ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
National Library of Medicine - ID: 101731606

International Journal of Medical Science and Innovative Research (IJMSIR)
IJMSIR : A Medical Publication Hub
Available Online at: www.ijmsir.com
Volume – 10, Issue – 6, December – 2025, Page No. : 35 – 39

To Evaluate The Role of Usg in Scrotal Lesions

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Citation this Article: Dr. Rutuja Kakad, Dr. Sonali Mhaske Kadam, Dr. Anadhi Joshi, Dr. Imaad Ali Fotowatzadeh, "To Evaluate The Role of Usg in Scrotal Lesions", IJMSIR - December – 2025, Vol – 10, Issue - 6, P. No. 35 – 39.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background: Scrotal lesions encompass a wide spectrum of conditions ranging from benign inflammatory disorders to surgical emergencies and malignancies. Rapid and accurate diagnosis is essential for timely management. Ultrasonography (USG), with grayscale and color Doppler capabilities, is considered the imaging modality of choice due to its safety, accessibility, and diagnostic accuracy.

Aim: To evaluate the diagnostic role of ultrasonography in scrotal lesions and correlate imaging findings with clinical, surgical, or pathological outcomes.

Methods: A prospective observational study was conducted in the Department of Radiodiagnosis of a tertiary care teaching hospital from January 2024 to June 2025. Twenty-five male patients presenting with scrotal pain, swelling, or mass were included. All underwent grayscale and color Doppler ultrasonography using a high-frequency linear probe. Findings were documented and correlated with surgical or clinical outcomes when available.

Results: Out of 25 patients, inflammatory lesions were most frequent (32%), followed by hydrocele (20%), torsion (12%), and varicocele (12%). Two cases (8%) of testicular malignancy and one case (4%) of microlithiasis were detected. Ultrasonography accurately identified lesion type and extent in 92% of cases when correlated with surgical or pathological outcomes.

Conclusion: Ultrasonography is a rapid, reliable, and non-invasive diagnostic tool in scrotal pathology, making it indispensable in both acute and chronic clinical scenarios.

Keywords: Ultrasonography, Scrotal lesions, Color Doppler, Epididymo-orchitis, Testicular torsion

Introduction

Scrotal disorders comprise a wide range of conditions from benign inflammatory diseases to life-threatening neoplasms. Prompt and accurate diagnosis is vital, particularly in acute conditions like testicular torsion where delays can cause irreversible ischemic damage. Ultrasonography (USG), especially high-frequency grayscale and color Doppler imaging, serves as the modality of choice for scrotal evaluation due to its real-time, non-invasive, and radiation-free nature [1].

High-resolution imaging of the testes, epididymis, and spermatic cord, combined with color Doppler assessment of vascularity, enhances diagnostic precision in conditions like torsion and epididymo-orchitis [3,4]. The combined grayscale and Doppler approach achieves sensitivities exceeding 90% in acute torsion, making it indispensable for emergency diagnosis [5].

Recent advances such as contrast-enhanced ultrasonography (CEUS) further aid in identifying viable tissue in trauma and differentiating avascular lesions [6]. USG is also safe, affordable, and repeatable across all age groups, providing dynamic evaluation for entities like varicocele on Valsalva or live filarial movement in endemic regions [7]. Its ability to detect cysts, calcifications, trauma, inflammation, and neoplasms underscores its comprehensive diagnostic scope [8]. Moreover, it plays a pivotal role in infertility workups by identifying obstructive causes such as epididymal cysts or varicoceles [9].

In the Indian healthcare context, USG remains a simple, cost-effective, and reliable diagnostic tool, particularly valuable in rural and resource-limited settings lacking access to advanced imaging modalities. Studies from India confirm its high sensitivity and specificity for both acute and chronic scrotal pathologies [10].

This study aims to evaluate the diagnostic accuracy of ultrasonography in scrotal lesions, correlate imaging findings with clinical or pathological outcomes, and reinforce its role as the first-line imaging modality for scrotal disorders in diverse clinical settings.

Materials and Methods

This prospective observational study was conducted in the Department of Radiodiagnosis of a tertiary care teaching hospital from January 2024 to June 2025 to evaluate the diagnostic role of ultrasonography in scrotal lesions. Male patients of all ages presenting with scrotal pain, swelling, or mass who consented to participate were included, while those with prior scrotal surgery (except complications), incomplete records, or unwillingness to consent were excluded. Purposive consecutive sampling was adopted, and 25 patients were enrolled for final analysis. Each patient underwent clinical evaluation followed by high-frequency (7.5–12 MHz) grayscale and color Doppler ultrasonography, assessing lesion type, laterality, echotexture, vascularity, and associated complications. Patients were grouped as inflammatory, vascular, fluid-related, or miscellaneous (including trauma, malignancy, microlithiasis, and Fournier's gangrene). Findings were correlated with surgical, pathological, or clinical outcomes where available. Data were recorded in a structured proforma and analyzed using descriptive statistics; sensitivity, specificity, and predictive values were calculated with a significance level of $p < 0.05$.

