Diagnostic Accuracy of Ultrasound in Detecting Ureteric Stone Keeping Non-Enhanced CT as Gold Standard

Mehboobul Wahab, Kifayat Tariq, Muhammad Ishtiaq, Kamran Ahmad, Muhammad Aslam

ABSTRACT

Background: Urolithiasis is common presentation to surgical department and the diagnosis of this is necessary for the early diagnosis of the location and presence of ureteric stones. **Objective:** To determine the sensitivity of trans-abdominal ultrasound in detecting stone in ureter. **Study Design:** Cross-sectional study. **Settings:** Urology department of Institute Kidney Disease, Peshawar Pakistan. **Duration:** 1st February 2019 to 31st July 2019. **Methodology:** All the patients with suspected renal colic presenting to urology department were included in the study. All those patients with any previous history of ureteric surgery or documented presence of ureteric stone were excluded from the study. Ultrasound was done focusing on the ureter of both sides of the patient. Then it was sent for non-enhanced CT scan using Acquilion multi slice (64) CT scanner. The results of the CT scan were interpreted by another consultant radiologist. **Results:** Total of 80 patients were examined. Mean age of the patient was 36.47± 8.243 years. Female were 43 (53.8%) while male were 37 (46.3%). The trans-abdominal ultrasound was having sensitivity of 69.64%, specificity of 66.6%, PPV of 82.92%, NPV of 48.48% and accuracy of 68.75% for detecting the ureteric stone. **Conclusion:** The ultrasound abdomen for diagnosis of ureteric stone have a greater positive predictive value but the sensitivity is comparable with other result.

Keywords: Ureteric stone, Non-enhanced CT scan, Trans-abdominal Ultrasound

INTRODUCTION

Urolithiasis is the stone in the ureteric pathways. It is a common cause of urological outpatient load or any surgical emergency department.[1,2]

Its prevalence in different ethnic groups in a study have been shown 29.5% of Egyptians, 24.9% of Pakistani, 23.3% of Indian, 20.5% of Yemeni, 17.6% of Sudanese,16.2 of Bangladeshi and 7.4% of Saudi Arabian.[3]

The initial diagnosis and then treatment are necessary to relieve the patient from the colicky pain associated with it. Non-enhanced CT scan is being evolved as the investigation of choice because of the sensitivity of 96-100% and specificity of 96-100%.[2,4,5] Because of this Non-enhanced CT scan is consider as the gold standard in detecting stone in the urinary tract.[1,2,6]

In the past the commonly methods for detecting such stone used was plan X-ray KUB, Ultrasound and even some time the intravenous urography. The ultrasound detection of ureteric stone in nineties was having sensitivity of up to 37%[7]. However due to the advance in technology and further improvement in ultrasound machines and transducers the detection of ureteric stone has reported that 98.3% of sensitivity and 100% of specificity.[8]

Due to new technology the sonography sensitivity has reached to higher level. A further study for its confirmation should be carried out to confirm this method and to develop the protocol of using ultrasound abdomen for detecting these stones.

METHODOLOGY

Study Design: Cross-sectional study.

Settings: Urology department of Institute Kidney Disease, Peshawar Pakistan.

Duration: 1st February 2019 to 31st July 2019.

Inclusion Criteria: All those patients with ureteric colic presenting to urology department were included in the study. Ureteric colic was considering the type of pain which was like spasmodic having a wave pattern which is severe in the right or left flank region.

Exclusion Criteria: All those patients with any previous history of ureteric surgery or known documented presence of ureteric stone were excluded from the study.

Methods: The study was approved from the ethical committee of the Hayatabad medical complex, Peshawar.

Data Collection: The patients were first stabilized in the hospital with antispasmodic medication. Care of the bladder and bowl was done. Then the patients were sent for ultrasound of the abdomen, specially focusing on the ureters of both sides of the patient. The ultrasound was done by a single consultant radiologist using the Toshiba Nemio XG® Doppler ultrasound scanner with 4.2MHz frequency transducer. Both the kidneys were initially observed in all respected (sagittal and coronal) planes. Then Ureters were traced down to bladder and looking carefully to ureterovesical junction.

Then the patient was sent for non-enhanced CT scan using Acquilion multi slice (64) CT scanner. The result of the CT scan was interrupted by another consultant radiologist.

RESULTS

Total of 80 patients were reviewed with age range from 22 years to 61 years with a mean age of the patient was 36.47± 8.243 years (Table 1).
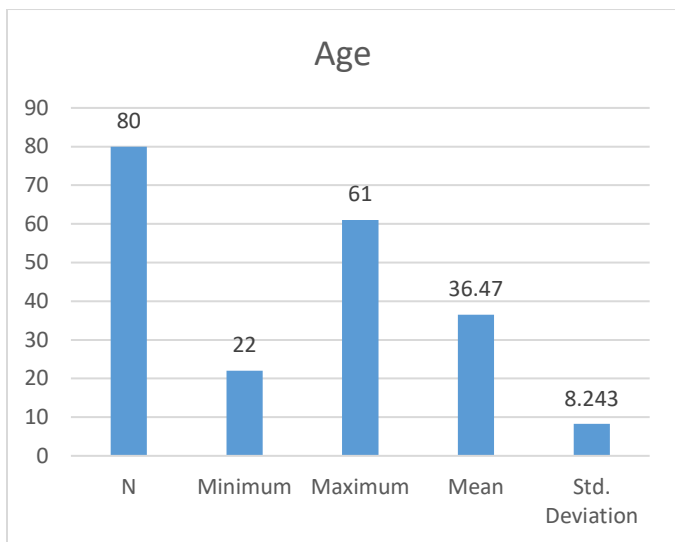

Figure 1: Mean age

Most of the patients were in age range from 30 to 42 years 53 (66.3%). The smaller number of patients was in age greater than 42 years which was 13 (16.3%) (Table 2).

