

# Sonographic scrotal assay

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## Abstract

The use of gray scale and color Doppler sonography to evaluate the scrotum prospectively studied with a sonographic unit 7-13MHz linear transducer. The 60 patients were 1 day to 81 years old (mean age, 40.5years). The most common diagnoses in patients was hydrocele (20patients) followed by epididymoorchitis (12patients) and inguino-scrotal hernia (10patients). Least common were of Tubular Ectasia, Microlithiasis (1patient each).We conclude that gray scale and color Doppler sonography is helpful in the initial evaluation of scrotum, providing accurate evaluation of the involved hemi-scrotum in our patients and also providing the benefit of both structural and flow information.

**Key Words:** Ultrasound, Scrotum

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testes and Varicocele in infertility. This pictorial review provides an overview of the ultrasonographic scrotal evaluation followed by diagnosis of a variety of intra- and extratesticular lesions based on different clinical manifestations.

## AIMS AND OBJECTIVES

- Aim of this study is to evaluate the role of US and Colour Doppler in diagnosis of scrotal pathologies.
- To differentiate between intratesticular from extratesticular and characterize scrotal pathologies.
- Evaluation of acute scrotum for cause.
- To assess the early diagnostic potential of High frequency transducer equipped US machine

## MATERIALS AND METHODS

All the patients referred, to the department of Radiodiagnosis for scrotal evaluation with or without swelling, pain, tenderness, trauma or fever. The type of the study is Prospective type carried out on 60 patients within the age group of 0-90 years. Standard USG machine (GE LOGIQ F6 US machine) equipped with a 7.0–13.0 MHz real-time high-frequency linear probe with a coupling gel was used. Patients were examined in supine position and scrotum was examined with use of ample amount of jelly to avoid pressure over it. Patients of varicocele were scanned in standing position during Valsalva manoeuvre. Abdominal study was performed in relevant cases as in varicocele, neoplasm of testes and in search of undescended testes.

## INTRODUCTION

Ultrasonography (US) is the exemplary noninvasive imaging modality for evaluating scrotal abnormalities and is the mainstay its imaging.<sup>1</sup> It can provide information which is valuable for the differential diagnosis of a variety of disease processes involving the scrotum that have similar clinical manifestations (pain, swelling, or presence of mass).<sup>2</sup> Scrotal US is characterized by high sensitivity in detection of intrascrotal abnormalities and is a very good mode in differentiating from testicular and paratesticular lesions. However its limitation is in determining if it's benign or malignant. Its major proven role is in patient with acute scrotal pain for which it is a primary imaging modality. Current uses are in acute scrotum evaluation of testes (inflammatory, infective, trauma, torsion and abscess); Primary lesion/ Neoplasm; Extratesticular lesions (cysts, hydrocele and epididymitis); undescended

Lesions were evaluated in respect to echogenicity, intra vs extra testicular, focal vs diffuse lesion, presence or absence of hydrocele, involvement of epididymis, scrotal wall involvement.

**Exclusion Criteria**

Patients referred with clinical suspicion of scrotal pathology but which were normal on US and Doppler study.

**RESULTS**

**Table 1**

Age Group	No. of Cases	Percentage
0-10	7	11
11-20	4	6.5
21-30	10	17
31-40	6	10
41-50	10	17
51-60	6	10
61-70	13	22
71-80	3	5
81-90	1	1.5

**Table 2**

Side	No. of Cases	Percentage
Left	22	37
Right	24	40
B/L	14	23

**Table 3**

US	No. of Cases	%
Hernia(Inguinoscrotal)	10	17
Varicocele	5	8.3
Undescended	8	13.3
Tumor	2	3.3
Hematoma/Necrosis/abscess	3	5
Microlithiasis	1	1.6
Tubular Ectasia with epididymal cyst	2	1.6
Torsion	1	1.6
Epididymal Cyst/Spermatocoele	7	13.3
Scrotal Wall Edema	4/5	8.3
Epididymoorchitis	8/12	13.3
Hydrocele	9/20	15

**DISCUSSION**

In our study of 60 patients having various pathologies, most patients were diagnosed with inguinoscrotal hernia followed by hydrocele. Hydrocele was also the most common associated finding followed by epididymoorchitis.

