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Role of USG in Evaluation of Abdominal Wall Hernias: A Descriptive Study

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Abstract

Background: Abdominal wall hernias are common surgical conditions affecting approximately 1.7% of the global population. High-resolution ultrasonography (USG) offers real-time dynamic assessment, overcoming limitations of clinical examination in obese or post-operative patients.

Aim: To evaluate the diagnostic utility of ultrasonography in various types of anterior abdominal wall hernias, identify associated complications, and correlate sonographic findings with clinical presentation.

Materials and Methods: A prospective observational study of 100 patients with clinically suspected abdominal wall or groin hernias. Evaluation used high-frequency linear (10–15 MHz) and curvilinear (7–15 MHz) transducers with static and dynamic Valsalva maneuver assessment.

Results: Inguinal hernias were most common (45%), followed by umbilical (14%) and femoral hernias (7%). Most defects measured 1.1–3 cm (62%). Sac contents included omentum alone (36%), bowel loops alone (27%), and combined (26%). Complications — obstruction (5%) and strangulation (4%) — were reliably identified. USG achieved sensitivity 91.2%, specificity 88.9%, and diagnostic accuracy 90.0%. Clinical-sonographic correlation was established in 76% of cases.

Conclusion: High-resolution dynamic USG is an accurate, non-invasive modality for evaluating abdominal wall hernias. It reliably maps defect anatomy, sac contents, and vascular integrity, enabling early detection of incarceration and obstruction, and serves as a valuable guide for surgical planning.

Keywords: Abdominal Wall Hernia, Inguinal Hernia, Ultrasonography, Dynamic Valsalva, Hernia Complication.

Introduction

Abdominal wall hernias are among the most common conditions requiring surgical intervention globally. While a thorough physical examination forms the cornerstone of clinical evaluation, definitive identification can be

frequently confounded by patient obesity, localized pain, scarring from previous surgeries, or small occult defects.[1,4]

High-resolution ultrasonography (USG) has emerged as a primary, cost-effective imaging technique to overcome these limitations. Utilizing the Valsalva maneuver or shifting patient positioning from supine to standing enables clear visualization of intermittent fascial defects and transient tissue herniation. Color Doppler evaluation further allows real-time assessment of tissue vascularity to identify strangulation.[2]

Materials and Methods

This prospective observational study was conducted in the Department of Radiodiagnosis at MGM Medical College and Hospital, Navi Mumbai. A sample size of 100 patients presenting with a clinical history or physical signs suggestive of an abdominal wall swelling or groin defect were consecutively enrolled over a two-year period.

Imaging Protocol

All ultrasound evaluations were executed using advanced ultrasound platforms (Samsung V8). High frequency linear array transducers (10–15 MHz) were utilized to evaluate superficial structures, fascial contours, and small defects, while curvilinear array transducers (7–15 MHz) were used for deeper anatomy or large volumes of herniated viscera.

Patients were evaluated in both the supine and standing positions. Examinations were conducted at rest and dynamically during an induced Valsalva maneuver or forced coughing effort. The sonographic criteria for diagnosing a hernia included demonstrating a clear structural defect in the echogenic fascial line of the anterior abdominal wall along with an associated protrusion of a hernial sac during dynamic maneuvers.

Data Collection

For every positive case, specific parameters were recorded: anatomical site, maximum defect width, contents of the sac (omentum, small bowel, large bowel, or fluid collections), reducibility status under direct probe pressure, and signs of structural compromise (such as thickened hyperemic walls, loss of peristalsis, or absent color flow signals). Final diagnostic outcomes were validated against surgical findings or direct clinical follow-up.

Results

Sonographic findings across the cohort are summarised in the following tables.

Table 1: Anatomical Types of Hernias Documented via USG

Type of Hernia	Frequency	Percentage (%)
Inguinal Hernia	45	45.0%
Umbilical Hernia	14	14.0%
Femoral Hernia	7	7.0%
Epigastric Hernia	7	7.0%
Incisional Hernia	6	6.0%
Divarication of Recti	5	5.0%
Lumbar Hernia	3	3.0%
Canal of Nuck Hernia / Others	5	5.0%
No Hernia Detected	8	8.0%