Table 2: Age distribution

		Frequency	Percent
Valid	**Less than 30**	14	17.5%
	30 to 42 years	53	66.3%
	greater than 42	13	16.3%
	Total	80	100.0%

Female were 43 (53.8%) while male was 37 (46.3%) (Figure 2).
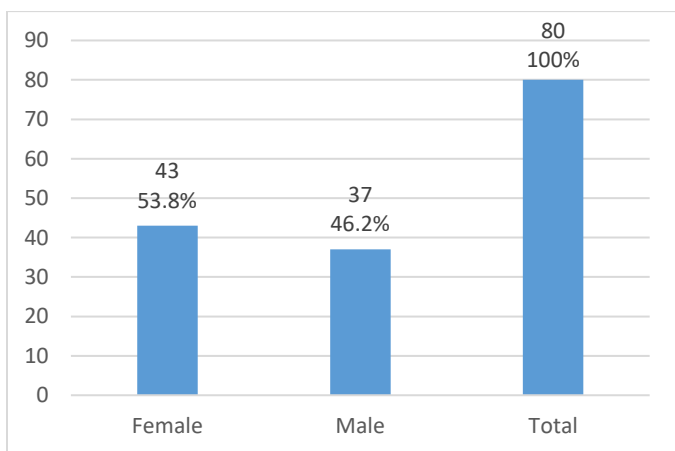

Figure 2: Gender distribution

On ultrasound, 47 (58.8%) were positive for ureteric stone while 33 (41.3%) were negative for stone in the ureter (Table 4). On CT scan 56 (70.0%) were positive for ureteric stone while 24 (30.0%) were negative for stone (p value 0.003). The transabdominal ultrasound was having sensitivity of 69.64%, specificity of 66.6%, PPV of 82.92%, NPV of 48.48% and accuracy of 68.75% (Table 3).

Table 3: Ultrasound (US) versus CT detection (CT) of stone Cross-tabulation

			CT		Total	P value
			Positive	Negative		
US	**Positive**	Count	39	8	47	0.003
		% of Total	48.8%	10.0%	58.8%	
	Negative	Count	17	16	33	
		% of Total	21.3%	20.0%	41.3%	
Total		Count	56	24	80	
		% of Total	70.0%	30.0%	100.0%	

DISCUSSION

Renal colic is a common emergency presenting to urology department. The American guideline say the CT scan as first choice for ureteric stone diagnosis while European says the ultrasound as the initial modality.[9-11] Non contrast CT of low dose can predict the site and size of the calculus more accurately with diagnosis other causes of abdominal pain like appendicitis, intestinal obstruction or any other things related to kidneys.

The mean age in our study was 36.47± 8.243 years which was coincide with the age found by Maryam et al. which was 35.69 ± 5.91 years.[12] A larger proportion of patient in our study was in age range of 30 to 42 years (66.3%) than those observed by Maryam et al. in which 46.9% of patients were in 31-45 years age group.[12] In our study the female were 43 (53.8%) while male was 37 (46.3%).

The sensitivity, specificity, PPV, NPV and accuracy of ultrasound found in this study was 69.64%, 66.6%, 82.92%, 48.48% and 68.75% respectively. Toru et al done the same type of study on 856 patients who showed ultrasound sensitivity of 78.9% and a specificity of 83.7%.[13] So our study result correlate with those by Toru et al. Maryam et al find out the sensitivity 69.64%, specificity 66.6%, PPV 82.92%, NPV 48.48% and accuracy 68.75% which also similar to our results.

CONCLUSION

The ultrasound abdomen for diagnosis of ureteric stone has a greater positive predictive value but the sensitivity is comparable with other result.

CONFLICT OF INTREST

There is no conflict of interest in this study.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

AUTHORS	Contribution to The Paper	Signatures
Dr. Mehboobul Wahab Senior Medical Officer, Urology Institute of Kidney Diseases, Peshawar	Manuscript Writing, Data Collection, Final Layout	
Dr. Kifayat Tariq Senior Medical Officer, Urology Institute of Kidney Diseases, Peshawar	Data Collection & Introduction Writing	
Dr. Muhammad Ishtiaq Senior Medical Officer, Urology Nowshera Medical College, Nowshera	Data Collection & Introduction Writing	
Dr. Kamran Ahmad Senior Medical Officer, Urology Nowshera Medical College, Nowshera	Data Collection & Methodology	
Dr. Muhammad Aslam Trainee Medical Officer, Urology Institute of Kidney Diseases, Peshawar	Data Analysis & Discussion	
Dr. Sahib Khan Trainee Medical Officer, Urology Khyber Teaching Hospital, Peshawar	Data Analysis	