

Evaluation of High-Frequency Ultrasound and Colour Doppler Study in Scrotal Pathologies

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Abstract

Original Research Article

Background: Ultrasound is the initial investigation of choice in various scrotal pathologies. This a prospective observational study to assess the role of high frequency ultrasound and colour Doppler in various scrotal pathologies, **Material And Method:** in this study 100 patients were examined with linear probe (7.5 MHz- 10 MHz) on the Hitachi Arietta 60 .Clinical history and clinical examination finding were recorded over a period of 3 years at Dr. D.Y.Patil medical college and hospital, Pune. **Result:** Out of 100 patients, 71 (71 %) patients were between age group of 21 to 40years of age. Most common symptom was scrotal pain and discomfort (73 pt-73%). Most common pathology was inflammatory seen in 25 patients (25 %) followed by hydrocoele 22(22%) disease, varicocele 12(12%) and undescended testis (7%). **Conclusion:** High frequency Ultrasonography and colour Doppler is non-invasive first investigation for assessing of scrotal lesions. Sensitivity of ultrasound to distinguish between solid from cystic masses is very high. It is very helpful to differentiate testicular and extra testicular swelling. Supplementation of colour Doppler increases the sensitivity to diagnose acute scrotal lesions.

Keywords: High frequency Ultrasonography, colour Doppler, scrotal pathologies, Doppler, epididymo-orchitis, hydrocele.

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INTRODUCTION

Scrotal sac consists of two testes, epididymis and distal spermatic cord. The median raphe or the ridge divides the scrotum externally into left and right halves. This raphe extends anteriorly on the undersurface of the penile region and posteriorly upto anus along the perineal midline. The testis is separated from the examining fingers by little more than few nun covering of loose skin and fibro muscular tissue, so is most accessible for clinical examination. Consequently, one should pre-suppose that clinical diagnosis of a scrotal swelling would be straightforward. On the contrary, certain testicular swellings are most difficult to diagnose with confidence based on physical examination alone. To differentiate between testicular and extra-testicular palpable masses is a clinical challenge.

Physical examination itself can be difficult in presence of pain and distorted scrotal contents. Clinical signs and symptoms are usually nonspecific, variable and misleading. Until mid-1970 clinical examination, palpation, trans-illumination and modalities such as

venography and thermography were commonly in practice.

The latest diagnostic modalities include a high frequency Ultrasound with colour Doppler, MR imaging, along with radioisotope and vascular angiographic study of the testis.

Since Miskin and Bain[1] and Murray Miskin Martin Buckspar and Jerald B[2] gave idea regarding ultrasound to evaluate various pathologies of the scrotum, recent improvements in instrumentation and transducers have made high frequency US as the investigation of choice in scrotal and testicular pathology. Even though CT and MRI have an essential role in the imaging of other regions of the body, their role in evaluating scrotal diseases is limited, this is due to harmful radiation to the gonads by CT and MRI Imaging being relatively expensive modality. High frequency Ultrasound is extremely useful for evaluation of scrotal pathologies. Sonography is convenient to perform, fast, non-invasive, inexpensive, and easily available without any risk of radiation to the gonads. The study is done to assess the usefulness of high

frequency grey scale US and colour Doppler study in evaluation of various scrotal pathologies.

MATERIAL AND METHODS

A total of 100 patients with known or suspected scrotal pathologies underwent scrotal ultrasonography after taking a written, informed consent at Department of Radio-diagnosis and Imaging, Dr. D. Y. Patil Medical College, Deemed University Medical College, Pune over a period of 3 years. This study was conducted on patients of any age group of male sex, referred to the for USG of scrotum. This was a descriptive study. Patients with a past history of surgery in the scrotal region were excluded from this study. The study design was approved by the institutional ethical committee and study protocol was followed as per the guidelines of the committee. Scrotal Ultrasound was performed with written consent on Hitachi Arietta 60 machine using linear 7.5 to 10 MHz transducer. Scrotal sac can be supported or elevated with the help of examiner's hand or sling provided. Images are obtained in longitudinal and transverse planes along with simultaneous evaluation of images of both testes for comparison. Colour Doppler is used to evaluate for abnormalities of flow and to differentiate vascular from nonvascular lesions.

RESULTS AND DISCUSSION

During the study period 100 patients were included in the study. The age of patients in our study ranged from 1-80 years. The most common age group was 31 to 40 years (Table 1). Out of 100 patients examined with ultrasonography, patients presented with a variety of symptoms as shown in the table & charts (Table 2). The commonest clinical presentation was pain with scrotal swelling, followed by pain, swelling & fever. Other presenting complaints were erythema, dysuria, infertility and abdominal pain.

Out of 100 cases of study, the pathological process was detected in 92 cases and eight cases

showed normal study. The distribution pattern is depicted in Table-3.

Table 3 describes the frequency of various pathological conditions. Epididymo-orchitis was the commonest inflammatory pathology noted in 25 cases. Other cases of inflammatory scrotal pathology were epididymitis, orchitis, funiculitis, Idiopathic scrotal wall inflammation, Fournier's gangrene.

Out of 92 cases, 54 cases had pathology bilaterally and unilaterally in 46 cases. Out of 46 cases of which has unilateral involvement, 26 cases were those involving right side, and 20 cases were those involving left side. In total, lesions were noted in 154 patients out of 100. Maximum patients (42) affected were due to inflammatory conditions. Few of the patients encountered were due to congenital lesion, these are accounting for 11 cases, 15 cases encountered in our study were due to male infertility. Pathologies related to trauma in our study were seen in 9 cases. Neoplastic lesions noted in two cases. Miscellaneous conditions like testicular micro-lithiasis complete inguino-scrotal hernia noted in 13 cases.

Arger *et al.* [3], 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.* [4], in a study of 43 pts (86 testes) noted the following distribution of pathologies: Inflammatory diseases 12 cases, Non-inflammatory diseases in 28 cases.

Richie *et al.* [5], 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 pathologies, followed by non-inflammatory swellings. Comparison with other series:

Author	No of Cases	Inflammatory Pathology	Non-Inflammatory Pathology
Willscher <i>et al.</i>	43	12 (28%)	28 (65%)
Richie <i>et al.</i>	124	31 (27 %)	75 (66%)
Arger <i>et al.</i>	62	16 (26%)	45 (67%)
Current study	100	42 (42%)	50 (50%)

In our study, most of the lesions identified by high frequency ultrasonography US belong to two categories: Inflammatory and non-inflammatory pathologies, which corresponds to findings reported in previous studies [1, 4]. Nonetheless, inflammatory lesions are proportionally higher in our study when correlate with previous studies. Elements confer for these alterations:

- Higher incidence of chronic inflammatory pathology, especially Tubercular aetiology.
- Higher complication rate in our study.

Inflammatory diseases of the scrotum and its contents

In our study out of 100 cases, 42 were having inflammatory scrotal pathology on high frequency US

and Doppler study. Types of inflammatory pathology are depicted in Table-4. Chronic Epididymo-orchitis was the commonest inflammatory pathology detected, noted in 14 cases (33%). Next most frequent inflammatory pathology detected was acute Epididymo-orchitis noted in 11 cases (26%). Other inflammatory pathology include, acute orchitis- 3 cases (7.2%), chronic epididymitis- 3 cases (7.2%), scrotal wall inflammation 3 cases (7.2%), Funiculitis 3 cases (7.2%), acute epididymitis 2 cases (5%), scrotal filariasis 2 cases (5%), Fournier's gangrene noted in 1 case (2.4%).

