

## EVALUATION OF TESTICULAR LESIONS, SCROTAL SWELLINGS BY HIGH RESOLUTION ULTRASONOGRAPHY AND COLOUR DOPPLER AND ITS CORRELATION WITH SURGICAL MANAGEMENT

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### ABSTRACT

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#### BACKGROUND AND OBJECTIVES

The necessity for scrotal ultrasound scanning is when clinical examination does not identify any significant abnormality. For patients presenting with a scrotal mass, it is critical to determine whether the mass is intra- or extra-testicular. High Resolution Ultrasonography (HRUS) combined with Colour Doppler Ultrasonography (CDUS) has become the imaging modality of choice for evaluating scrotal diseases. US is helpful in differentiating extra- from intratesticular lesions. US provides excellent anatomic detail; when colour Doppler and power Doppler imaging are added testicular perfusion can be assessed.

#### MATERIALS AND METHODS

Data for study was collected from 50 patients attending/referred to Basaveshwara Teaching and General Hospital (BTGH), Gulbarga. The gray scale and colour Doppler sonography routinely performed in all these patients. Subsequently, these cases were followed up and correlated with either surgical findings, response to treatment or follow-up scans wherever applicable.

#### RESULTS

Commonest clinical presentation was scrotal swelling with/or without pain. Majority number of patients with scrotal pathologies presented in this study belongs to the age group of 20 to 50, which constitute 50% of all pathologies. Most of the diagnosis were epididymitis or epididymo-orchitis, hydrocele, varicocele, orchitis, testicular torsion, hematocele, pyocele, Fournier's gangrene. Colour Doppler ultrasonography accurately diagnosed all cases of epididymitis or epididymo-orchitis, testicular torsion, varicocele and hydrocele. Overall, sensitivity of high frequency ultrasonography with colour Doppler in diagnosing scrotal diseases was 95%, while specificity was 66%. High frequency grey scale US with Colour Doppler sonography accurately differentiates between testicular ischemia/torsion from acute inflammatory diseases in acute painful scrotal conditions.

#### CONCLUSION

High frequency ultrasonography when supplemented with colour Doppler sonography is sensitive in diagnosing acute scrotal pathology. It is also highly sensitive in differentiating solid from cystic scrotal masses. It is also highly sensitive intratesticular from extratesticular origin of scrotal masses. High frequency ultrasonography with Doppler is highly sensitive in demonstrating the varicoceles. We conclude that high frequency ultrasonography and colour Doppler plays an important role in the diagnosis and proper management planning of the scrotal disorders.

#### KEYWORDS

Orchitis Epididymitis; Testicular Torsion; Fournier's Gangrene; Varicocele; US studies; Colour Doppler; Scrotum.

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#### INTRODUCTION

Scrotum is a cutaneous bag containing right and left testis, the epididymis and the lower part of the spermatic cord. Externally, scrotum is divided into right and left parts by a ridge or median raphe, which is continued forwards onto the undersurface of the penis and backwards along midline of the perineum to the anus.

The test is separated from the examining fingers by little more than a few millimeters covering of loose skin and fibromuscular tissue, so is most accessible for clinical examination.

Ultrasound is the modality for imaging palpable testicular lesions in the setting of acute traumatic injury/pain. Accurate interpretation of the findings is essential to guiding treatment and further intervention because a wide spectrum of pathologies can produce symptoms.

Clinical symptoms and physical examination are often not enough for definite diagnosis due to pain and swelling that limit an accurate palpation of the scrotal contents. Clinical signs and symptoms are usually nonspecific, variable and misleading. For patients presenting with a scrotal mass, it is critical to determine whether the mass is intra or extra-testicular.

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US provides excellent anatomic detail; when colour Doppler and power Doppler imaging are added, testicular perfusion can be assessed.

Sonography is simple to perform, rapid, non-invasive relatively inexpensive, easily reproducible, widely available and does not involve irradiation of gonads.