**Age Distribution:**

Youngest patient was of 1day and oldest 81years. Most common age group being 61-70 years (22%). The mean age of the study population was 36.13 years. Most of the patients (57.1%) were within the age group of 30 and 49 years in a study conducted by AA Adekanmi *et al.*<sup>3</sup>

**Acute scrotal pain and/ or swelling- Epididymitis and Epididymoorchitis:**

A cause of acute scrotal pain in adolescent boys and male adults is epididymitis, which is rather common and is usually the result of an acute bacterial infection. Extension to the testis, then termed as epididymo-orchitis, occurs in about 20- 40% of cases due to direct spread.<sup>4</sup> Doppler sonography showed increased blood flow in the affected epididymis and testes and thus showed 100% accuracy in diagnosis of acute inflammation.<sup>5</sup> 12 patients had epididymoorchitis [Figure1] out of which 8 were isolated and 4 had associated pathologies. Amongst the 12, 8 had isolated epididymitis and none isolated orchitis. Isolated orchitis i.e. without epididymal involvement is uncommon and seen in Mumps and TB.<sup>2</sup> Janis Brown in his study in 1995 could not report any isolated case of Orchitis.<sup>6</sup> Epididymoorchitis being an inflammatory condition showed mild to moderate increase in size with preserved normal shape and contour with heterogeneous echotexture in almost all cases. Associated findings include funiculitis [Figure 2] in 11/12 and Hydrocele in 5/12 likely reactive. Other associated findings can include scrotal wall thickening, fistula formation, calcifications and granulomas [Figure 3 and 4].<sup>7</sup> Torsion: [Figure 5] Testicular torsion is more commonly seen in pubescent boys, though it can occur at any age. The testes is fixed posteriorly by the tunica vaginalis. If it, joins high on the spermatic cord, it leaves the testes free to rotate within the scrotal sac (bell clapper deformity). Most often the deformity is found bilaterally. Thus surgical orchidopexy is performed bilaterally. Progressive enlargement and heterogeneity of the testicle is seen in later phases due to oedematous changes and arterial obstruction.<sup>8</sup> Definite diagnosis of testicular torsion (complete) is made when color Doppler fails to detects blood flow to the torsed testis with normal blood flow to the unaffected side as seen in our case of an 81year old man. On US showed heterogeneous bulky testes with lack of identifiable intratesticular flow on power Doppler. Reactive Hydrocele with epididymoorchitis were also noted.

**Trauma:**

Testicular trauma usually manifests as fluid collections (haematocele, hydrocele, or hematoma), testicular disruption (fracture or rupture) or vascular injury. US evaluation of an injured testicle is crucial in determining the requirement of immediate surgical intervention. Heterogeneous appearance of the testes, irregular contour abnormality with/ without visualized interruption of the tunica albuginea, and loss of focal / diffuse vascular flow are signs consistent with testicular rupture.<sup>9, 10</sup> Hematoma [Figure 6] on Sonography appears as a hyperechoic space occupying lesion with irregularity of testicular contour. Heterogeneous appearance may be seen in cases of

testicular rupture. Older haematoceles seem more hypoechoic and may demonstrate fluid-fluid levels or septations. Contusion/infarction of testes- appear as hypoechoic areas which are wedge shaped and peripherally arranged in cases of infarcts. There may be progression to necrosis and abscess formation as seen in one of our cases. [Figure 7 and 8]. In our study 2cases of testicular hematoma and 1case of infarct was noted which on follow up showed area of central necrosis/intratesticular abscess formation.

#### **Hernia:**

A hernia is the “the protrusion of a part or structure through the tissues normally containing it”<sup>11</sup> /bulging of part of the contents of the abdominal cavity through a weakness in the abdominal wall into the scrotum through the inguinal canal. 10 out of 60 cases (17%) were of inguinoscrotal hernia in our study (Maximum no of cases). There was herniation of bowel loops in 8 cases the other 2 showed herniation of omentum. 9 out of 10 cases were on the right side. 4 patients showed associated B/L Hydrocele.