Horstman, Middleton, and Nelson, studied 45 patients and have observed 25 cases were with acute epididymitis (56%), 19 cases were with acute Epididymo-orchitis (42 %), and acute orchitis was seen in 1 case (2 %) [6]. Chronic Epididymo-orchitis cases were not reported.

Lerner *et al.* have taken five cases of inflammatory pathologies of the scrotum of acute aetiology, of which 2 patients were acute Epididymo orchitis (40%)[7], and three were acute epididymitis patients (60%).

Farriol *et al.* similarly have taken twenty five cases of inflammatory pathologies of the scrotum of acute aetiology, and observed that out of 25 cases Epididymo-orchitis was seen in 10 cases (40%), epididymitis in 11 cases (44%), funiculitis in 2 cases (8%) [8] and orchitis in 2 cases (8%).

Comparison with other series is depicted in table -7.

Compared to other studies, in the present study, there is low incidence of acute inflammatory conditions and higher incidence of complications of acute scrotal inflammatory disease. This is due to the fact that there is a larger gap of time between onset of symptoms and time of examination (average 4.5 days), which may be less in western population, (details not available), but it is hypothesised that those patients are evaluated at the early stage of disease and less likely to present with complications. In comparison to western population, present numbers of chronic Epididymo-orchitis cases are increased mainly due to tubercular aetiology.

High resolution us and doppler findings of inflammatory scrotal pathologies

In our study of 42 cases of inflammatory scrotal pathology, the High-resolution US appearance findings are depicted in table 5; colour Doppler findings are depicted in table - 6.

Of two cases of acute epididymitis, generalized decrease in echogenicity with increase in the vascularity was seen. Increase in epididymis size was seen. Findings were similar with the study of Horstman *et al.* [6], in their study of 45 cases (51

hemiscrotum), Farriol *et al.* in their study of 11 cases [8]:

To correlate with other series: (acute epididymitis) is depicted in table - 8.

Of 11 cases of acute Epididymo-orchitis, we observed diffuse hypoechogenicity with diffuse increase in vascularity in 6 to 7 cases. 2 cases showed focal hypoechoic echotexture. 3 cases were normal echotexture. 7 cases showed diffuse increase in vascularity. 4 cases showed focally increased vascularity and size in 1 case. Findings were similar with the study of Horstman *et al.* [6] who have taken 45 cases (51 hemiscrotum) for their study, whereas Farriol *et al.* [8], included 11 cases in their study.

To correlate with other series: (Epididymo-orchitis) is depicted in table -9.

Of 3 cases of acute orchitis, we observed all three cases. On unilateral involvement, with 2 cases on right side and 1 case on left side. One case showed focal involvement, 2 cases showed diffuse involvement on high frequency US sonography. Focal involvement appeared as focal area of hypoechogenicity. Two cases showed normal in size with diffuse increased in vascularity. On colour Doppler sonography, 2 cases showed increased vascularity in the areas of hypoechogenicity. Findings were similar with the study of Horstman *et al.* [6] who have taken 45 cases (51 hemiscrotum) for their study, whereas Farriol *et al.* [8], included 11 cases in their study.

To correlate with other series: (Acute orchitis) is depicted in table-10.

In the current study of 42 cases of inflammatory scrotal lesions, we have observed 5 cases of acute scrotal pathology complications; out of these 3 cases are scrotal wall inflammation, only single case of Fournier's gangrene and 3 cases of funiculitis. In Fournier's gangrene, changes in the normally seen homogeneously hypoechoic scrotal wall, increased scrotal wall thickness with normal testes and other scrotal contents were observed on High-resolution ultrasonography. Findings were similar with the study of Luker and Siege [9].

Out of the 42 cases of inflammatory scrotal lesions, it is observed that chronic Epididymo-orchitis found in 14 patients (33%). Among these 14 patients, 7 patients were unilateral and bilateral each.

In our study, diffusely enlarged epididymis is seen in 8 patients, and testis of normal size is seen in 8 patients, both testis and epididymis are normal in size in 6 patients. Heterogenous echotexture were seen in 9 patients, hypo-echogenicity in 5 patients. Hydrocoele was seen in 5 patients; Pyocele and testicular abscess were seen in 1 patient each. On Doppler US, focally increased vascularity was seen in 7 patients, normal

vascularity in 4 patients, decreased vascularity in 3 patients.

High-frequency US sonography and colour Doppler sonography findings are in similarity with study Kim SH *et al.* [10].

Comparison with other series: (chronic Epididymo-orchitis) is depicted in table — 11.

Two cases of scrotal filariasis also noted which showed classical "scrotal filarial dance- on high frequency US scan.

Non-inflammatory swellings of the scrotum:

In current study, scrotal swellings of non-inflammatory aetiology are observed in 36 cases (36%), among these, swelling is seen in 3 cases (8%), whereas both pain and swelling is seen in 14 cases (39%), differentiation of inflammatory swellings from non-inflammatory swellings among these 14 cases is made by the severity of pain which was low and dull in character.

Of 36 cases of non-inflammatory scrotal swellings, 2 cases were neoplastic lesions; remaining 34 cases were non-neoplastic non-inflammatory swellings.

The 2 cases of neoplastic swellings were germ cell tumour, which was histopathologically confirmed to be seminoma. These cases showed ill-defined margins of testis, heterogeneous hypo-echotexture. Both cases showed increased vascularity on colour Doppler study. One of the cases of seminoma had distant metastases in lungs. These findings are in similarity to previous studies by Grantham *et al.* [11] and Schwerk *et al.* [12].

Of remaining 34 cases, pathology was seen in both hemiscrotum in 22 cases, unilateral in 12 cases. Of total 56 hemiscrotum, more than one pathology noted in 4 cases. So totally 60 pathologies are detected.

The various pathologies detected are depicted in table-12. The comparison to previous studies of Willscher *et al.* [4], Arger *et al.* [3] and Richie *et al.* [5] is as follows:

	No of cases	Neoplastic	Non-neoplastic
Arger <i>et al.</i>	54	16 (30%)	38(70%)
Richie <i>et al.</i>	117	22(19%)	53(45 %)
Willscher <i>et al.</i>	40	5(12 %)	20 (50%)
Current study	36	2 (6%)	34 (94%)

	No of cases	Intra testicular	Extra testicular	Intra +Extra testicular
Arger <i>et al.</i>	54	13(24%)	41(76%)	--
Richie <i>et al.</i>	117	22 (19%)	53 (45%)	--
Willscher <i>et al.</i>	40	5 (12 %)	20 (50%)	--
Current study	36	2 (5%)	33 (92%)	1 (3%)

In all the studies, including the present study, we observed neoplastic swellings are much lower compared to non-neoplastic scrotal swellings, also intra testicular swellings incidence is lower compared to extra testicular swellings. In addition, Ultrasonography has a sensitivity of 100% to distinguish between extra testicular and intra testicular swellings. In present study, we noted presence of both intra and extra testicular swellings in same patient in 3 % of cases.

Among non-neoplastic scrotal swellings, hydrocoele is the commonest pathology noted 22 cases (50%). Out of 22 cases, 3 cases were primary vaginal hydrocoele (14%), 1 case was encysted hydrocoele of cord (4%). Among these unilateral hydrocoeles was seen in 7 patients, bilateral hydrocoele was seen in 11 of them. The above study is in accordance with studies of Arger *et al.* [3] and Willscher *et al.* [4].