### OBJECTIVES OF THE STUDY

**To evaluate scrotal pathology with reference to:**

1. To assess the accuracy of high resolution sonography and colour Doppler in the diagnosis of scrotal swellings and testicular lesions.
2. To evaluate the sonographic appearance of spectrum of scrotal diseases.
3. To compare the sonological features with operative diagnosis.

### MATERIALS AND METHODS

Data for study was collected from 50 patients attending/referred to Basaveshwara Teaching and General Hospital (BTGH), Gulbarga.

The gray scale and colour Doppler sonography routinely performed in all these patients. Subsequently these cases were followed up and correlated with either surgical findings, response to treatment or follow up scans wherever applicable.

### RESULTS

Fifty cases of scrotal swellings were studied with real time High frequency ultrasonography, Colour Doppler sonography and were followed up and correlated with either surgical findings, response to treatment or follow up scans wherever applicable.

The commonest indications for scrotal ultrasonography in clinical practice were inflammatory scrotal disorders and non-inflammatory scrotal swellings, which together constituted more than 50% of all pathologies. Commonest clinical presentation was scrotal swelling with or without pain. Largest number of patients with scrotal pathologies presented in this study belongs to the age group of 21 to 40 years, which constituted 56% all cases.

The bulk of scrotal and testicular pathologies were unilateral with regard to side of involvement. The greatest degree of bilateral pathology was seen in infertility related lesions. Patients in the present study presented late in the course of their illness, which explains more extensive nature of illness and higher complications rate.

Among acute scrotal inflammatory diseases, acute epididymo-orchitis was the leading cause, which was confirmed in earlier studies.<sup>1</sup> High-resolution ultrasonography enables in clear demonstration of morphological alterations associated with acute scrotal inflammatory diseases, but has the limitations, because it does not enable assessment of perfusion of scrotum and its contents.

When colour Doppler sonography is supplemented with high frequency grey scale US, the sensitivity of diagnosing acute scrotal pathology will be increased. In addition, colour Doppler sonography accurately differentiates between testicular ischemia and torsion from acute inflammatory diseases in acute painful scrotal conditions.

High frequency ultrasonography was invaluable in demonstrating normal size of testes and epididymis in

presence of large hydroceles, in excluding any cause for secondary hydrocele. High frequency ultrasonography is not sensitive in specifically differentiating between epididymal cysts and spermatocele in absence of fluid level or fluid debris level, which were rarely seen.

This study also showed that most of extra testicular scrotal masses are benign. Varicocele was the commonest pathology noted in cases of infertility. A high incidence of bilateral varicocele is noted in present study. High frequency ultrasonography with Doppler is highly sensitive in demonstrating the dilated, tortuous veins of pampiniform plexus and flow reversal on Valsalva maneuver. When compared to physical examination, it is highly sensitive in detecting sub clinical cases of varicoceles.

### DISCUSSION

In this study, we have examined 50 patients with high frequency ultrasound scan and colour Doppler study was done in relevant cases, for detection of scrotal, testicular pathology and cases were followed up and correlated with either surgical findings, response to treatment or follow-up scans wherever applicable.

#### Types of scrotal and testicular pathology detected:

In 50 cases of study, the pathological process were detected in all cases. Out of 50 cases 22 cases of unilateral side involvement 10 cases of involvement were on right side, 12 cases involvement was on left side. Totally, pathology was noted in 22 hemiscrotum out of 50 patients studied.

Inflammatory conditions noted in largest number of cases – 28 cases, congenital lesions were noted in 05 cases, pathology related to male infertility noted in 05 cases, traumatic lesions noted in 05 cases. Miscellaneous conditions like, testicular microlithiasis 04 cases.

Arger et al.<sup>2</sup> in a series of 62 patients, detected the following pathologies: Inflammatory diseases in 16 cases (26%), and non-inflammatory swellings in 45 cases (67%).

