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## Assessment of scrotal disorders using ultrasonography and Color Doppler Imaging

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### Abstract

**Background and Aim:** An acute scrotum is defined as acute pain with or without scrotal swelling, may be accompanied by local signs or general symptoms. Ultrasound is an ideal imaging modality for the evaluation of scrotum in pediatric patients. Scrotal ultrasound can differentiate between solid and cystic masses and localize the mass as either testicular or Para testicular. The present study was aimed to know role of ultrasound and color Doppler imaging in the diagnosis of scrotal disorders.

**Material and Methods:** It was prospective study conducted at Tertiary care teaching Hospital. We observed total 200 patients referred to the department of Radiodiagnosis for scrotal ultrasonography and Doppler study by the department of Surgery. Clinical history was obtained along with thorough physical examination before subjecting the patients for ultrasound examination. The Grey scale & color Doppler ultrasound routinely performed in all these patients.

**Results:** Majority of cases had inflammatory lesion (32%) followed by hydrocele (28%), hernia (9%), undescended testis (8%) and scrotal tumors (3%). In majority of cases left side involved (36%) followed by right side (32%) while 64 cases bilateral side involved. With color doppler appearance of inflammatory scrotal pathology we found that there were 19 cases of acute epididymo orchitis, 10 cases with diffuse increase in vascularity. Among 5 cases of chronic epididymo-orchitis, 4 cases showed increase in vascularity.

**Conclusion:** High-frequency ultrasonography enables in clear demonstration of morphological alterations associated with acute scrotal inflammatory diseases, and color Doppler sonography is highly sensitive in diagnosing acute scrotal pathology. In addition, Color Doppler sonography accurately differentiates between testicular ischemia and torsion from acute inflammatory diseases in acute painful scrotal conditions.

**Keywords:** Acute scrotum, Color Doppler Imaging, epididymo-orchitis, ultrasonography

### Introduction

The scrotum is a superficial structure separated by a midline septum, with each half of the scrotum containing testis, the epididymis and the lower part of the spermatic cord. Normal testes are paired organs with a symmetrical fine homogenous echotexture; each testis has a volume of 12–20 cc. It is usually difficult to decide whether a palpable scrotal mass is arising from the testes itself or from the extra testicular elements. In addition, the normal examination may overlook significant pathology and physical signs elicited may be improperly interpreted<sup>[1]</sup>.

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<sup>[2]</sup>. Diagnosis of scrotal diseases has always been a challenge for the clinician due to non-specific signs and symptoms<sup>[3]</sup>. The causes of scrotal swelling can be classified as acute and non-acute. Acute causes include torsion, trauma, abscess, and orchitis. Nonacute causes include hydrocele, scrotal hernia, lymphocele, and others. Scrotal lesions can also be classified as testicular and extratesticular. The common testicular lesions are torsion, trauma, neoplasms, and inflammatory conditions. Extratesticular lesions include lesions of the spermatic cord, the epididymis, and the scrotal wall. This distinction is important because extratesticular masses are almost always benign while intratesticular solid masses may be malignant.

The safest imaging modality to diagnose scrotal abnormalities is ultrasound (USG). Testicular ultrasound is a useful and readily available noninvasive tool in both adult and pediatric patient. It acts as a good screening and diagnostic method and helps transcribe further confirmation or exclude the clinical diagnosis. Scrotal ultrasonography has different applications, varying from acute testicular pain to chronic and asymptomatic diseases.

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Doppler ultrasound is a noninvasive medical imaging technique which is highly sensitive in the detection of scrotal abnormalities [4]. Ultrasound deservedly became the first choice to detect scrotal abnormalities especially emergency cases because it is easy, simple, rapid, relatively inexpensive and widely available [5]. Scrotal ultrasound (USG) shows detailed anatomy of scrotum without the associated risk of any ionizing radiation, with relatively low cost, easy portability without the need for sedation. Thus, Ultrasound is an ideal imaging modality for the evaluation of scrotum in pediatric patients [6, 7]. Scrotal ultrasound can differentiate between solid and cystic masses and localize the mass as either testicular or Para testicular [8]. The present study was aimed to know role of ultrasound and color Doppler imaging in the diagnosis of scrotal disorders.