#### **Palpable lumps and incidental findings-**

Epididymal Cysts and Spermatoceles:

Epididymal cysts can occur throughout the length of epididymis and contain serous fluid unlike spermatocele that arise from the head and contain cheesy material. Unless symptomatic, these cysts are clinically irrelevant and no treatment is necessary. Spermatoceles arise in the head of the epididymis and are caused by cystic dilatation of the tubules of the efferent ductules.<sup>12</sup> They are indistinguishable from epididymal cysts. However, spermatoceles are larger in size, multilocular cystic lesion with internal echoes representing proteinaceous fluid and spermatozoa.<sup>13</sup> Some literature state higher incidence of in patients after vasectomy, whereas epididymal cysts are reported to be more common in the general population.<sup>14-17</sup> Leung *et al* in 1984 reported 20-40% incidence of spermatocele in general population.<sup>18</sup> In 1987 G Goodling and W Leonhardt of the 307 men examined 30(9.8%) had epididymal cysts with an average age of 63.4years. 3 cases were bilateral.<sup>19</sup> Our study reports 8 cases of epididymal cysts and 1 case of spermatocele [Figure 9] i.e. 15% patients with an average age of 60years. 1 case being bilateral. Testicular Cysts are simple cysts within the testicular parenchyma are incidental findings. They are solitary, anechoic, well circumscribed, round to oval lesions with increased through transmission.<sup>20</sup> They are most often idiopathic; however, they might represent sequelae from prior trauma/inflammation. Epidermoid cysts show varied appearance depending on their maturation on US. Lamellated pattern i.e. alternating hypo and hyperechoic bands forming an onion-ring pattern is classical presentation of a maturing epidermoid cyst which corresponds to the multiple intraluminal layers of keratin

within the cyst<sup>21-23</sup>. Often difficult to distinguish from malignant neoplasms such as teratomas, which present with similar imaging picture.<sup>23-26</sup>

#### **Varicocele:**

Varicoceles form due to impaired drainage of blood from the spermatic cord causing abnormal dilatation of the pampiniform venous plexus<sup>23, 27</sup>. A varicocele is seen in 15% of adult men (approximately), making it the most common palpable mass of the spermatic cord<sup>28</sup>. Idiopathic varicocele are caused by incompetent venous valves. Secondary cases occur due to an increase of pressure in the spermatic veins caused by an extratesticular method such as cirrhosis of the liver, hydronephrosis or an abdominal/pelvic mass.<sup>2, 23</sup> Most commonly found on the left as left testicular vein is longer and connects at an angle of a 90°, resulting in increased pressure compared to the right, which drains directly into the IVC. A newly diagnosed unilateral right-sided varicocele raises concerns of a secondary cause such as abdominal/ pelvic malignancy.<sup>29</sup> On gray scale, they were seen as anechoic serpiginous tubular dilated structure measuring >2.5-3.5mm, with uptake of colour on Doppler i.e. dilatation of pampiniform plexus with increase in diameter up to 5mm and flow reversal on Valsalva manoeuvre. 5patients were diagnosed as Varicocele [Figure 10] (8.3%). Amongst them 3 cases were on the left and 2 were bilateral. The most common US finding was varicocele (29.4%), which was bilateral in more than half of the cases in a study conducted by AA Adekanmi *et al*.<sup>3</sup> A recent study by Seyed MB *et al* in 2018 proposed a new pattern of scrotal Doppler for predicting the severity of varicocele by evaluating reflux pattern, pampiniform venous plexus diameter and venous reflux time. Reflux pattern and vein diameters, reflux time had a significant correlation. A significant correlation between the reflux pattern and parameters of semen analysis namely sperm count and its motility were also noted. They classified the patterns of reflux into as follows: Grade 1 (retrograde), Grade 2 (augmented), Grade 3 (enhancing), and Grade 4 (stasis). In conclusion, the reflux pattern classification suggested could be used as a useful predictor of severity and sperm parameters in patients with varicocele.<sup>30</sup>

#### **Hydrocele:** [Figure 11 and 12]

Most are pure anechoic collections within the layers of tunica vaginalis. Since there is normally a variable amount of small fluid within the scrotal sac, hydrocele is suggested only when skin floats off the anterior surface of testes when patient is supine. Hydroceles can be congenital or acquired. Congenital hydroceles are due to a patent processus vaginalis, which permits accumulation of peritoneal fluid in the scrotal sac. Acquired ones are either idiopathic or due to overproduction, impaired absorption of serous fluid. They may be secondary because of