Willscher et al.<sup>3</sup> in a study of 43 patients (86 testes), noted the following distribution of pathologies: Inflammatory diseases 12 cases, non-inflammatory diseases in 28 cases. Richie et al. in their study of 124 patients (243 testicles) by ultrasonography, found inflammatory lesions in 31 cases and non-inflammatory swellings in 75 cases.

In our study, inflammatory conditions constitute the largest number of detected pathology followed by non-inflammatory swellings.

In our study, the bulk of the pathology detected by high-resolution US are from two groups: Inflammatory pathologies (26 cases – 56%) and non-inflammatory swellings (22 cases – 44%), which correlates with findings documented in previous studies.<sup>2,3,4,5</sup> However, in our study, we noticed that proportion of inflammatory pathology is higher, compared to previous studies.

#### Inflammatory diseases of scrotum and its contents:

In our study, out of 50 cases 28 cases were detected have inflammatory scrotal pathology on high frequency US and Doppler study. Chronic epididymo-orchitis was the commonest inflammatory pathology detected noted in 11 cases (39.3%). Next most frequent inflammatory pathology detected was acute epididymo-orchitis, noted in 7 (25%). Other detected inflammatory pathology include scrotal

filariasis 4 cases, acute orchitis 04 cases (11.1%), chronic epididymitis, 3 cases (8.3%), scrotal wall inflammation 02 cases (04%), acute epididymitis 03 cases (8.3%), Fournier's gangrene 05 (10%) and funiculitis are noted in 02 cases each (04%).

Horstman, Middleton and Nelson, in their study of 45 patients found acute epididymitis present in 25 cases (56%), acute epididymo-orchitis in 19 cases (42%), acute orchitis in 1 case (2%).<sup>6</sup> No case of chronic epididymo-orchitis was reported.

Lerner et al. in their limited series of 5 cases of acute inflammatory diseases of scrotum, found acute epididymitis in 3 patients (60%), acute epididymo-orchitis in 2 patients (40%).<sup>2</sup>

Fariol et al. in their study of 25 cases of acute inflammatory diseases of scrotum using high-resolution grey scale and power Doppler sonographic study, found epididymitis in 11 cases (44%), epididymo-orchitis in 10 cases (40%), orchitis in 2 cases (8%), funiculitis in 2 cases (8%).<sup>7</sup>

In addition, there is increased incidence of chronic epididymo-orchitis in this study seen. The incidence of which is less in Western population.

High frequency US and colour Doppler appearance of inflammatory scrotal pathology.

Of three cases of acute epididymitis, we observed diffuse hypoechogenicity with diffuse increase in vascularity and size of epididymis was increased. These findings are similar to the findings of Horstman et al. in their study of 45 cases (51 hemiscrotum), Fariol et al. in their study of 11 cases.

These findings are similar to the findings of Horstman et al.<sup>7</sup> in their study of 45 cases (51 hemiscrotum), Fariol et al. in their study of 11 cases.<sup>8</sup>

#### **Comparison with other series: (Acute-orchitis)**

In our study of 28 cases of scrotal inflammatory pathologies, we observed 04 cases of complications of acute scrotal pathology, out of which one case is associated with scrotal wall cellulitis, one case of Fournier's gangrene, one case of funiculitis, one case of right-sided hydrocele.

In cellulitis of scrotal wall, high-frequency US sonography showed loss of normal uniform hypoechoic appearance of scrotal wall, thickening of scrotal wall, presence of normal testis, epididymis and tunical sac. These findings are similar to those of Luker and Siegel of 28 cases of inflammatory scrotal pathology, we noted chronic epididymo-orchitis in 17 cases (34%). Of these, 11 cases were bilateral involvement, 7 cases were unilateral involvement.