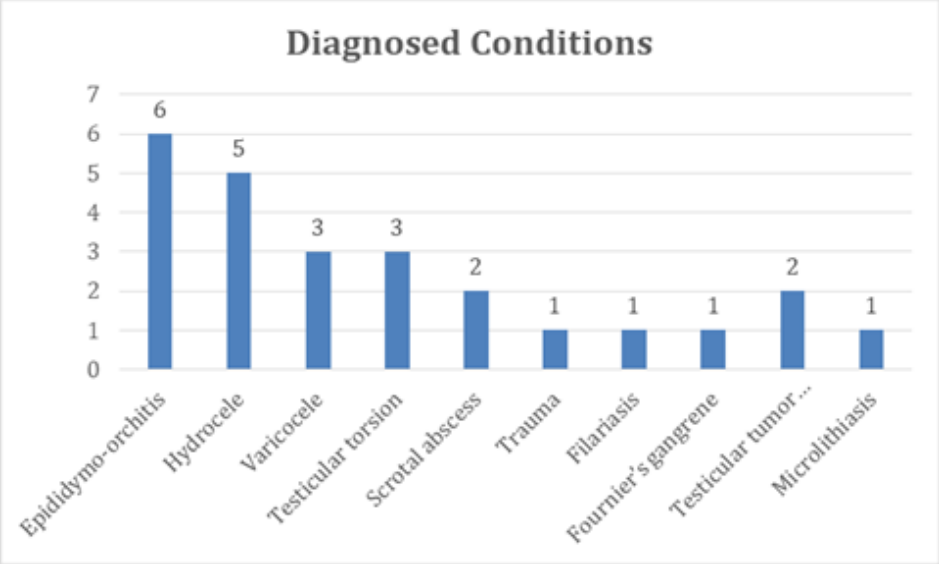
Results

Diagnosed Conditions

Epididymo-orchitis was the most common diagnosis, followed by hydrocele and torsion, supporting the utility of USG in distinguishing infections from emergencies (Table 1).

Table 1: Diagnosed Conditions

Condition	Number of Cases (n)	Percentage (%)
Epididymo-orchitis	6	24
Hydrocele	5	20
Varicocele	3	12
Testicular torsion	3	12
Scrotal abscess	2	8
Trauma	1	4
Filariasis	1	4
Fournier's gangrene	1	4
Testicular tumor (malignant)	2	8
Microlithiasis	1	4
Total	25	100



Graph 1: Diagnosed Conditions

Discussion

The present study of 25 patients reaffirmed epididymo-orchitis as the most prevalent condition (24%), consistent with earlier observations that inflammatory lesions dominate scrotal pathology in young and middle-aged males [11]. Hydrocele remained a frequent benign finding (20%), often co-existing with infection or trauma [12].

Testicular torsion accounted for 12% of cases, aligning with studies that highlight color Doppler's diagnostic sensitivity above 90% for torsion-detorsion patterns [13]. Early detection in our cases facilitated timely surgical intervention, preventing infarction.

Varicocele, seen in 12% of patients, was well characterized on Valsalva maneuver and graded based on venous reflux, supporting its established role in infertility evaluation [14].

A notable addition in our study was the identification of two malignant testicular lesions (8%), confirmed histopathologically as seminoma and mixed germ cell

tumor. Ultrasonography showed heterogeneous intratesticular echotexture with focal hypoechoic areas and internal vascularity on color Doppler, findings consistent with previous series [15]. The role of USG in differentiating solid intratesticular masses from benign cystic lesions remains crucial for early oncological referral.

Another important observation was one case of testicular microlithiasis (4%), presenting as multiple punctate echogenic foci within the parenchyma without acoustic shadowing. Although often incidental, its recognition is clinically significant due to the reported association with testicular malignancy, infertility, and cryptorchidism [16]. Periodic ultrasonographic surveillance was recommended.

Rare entities, including abscess, trauma, filariasis, and Fournier's gangrene, highlighted USG's versatility. In Fournier's gangrene, subcutaneous gas with dirty shadowing and absent perfusion zones were well demonstrated, aiding early debridement planning.

Conclusion

Ultrasonography proved to be a highly effective diagnostic modality in evaluating scrotal lesions, accurately identifying common conditions such as epididymo-orchitis, hydrocele, torsion, and varicocele, while also detecting rare entities like trauma, filariasis, and Fournier's gangrene. Its non-invasive, radiation-free, and widely accessible nature makes it indispensable for both routine and emergency evaluation. The findings reinforce ultrasonography as the first-line imaging tool, providing reliable differentiation of infectious, vascular, and benign lesions, thereby guiding timely management and reducing unnecessary surgical interventions.

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