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ORIGINAL ARTICLE

TWIRKLING SIGN IN DETECTION OF RENAL AND URETERAL STONE: A CLINICAL STUDY

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ABSTRACT:

Background: Kidney stone disease (urolithiasis) is when a solid piece of material (kidney stone) occurs in the urinary tract. The present study was conducted to compare standard gray scale ultrasound with color Doppler ultrasound for the detection of urinary stones. **Materials & Methods:** It included 40 patients with urinary stones. It included 22 males and 18 females. All patients were evaluated for the presence of urinary stones by unenhanced spiral computed tomography (CT). Plain abdominal radiography was performed in all patients. USG examinations were done within 24 hours after CT. US examinations were performed by experienced radiologists. Gray-scale, color and power Doppler USG, and pulsed-wave spectral Doppler USG were performed in all 40 patients. All studies were performed with a transmit frequency of 2.5 to 6.0 MHz. **Results:** Out of 40 patients, 22 were males and 18 were females. The difference was non - significant ($P > 0.05$). Renal stones with size < 4mm were 28 and ureteral stones were 18. Renal stones with size > 4mm were 20 and ureteral stones were 6. Gray scale USG detected 60% of stones with size < 4mm and 80% with size > 4mm. Color Doppler USG detected 95% with stones < 4mm and 100% with stones > 4mm. The difference was significant ($P < 0.05$). Echo difference in renal stones was marked (30), slight (4) and indistinct (14) and in ureteral stones was marked (13), slight (3) and indistinct (8). The difference was significant ($P < 0.05$). In marked posterior shadowing in renal stones 30 had strong intensity and in ureteral stones had 13 had strong intensity. **Conclusion:** Color Doppler twirkling sign is effective in detecting renal and ureteral stones. This can be considered as diagnostic aid in assessing stones.

Key words: Color Doppler, twirkling sign, kidney stone

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INTRODUCTION

Pain in abdominal may be due to abnormalities in gall bladder, kidneys, pancreas, stomach, duodenum, spleen etc. Kidney stone disease (urolithiasis) is when a solid piece of material (kidney stone) occurs in the urinary tract. Kidney stones typically form in the kidney and leave the body in the urine stream.[1] A small stone may pass without causing symptoms. If a stone grows to more than 5 millimeters it can cause blockage of the ureter resulting in severe pain in the lower back or abdomen. A stone may also result in blood in the urine, vomiting, or painful urination. About half of people will have another stone within ten years.[2]

For the diagnosis of abdominal pain, we have different diagnostic modalities. Among all, ultrasound is preferred one. It does not cause any radiation damage to patient as x rays are not used in this technique. Ultrasound is non-invasive and is not painful.[3]

Detection of urinary stones on ultrasound (US) may be problematic when the stones are obscured by ultrasonic beam-attenuating tissue, such as renal sinus fat, mesenteric fat, and bowel, or when their posterior acoustic shadowing is weak.[4] The twinkling sign is a color-flow US artifact described behind calcifications and presenting as a random color encoding in the region were shadowing would be expected on gray-scale images. Recent studies have reported that the twinkling sign may be useful for detection of urinary stones.[5]

The present study was conducted to compare standard gray scale ultrasound with color Doppler ultrasound for the detection of urinary stones.

MATERIALS & METHODS

This study was conducted in the department of Radio-diagnosis in year 2014. It included 40 patients with urinary stones. It included 22 males and 18 females. Patients were informed regarding the study and written consent was