All cases of hydrocoeles appeared as collection of clear fluid between two layers of tunica. In encysted hydrocoele of cord, anechoic collection is noted adjacent to the spermatic cord. In present study, we noted 4 cases of inguino scrotal hernia in association

with hydrocoele. On High-frequency US scan, there was a hernial sac in the inguinal region, extending up to upper pole of the testis with bowel loops within the sac. Ipsilateral testis and epididymis were normal.

The superficial location of the scrotal contents makes them ideally suited for sonographic examination. Next most common lesion was varicocele, noted in 12 out of 44 cases (27%). Out of 12 cases, unilateral varicocele noted in 3 cases (25%) which were on left side. Bilateral varicocele noted in 9 cases (75%).

On high resolution Ultrasonography varicocele can be described as presence of 2 or more identifiable veins of which atleast 1 of them shows diameter 3mm or more. Whereas on colour Doppler it is demonstrated by retro-grade flow in pampiniform plexus on Valsalva/spontaneously (Randall BM *et al.* [13]) and Petros J A *et al.* [14]. Varicocele was detected in patients presenting with symptoms like scrotal swelling, pain and infertility. Among 15 patients who presented clinically with infertility, varicocele was noted in 8 cases.

Among 46 cases of scrotal swellings, with or without associated pain, different grades of varicocele were seen in 10 cases. Out of 12 cases of ultrasonographically confirmed cases of varicocele 8

cases showed pathological abnormalities in semen analysis in form of azoospermia or aethenospennia. These findings were in similarity with previous studies [13-16].

	No of cases	B/L Varicocele	Unilateral Varicocele	Abnormal sperm count
Kondoh <i>et al.</i>	56	30 (54%)	26 (46%)	30 (54%)
McClure <i>et al.</i>	50	35 (70%)	15 (30%)	34 (67%)
Randall <i>et al.</i>	12	4 (33%)	8 (67%)	5 (42%)
Current study	12	9 (75%)	3 (25%)	8 (67%)

In our study of 44 cases of non-neoplastic scrotal swellings, we noted 7 cases of Spermatoceles, 2 cases of epididymal cysts. Both cases of epididymal cysts were bilateral, and 1 case showed multiple cysts. Most of the epididymal cysts are uniloculated, situated in the head of epididymis, thin walled anechoic. In our study of 7 cases of spermatocele, which is seen as a cystic structure with or without debris within, Leung *et al.* [17] in their study of 40 subjects, have observed 29 cases of spermatoceles and epididymal cysts.

In the present study, out of 100 subjects examined, 9 cases (9%) of scrotal and testicular trauma were detected. The aetiology of trauma included, sports injury in 5 cases (63%), road traffic accident in 1 case

(12%), h/o assault in 2 cases (25%). Out of 9 cases, 3 were on right side (33%), 2 cases (23%) were on left side and 4 cases (44%) were bilateral.

Alexander S Cass *et al.* [18], have studied scrotal trauma in cases, and found the incidence of unilateral (96%) involvement much more compared to bilateral (4%). In addition to this George Schuster¹⁹ described that trauma is more common on the right side, among the 72 cases he studied, right sided testicular traumatic injury was observed in 40 patients (56 %) and left sided traumatic injury in 32 patients (44 %). Various traumatic pathologies noted are compared to previous study by Cass *et al.*

Sr. no.	Pathology	Cass <i>et al.</i> n = 6	Present study n = 8
1	Hematocele	4	0
2	Testicular torsion	1	3
3	Testicular haematoma	0	0
4	Testicular rupture	0	0
5	Scrotal wall haematoma	1	1

On high frequency US scan, 3 cases of testicular torsion were noted, 2 were on right side and 1 on left side. On High-frequency gray-scale US scan, it appeared as enlargement of the testis with decrease in echogenicity. On colour Doppler US scan; there was complete absence of flow on the affected side. On high frequency US, one case of scrotal wall haematoma appeared as hypoechoic collections in the layers of the scrotal wall, where no flow was seen on colour Doppler scan.

In present series, no case of testicular rupture, hematocele and testicular haematoma were found.

In the present study of 11 patients of congenital anomalies, the incidence is as:

Incompletely descended testis – 2 patients (18%)

Undescended testis – 5 patients (45%)

Congenital hydrocoele - 4 patients (37%)

Among the 2 patients with suspicion of incompletely descended testis, which are palpable on clinical examination, both were observed to be unilateral.

In the cases of the undescended testis which were presented in the later stages, the size of the testis is observed to be smaller. Only one case of the incompletely descended testis is visualised Ultrasonographically, was at the inguinal region and this testis shows normal flow on colour Doppler however is of smaller size compared to the opposite testis. The other case which was palpable clinically was not visualised Ultrasonographically.

Out of 5 clinically non-palpable undescended testes, 3 cases of the abdominal testis were not visualised even by high resolution Ultrasonography.

In our current study it is observed that the sensitivity of High resolution Ultrasound in identifying clinically palpable cases is less and is not dependable diagnostic tool to identify the ectopic testis in the abdomen.

Out of 11 cases, 3 cases with clinical presentation of scrotal swelling which was congenital hydrocoele/hernia were identified as congenital hydrocoele, all of them were unilateral.

Similar findings were noted in a previous study by Robert Weiss *et al.* [20], in which they studied 20 cases of palpable undescended testes, could identify 14 cases only (70%) by high frequency US and out of 21 cases of non-palpable testes only one case was identified by high frequency US. They concluded that high frequency US cannot satisfactorily stand alone as a screening modality, particularly in the young patient. However, high frequency US is sensitive in differentiating clearly between testes and lymph nodes on a textural basis.

CASE GALLERY

Case No.1: Acute orchitis

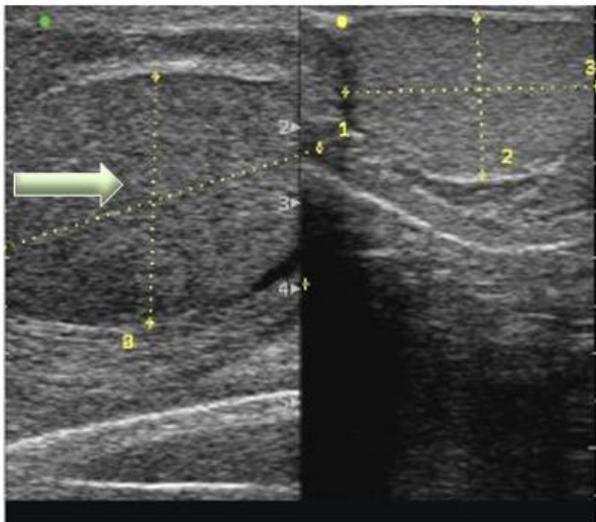


Fig-9.a: Diffusely enlarged testis with hypochoic echotexture (High frequency ultrasound image)

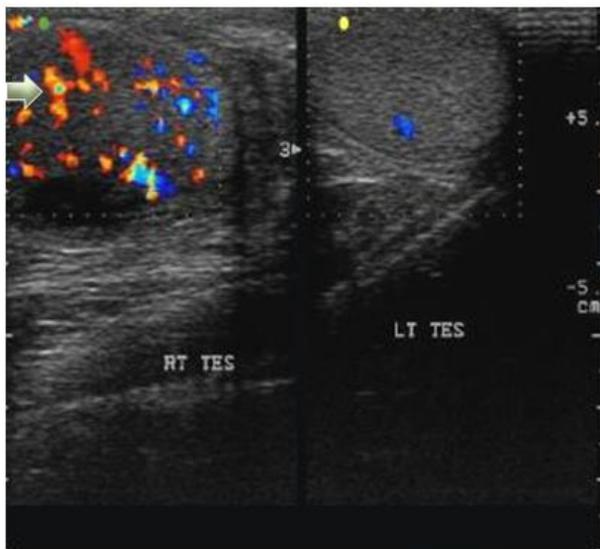


Fig-9.b: Colour Doppler shows increase blood flow (Colour doppler image)

