ACCURACY OF ULTRASONOGRAPHY IN DETECTION OF <5mm RENAL STONES

Dr. Suyog Shetty, Prof. Suresh Bhat, Dr. Fredrick Paul

GMC KOTTAYAM

INTRODUCTION

Ultrasound (US) continues to be performed commonly as an initial modality of investigation in the setting of abdominal pain, as it is readily available, cheaper and can be performed by the attending emergency-care physician.(1)

Therefore establishing the accuracy of US for renal calculi (which is one of the major causes for acute abdominal pain) will allow the treating doctor to make informed decisions regarding the amount of importance he/she needs to give to such a finding on US. Especially when the size of the stone detected is less than 5 mm as this is more likely to be confused with other causes of hyperechoic foci.

The accuracy of US for detection of renal stones varies from 60 to 90%. Conditions like appendicitis, cholecystitis, radicular pain etc can be mistaken for renal stones.(2,3,4) In this clinical scenario, an initial US may give a wrong diagnosis of renal stone (false positive) and thereby leading to wrong management

MATERIALS & METHODS

All patients seen in the Department of Urology MCH Kottayam with complaints of flank or abdomen pain were evaluated with ultrasound. Those who were found to have renal stones less than 5mm were included in the study. These patients underwent serum Creatinine measurement and Urine Routine Examinations

A Non Contrast enhanced Computerized Tomography (CT) of the abdomen on the same day was then done to confirm the presence of renal stones as CT is the gold standard (5)

Men weighing more than 129 kg and women weighing more than 113 kg were excluded, since the accuracy of imaging may be reduced in obese patients

Sensitivity and specificity of US is calculated using CT as the standard of diagnosis.

STATISTICS & ANALYSIS

Table 1 Patients included in the study

Statistics		
	US	Confirmed on CT
No of Patients having Stones	98	46
Total no of Stones	224	98

Table 2 Stone size comparisons between US and CT

	Actual Size of Stones on CT						
on US	No Stones	2mm	3mm	4mm	5mm	>5mm	total
2mm on usg	12	3	0	6	0	0	21
3mm on usg	50	8	5	13	2	2	80
4mm on usg	25	4	5	11	19	0	64
5mm on usg	39	2	3	0	10	5	59
total	126	17	13	30	31	7	224

Comparison of stone sizes on US vs CT(figure 1)

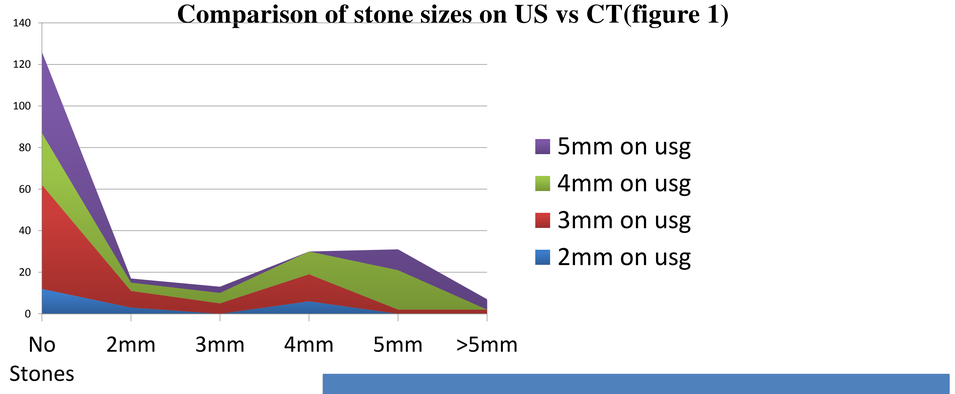
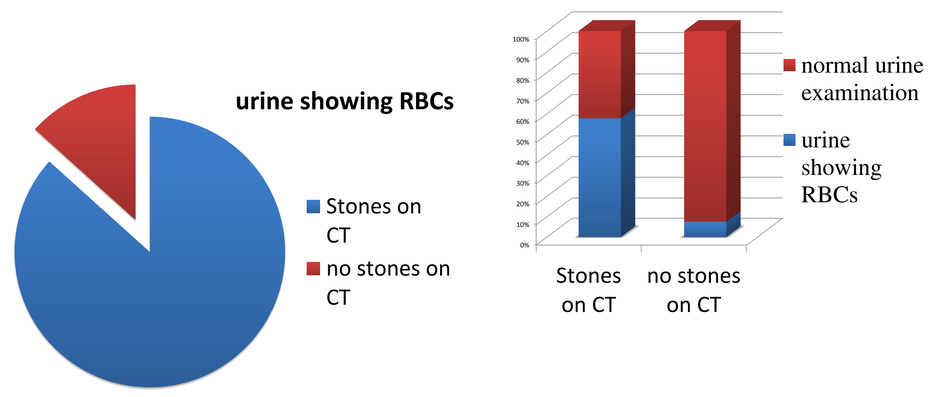


Table3- US +Urine Routine to Detect Stones

	Stones on CT	no stones on CT	
urine showing RBCs	26	4	30
normal urine examination	19	49	68

Figure 2,3- Showing probability of stones in the presence of RBCs on urine examination



RESULTS

Table (5)

46 out of the 98 patients with <5mm renal stones on US were actually confirmed to be stones on CT yielding an accuracy of 45%. i.e. of the 224 stones detected in the 98 patients 126 (66.25%) were not actually stones. There was a difference in the detection rates of stones on the left and right side with the accuracy rates dropping to 41.5% for those showing stones on Left side on US however this difference was not found to be statistically significant.

Calculus size among the 52 patients found having calculi on both CT and US however did not differ significantly with the average size of the 51 detected stones being 3.95 on US as compared to 3.99 on CT. Neither was any significant difference in detection rates noted based on the size of renal calculi.

Renal stones detection rates however were found to be more accurate when US was combined with urine examination for the presence of RBCs showing a sensitivity of 57.8% and **a specificity of 92.5%** Thus the combined US and urine examination having a positive predictive value of 86.7% and a negative predictive value of 72.1%.

DISCUSSION & CONCLUSION

In our study ultrasound is found to have limited role in the detection of renal stones less than 5mm. High rates of of false positive outcomes resulting in more than half the patients being wrongly diagnosed and treated for renal stone disease. Therefore it is prudent to conclude that treating renal stones solely based on US findings especially in <5mm calculi is not advisable. However if ***<5 mm stones on US is seen in the presence of RBCs in urine the diagnostic accuracy of the same is markedly improved.***

REFERENCES

1. Clark JY, Thompson IM, Optenberg SA. Economic impact of urolithiasis in the United States. J Urol 1995 Dec;154(6):2020e4
2. Middleton WD, Dodds WJ, Lawson TL, et al: Renal calculi: sensitivity for detection with US. Radiology 1988, 167(1):239-44,
3. Kaude JV, Williams JL, Wright PG, Bush D, Derau C, Newman RC. Sonographic evaluation of the kidney following extra-corporeal shock wave lithotripsy. J Ultra- sound Med 1987; 6:299–306.
4. Levine JA, Neitlich J, Verga M, Dalrymple N, Smith RC. Ureteral calculi in patients with flank pain: correlation of plain radi-ography with unenhanced helical CT. Ra- diology 1997; 204:27–31.
5. Smith RC, Verga M, McCarthy S, Rosen- field AT. Diagnosis of acute flank pain: value of unenhanced helical CT. AJR Am J Roentgenol 1996; 166:97–101.