On high-frequency US sonography, we observed diffuse increase in size of epididymis with normal testicular size in 11 cases, normal size of epididymis and testis in 7 cases. There was heterogeneous echotexture in 11 cases, hypoechogenicity in 3 cases, hyper-echogenicity in 4 cases. There was evidence of epididymal calcification seen in 3 case, testicular micro calcification in 2 cases. On colour Doppler sonography, there was evidence of diffuse increase in vascularity in 9 cases, normal vascularity in 4 cases, decreased vascularity in 4 cases.

High-frequency US sonography and colour Doppler sonography findings are in similarity with study Kim SH, et al.<sup>9</sup>

#### **Non-inflammatory Swellings of Scrotum**

In our study, we examined 22 cases of non-inflammatory scrotal swellings (44%), out of which 10 cases (45%) presented with only swelling and 9 cases (40.9%) presented

with pain with swelling. In all 3 cases of scrotal swellings associated with pain, the pain was of low intensity and mild dragging in character, which helped to differentiate inflammatory swellings from non-inflammatory swellings.

Among non-neoplastic scrotal swellings, hydrocele is the commonest pathology noted 14 cases (28%). Out of 24 cases 10 cases were primary vaginal hydrocele (71%), 4 cases were encysted hydrocele of cord (28.5%). Out of 14 cases hydrocele was noted unilaterally in 8 cases, bilateral in 6 cases.

These findings are in similarity to previous studies of Arger et al.<sup>2</sup> and Willscher et al.<sup>2</sup> Out of 8 cases of hydroceles, 6 cases have long-standing history more than 5 years which showed appeared as particulate collection between two layers of tunica and 2 cases showed collection of clear fluid between two layers of tunica. Two cases were associated with acute orchitis and acute epididymo-orchitis. In encysted hydrocele of cord, the collection of clear fluid along spermatic cord appeared as anechoic lesions adjacent to spermatic cord that moves with gentle traction to cord. Varicocele noted in 04 cases (18%). Out of 04 cases, unilateral varicocele noted in 01 case which was on left side. Bilateral varicocele noted in 03 cases.

In this study, we studied about the positive predictive value of colour Doppler sonography in identifying varicoceles in cases of male infertility, as compared to physical examination.

Out of 04 cases, two cases which were clinically diagnosed as unilateral left sided varicoceles, confirmed by colour Doppler sonography as having bilateral varicoceles. One case which was diagnosed as having bilateral varicoceles by physical examination had unilateral left varicocele on colour Doppler sonography.

One case was referred as not having varicoceles by physical examination, which turned out to be having bilateral varicocele. Out of 04 cases, only 01 case which were found to be having varicoceles on unilateral left side was confirmed to be having on left side only on colour Doppler study.

These results indicate that colour Doppler sonography is having high sensitivity (100%) and positive predilection value (72%), compared to physical examination. These findings were compared to previous similar study by Randall B Meacham et al.<sup>10</sup> and Petros JA et al.<sup>8</sup> The findings show similarity to previous studies.

Among non-inflammatory scrotal swellings, we noted 05 cases of epididymal cysts, 04 cases of spermatoceles. Out of 05 cases of epididymal cysts 5 were unilateral, one was bilateral and 2 cases showed multiple cysts.

Epididymal cysts range from uniloculated to multiloculated, situated in the head of epididymis. Out of 5 cases 03 cases were bilateral, multiloculated associated with debris and septations. One case was bilateral uniloculated situated in the head of epididymis, thin walled anechoic. One was unilateral left sided multiloculated with debris and septations. Out of 5 cases 3 patients presented with pain, swelling and fever, 2 patients presented with pain and swelling. Associated ipsilateral hydrocele was noted in 01 case and bilateral hydrocele in one case.

In present study, we detected 04 cases of spermatocele, which appeared on high frequency US scan as cystic structure with fluid level or fluid-debris level.

Leung et al.<sup>11</sup> in their study of 40 subjects, detected 29 cases of epididymal cysts and spermatoceles.