Table 2: Sonographic Hernia Characteristics Parameter

Parameter	Frequency	Percentage (%)
Defect Size: Minimal (≤ 1.0 cm)	8	8.7%
Defect Size: Moderate (1.1–3.0 cm)	57	62.0%
Defect Size: Large (3.1–5.0 cm)	24	26.1%
Defect Size: Massive (> 5.0 cm)	3	3.2%
Contents: Omentum alone	33	35.9%
Contents: Bowel loops alone	25	27.2%
Contents: Combined Bowel and Omentum	24	26.1%
Contents: Fluid / Atypical contents	10	10.8%

Table 3: Secondary Associated Complications Detected on USG

Complication Status	Frequency	Percentage (%)
Uncomplicated / Completely Reducible	89	89.0%
Intestinal Obstruction	5	5.0%
Strangulation	4	4.0%
Incarceration without ischemia	2	2.0%

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Table 4: Statistical Performance Parameters of USG Diagnostic

Diagnostic Parameter	Calculated Value (%)
Sensitivity	91.2%
Specificity	88.9%
Positive Predictive Value (PPV)	96.8%
Negative Predictive Value (NPV)	72.7%
Overall Diagnostic Accuracy	90.0%

Ultrasound Imaging Findings

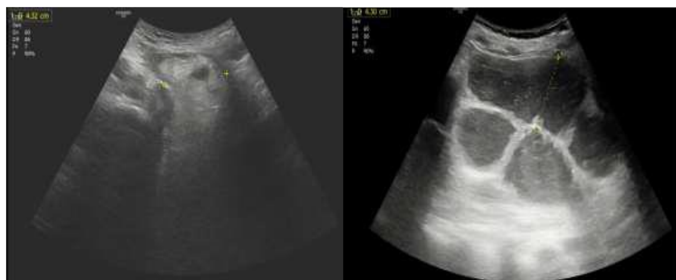

Figure 1: There is a 4 cm sized defect in the lower anterior abdominal wall on the right side with herniated sac containing bowel and omentum descending upto the base of scrotum with gross enlargement of the right hemi scrotal sac. It is irrreducible with absent cough impulse suggestive of an obstructive right inguinal hernia.

Multiple dilated small bowel loops are noted in the right hypochondrium region measuring upto 4.3 cm in maximum diameter showing to and fro peristalsis, suggestive of small bowel obstruction.

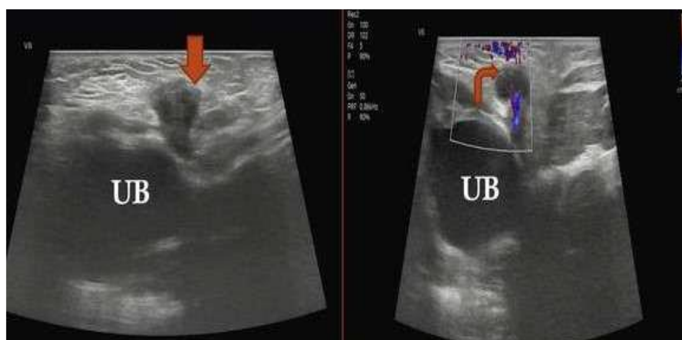

Figure 2: Color Doppler sonogram of a female infant groin swelling showing a left side indirect canal of Nuck hernia containing a round organ structure with cystic follicles verified as an herniated ovary.

Discussion

A pronounced male prevalence (68%) was documented in our cohort, consistent with worldwide data on inguinal hernia distribution attributed to anatomical variations in the inguinal canal.

Dynamic high-resolution ultrasound achieved a diagnostic sensitivity of 91.2% and an overall accuracy of 90.0%, consistent with clinical benchmarks documented in international radiologic literature.[3] Crucially, a mismatch between primary clinical impressions and final USG maps occurred in 24% of our cohort. The bulk of these cases represented small, non-palpable direct defects, or deep femoral hernias that were clinical mimickers of direct groin swellings. Ultrasound resolves these errors by tracing anatomical milestones, such as verifying the sac orientation relative to the inferior epigastric arterial system.

USG reliably identifies sac contents, distinguishing benign omental fat plugs from non-viable bowel.

Fluid collections within an aperistaltic, wall-thickened herniated bowel segment signal structural incarceration or mechanical obstruction, shifting the clinical pathway from elective to emergency surgical intervention.[5]

Conclusion

High-resolution dynamic ultrasonography is an accurate, reproducible tool for diagnosing abdominal wall hernias. With a diagnostic accuracy of 90.0%, it enables complete mapping of wall defect architecture, sac contents, and vascular integrity, serving as an essential guide for surgical planning.

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