Case No.2: Focal Orchitis

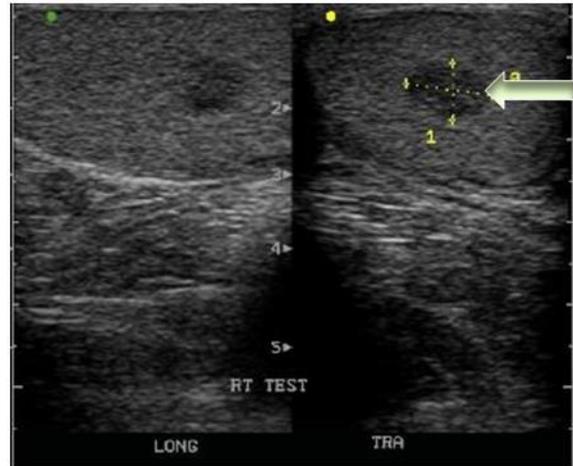


Fig-10.a: Focal area of hypochoic lesion (High Frequency Ultrasound Image)

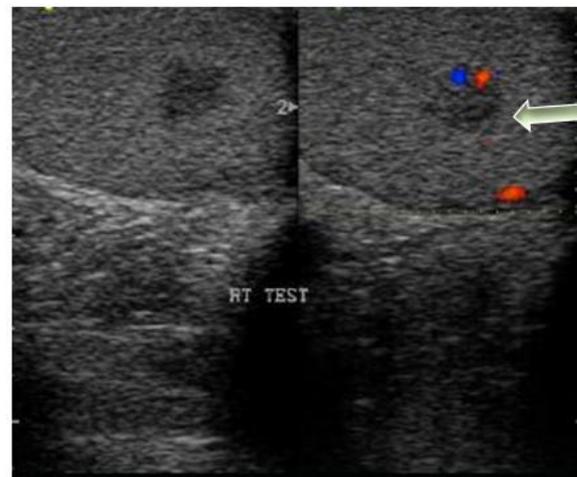


Fig-10.b: Colour Doppler shows increase blood flow (Focal Orchitis – Colour Doppler Image)

Case No.3 Acute Epididymitis



Fig-11.a: Diffusely enlarged epididymis with hypochoic echotexture (High Frequency Ultrasound Image)

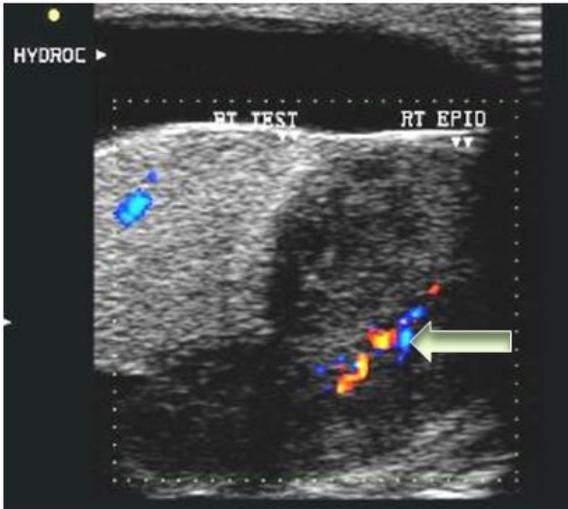


Fig-11.b: Colour Doppler shows increase in vascularity (Colour Doppler Image)

Case No. 4: Acute Epididymo-Orchitis



Fig-12.a: Focal enlargement of both testis and epididymis with hypoechoic echotexture (High Frequency Ultrasound Image)

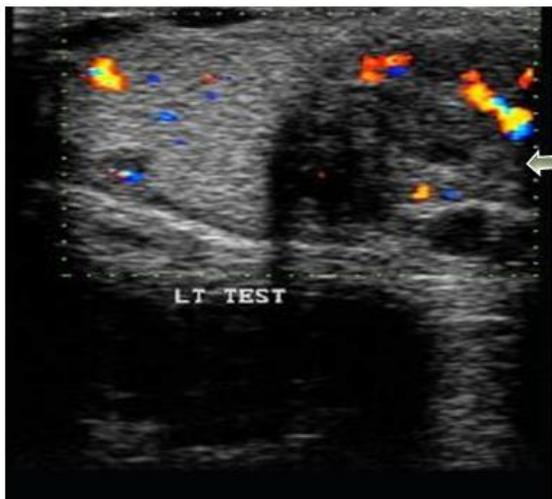


Fig-12.b: Colour Doppler shows increase in vascularity (Colour doppler image)

Case No.5: Chronic Epididymo-Orchitis

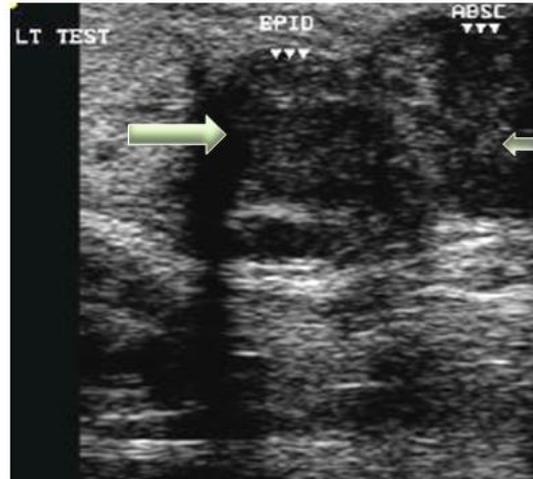


Fig-13.a: Diffuse involvement of both testis and epididymis with heterogeneous hypoechoic echotexture (High Frequency Ultrasound Image)

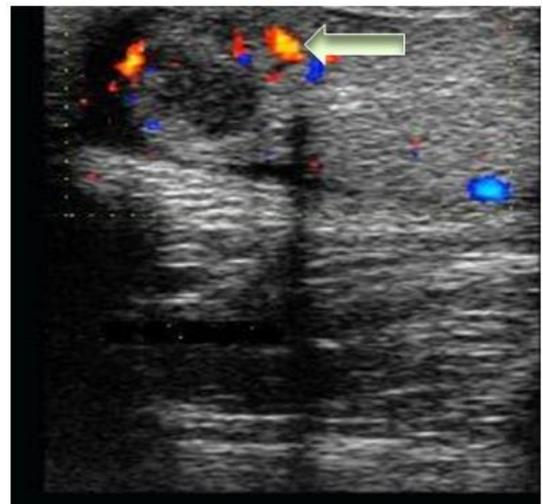


Fig-13.b: Colour Doppler shows focal increase in vascularity (Colour Doppler Image)

