

Ultrasonography In Evaluation Of Scrotal Lesions

Dr. Maitrey Ketankumar Modi

Dr Ajay Ramanlal Upadhyay

(2nd Year Pg Student)

Department Of Radiodiagnosis

(Professor At Gcs Medical College, Hospital & Research Centre)

Gcs Medical College, Hospital & Research Centre

Abstract:

Background: Scrotal lesions encompass a wide range of pathologies, including benign, inflammatory, traumatic, and malignant conditions. Accurate and timely diagnosis is essential to guide appropriate management and avoid unnecessary surgical interventions. Ultrasonography (US), particularly with the addition of color Doppler imaging, is the primary imaging modality for the evaluation of scrotal pathology due to its non-invasiveness, accessibility, and high diagnostic accuracy.

Objective: Aim to assess ultrasonography in the characterization and differentiation of scrotal lesions, focusing on its diagnostic capabilities, limitations, and contribution to clinical decision-making.

Methods: A Cross-sectional observational study was done in 50 patients, was conducted on patients presenting with scrotal symptoms who underwent scrotal ultrasonography. Lesions were evaluated based on echogenicity, vascularity, location (intratesticular vs. extratesticular), and other sonographic features.

Results: Ultrasonography demonstrated high sensitivity and specificity in distinguishing between benign and malignant lesions, as well as between intratesticular and extratesticular pathologies. Common benign findings included hydrocele, epididymal cysts, and varicocele, while malignant lesions were predominantly hypoechoic intratesticular masses with increased vascularity. Doppler imaging was particularly useful in identifying torsion and inflammation.

Conclusion: Ultrasonography remains an indispensable tool in the evaluation of scrotal lesions, providing critical information for diagnosis, management planning, and surgical triage. Its real-time, radiation-free imaging capability ensures its continued prominence in scrotal lesions.

Date of Submission: 01-11-2025

Date of Acceptance: 10-11-2025

I. Introduction:

Ultrasonography (US) plays a **central and indispensable role** in the evaluation of scrotal lesions due to its non-invasive nature, lack of ionizing radiation, real-time imaging capability, and excellent spatial resolution for superficial structures.

Role of ultrasonography in scrotal lesions:

Primary imaging modality

Ultrasound is considered the first line imaging modality for assessing scrotal pathology especially in acute conditions such as:

- Testicular torsion
- Epididymitis/Orchitis
- Trauma
- Testicular masses

1. Differentiation of Intratesticular vs. Extratesticular Lesions

- Intratesticular lesions are more likely malignant.
- Extratesticular lesions are usually benign.

Ultrasound helps distinguish between these based on echotexture, location and vascularity.

2. Characterization of lesions

Ultrasound provides details on:

- Echogenicity (hypoechoic, hyperechoic, complex)

- Solid vs cystic nature
- Presence of calcifications
- Internal vascularity using doppler

These features help narrow down the differential diagnosis.

3. Vascular assessment (color and spectral doppler)

- Crucial in evaluating testicular torsion(Reduced or absent blood flow)
- Helps assess hyperemia in infections
- Assists in tumor vascularity analysis

4. Evaluation of trauma

- Detection of testicular rupture, hematoma or hematocele
- Guides surgical decision making

5. Guidance for intervention

- Real time imaging for aspiration or biopsy of scrotal masses
- Drainage of abscesses or hydroceles

6. Monitoring and follow up

- Surveillance of non-surgical lesions(eg.Microlithiasis)
- Post treatment monitoring of malignancies and infection

7. Detection of associated findings

- Varicocele
- Hydrocele, spermatocele
- Hernias involving scrotum

Common scrotal pathologies identified with ultrasound:

Pathology	Sonographic Features
Testicular torsion	Enlarged, hypoechoic testis; absent/reduced Doppler flow
Epididymitis/Orchitis	Enlarged, hyperemic epididymis/testis
Testicular tumors	Solid, hypoechoic intratesticular mass
Hydrocele	Anechoic fluid around testis
Varicocele	Dilated, serpiginous veins with increased flow on Valsalva

II. Material And Method –

The study comprised of 50 patients referred to the department of Radio-diagnosis at a tertiary care hospital who had presented with

- An unusual lump
- Sudden pain in groin
- Dull aching or a feeling of heaviness in the scrotum
- Pain that spreads all over the groin
- A tender, swollen or hardened testicle or epididymis
- Swelling in the scrotum
- A change in colour of the skin of the scrotum

Study was performed on GE VERSANA ULTRASONOGRAPHY MACHINE at GCS Hospital, Ahmedabad over a period of 12 months from May 2024 to May 2025.

