

A Prospective Study Assessing the Role of Color Doppler Ultrasonography in Acute Scrotum: an Observational StudyVijay Kumar¹, Sanjay Kumar Suman²¹Senior Resident, Department of Radiodiagnosis, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India²Professor and Head, Department of Radiodiagnosis, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India

Received: 14-09-2023 Revised: 22-10-2023 / Accepted: 28-11-2023

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Conflict of interest: Nil

Abstract**Aim:** The aim of the present study was to assess the role of color doppler ultrasonography in acute scrotum.**Methods:** We did a prospective study on 70 patients who were referred to our Department of Radiodiagnosis presenting with acute scrotal pain for the period of one year.**Results:** In our study, we evaluated 70 patients presenting with acute scrotal pain by color Doppler ultrasonography. The results of these imaging studies were correlated with final diagnosis established by means of surgery or clinical follow-up. In our study, out of 70 patients presenting with acute scrotal pain, 15 were diagnosed to be having torsion testis by color as increased frequency, dysuria, and urgency. In our study, we diagnosed 47 cases as epididymo-orchitis by color Doppler ultrasonography who had findings with a straight spermatic cord, a swollen epididymis, testis, or both, an absent focal lesion in the testis, and increased flow on color Doppler studies along with the clinical features of infection.**Conclusion:** We concluded that color Doppler of scrotum is must in a patient presenting in emergency department with acute scrotal pain. It can reliably rule out testicular torsion and helps in clearing clinical dilemma between torsion testis and epididymo-orchitis, and thus help in avoiding unnecessary surgical explorations.**Keywords:** Color Doppler in acute scrotum, sonographic evaluation of acute scrotum, torsion of testis

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Introduction

Color Doppler ultrasonography (CDUS) is an important tool for diagnosis of scrotal diseases because of its ability to depict anatomy and perfusion in real time. [1] Diagnosis of scrotal diseases has always been a challenge for the clinician due to a non-specific signs and symptoms. [2] Common acute causes are epididymitis, epididymo-orchitis, torsion of testis, torsion of testicular appendage, strangulated hernia and trauma. Incidence of epididymitis is 30% to 35% in patients with acute scrotal pain and 75% of acute intrascrotal inflammatory process. [3,4] The incidence of testicular torsion is 1 in 160 patients, present with acute scrotal pain that is difficult to differentiate from epididymo-orchitis. The onset of symptoms is usually spontaneous but may follow trauma. [5]

Other causes of acute scrotal pain include idiopathic scrotal edema, Henoch Schonlein purpura, hydrocele, inguinal hernia are rare. [6] Ultrasound along with color doppler helps in accurate differentiation of surgical versus a nonsurgical cause of acute scrotal pain, as early surgery to torsion of

testis helps to salvage testes. [7] Acute scrotal pain is a common presenting symptom for both pre- and post-pubertal males. High-frequency sonography remains the imaging modality of choice, with excellent sensitivity and specificity in diagnosing acute scrotal pathologies, such as epididymitis or testicular torsion. [1,8] Ultrasound is fast, portable, and allows for rapid evaluation of potential urologic emergencies. While grayscale imaging is helpful, color flow Doppler (CFD) ultrasound is the scrotal and testicular imaging's backbone. [9]

Despite increasing sophisticated diagnostic techniques distinguishing testicular torsion from other causes of acute scrotum still remains a challenge. The acute scrotum in childhood or adolescence is a medical emergency and is defined as scrotal pain, swelling, and redness of acute onset. As the testicular parenchyma cannot tolerate ischemia for more than a short time, testicular torsion must be ruled out rapidly as the cause. [10-12] Doppler ultrasonography (DUS) is a noninvasive examination that lacks ionizing radiation and is highly sensitive in the

detection of intrascrotal abnormalities [12]; therefore, it is considered nowadays the first imaging modality for the assessment of acute scrotum. A DUS study includes a gray scale imaging and color and spectral Doppler flow of the scrotal contents, mainly the testis and epididymis. By enabling the distinction between surgical emergencies, such as testicular torsion and traumatic testicular rupture, which mandate immediate scrotal exploration to prevent testicular loss, and surgical non-emergencies and nonsurgical entities, scrotal DUS has become the standard diagnostic test on which the therapeutic approach in patients with acute scrotum is based.

The aim of the present study was to assess the role of color doppler ultrasonography in acute scrotum.

Materials and Methods

We did a prospective study on 70 patients who were referred to our Department of Radiodiagnosis, Indira Gandhi Institute of medical sciences (IGIMS), Patna, Bihar, India presenting with acute scrotal pain for the period of one year. Patients with history of trauma and scrotal mass were excluded from the study. These patients were subjected to high frequency ultrasonography and color Doppler using standard machine (Philips HD7 XE) equipped with high resolution and color Doppler linear probe (7.5–12 MHz). Serial transverse and sagittal images of each scrotum are obtained and both testis are compared for echotexture and color flow. The study included both the scrotum and inguinal area. The clinical presentation, outcome, and US results were analyzed.

Results

Table 1: US diagnosis of acute scrotum

	Number of cases	US diagnosis
Epididymo-orchitis, epididymitis, funiculitis	48	46
Torsion	12	11
Obstructed/strangulated hernia	2	3
Others like torsion of testicular appendage, hydrocele, varicocele	8	10

In our study, we evaluated 70 patients presenting with acute scrotal pain by color Doppler ultrasonography. The results of these imaging studies were correlated with final diagnosis established by means of surgery or clinical follow-up.

