney was involved. The mean stone size in patients 3.52 ± 6.71 mm. table 1.

Table 1.Frequency and percentage of stones on the ultrasound in the study

	number	percent
right kidney	39	28/7
Left kidney	28	20/6
pelvis	13	9/5
The beginning of the ureter	8	5/8
Mid ureter	4	2/9
The end of the ureter	32	23/6
Bladder	7	5/2
other	5	3/7
Total	136	100

Also, in 292 patients (47.3 percent) hydronephrosis was observed. That in 69.5 cases were mild and in 30.5 percent moderate grades. 50% of hydronephrosis in the right kidney and50% in left kidney were seen.

In 24 patients (3.9 percent) urinoma was seen, in 31.8 percent on the right and 68.2 percent in left were seen.

The relationship between gender and ultrasound results in patients participating in the study

99 (75.6) of the stones were seen in male and 24 (24.4%) were female. Based on gender, 24.6 percent of men and 20.9 of women had urinary stones in this area between the two groups was not significant (p =0.355).

The relationship between age and ultrasound findings in patients participating in the study

The average age of people that in their ultrasound stones were showed, was 13.8 ± 35.7 years and those who have not seen on ultrasound was 13.6 ± 37.6 years, the difference between the two groups was not significant (p=0.798).

The frequency of flank pain in patients participating in the study

431 patients (68%) had flank pain that in 206 patients (47.8 percent), pain was on the right side, in 190 patients (44.1 percent), pain was in the left and in 35 patients (8.1%) pain was felt on both sides.

Relationship between flank pain and ultrasound results in people participating in the study

In Ultrasound of 105 (24.8 percent) of the patients who had flank pain, the stone was visible. In Ultrasound of 26 (12.8) cases whom had not flank pain, stone was observed. The stones in people who had flank pain were significantly more than those who had not flank pain.(p;0.01)

Table 2; Comparison of stones observation on ultrasound based on flank pain

Stone on ultrasound	Flank pain Yes (number)	Flank pain No (number)	P.Value
yes	105	26	P;0.01
no	326	283	
total	431	239	

In 222 patients (51.5 percent) of those who had flank pain, hydronephrosis was observed and in 19 patients (4.5%) of them had urinoma. There was significant relationship between Hydronephrosis observation and flank pain (p = 0.001)) but not significant relationship between flank pain with urinoma. P = 0.135 Table 2, 3

Frequency of pain in patients participating in the study

In 198 patients (30.9%) of the total 327 patients' pain was present in 153 patients (77.3 percent) of them radiating pain in the lower abdomen, in 125

cases (63.1%) of these people pain spreading to the back, in 33 patients (17%) of the radiating pain to the shoulder and in 16 patients (1.8%) to other parts of the pain. Table 4

Table 3; Frequency ultrasound results according to sex in individuals participating in the study based on flank pain

variable	gender	Stone (number)	Hydrone phrosis (number)	Urinoma (number)
Flank pain	Male	76	167	13
	Female	29	55	6
	total	105	222	19

Table 4; The frequency and percentage of pain in patients participating in the study

Pain localization	number	percent
Lower abdomen	153	3.77
Back	125	63/1
Shoulder	33	17
Other parts	16	8/1

Regards the pain and ultrasound results in people participating in the study

In Ultrasound of 55 (27.8) of the patients who had a history of pain, the stone was visible. Also in Ultrasound of 76 (17.2) of patients without pain the stones were observed. Presence of the stones in people who had pain in the ultrasound was significantly more than those who did not (p; 0.05 =).

In 91 patients (46%) of people who had pain, hydronephrosis (p; 0.454) and in 6 patients (3%) of them urinoma (p;0.88) It was found that the relationship between these variables were not significant. Table 5,6

Table 5; Comparison of stones observed in ultrasound based on patients' pain

stones observed in ultrasound	Pain Distribution (yes)	Pain distribution (no)	P value
yes	55	76	P;0.05
no	143	366	
total	198	442	

Table 6; Frequency of ultrasound results according to sex based on the participants' pain

	gender	stone	Hydrone phrosis	urinoma
Pain distribution	male	43	69	5
	female	12	22	1
	total	55	91	6

DISCUSSION

This study aimed to evaluate the results of renal ultrasonography in the evaluation of patients with renal colic whom referred to the emergency room of Imam Khomeini Sari. Ultimately 640 patients were enrolled, including 72% of men and 28% women. Ultrasound performed in these patients, in 21% of cases the right kidney stone was observed.

In the study conducted by Chauhan in America, the amount specified in ultrasound, kidney stones were observed in 63 percent of males (Chauhan et al., 2004). Cupisti and colleagues in 2007 in Turkey showed that 54 percent (Turkcuer et al., 2010) that were less than our study. Although patients with urinary stones are seen in all regions of the world, but this disease in Middle East and Far East countries, especially India, Iran and Egypt have a higher prevalence (Delvecchio et al., 2003). The prevalence of urolithiasis in Iran is 7.5 percent above the rate of 1.6% in men and 3.5% women have been reported (Romero et al., 2010).

The average age of people in the ultrasound with stone, were 35 years versus 37 years without stone, the difference between the two groups was not significant. In Chauhan (Chauhan et al., 2004) study, the mean age of patients was 44 years that was more than of our study.

68% of patients complained of flank pain that 25% of these had stone at ultrasonography. In Edmonds study at 2010 in London, on ultrasound in 29% (Edmonds et al., 2010) and in Kartal study Turkey in ultrasound, 23% of patients who had been admitted with renal colic, stone was observed (Kartal et al., 2006) that were similar to our study. But Kuuliala study in Finland in ultrasound 44% (Aslaksen et al., 1990), in a study of Aslaksen in Norway, in ultrasound 37% (Kuuliala et al., 1998) and in Sheafor study in America, at sonography, 31% of patients who had renal colic, stones were reported (Sheafor et al., 2000) that was more than our study. In this study, nearly half of the patients had nausea and vomiting in ultrasound of 17% had stone, 45% hydronephrosis and 4% urinoma was observed. In Cupisti study 33 percent of patients had nausea and vomiting (Turkcuer et al., 2010).

Hydronephrosis were seen on ultrasound in More than 50 percent of patients Due to the progression of the disease leads to kidney tissue atrophy Take an ultrasound to check the kidneys in patients with renal colic is useful in terms of hydronephrosis. Flank pain, the pain and tenderness are the important things which can

lead to choose Ultrasound to study in renal colic in patients. Other factors, such as nausea and vomiting, urinary symptoms, and a history of kidney stones can be somewhat helpful in this regard.

CONCLUSION

Our study showed that Flank pain with pain radiation, tenderness and urinary symptoms and history of kidney stones were crucial items for choosing ultrasound.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

ACKNOWLEDGEMENT

All authors have given final approval of the version to be published

AUTHOR CONTRIBUTIONS

All authors have made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data

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