Inclusion criteria:

Patient with the symptoms below included in the study:

- An unusual lump
- Sudden pain in groin
- Dull aching or a feeling of heaviness in the scrotum
- Pain that spreads all over the groin

- A tender, swollen or hardened testicle or epididymis
- Swelling in the scrotum
- A change in colour of the skin of the scrotum

Exclusion criteria:

- Patients refused the radiological examination
- Patient with the raw area at site of examination

Patient preparation:

For a **scrotal ultrasound**, the preparation is typically minimal, but following some basic steps ensures the procedure goes smoothly:

● **Clothing:**

The patient should wear loose, comfortable clothing, as the procedure involves undressing the lower part of the body. Typically, they will need to remove pants or shorts and may be given a gown to wear.

● **Hygiene:**

The scrotum and surrounding area should be clean and free from lotions, powders, or oils. This helps prevent any interference with the ultrasound images.

● **Fasting:**

Fasting is generally not required for scrotal ultrasound. However, if the ultrasound is being performed alongside other abdominal imaging (such as pelvic ultrasound), the patient may be asked to fast for a few hours beforehand.

● **Full Bladder (if needed):**

If the ultrasound involves imaging of the lower abdomen or bladder, the patient may be asked to drink water prior to the exam to ensure a full bladder, but this is not usually necessary for scrotal imaging.

● **Preparation for Transducer Use:**

A **conductive gel** will be applied to the scrotum to allow proper transmission of sound waves and facilitate imaging. This gel is usually warm and easy to clean off after the exam.

● **Comfort and Positioning:**

The patient will be asked to lie down on an examination table, and the scrotum will be gently positioned in a relaxed manner. The sonographer may gently move the scrotum into different positions for optimal visualization of the testicles and surrounding structures.

● **Communication:**

The sonographer should explain the procedure and encourage the patient to remain still and relaxed. Some slight pressure from the transducer might be felt, but it should not be painful.

Techniques:

- **High-frequency (7.5–15 MHz) linear probe** for detailed images.
- **Color Doppler** to evaluate vascularity.
- **Spectral Doppler** may help quantify flow in torsion or inflammation.
- **Valsalva maneuver:** Assists in varicocele detection.

III. Results:

❖ A total of 50 male patients, presenting with scrotal pain, swelling, or palpable masses were evaluated using high-resolution ultrasonography with color Doppler over a period of 12 months.

❖ Key findings are as follows:

● **Distribution of Lesions:**

Intratesticular lesions: 17 cases (34%)

Extratesticular lesions: 33 cases (66%)

● **Nature of Lesions:**

➤ Benign conditions: 42 cases (84%)

Hydrocele: 14 cases (28%)

Epididymo-orchitis: 10 cases (20%)

Epididymal cysts/Spermatoceles: 5 cases (10%)

Varicocele: 4 cases (8%)

Scrotal wall edema/infection: 3 cases (6%)

Testicular microlithiasis: 1 cases (2%)

Undescended testis: 1 cases (2%)

➤ Malignant lesions: 3 cases (6%)

➤ Traumatic findings: 3 cases (6%)

Testicular Trauma: 3 cases

➤ Testicular torsion: 2 cases (4%)

● Laterality of Lesions:

Right-sided involvement: 24 cases (48%)

Left-sided involvement: 23 cases (46%)

Bilateral involvement: 3 cases (6%)

● Diagnostic Accuracy:

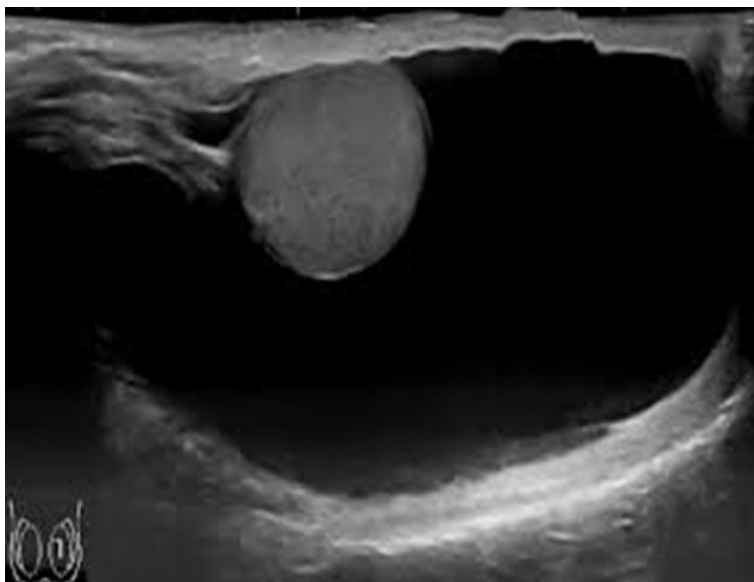
Ultrasonography with color Doppler demonstrated a sensitivity of 96.4% and specificity of 94.8% in distinguishing benign from malignant intratesticular lesions.