Case No.6: Calcifications

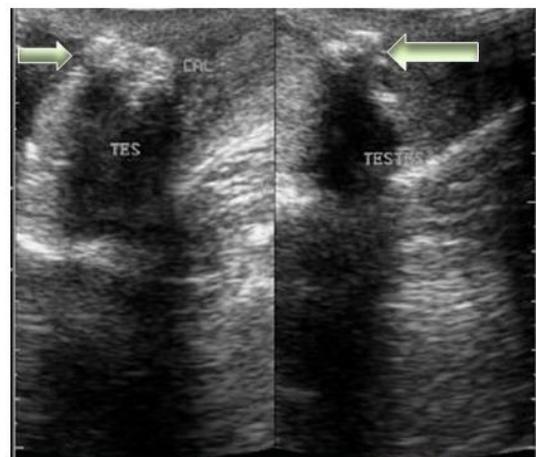


Fig-14.a: Multiple tiny hyperechoic foci within the testis (Testicular Calcification)

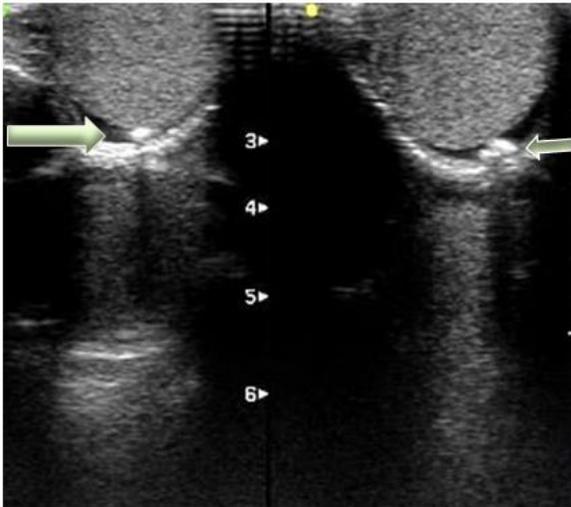


Fig-14.b: Multiple mobile echogenic foci with acoustic shadowing (Scrotal Pearl)



Fig-14.c: Echogenic foci noted within the epididymis (Epididymal Calcification)



Fig-14.d - Multiple mobile echogenic foci without acoustic shadowing (Testicular Microlithiasis)

Case No.7: Scrotal Filariasis

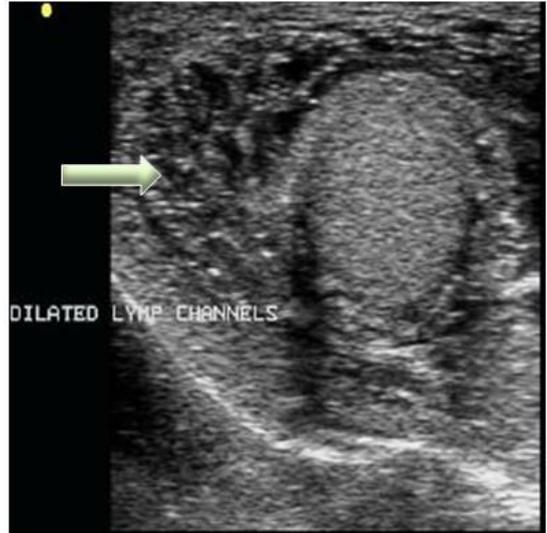


Fig-15.a: Dilated lymphatic channels (Scrotal Filariasis – High Frequency Ultrasound)



Fig-15.b: Colour Doppler shows mild increase in vascularity (Scrotal Filariasis – Colour Doppler Image)

Case No.8



Fig-16: Anechoic cystic lesion in the Epididymal head (Epididymal Cyst – High Frequency Ultrasound Image)

Case No: 9



Fig-17: Anechoic cystic lesion with internal septations and fluid level (Spermatocele – High Frequency Ultrasound Image)

Case No.11



Fig-19.a: Lobulated collection with internal echoes/ fluid-debris level (Pyocele – High Frequency Us Image)

Case No.10: Hydrocoele



Fig-18.a: Anechoic collection in the tunical sac (High Frequency Us Image Showing Bilateral Hydrocoele)

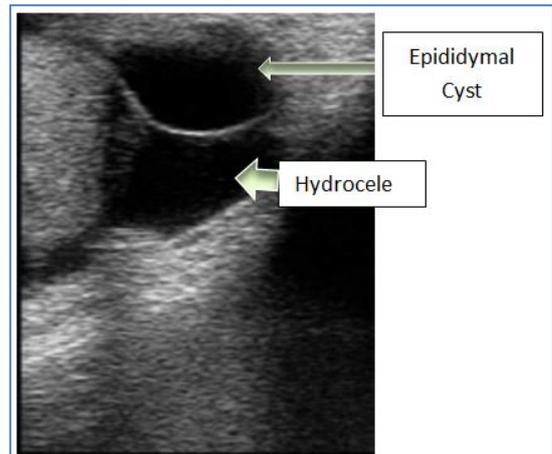


Fig-19.b: Epididymal cyst with anechoic collection (Epididymal Cyst with Hydrocoele)

Case No.12: Incompletely Descended Testis

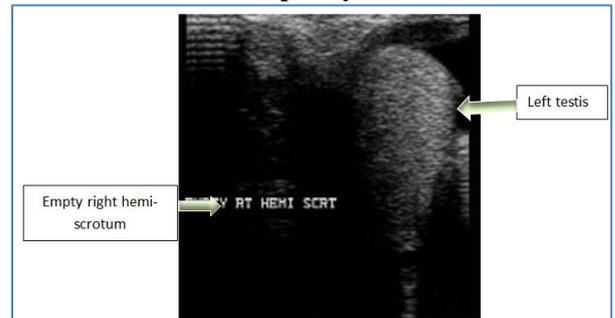


Fig-20.a; Empty right hemi scrotum (High Frequency Us Image)

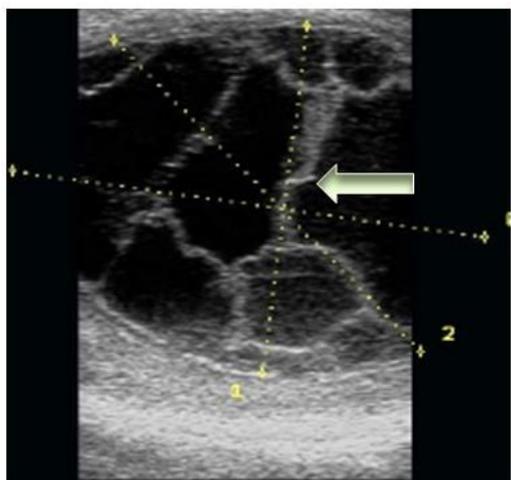


Fig-18.b: Anechoic collection in the tunical sac with internal septations (Hydrocoele with Internal Sepations)



Fig-20.b: Right testis seen in inguinal region (Testis in inguinal region)



Fig-22.b: Colour Doppler shows absent flow in the left testis (Colour Doppler Image)

Case NO: 13: Torsion Testis



Fig-21.a: Mild increase in size of the left testis with hypochoic echotexture (High Frequency Us Image)

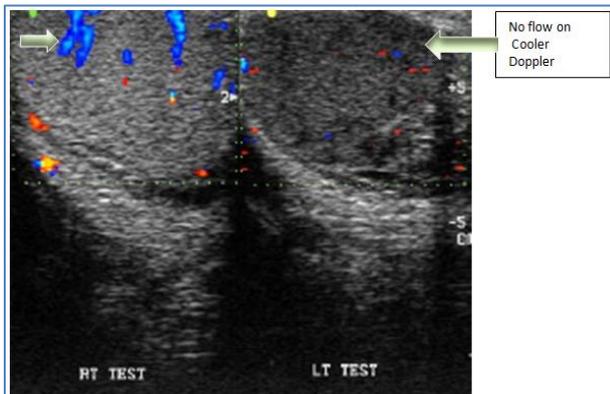


Fig-21.b: Colour Doppler shows absent flow in the left testis (Colour doppler image)