In the present study, out of 50 subjects examined 05 cases (10%) of scrotal and testicular trauma were detected. The etiology of trauma included road traffic accident in 03 cases (60%), h/o assault in 2 cases (40%). Out of 5 cases 03 were bilateral (60%), 2 cases (40%) were on left side. One case was associated with left testicular rupture. Alexander S Cass et al.<sup>4</sup> in their series of 86 patients with scrotal trauma noted unilateral involvement in 81 cases (94%) and bilateral in 5 case (6%). George Schuster.<sup>12</sup> had stated that right-sided traumas are more common. In a series of 72 patients, right sided testicular injury noted in 40 patients (56%) and left sided injury noted in 32 patients (44%).

On high frequency US scan, all 05 cases of hematocele appeared as echogenic collection. One case of testicular hematoma appeared as irregular hypoechoic region within left testis adjacent to normal echoic testis, which on colour Doppler showed reduced flow in hypoechoic area. On high frequency US, three cases of scrotal wall hematoma appeared as hypoechoic collections in the layers of the scrotal wall, where no flow was seen on colour Doppler scan.

McAninch reported that the single imaging finding of heterogeneous echogenicity of the testicular parenchyma with loss of contour definition had a sensitivity of 100% and a specificity of 93.5% for the diagnosis of rupture in a series of 65 patients with blunt scrotal trauma.<sup>13</sup>

In present series, one case of left-sided testicular rupture with haematocele is noted. In this study, we came across 06 cases of congenital anomalies. All 6 cases were incompletely descended testis. These cases were clinically referred as scrotal swelling with suspicion of congenital hernia or congenital hydrocele.

Of 06 cases of congenital anomaly associated with descent of testes, 04 cases were referred with clinical suspicion of incompletely descended testes, which were clinically palpable. All were unilateral in presentation. Age of presentation varied from 1 year to 26 years with a median age of 3 years. The size of undescended testes found to be smaller in cases, which presented clinically in later stages. High frequency US could identify all cases of undescended testes, which were in the inguinal region. These testes were small compared to contralateral testes. These were showing normal colour flow on Doppler suggesting viability.

In the present study, out of 50 subjects examined 05 cases (10%) of testicular torsion. Out of 5 cases, 3 cases were involving left side and 2 cases were involving right side. Age of all patients were between 16 years to 18 years. Out of 5 cases, 2 cases were associated with reactive hydrocele one was on right and one was on left. Gray scale sonographic changes showed hypoechoic compared with the contralateral normal testis in all cases. On colour Doppler ultrasonography in all the five cases blood flow was significantly less than in the normal contralateral testicle. Surgery was done, which supported the diagnosis.

Prompt diagnosis is necessary because torsion requires immediate surgery to preserve the testis. The testicular salvage rate is 80% to 100% if surgery is performed within 5 to 6 hours of the onset of pain, 70% if surgery is performed within 6 to 12 hours and only 20% if surgery is delayed for more than 12 hours.

## CONCLUSION

High-frequency ultrasonography enables in clear demonstration of morphological alterations associated with

acute scrotal inflammatory diseases and colour Doppler sonography is highly sensitive in diagnosing acute scrotal pathology. In addition, colour Doppler sonography accurately differentiates between testicular ischemia and torsion from acute inflammatory diseases in acute painful scrotal conditions.

High frequency ultrasonography is highly sensitive in differentiating solid from cystic scrotal masses. High frequency ultrasonography is highly sensitive in detecting intratesticular microlithiasis. High frequency ultrasonography is invaluable in demonstrating normalcy of testes and epididymis in presence of large hydroceles. High frequency real time sonography is highly sensitive in distinguishing scrotal mass as either testicular or extra testicular masses and is clearly superior to clinical diagnosis.

High frequency ultrasonography with Doppler is highly sensitive in demonstrating the varicoceles. When compared to physical examination, it is highly sensitive in detecting subclinical cases of varicoceles. The advantages of high frequency US and colour Doppler includes non-invasiveness, lack of ionizing radiation, simplicity, wide availability, cost effectiveness and repeatability.