In cases of torsion and inflammation, color Doppler was instrumental in demonstrating vascular compromise or hyperemia, respectively.

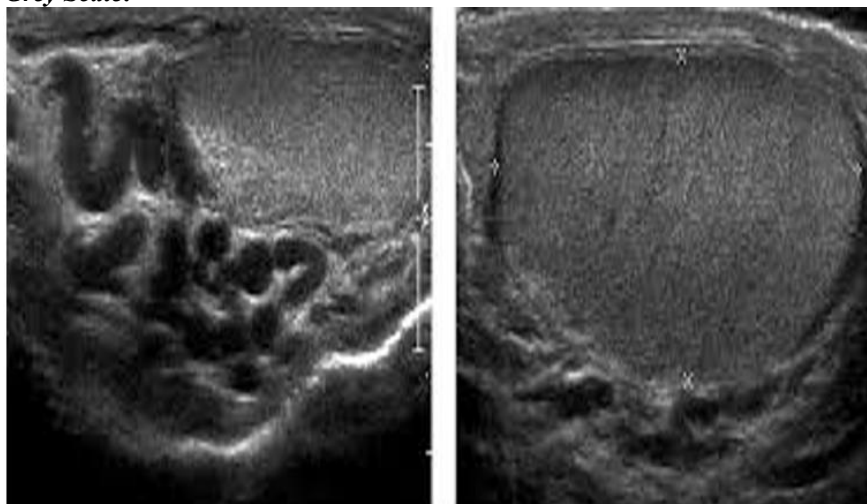
● Clinical Correlation:

In 92% of cases, ultrasonographic findings correlated well with clinical diagnosis.

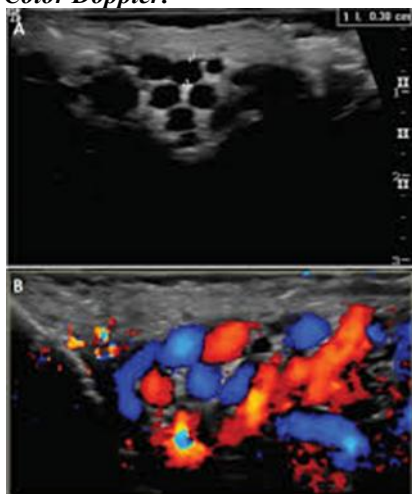
Hydrocele



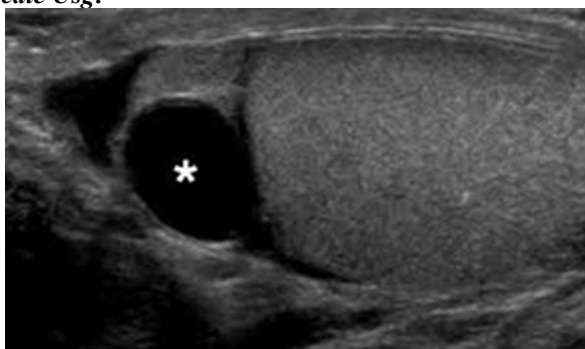
Varicocele On Grey Scale:



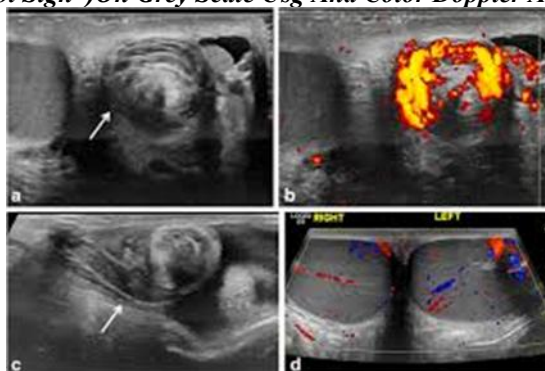
Varicocele On Grey Scale Usg And Color Doppler:



Epididymal Cyst On Grey Scale Usg:



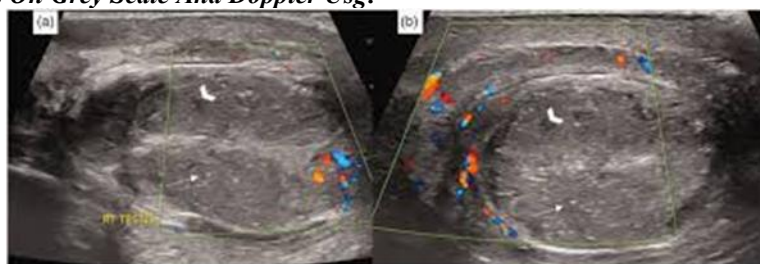
Testicular Torsion (“Whirpool Sign”)On Grey Scale Usg And Color Doppler And Pw:



Testicular Tumor On Grey Scale:



Epididymo Orchitis On Grey Scale And Doppler Usg:



■ **ADVANTAGE:**

- **No radiation** exposure
- **Portable and widely available**
- **High resolution** for superficial structures
- **Cost-effective** and rapid
- **Advantages of Ultrasound vs CT scan**

Feature	Ultrasonography (USG)	CT Scan
Radiation Exposure	No radiation exposure. Safe for repeated imaging.	Ionizing radiation exposure.
Cost	Relatively low cost and widely available.	Higher cost and less accessible.
Resolution	High spatial resolution , particularly for superficial structures like the testes, epididymis, and scrotal contents.	Moderate spatial resolution for soft tissue, but less detailed for superficial structures.
Speed	Real-time imaging , quick and easy to perform, especially for emergency situations.	Slower procedure , requires more preparation time (contrast injections, etc.).
Non-invasiveness	Non-invasive and well-tolerated.	Non-invasive , but requires more complex procedures and may need contrast agents.
Procedure	Simple and painless procedure with no preparation needed.	Requires patient preparation and is more complex, especially with contrast.
Guidance for Procedures	Excellent for guiding biopsies, aspiration, or drainage of scrotal masses or fluid collections.	Limited use for guidance, as CT is primarily diagnostic.
Comfort	More comfortable for the patient as it does not require lying in a fixed position for long.	May be less comfortable due to longer duration and the need to hold still for extended periods.
Soft Tissue Visualization	Excellent for differentiating cystic vs. solid lesions , assessing vascularity (with Doppler), and identifying masses in the scrotum.	Provides less detail on soft tissues compared to USG. Often more useful for bony structures or larger body regions.
Effectiveness in Detecting Pathologies	Highly effective for detecting testicular torsion, hydroceles, varicoceles, and epididymitis .	Less effective for detecting detailed scrotal pathologies like testicular torsion or small cysts.
Versatility	Can assess vascularity using Doppler, detect small masses , and provide dynamic imaging in real time.	Primarily used for evaluating the extent of disease in larger regions or in cases where USG is inconclusive.
Patient Safety	No risk for allergic reactions or contrast-related issues.	Contrast agents can cause allergic reactions and are contraindicated in some patients (e.g., kidney issues).

IV. Conclusion:

Ultrasonography is the **first-line and most essential imaging modality** for evaluating scrotal lesions. It helps in:

- Accurate diagnosis
- Differentiation between benign and malignant conditions
- Guiding timely management decisions
- It is **safe, rapid, and highly sensitive first-line and most essential imaging modality** for evaluating scrotal lesions

Reference:

- [1]. **Rumack CM, Levine D, Et Al.** *Diagnostic Ultrasound. 5th Ed. Elsevier; 2018.* Chapter: *Scrotum And Testes*. Comprehensive Overview Of Scrotal Sonography, Anatomy, Technique, And Differential Diagnosis.
- [2]. **Bateson EM, Golding SJ.** *Gray's Ultrasound Anatomy. Churchill Livingstone; 2021.* Includes Normal And Pathological Anatomy With Ultrasound Correlation.
- [3]. **Dahnert W.** *Radiology Review Manual. 9th Ed. Wolters Kluwer; 2022.* Concise, Clinically Focused Summaries Of Sonographic Findings In Scrotal Pathologies.