CASE No.14: Post Torsion Testicular Atrophy



Fig-22.a: Decrease in the size of left testis with hypochoic echotexture (High frequency us image)

Case No.15: Scrotal collection



Fig-23: Echogenic collection in the scrotal wall (Scrotal haematoma)

Case No.16: Varicocele

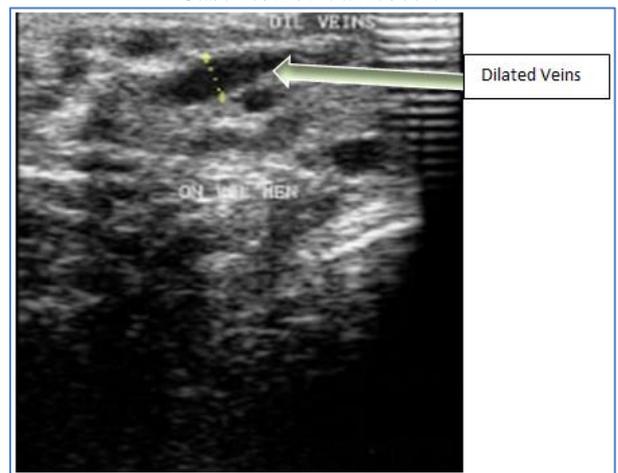


Fig-24.a: Dilated tubular/serpigenous veins (High frequency us image showing dilated pamapniform plexus)



Fig-24.b: Color Doppler shows flow reversal on Valsalva manoeuvre (Flow reversal on colour Doppler Varicocele)

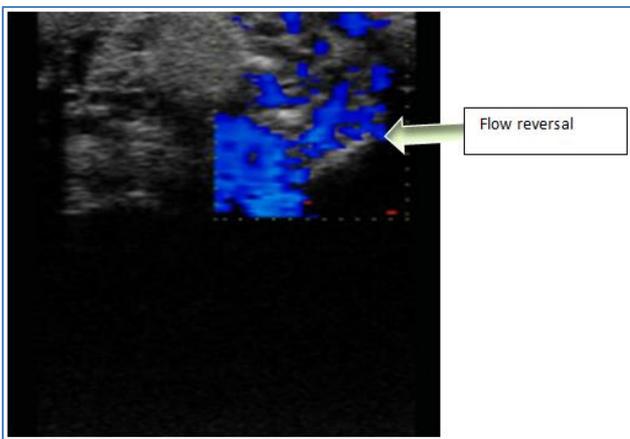


Fig-24.c: Color Doppler shows flow reversal on Valsalva manoeuvre (Flow reversal on colour Doppler)

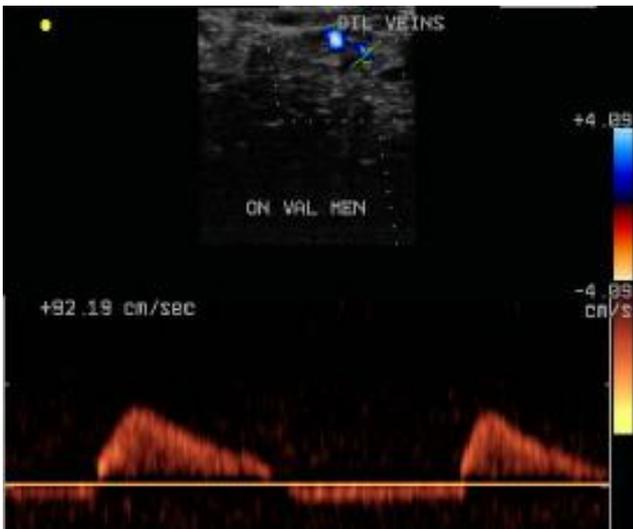


Fig-24.d: Flow reversal on power Doppler (Flow reversal on power Doppler)

Case no.17: Testicular Tumour



Fig-25.a: Ill-defined heterogeneously hypoechoic lesion in the testis (High frequency us image)



Fig-25.b: Ill-defined heterogeneously hypoechoic lesion in the testis with few hyper echoic areas (High frequency us image)

Testicular tumour

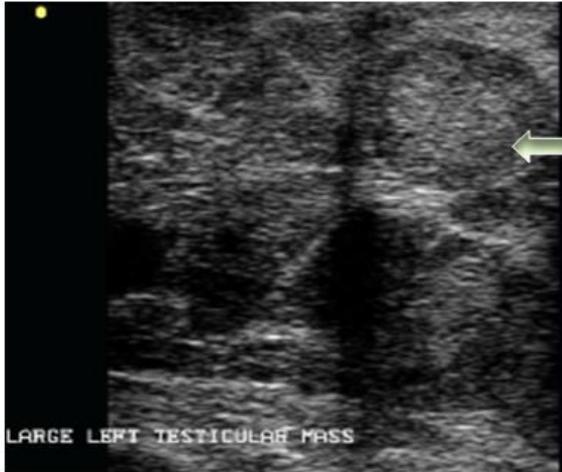


Fig-25.c: Diffusely enlarged lobulated testicular mass lesion, with heterogeneously hypoechoic echotexture (High frequency us image)

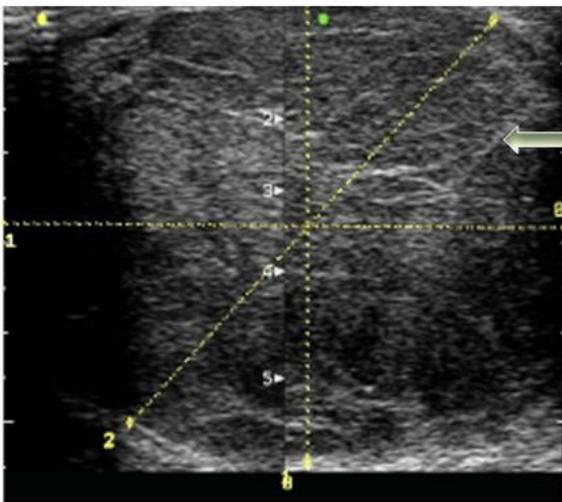


Fig-25.d: Diffusely enlarged lobulated testicular mass lesion, with heterogeneously hypoechoic echotexture (High frequency us image)

Case No.18: Scrotal hernia

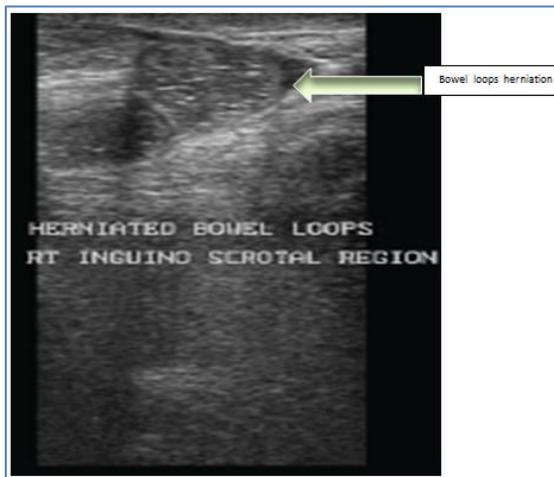


Fig-26.a: Herniation of bowel loops till the scrotum (High frequency us image)