infection, torsion, trauma, or tumour. <sup>2, 23</sup>Internal echoes within the fluid collection may be appreciated and are related to protein or cholesterol content. <sup>31, 32</sup>Dotrethy FJ in his series of 70 patients in 1991[33] noted minute particles within the fluid in 62%cases. These were cholesterol crystals and are of no significance. We encountered these particles in 5% cases. 20 patients had hydrocele out of which 9 i.e. 15% were isolated and 11 were associated with other pathologies most common being epididymoorchitis. 2 patients were of funicular hydrocele and inguinoscrotal hernia each. 10% patients showed echoes and septae within suggestive of chronicity. A patient who had hydrocele with septae also showed 2 scrotoliths [Figure 13] within. Scrotoliths, pearls or calculi are mobile calcifications representing calcified loose bodies <sup>34, 35</sup>. US, they appear as free-floating, echogenic foci measuring up to 10 mm with posterior acoustic shadowing and are located outside of the testes. The presence of fluid or a hydrocele (50% association) facilitates their identification. Overall, these calcifications have no clinical significance. Pyoceles are purulent fluid collections in the scrotum that generally occur with epididymoorchitis /surgery /trauma. On US they are complex heterogeneous fluid collection with septae and gas may be present. In our case series 2 cases were diagnosed as pyocele [Figure14] out of which 1 was associated with epididymoorchitis and other was post orchiectomy i.e. surgical.

**Microlithiasis**

Represent the deposition of multiple tiny calcifications throughout both testicles. The most common criteria for its diagnosis is five micro calcifications in one testicle. On US they appear as small non-shadowing hyperechoic foci ranging from 1-3mm within the testicular parenchyma and

distributed uniformly. 1 case of B/L Microlithiasis [Figure 15] (1.6%) in a 65 year old with >30 foci of calcifications was seen in our study. Testicular microcalcifications are usually found incidentally and are only seen in about 5% of males between the age of 17 and 35. <sup>36</sup>

**Testicular Tumour:**

Krone KD *et al* in 1985 pointed out that an intratesticular lesion should be considered malignant until proven otherwise. <sup>37</sup>Seminoma is most common germ cell tumour of the primary neoplasms (40-50%) with peak incidence 30-40years. In our study one case of tumour suspected to be seminoma was aged 30years.

Rickfield and Middleton in 1992<sup>38</sup> described features of seminoma on USG as

Hypoechoic solid mass, [Although most avascular hypoechoic testicular lesions are benign, a substantial proportion are malignant. <sup>39</sup>

Homogenous,

Round/oval,

Sharp demarcation,

Possible multifocal involvement.

In our study 2 cases of tumour – seminomatous germ cell

- 1<sup>st</sup> aged 30years showed single hypoechoic mass with area of necrosis in it. Doppler revealed no vascularity. This is in contrast to study done by William D Middleton in 1991<sup>40</sup> where he postulated that any tumor more than 1.5cms shows evidence of vascularity in it.
- 2<sup>nd</sup> aged 60years showed heterogeneous mass lesion with multiple hypoechoic round sharp demarcated lesions in left testes with raised vascularity on Doppler. [Figure 16]

