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Twinkle, the Artifact of a Good Diagnostic Value, Case Study

Ahmad Mokhtar Abodahab[1,2,], Hagar Mohammad Atta[2,3], Rayan Fareed Mustafa[4,5] and Ahmed Samir Kamel[1].*

[1] Radiology Department, Faculty of Medicine, Sohag University, Sohag, Egypt.
[2] Radiology Department, Olaya Medical Center "OMC", Riyadh, KSA.
[3] Radiology Specialist, AL Gharbia Medical Directorate, AL Gharbia, Egypt.
[4] Emergency Department, Olaya Medical Center "OMC", Riyadh, KSA.
[5] Medical officer, Khartoum Medical Directorate, Khartoum, Sudan.

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Abstract: Renal stones are a common complaint and presentation of acute abdominal pain. Ultrasound is the initial modality for diagnosing. The smaller stones are more difficult to diagnose by ultrasound, which are easier to be diagnosed by CT, which is less available in all medical centers than ultrasound and Doppler. Color Doppler is the ultrasound-dependent modality for the assessment of the vascular system and blood flow, which has its own physics. Some types of artifacts are related to Color Doppler. Twinkle is one of them that can be helpful as a guide for the detection of small stones that makes its detection easier than detecting them by ultrasound alone. This can also decrease the need to expose patients to X-ray ionizing radiation of computed tomography to diagnose small stones not detectable by ultrasound alone, with no guidance of twinkle artifacts.

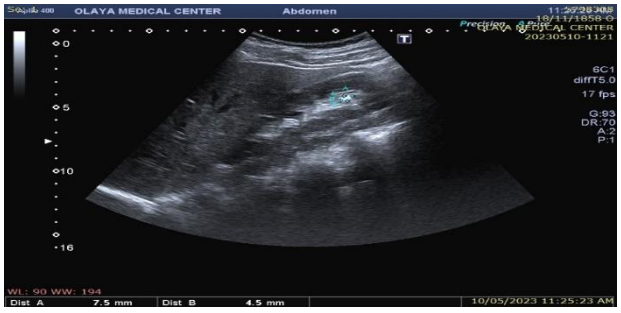
Keywords: Cybersecurity, Aftereffect of Covid-19 pandemic, Mathematical model, Hackers.

1 Introduction

A small renal stone diagnosis by ultrasound can sometimes be a challenge for radiologists. This challenge is more difficult when the stone is smaller, less calcified, surrounded by more fat tissue, echogenic cortical tissue, or using a low-frequency probe. Twinkle artifact is one of the color Doppler artifacts that give the shape of a mixed-color comet tail. It occurs in relation to small stones "behind it" at a similar extension of its posterior aquatic shadow due to applying of color Doppler on the stone with its strong reflecting nature [1].

Case Presentation:

A 63-year-old female patient presented to OMC ER with mild right renal pain. By abdominal ultrasound, a small lower calyceal echogenic non-shadowing focus is noticed (Fig. 1), but when color Doppler is applied, a strong twinkle artifact occurs, giving the specific appearance of the colored comet tail sign and confirming the diagnosis of the small renal stone. Diagnosis was confirmed by CT scan of the urinary tract.



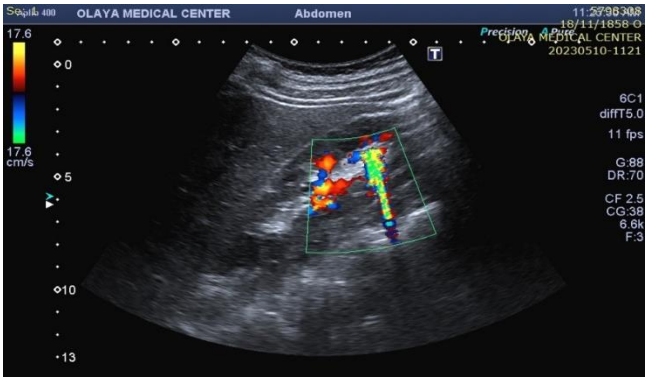


Fig. 1: (A & B) A. female patient 63 y, Abdominal ultrasound is showing lower non shadowing echogenic focus 7.5 X 4.5 mm. **B.** by applying color Doppler on the previous described echogenic focus, strong twinkle artifact occurs giving the appearance of colored commit tail confirming Prescence of small renal stone at the site of commit head.