Table 2: US diagnosis in testicular torsion and accuracy of US in diagnosing testicular torsion

Torsion	
True positive	15
True negative	55
False positive	0
False negative	0
Accuracy of US in diagnosing testicular torsion	
Positive predictive value	100%
Negative predictive value	100%
Specificity	100%
Sensitivity	100%

In our study, out of 70 patients presenting with acute scrotal pain, 15 were diagnosed to be having torsion testis by color as increased frequency, dysuria, and urgency.

Table 3: US diagnosis in epididymo-orchitis and accuracy of US in diagnosing epididymo-orchitis

US diagnosis in epididymo-orchitis	
True positive	47
True negative	14
False positive	2
False negative	7
Accuracy of US in diagnosing epididymo-orchitis	
Positive predictive value	94.6%
Negative predictive value	71.7%
Specificity	86.8%
Sensitivity	87.2%

In our study, we diagnosed 47 cases as epididymo-orchitis by color Doppler ultrasonography who had findings with a straight spermatic cord, a swollen epididymis, testis, or both, an absent focal lesion in the testis, and increased flow on color Doppler studies along with the clinical features of infection. Out of 47 positive diagnosis made by US, two were found to be false positive on clinical follow-up, of which one being diagnosed as omental hernia and other being varicocele limited to inguinal region, which were misdiagnosed as funiculitis.

Discussion

The ability to confidently establish a surgical versus a nonsurgical diagnosis for acute scrotal pain is important. The benefits of early surgery for testicular salvage in ischemic disease, primarily torsion of the testis, are well-known; but must be balanced against the costs of operating unnecessarily on a large number of patients with nonsurgical disease, primarily acute epididymo-orchitis. Acute scrotum is defined as acute pain with or without scrotal swelling, may be accompanied by local signs or general symptoms. The most common differential diagnoses of the acute scrotum include: i) Torsion of the spermatic cord and ii) acute epididymitis or epididymo-orchitis. Less common diagnoses include: Strangulated hernia, segmental testicular infarction, testicular tumor, and idiopathic scrotal edema. [13]

Acute onset scrotal pain, swelling and redness constitute acute scrotum. Physical examination adds only a little information and limited by acute pain and discomfort for patient further limits the proper examination. In these situations ultrasound with color doppler is valuable in differentiating between medically treatable and surgical emergency scrotum avoiding unnecessary surgical exploration. [14] In our study, we evaluated 70 patients presenting with acute scrotal pain by color Doppler ultrasonography. The results of these imaging studies were correlated with final diagnosis established by means of surgery or clinical follow-up. In our study, out of 70 patients presenting with acute scrotal pain, 15 were diagnosed to be having torsion testis by color as increased frequency, dysuria, and urgency. Testicular torsion is one of the most important cause of acute scrotum. Prompt diagnosis is necessary because torsion requires immediate surgery to preserve the testies. The grey-scale ultrasound findings of acute and subacute torsion are not specific and may be seen in testicular infarction caused by infections or trauma. [15] CDUS shows absent blood flow in the affected testies [16] or significantly less than in the normal, contralateral testies. The spermatic cord immediately cranial to the testies and epididymis is twisted causing a characteristic "whirlpool pattern" on CDUS. [15,17]

There is no definite protocol of acute scrotum screening for the primary care physicians to follow. Early detection of testicular torsion through color Doppler is the only means to reduce the burden of morbidity. This article emphasizes the importance and protocol of screening of patient with acute scrotal pain to create awareness among primary healthcare providers so as to detect testicular torsion at the earliest, so immediate surgery can be performed to salvage the testis as well as to rule out testicular torsion so that unnecessary surgery can be avoided. In our study, we diagnosed 47 cases as epididymo-orchitis by color Doppler ultrasonography who had findings with a straight spermatic cord, a swollen epididymis, testis, or both, an absent focal lesion in the testis, and increased flow on color Doppler studies along with the clinical features of infection. Classically, testicular torsion presents with sudden onset, severe scrotal pain with associated swelling, nausea, and vomiting. Atypical presentations are also common. [19] The physician needs to be aware that an embarrassed child may state that he has lower abdominal or inguinal pain rather than scrotal pain. A child may also minimize his symptoms out of fear. On examination, high lying, transverse testis may be seen. In addition, there may be loss of the cremasteric reflex; lifting the testis does not abolish the pain (Prehn's sign). [18,19] This can be a difficult clinical sign to elicit and has shown significant clinician variance. This large inconsistency makes it unsuitable as an adequate screening or diagnostic test. [11]

Testicular involvement usually diffuse and in 10% focal (adjacent to enlarged portion of epididymis) and they appear hypoechoic. Reactive hydrocele formation is common, and associated skin thickening may be seen. Color flow Doppler sonography usually shows increased blood flow in the epididymis or testis, or both, compared with the asymptomatic side. When vascular disruption is severe, resulting in complete testicular infarction, the changes are indistinguishable from those seen in testicular torsion. The important distinction is on spectral Doppler, in epididymitis there is high flow and low resistive index in comparison to high resistive flow found in torsion of the spermatic cord. [20,21]

Conclusion

We concluded that color Doppler of scrotum is must in a patient presenting in emergency department with acute scrotal pain. It can reliably rule out testicular torsion and helps in clearing clinical dilemma between torsion testis and epididymo-orchitis, and thus help in avoiding unnecessary surgical explorations. Hence, it can significantly improve outcome and decrease morbidity of patient. It is an accurate, rapid, nonresponsive, nonionizing, important adjunct to clinical assessment of scrotum.

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