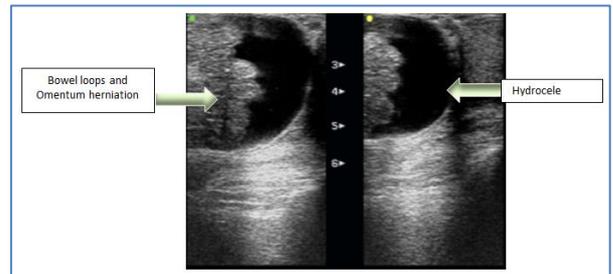


Fig-26.b: Herniation of bowel loops with omentum into the scrotal sac and hydrocele

Bowel Loops and Omentum with Fluid Collection Herniating Into Scrotal Sac

Case No.19: Transmediastinal Vessel

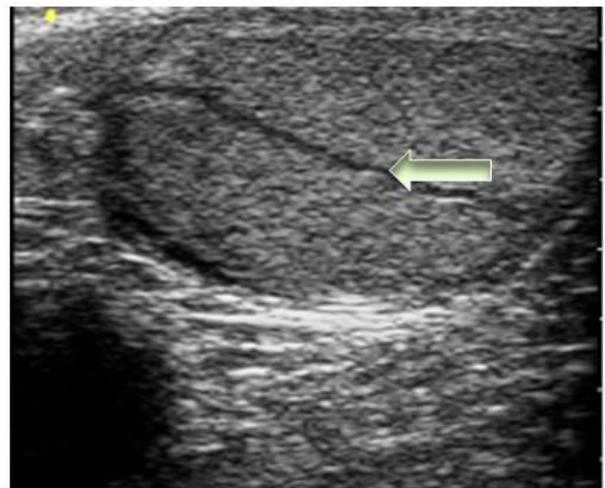


Fig-27.a: Linear low reflective structure traversing the testis (High Frequency Us Image)

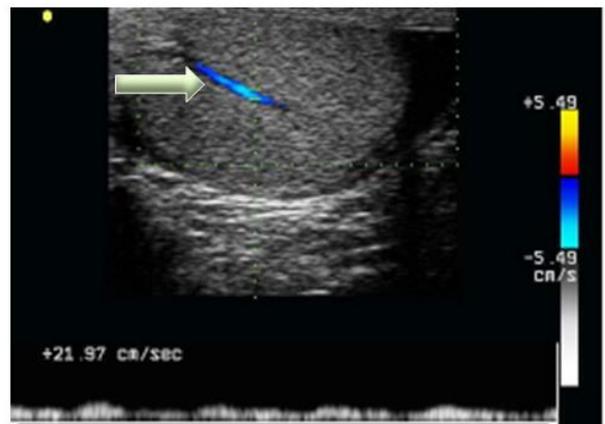


Fig-27.b: Doppler study shows colour flow in the linear structure traversing the testis (Colour doppler image)

Table-1: Distribution of cases according to various age groups

Sr. No.	Age groups (Yrs)	Frequency	Percentage (%)
1	0-10	8	8.0
2	10-20	2	2.0
3	20-30	26	26.0
4	30-40	45	45.0
5	40-50	7	7.0
6	50-60	8	8.0
7	60-70	3	3.0
8	70-80	1	1.0
-	Total	100	100.0

Table I shows the age distribution of cases, which varied from 2 years to 73 years. Maximum cases were observed in 31 to 40 years of age groups (45

cases- 45%) followed by 21 to 30 years (26 cases 26%). The age group between 21 to 40 years contributes 71 %.

Table-2: Clinical presentation- frequency of symptoms

Symptoms	Frequency	Percentage (%)
Pain	73	73
Swelling	46	46
Fever	24	24
Erythema	23	23
Pain and swelling	15	15
Fever and swelling	9	9
Abdominal pain	16	16
Dysuria	13	13
Trauma	9	9
Infertility	7	7
Skin discharge	0	0

Most of the patients are presented with combination of the multiple symptoms. Commonest

presentation was pain and swelling (73 & 46 cases respectively).

Table-3: Scrotal and testicular diseases Types of detected pathologies

PATHOLOGY	NO OF CASES	PERCENTAGE (%) OF CASES
Inflammatory diseases	42	42
Infertility	15	15
Congenital abnormalities	11	11
Trauma	9	9
Neoplastic	2	2
Miscellaneous	13	13
Normal	8	8

Most of the patients are presented with combination of the multiple symptoms. Among the

detected pathologies, most common was inflammatory diseases (42 cases).

Table-4: Inflammatory scrotal pathology distribution

PATHOLOGY	NO OF CASES	PERCENTAGE (%) OF CASES
Acute Epididymitis	2	2
Acute Epididymo Orchitis	11	11
Acute Orchitis	3	3
Chronic Epididymitis	3	3
Chronic Epididymo Orchitis	14	14
Scrotal Wall Inflammation	3	3
Scrotal Filariasis	2	2
Funiculitis	3	3
Fournier's Gangrene	1	1

Total	42	42
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Out of 100 cases, 42 cases were having inflammatory pathologies. Chronic Epididymo orchitis was the commonest inflammatory pathology found in

14 cases (14%). Next most frequent inflammatory pathology detected was acute Epididymo orchitis found in 11 cases (11%).

Table-5: High-resolution us appearance of inflammatory scrotal pathology:

Sr. no	USG Findings	Acute epididymitis	Acute Orchitis	Acute Epididymo-orchitis	Chronic epididymitis	Chronic Epididymo-orchitis
1	Hyper echoic	--	--	--	--	--
2	Hypo echoic	2	2	8	1	--
3	Iso echoic	--	1	3	--	--
4	Heterogeneous	--	--	--	2	14
5	Complex cystic	--	--	--	--	4
6	Purely cystic	--	--	--	--	1
7	Epididymal calcification	--	--	--	--	2
8	Testicular calcification	--	--	--	--	2

Table-6: Colour doppler findings of inflammatory scrotal pathology

Sr. no	Colour Doppler Findings	Acute epididymitis	Acute Orchitis	Acute Epididymo-orchitis	Chronic epididymitis	Chronic Epididymo-orchitis
1	Focal increase	--	--	4	2	7
2	Diffuse increase	2	2	7	--	--
3	Focal decrease	--	1	--	--	2
4	Diffuse decrease	--	--	--	--	1
5	Normal vascularity	--	--	--	1	4

Among various inflammatory pathologies, Chronic Epididymo orchitis is commonly presented as a Focal increase of vascularity on colour Doppler,

whereas acute Epididymo orchitis is commonly presented as diffuse increase of vascularity on colour Doppler.