obtained. Patient data such as name, age, gender etc was recorded. All patients were evaluated for the presence of urinary stones by unenhanced spiral computed tomography (CT). Plain abdominal radiography was performed in all patients. USG examinations were done within 24 hours after CT. US examinations were performed by experienced radiologists. Gray-scale, color and power Doppler USG, and pulsed-wave spectral Doppler USG were performed in all 40 patients. All studies were performed with a transmit frequency of 2.5 to 6.0 MHz. Color Doppler USG was performed using a redand- blue color map and power Doppler USG using a pink color map with a standardized Doppler protocol to detect the twinkling artifact. USG findings were evaluated by a radiologist. The gray-scale US appearance of urinary stones was analyzed for size, echo difference between stone and adjacent tissue, and posterior acoustic shadowing. Stone size was determined on gray-scale US alone. The location of the stones was determined either on gray-scale US or color Doppler US findings. Echo difference between stone and adjacent tissue was recorded as marked, slight, or indistinct. Posterior acoustic shadowing was noted as absent, weak or strong. On color and power Doppler images, the presence, appearance, and intensity of the twinkling sign was assessed. The intensity of the color signal was recorded as 0 = absent, 1= weak, present and 2= strong, present. Furthermore, the length of the twinkling sign was classified and a length of > 1 cm was defined as 2 (= strong present). At pulsed-wave spectral Doppler US, the pattern of the spectrum was analyzed. Results thus obtained were tabulated and subjected to statistical analysis using chi square test. P value < 0.05 was considered significant.

RESULTS

Table I shows that out of 40 patients, 22 were males and 18 were females. The difference was non - significant (P > 0.05). Table II shows that renal stones with size < 4mm were 28 and ureteral stones were 18. Renal stones with size > 4mm were 20 and ureteral stones were 6. Gray scale USG detected 60% of stones with size < 4mm and 80% with size > 4mm. Color Doppler USG detected 95% with stones < 4mm and 100% with stones > 4mm. The difference was significant (P < 0.05). Graph I shows that echo difference in renal stones was marked (30), slight (4) and indistinct (14) and in ureteral stones was marked (13), slight (3) and indistinct (8). The difference was significant (P < 0.05).

Graph II shows that in marked posterior shadowing in renal stones 30 had strong intensity and in ureteral stones had 13 had strong intensity.