### Material and Methods

It was prospective study conducted at Tertiary care teaching Hospital. We observed total 200 patients referred to the department of Radiodiagnosis for scrotal ultrasonography and Doppler study by the department of Surgery. Prior to ultrasound examination, patient details, detailed clinical history was obtained along with thorough physical examination. Subsequently these cases were followed up and correlated with histopathology report, fine needle aspiration cytology results, surgical findings, response to treatment. Follow up scans were done in cases wherever applicable. Abdominal ultrasound scan was done in conjunction with scrotal scans in cases of undescended testis to look for ectopic testis, in tubercular Epididymo orchitis cases to look for abdominal tuberculosis and metastatic nodes in cases of malignancy. Approval of ethical committee was taken and informed patient consent of all the patients was taken prior to collecting the data. Equipment used was high-resolution real time gray scale ultrasonography and Doppler study of scrotum was carried out using 7.5 to 10 MHz linear transducer, abdominal ultrasonography in required cases was done using curvilinear probe of 2-5 Mhz transducer of PHILIPS HD 11XE ultrasound machine.

### Statistical analysis

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). For all tests, confidence level and level of significance were set at 95% and 5% respectively.

### Results

In the present study out of 200, maximum i.e. 48 (24%) patients were ranged in age from 31 to 40 years. Pain with scrotal swelling was seen in 70 (35%) while unilateral and bilateral scrotal swelling seen in 34 (17%) and 12 (6%) study subjects respectively. It was observed that majority of cases had inflammatory lesion (32%) followed by hydrocele (28%), hernia (9%), undescended testis (8%) and scrotal tumors (3%). In majority of cases left side involved (36%) followed by right side (32%) while 64 cases bilateral side involved. (Table 1) Out 56 cases with hydrocele, secondary hydrocele was present among 36 (64.28%) cases followed by primary hydrocele. Among 64 cases inflammatory scrotal pathology acute epididymo orchitis was present among 19 (29.68%) cases followed by acute epididymitis 16

(25%) and acute orchitis in 10 (15.62%) study subjects. (Table 2)

With color doppler appearance of inflammatory scrotal pathology we found that there were 19 cases of acute epididymo orchitis, 10 cases with diffuse increase in vascularity. Among 5 cases of chronic epididymo- orchitis, 4 cases showed increase in vascularity. Out of 18 cases of inguino-scrotal hernia, 10 cases shows omentocele, while majority were on right side 13, 03 on left side and 02 were bilateral. Among 70 cases of non-neoplastic cystic swellings of scrotum 56 cases were of hydrocele followed by 14 cases of epididymal cyst.

**Table 1:** Types of pathology detected: Scrotal and Testicular diseases

Type of pathology	No of Cases (n=200)	Percentage (%)
Inflammatory	64	32
Undescended testis	16	8
Hydrocele	56	28
Hernia	18	9
Epididymal cyst	14	7
Torsion testis	8	4
Scrotal tumors	6	3
Varicocoele	8	4
Torsion testis	6	3
Normal	4	2

**Table 2:** Inflammatory scrotal pathology distribution

Pathology	No of Cases (n=64)	Percentage (%)
Acute epididymo orchitis	19	29.68
Acute epididymitis	16	25
Chronic epididymitis	4	6.25
Acute orchitis	10	15.62
Scrotal wall cellulitis with pyocele	3	4.68
Chronic epididymo orchitis	5	7.81
Funiculitis	2	3.1
Scrotal filariasis	2	3.1
Epididymal and testicular abscess	2	3.1
Tubercular epididymo orchitis	1	1.56

### Discussion

Acute scrotal pain is a medical emergency. Depending on cause, the management is entirely different. Torsion of testis and strangulated hernia are surgical emergency; whereas, epididymo-orchitis is treated by medicines. Testicular trauma and obstructed hernia can be differentiated by mere taking history from patient. Although, scrotal contents are the most accessible to clinical examination, serious dilemmas occur. Physical examination adds only a little information and limited by acute pain and discomfort for patient which further limits the proper physical examination. In these situations, US with color Doppler is valuable in differentiating between medically treatable and surgical emergency of scrotum and avoiding unnecessary disastrous surgical exploration [9]. Now, US with high frequency transducer in combination with color Doppler has become the imaging modality of choice for evaluation of acute scrotum.