We conclude that high-frequency ultrasonography and colour Doppler sonography is an extremely valuable tool in evaluation of scrotal and testicular pathologies.

## REFERENCES

1. Elder JS. The undescended testis. Hormonal and surgical management. *Surg Clin North Am.*1988;68:983-1005. [PubMed].
2. Peter H Arger, et al. Prospective analysis of the value of scrotal ultrasound. *Radiology* 1981;141:763-766.
3. Max K Willscher, et al. Scrotal ultrasonography. *The Journal of Urology*, 1983;130:931-935.
4. Luker, colour Doppler of scrotum in children, *AJR* 1994;163:649-655.
5. Alexander S Cass, Michael Luxenberg. Testicular injuries, *Urology* 1991;37:528-530.
6. Horstman WG. Scrotal inflammatory disease-colour Doppler evaluation, *Radiology*1991;179:55-59.
7. Victoria Garriga Farriol, et al. Gray-scale and power Doppler sonographic appearances of acute inflammatory diseases of the scrotum. *J of Clin Ultrasound* 2000;28:67-72.
8. Victoria Garriga Farriol, et al. Gray-scale and power Doppler sonographic appearances of acute inflammatory diseases of the scrotum. *J of Clin Ultrasound* 2000;28:67-72.
9. Horstman WG. Scrotal inflammatory disease-colour Doppler evaluation, *Radiology* 1991;179:55-59.
10. Chinn DH, Miller EI. Generalized testicular hyperechogenicity in acute testicular torsion. *J Ultrasound Med* 1985;4:495-496.
11. Thomas E Herbener. Ultrasound in the assessment of the acute scrotum. *Journal of Clin US*, 1996;24:405-421.
12. George Schuster. Traumatic rupture of the testicle and a review of the literature. *The Journal of Urology*, 1982;127:1194-1196.
13. Buckley JC, McAninch JW. Use of ultrasonography for the diagnosis of testicular injuries in blunt scrotal trauma. *J Urol* 2006;175(1):175-178.