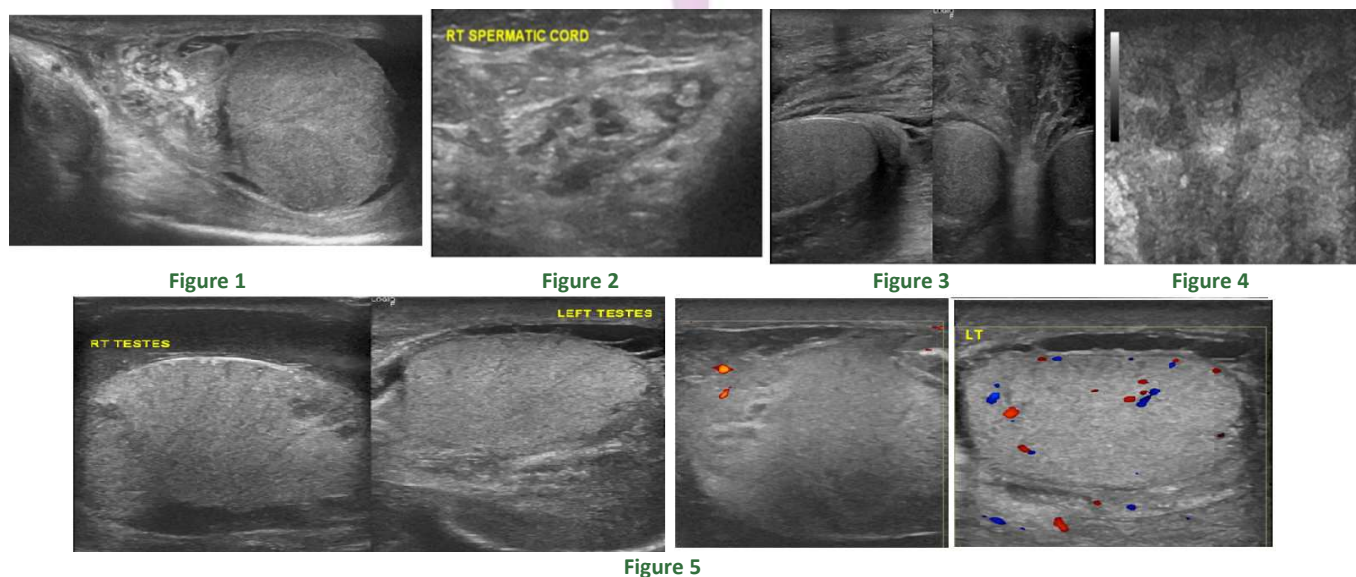


Figure 5

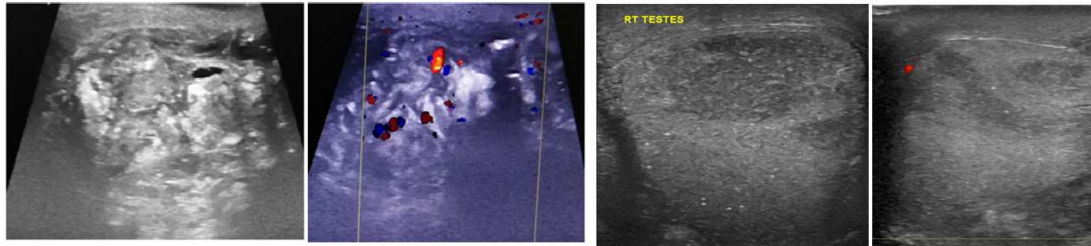


Figure 6

Figure 7

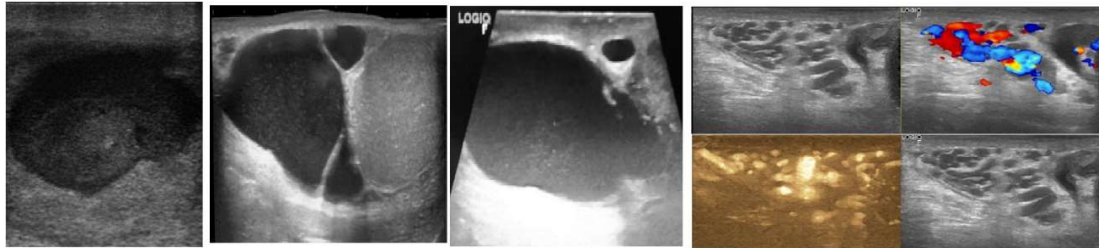


Figure 8

Figure 9

Figure 10

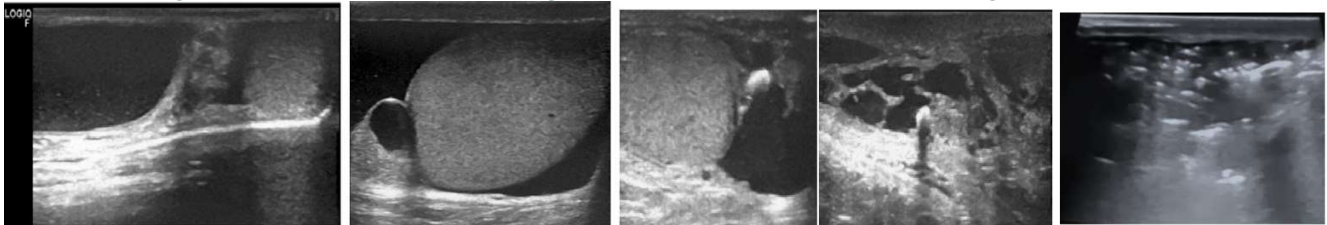


Figure 11

Figure 12

Figure 13

Figure 14

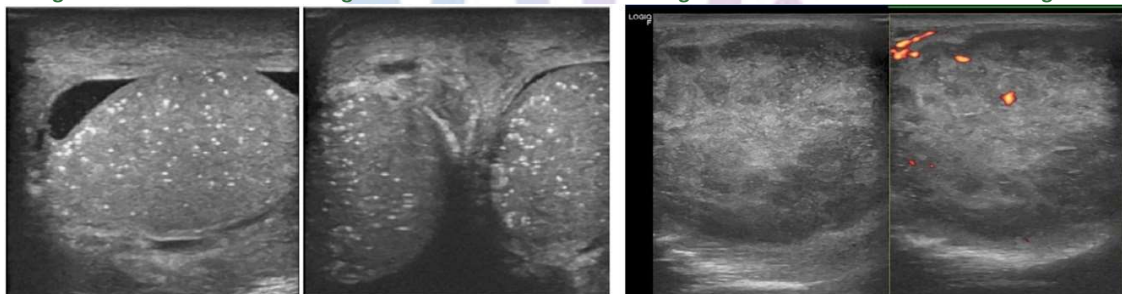


Figure 15

Figure 16

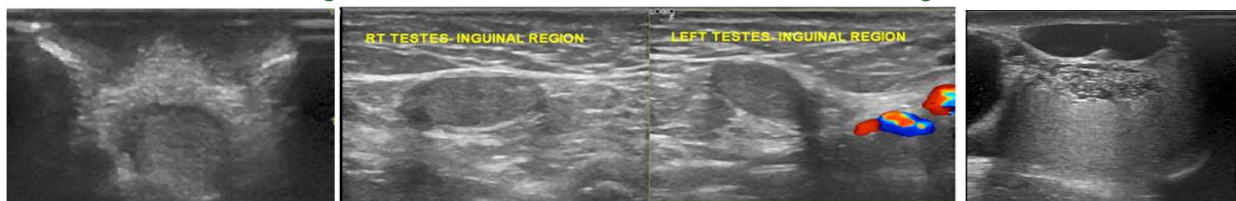


Figure 17

Figure 18

### Legend

**Figure 1:** Right testes appears bulky heterogeneously hypoechoic and bulky heterogeneously hyperechoic epididymis and spermatic cord s/o Epididymoorchitis with funiculitis; **Figure 2:** Bulky hyperechoic spermatic cord with raised vascularity – Funiculitis; **Figure 3:** Scrotal wall edema with Fountain sign; **Figure 4:** Granulomata scrotal skin due to chronic infective cause; **Figure 5:** Gray scale and colour Doppler images of both testes the right testes is bulky with scrotal wall thickening, no flow when compared to the left- Right Testicular Torsion; **Figure 6:** Testicular haematoma; **Figure 7:** Testes shows multiple wedge shaped hypoechoic areas not taking vascularity on Doppler s/o Infarct; **Figure 8:** Testicular Necrosis; **Figure 9:** Epididymal Cysts/Spermatocele; **Figure 10:** Gray scale, Colour Doppler and B flow images of Varicocele; **Figure 11:** Funicular hydrocele of the cord; **Figure 12:** Hydrocele with epididymal cyst; **Figure 13:** Scrotoliths [two] in a patient with chronic mild hydrocele with septae; **Figure 14:** Pyocele- fluid with multiple air foci; **Figure 15:** B/L testes show multiple echogenic foci (diffuse) with no posterior shadowing- Microlithiasis; **Figure 16:** Left Testes shows a heterogeneous mass lesion with multiple hypoechoic round sharp

demarcated lesions with raised vascularity which proved to be a seminoma postoperatively; **Figure 17:** B/L Empty scrotal sacs with both testes in inguinal region respectively; **Figure 18:** Tubular Ectasia- multiple serpiginous anechoic cystic dilated channels involving a focal area of the testes likely secondary to cyst causing obstruction

## CONCLUSION

Ultrasonography is a safe, non-invasive and reliable technique for evaluating patients with scrotal diseases and remains the first-line imaging modality for evaluation of both acute/chronic scrotal diseases. It is especially important in conditions like testicular torsion where immediate diagnosis is required. Testicular viability can also be very well assessed with Colour Doppler in cases of testicular trauma. High frequency transducers have made possible, to clearly show normal anatomy and pathology in the region such as infection, trauma, vascular aetiology and tumours and hence, helpful in preventing unnecessary surgical explorations. It is cost efficient, easily available modality with no radiation effects, as compared to other diagnostic techniques and is well tolerated by the patient.

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