Table-7: Inflammatory diseases of scrotum and its contents: Comparison with other series

Inflammatory disease	Horstman et al.	Lerner et al.	Farriol et al.	Current study
Acute epididymitis	25, (56%)	3, (60%)	11, (44%)	2, (2%)
Acute Epididymo-orchitis	19, (42%)	2, (40%)	10, (40%)	11, (11%)
Acute orchitis	1, (2%)	--	2, (8%)	3, (3%)
Complications of acute inflammation	5, (11%)	--	--	5, (5%)
Cellulitis of scrotal wall	--	--	--	3, (3%)
Fournier's gangrene	--	--	--	1, (1%)
Funiculitis	--	--	--	3, (3%)
Chronic Epididymo-orchitis	--	--	--	14, (14%)

Table- 8: Comparisons with other series of acute epididymitis

Acute epididymitis	Horstman et al.	Farriol et al.	Current study
Focal enlargement in size	9, (18%)	11, (44%)	--
Diffuse enlargement in size	36, (70%)	9, (82%)	2, (100%)
Normal size	6, (12%)	--	--
Focal hypoechoic	--	2, (18%)	--
Diffuse hypoechoic	36, (70%)	9, (82%)	2, (100%)
Isoechoic	15, (29%)	--	--
Focal increase in vascularity	10, (20%)	1, (9%)	--
Diffuse increase in vascularity	35, (69%)	8, (73%)	2, (100%)
Normal vascularity	6, (12%)	--	--

Table-9: Comparisons with other series of acute epididymo-orchitis

Acute epididymo-orchitis	Horstman <i>et al.</i>	Farriol <i>et al.</i>	Current study
Focal enlargement in size	2, (10%)	2, (25%)	1, (9%)
Diffuse enlargement in size	10, (50%)	--	1, (9%)
Normal size	8, (40%)	6, (75%)	9, (81.8%)
Focal hypoechoic	2, (10%)	--	2, (18.2%)
Diffuse hypoechoic	10, (50%)	--	6, (54.5%)
Isoechoic	8, (40%)	6, (75%)	3, (27.3%)
Focal increase in vascularity	2, (10%)	2, (25%)	4, (36.4%)
Diffuse increase in vascularity	13, (65%)	6, (75%)	7, (63.6%)
Reactive hydrocoele	--	5, (62.5%)	3, (27.3%)

Table-10: Comparisons with other series of acute orchitis

Acute orchitis	Horstman <i>et al.</i>	Farriol <i>et al.</i>	Current study
Focal enlargement in size	2, (10%)	--	1, (33.3%)
Diffuse enlargement in size	10, (50%)	--	--
Normal size	8, (40%)	2, (100%)	2, (66.6%)
Focal hypoechoic	2, (10%)	--	--
Diffuse hypoechoic	10, (50%)	--	2, (66.6%)
Isoechoic	8, (40%)	2, (100%)	1, (33.3%)
Focal decrease in vascularity	1, (5%)	--	1, (33.3%)
Diffuse increase in vascularity	18, (90%)	2, (100%)	2, (66.6%)
Reactive hydrocoele	1, (5%)	--	1, (33.3%)

Table-11: Comparison with other series of chronic epididymo-orchitis

Epididymal involvement		KIM S H <i>et al.</i>	Current study
	Diffuse	8 (67%)	8 (57%)
Focal	4 (33%)	6 (42.8%)	
Epididymal echotexture	Heterogenous Hypoechoic	9 (75%)	9 (64 %)
	Homogenous Hypoechoic	2 (17 %)	5 (35.7) %
Testicular involvement (size)	Normal	6 (50%)	8 (57%)
	Increased	2 (17 %)	1 (7%)
	Irregular margin between epididymis-testis	4 (33%)	5 (35.7%)
Colour Doppler appearance	Focally increased	--	7 (50%)
	Diffusely decreased	--	1 (7%)
	Focally decreased	--	2 (14%)
	Normal	--	4 (28.6%)

Table-12: Non-neoplastic swellings of scrotum: Types of pathology detected

PATHOLOGY	NO OF CASES	% OF CASES
Hydrocoele	22	22%
	Congenital- 4	4%
	Acquired- 18	18%
	Pyocele - Associated with Epididymo-orchitis-1	1%
Varicocele	12	12%
Epididymal Cyst	2	2%
Spermatocele	7	7%
Complete inguinal hernia	5	5%
	Right	2
	Left	2
	Bilateral	1
	Associated with reactive hydrocoele	4
Testicular Cyst	1	1%
Total	44 cases out of 100 cases	44%

Among non-neoplastic scrotal swellings, hydrocoele is the commonest pathology noted in 22 cases out of 100 cases (22%). The incidence of non-neoplastic scrotal swellings is very much high compared to neoplastic swellings. Incidence of extra

testicular swellings is more, compared to infra testicular swellings. High frequency was 100% sensitive in differentiating intra testicular swellings from extra testicular swellings.

Table-13: Comparison between sonological diagnoses with Clinical diagnosis

SI No	Clinical diagnosis		High-frequency US diagnosis	
	1	Intra testicular	13	<ul style="list-style-type: none"> ● Intra testicular ● Extra testicular ● Both intra + extra testicular
2	Extra testicular	23	<ul style="list-style-type: none"> ● Intra testicular ● Extra testicular ● Both intra + extra testicular 	17 -- 6
3	Both intra + extra testicular	5	<ul style="list-style-type: none"> ● Intra testicular ● Extra testicular ● Both intra + extra testicular 	-- 4 1
4	No diagnosis	22	<ul style="list-style-type: none"> ● Normal ● Intra testicular ● Extra testicular ● Both intra + extra testicular 	8 5 10 --
5	Unilateral	RT-26 LT-20	<ul style="list-style-type: none"> ● Bilateral ● Unilateral 	54 RT-26 LT-20

The sensitivity and specificity of High-frequency ultrasonography is compared with physical

examination in differentiating a scrotal mass as either intra-testicular or extra testicular.

Table-14: Results of evaluation of varicocele

Pt no	Varicocele		
	Varicocele with Infertility	Physical Examination	Colour Doppler examination
1	+	Lt	Bilat
2	+	--	Lt
3	+	--	Bilat
4	--	Bilat	Lt
5	--	Lt	Lt
6	+	Lt	Bilat
7	+	Lt	Bilat
8	+	--	Bilat
9	--	--	Bilat
10	--	Lt	Bilat
11	+	Bilat	Bilat
12	+	--	Bilat

Among the Non-neoplastic swellings the patients presented with complaint of infertility with combination of physical examination, the number of

cases presented bilaterally on colour Doppler examination was 9, while on left side was 3 cases.

Table-15: Types of detected pathologies

Pathologies	Frequency	Percentage (%)
Atrophic	2	2
Epididymal cyst	2	2
Epididymitis	5	5
Epididymo-orchitis	25	25
Orchitis	3	3
Undescended Testis	7	7
Testicular Microlithiasis	1	1
Testicular Neoplastic	2	2
Testicular Infarct	1	1
Testicular cyst	1	1
Torsion	3	3
Testicular abscess	1	1
Funiculitis	3	3
Rete Testis Tubular ectasia	1	1
Hydrocoele	22	22
Pyocele	1	1
Complete inguinal hernia	5	5
Spermatocele	7	7
Varicocele	12	12
Scrotal wall inflammation	3	3
Scrotal wall microlithiasis	1	1
Scrotal wall haematoma	1	1
Filariasis	2	2
Fournier's gangrene	1	1
Normal	8	8

CONCLUSION

High-frequency ultrasound testifies various morphological distortions in acute scrotal pathologies and colour Doppler is highly precise for diagnosis. Along with this Colour Doppler can precisely distinguish acute painful scrotal pathologies from testicular ischaemia and torsion. High-resolution ultrasound can differentiate the solid from cystic scrotal masses. High-frequency ultrasonography is highly sensitive in detecting intra-testicular micro-lithiasis. High-resolution ultrasound is highly valuable in establishing normalcy of intra-scrotal contents in cases of gross hydrocoele, it is also distinguishing intra-scrotal masses into testicular versus extra-testicular category. High-resolution ultrasound with colour Doppler is very precise to detect Varicocele in clinical as well as subclinical patients. The advantages of High resolution ultrasound and colour Doppler include non-invasiveness, lack of ionizing radiation, simplicity, wide availability, cost effectiveness and repeatability. In our conclusion High resolution ultrasound with colour Doppler is an exceedingly worthwhile tool for assessing scrotal and intra-scrotal pathologies.

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