Color Doppler ultrasonography has many advantages over conventional ultrasonography. In addition to detecting non-specific grey scale changes that can occur with testicular ischemia, it also shows blood flow in testicular arteries. Till recently, radionuclide scanning has played an important role

in evaluation of equivocal cases of acute scrotal diseases. It has provided useful information regarding scrotal blood flow [10]. However, it cannot accurately depict the anatomy [12].

In our study highest numbers of cases presented were in the age group of 31 to 40 years, followed by 41 to 50 years. Similar observations were reported by Thinyu *et al.* [12], Syed Amjad Ali Rizvi *et al.* [13]. Acute epididymo orchitis was present among 19 (29.68%) cases followed by acute epididymitis 16 (25%) and acute orchitis in 10 (15.62%) study subjects. Similar findings were observed in S Thinyu *et al.* [12] in which 52 (47.27%) out of 110 cases had inflammatory lesion. These findings comparable to the finding of Horstman *et al.* [14], Donald P Orr *et al.* [15], Farriol *et al.* [16].

Out of the 16 referral, high frequency US could localize testis in 15 cases (93.75%) of undescended testes, out of 16 in 11 cases (68.75%) testis were in the inguinal region while in 5 cases (31.25%). Testis is located intra abdominally at different sites. Inguinal hernia was the next most common pathology, the side of involvement and contents of sac. Out of 18 cases of inguino-scrotal hernia, 10 cases shows omentocele, while majority were on right side 13, 03 on left side and 02 were bilateral.

In present study, two patients were diagnosed as strangulated and obstructed hernia, showing dilated bowel loops within the herniated sac which were showing sluggish peristalsis, no vascularity in the bowel wall and mild free fluid in herniated sac which was operated immediately because of acute bowel obstruction. A study conducted by Subramanyam *et al.* [17], on 65 patients with clinical diagnosis of primary scrotal mass, concluded that Sonography is effective in evaluation of primary scrotal masses, in the differentiation of scrotal hernia from other extra testicular or testicular masses by scanning the inguinal region in addition to the scrotum.

We noted 14 cases of epididymal cysts. Leung *et al.* [18] in their study of 40 subjects, detected 29 cases (72.5%) of epididymal cysts and Spermatoceles. Derouet and coworkers observed ultrasonography to be 90% sensitive and 55% specific in detection of testicular neoplasms [19] whereas Gallardo Agromayor and colleagues reported sensitivity of 100% for ultrasonography in diagnosing testicular neoplasm [20].

The testicular salvage rate is 80% to 100% if surgery is performed within 5 to 6 hours, but the rate decreases to approximately 20% if detorsion is performed after 12 hours following the onset of symptoms. Similar findings were observed in S Thinyu *et al.* [12] study to determine the role of ultrasonography in diagnosis of scrotal disorders were out of 122 cases 4 cases of torsion testis were present. In our study total 8 cases were detected as varicocele. 7 patients presented with acute severe pain. One patient presented as scrotal swelling.

Other investigations like magnetic resonance imaging can be applied when ultrasonography proves inconclusive. Its use in scrotal diseases is increasing, however it is more expensive and not always available. Nuclear scintigraphy, which has high sensitivity and specificity in differentiating ischemia from infarction, cannot accurately distinguish ischemia from conditions such as hydrocele, spermatocele, and inguinal hernia and is uncommon due to high accuracy of CDUS.

## Conclusion

High-frequency ultrasonography enables in clear demonstration of morphological alterations associated with acute scrotal inflammatory diseases, and color Doppler sonography is highly sensitive in diagnosing acute scrotal pathology. In addition, Color Doppler sonography accurately differentiates between testicular ischemia and torsion from acute inflammatory diseases in acute painful scrotal conditions. It is an extremely valuable tool and can be one stop shop in evaluation of scrotal and testicular pathologies.

## Conflict of Interest

None

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Nil

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