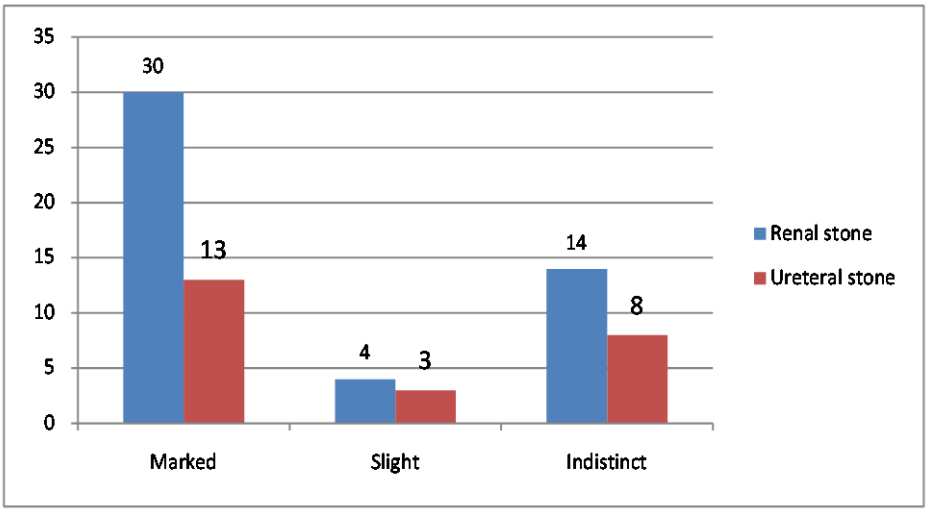
Table I Distribution of patients

Total - 40		
Male	**Female**	**P value**
22	18	0.2

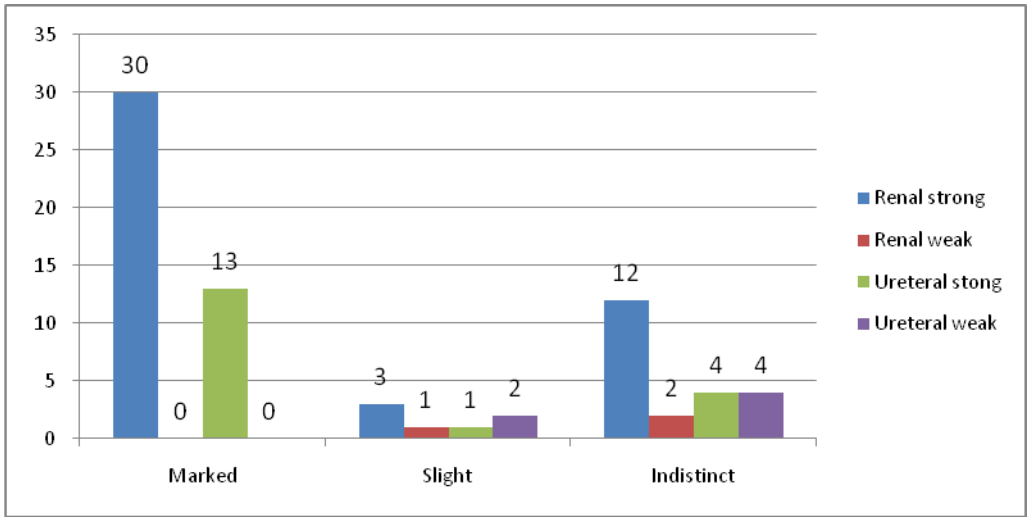
Table II Comparison of gray-scale ultrasound (US) and Doppler twinkling artifacts of urinary stones

	Location		Gray scale USG	Twirkling artifact
Size	**Renal stones**	**Ureteral stones**		
<4mm	28	18	27 (60%)	44 (95%)
>4mm	20	6	21 (80%)	26 (100%)
Total	48	24	48 (67%)	90 (97%)

Graph I Echo difference of renal and ureteral stone



Graph II Posterior shadowing in of renal and ureteral stone



DISCUSSION

The twinkling sign is generated from the 'noise' stemming from rough interfaces composed of sparse reflectors, such as lithiasis or vascular calcifications, which split the sonography beam in a complex unit of waves. This produces a mix of red and blue pixels on color Doppler as turbulent flows.[6] The present study was conducted to compare standard gray scale ultrasound with color Doppler ultrasound for the detection of urinary stones.

In our study, out of 40 patients, 22 were males and 18 were females. A total of 48 renal stones and 24 ureteral stones were seen in 40 patients.

We found that renal stones with size < 4mm were 28 and ureteral stones were 18. Renal stones with size > 4mm were 20 and ureteral stones were 6. Similar results were seen in study of Lee JY et al.[7]

In present study we compared the Gray scale USG with color Doppler USG and found that Gray scale USG detected 60% of stones with size < 4mm and 80% with size > 4mm. Color Doppler USG detected 95% with stones < 4mm and 100% with stones > 4mm. This is in accordance to Sheafor DH et al.[8] We found that echo difference in renal stones was marked (30), slight (4) and indistinct (14) and in ureteral stones was marked (13), slight (3) and indistinct (8). This is in accordance to Aytac et al.[9] We found that in marked posterior shadowing in renal stones 30 had strong intensity and in ureteral stones 13 had strong intensity. Sonographic detection of urinary stones is relative easy for stones with both distinct echogenicity and posterior acoustic shadowing.

However, sometimes it is difficult to determine whether a urinary stone is present because of its indistinct echogenicity and indiscrete posterior acoustic shadowing.

Indistinct echogenicity of stones results from surrounding echogenic tissue, such as prominent renal sinus fat, mesenteric fat, and bowel. When a renal stone is poorly distinguished from echogenic renal sinus fat and has an indiscrete posterior acoustic shadowing,[10]

CONCLUSION

Color Doppler twirkling sign is effective in detecting renal and ureteral stones. This can be considered as diagnostic aid in assessing stones.

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