2 Discussion:

Twinkle artifact is a type of an ultrasound physical artifacts. Color Doppler is a division of US for examination and assessment of the vascular system and blood flow. Color Doppler has some types of artifacts, which usually interfere with the integrity of accurate diagnosis. These artifacts, such as aliasing, blooming, and twinkle artifacts. Doppler artifacts generally may be related to too low flow or too high flow. Understanding these artifacts is very important for radiologists to avoid misdiagnosis of color Doppler findings, which mainly depend on color Doppler physics

*Corresponding author e-mail: Dr.AhmadAbodahab@gmail.com

[2,6]. Twinkle artifacts occurred in relation to the reflecting object "as catheter tip or small stone" as a focus of alteration of the color Doppler signal, giving the shape of a colored comet tail shape [3,6,7]. Twinkle artifact is a stronger sign in the detection of a diagnosis of small renal stones than posterior shadow. Small stones may have no posterior shadow that is enough to attract the attention of a radiologist to diagnose it [3,8]. But when a radiologist has doubts about the presence of a small renal stone and applies color Doppler, the twinkle artifact will be a powerful sign to detect and diagnose it. Detection of small stones with in renal calyces is more difficult than detecting it at distal ureter, as the renal hilar fat can mask it, while at distal ureter it usually causing ureteric dilatation proximal to it which make detection is easier. Twinkle artifact although classified as an artifact of color doppler as regarding physics but it is a very powerful sign for confirming diagnosis of small renal stones [6-8]. CT is the next confirmatory modality of choice with higher accuracy in detection of small renal stones, with good differentiation of their densities. But still ultrasound is the safer as it using non ionizing US waves. CT as using X ray of high dose so it is contraindicated in pregnancy, so depending on twinkle artifact become more important in this case [3-8]. Urinary stones are a common complaint in different age groups. The patients suffering from it may be presented with pain, hematuria, or may be silent and accidentally discovered during radiological scans. US is the initial and basic method of diagnosis of renal stones. When the stone is larger and/or obstructing certain renal pathways, it is easier to be detected, but when the stone is smaller in size and located in-between echogenic fat of the kidney (Fig. 2), it is more difficult to be detected, and twinkle artifacts become a good indicator of its presence. Twinkle artifact is a sensitive tool for detection of renal stones, but sometimes other echogenic lesions can give the same sign, with a false positive diagnosis of renal stones. This can be confirmed by CT scan, which is the most sensitive tool for detection of renal stones (Fig. 3). CT scan is the most sensitive and most accurate radiological tool to detect small renal stones, but it is not available in all departments, hospitals, or clinics, so Twinkle artifact of color Doppler can be a good indicator for small stone detection and follow up [7-10].

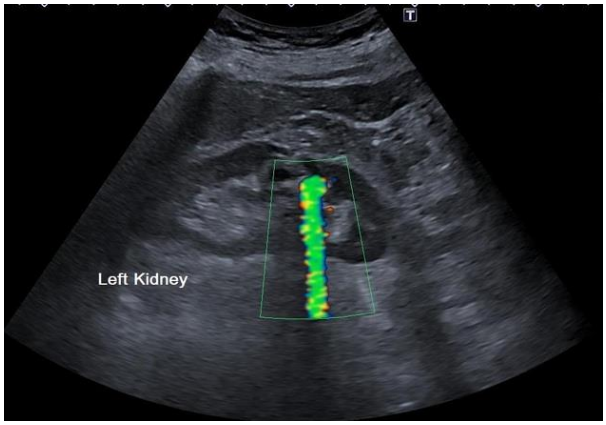


Fig. 2: (A & B) Left kidney stone (an echogenic focus with posterior acoustic shadowing). The color Doppler shows a non-homogenous colors signal behind the stone giving the appearance of turbulent blood flow in keeping with twinkling artifact. No dilatation of the renal cavities [9].

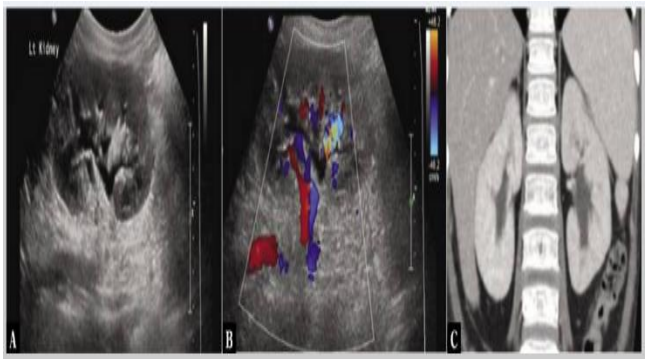


Fig. 3: (A, B & C) A 6-year-old male: presented with hematuria. A. ultrasound of the left kidney showed mild hydronephrosis with a lower pole non-shadowing echogenic focus. B. Color-Doppler ultrasound showed the twinkle artifact within the left lower pole echogenic focus. C- CT scan showed bilateral mild hydronephrosis with no stones in the left kidney [10].

3 Conclusion:

Twinkle artifact is a type of Color Doppler artifacts which has an important role in diagnosis of small renal stones that help radiologist to detect and diagnose it and decrease the need to diagnose it by CT scan. This will help in decreasing patients' exposure to ionizing radiation and increase the ability of detection of small stones by US especially when CT is contraindicated as in pregnancy. The twinkle artifact is an US sensitive tool for detecting renal and ureteric stones, but with a small risk of false positive findings.

Abbreviations:

CT Computed Tomography

ER Emergency Room

US Ultrasound

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