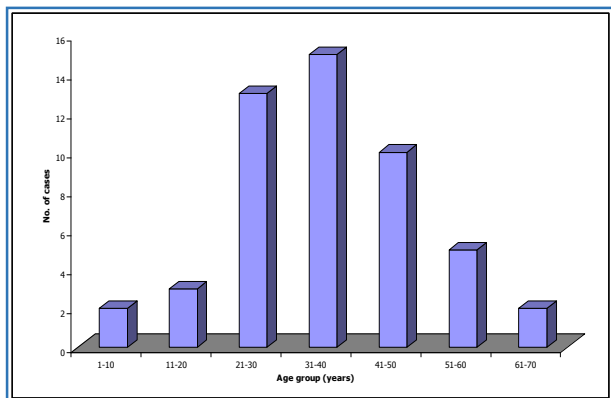


Fig. 1: Age wise distribution of cases

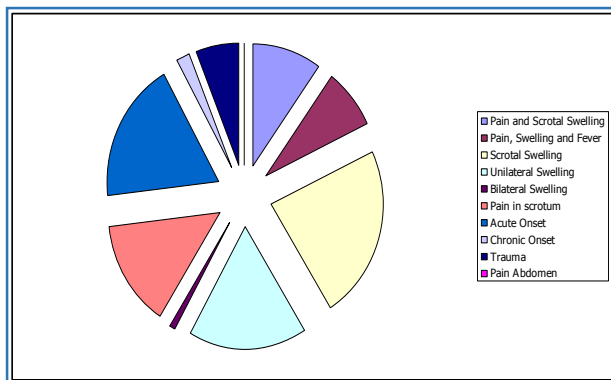


Fig. 2: Symptoms wise distribution of cases

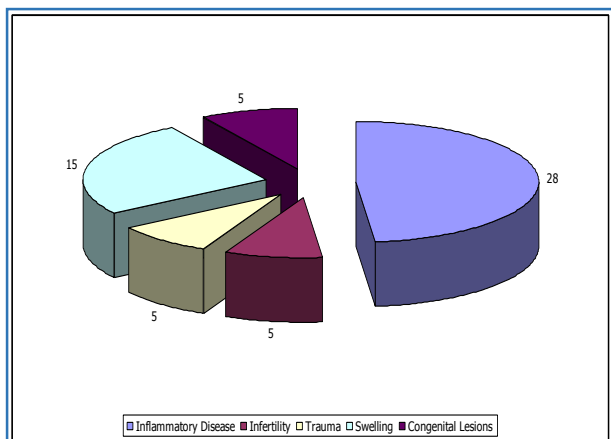


Fig. 3: Distribution of cases according to types of pathology detected

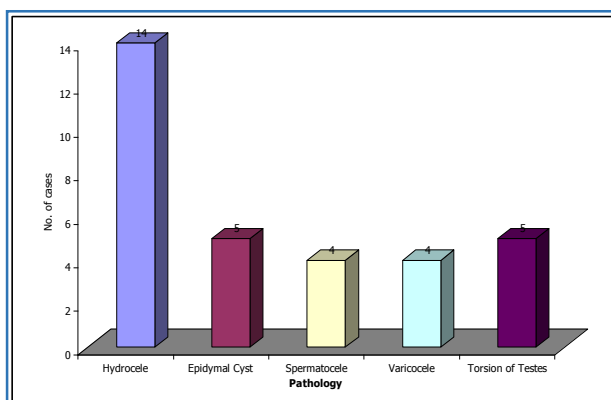


Fig. 4: Pathology of non-neoplastic lesions of scrotum

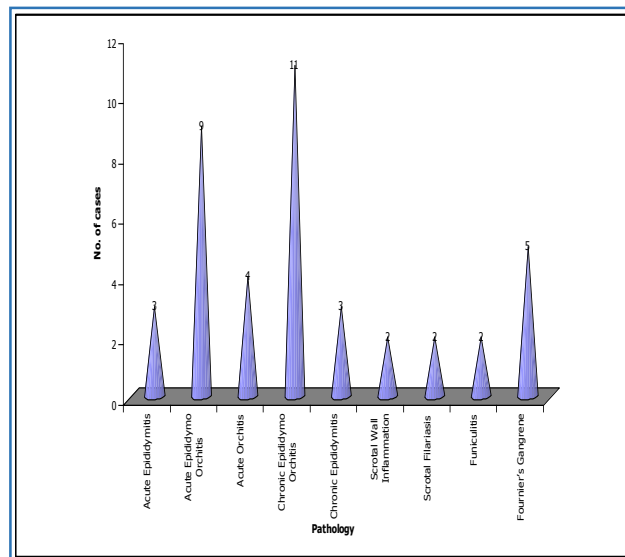


Fig. 5: Inflammatory scrotal pathology distribution

		High Frequency US Diagnosis	Intraoperative Diagnosis
01	Intratesticular	10	10
02	Extratesticular	30	30
03	Both Intra+Extra testicular	15	13
04	Unilateral	22	22
05	Bilateral	17	15

Table 1: Comparison between sonological diagnoses with intraoperative diagnosis

Sl. No.	Radiological Diagnosis	Sonological Diagnosis	Cytological Diagnosis
1.	Pyocele	04	04
2.	Hematocele	05	05
3.	Simple Hydrocele	09	09
4.	Complex Hydrocele	05	01
5.	Epididymal Cyst	05	05
6.	Spermatocele	04	02
7.	Fournier's Gangrene	05	05
	<b>Total</b>	<b>37</b>	<b>31</b>

Table 2: Comparison between sonological diagnosis with cytological diagnosis