

A Study of Scrotal Radiology

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Abstract

Introduction: The diagnosis of the scrotal pathologies primarily rests upon clinical history and careful physical examination.

Aims And Objectives: Looking at the immense importance of high resolution ultrasonography and color duplex sonography as a non invasive imaging modality, the availability of good doppler equipment in the institute and high incidence of scrotal pathologies, we decided in favour of usefulness of this study as first line non invasive investigation.

The study was carried out with following aims and objectives.

- To determine the imaging characteristics of scrotal lesions.
- To study the spectrum of sonological findings of various scrotal swellings.
- To determine the efficacy of Gray scale sonography in diagnosis of scrotal lesions.
- To classify scrotal lesions into testicular and extra-testicular.

Material and Methods: The present study was done in the department of Radiodiagnosis, g.r. Medical college and j.a. Group of hospitals, gwalior (m.p.) In usg machine ssd 4000sv (aloka trivitron pvt. Ltd., Tokyo, japan) from august 2015 to Nov. 2016.

Summary & Conclusion: this study was undertaken to evaluate the multifold data obtained by high-resolution grey scale sonography, CDFI and PD in the evaluation of scrotal pathology. A total of 68 patients from all age groups with signs and symptoms related to scrotal diseases have been included in this study. The scrotal pathologies were seen to be commonest in young males. The chief complaint was scrotal swelling followed by scrotal pain. All the 68 patients were properly followed up sonographically/ medically/surgically/pathologically as per indication, to arrive at a final diagnosis. There were 96 pathological lesions in total at the final diagnosis, as some of the patients had more than one lesion. Out of these, majority of the lesions were extra testicular in origin (80.2%). The final diagnosis was extra-testicular fluid collection in 28 cases, acute inflammation in 14 cases, chronic inflammation in 6 cases, testicular tumor in 1 case, torsion of testis in 2 cases, testicular and epididymal cysts in 7 cases, varicocele in 8 cases. The rest of the lesions included

malpositioned testis, testicular trauma, testicular atrophy, scrotal hernia, testicular microlithiasis, scrotoliths and scrotal wall thickening.

Keywords: Scrotal; Testicular; Extra-Testicular; Sonography

Introduction

The diagnosis of the scrotal pathologies primarily rests upon clinical history and careful physical examination [1]. However, in many patients clinical symptoms are non-specific and often misleading [2]. Definitive diagnosis is not possible, especially in patients with marked inflammatory reactions of the testis and/or its surrounding structures which further limit the proper physical examination [3].

Aims and Objectives

Looking at the immense importance of high resolution ultrasonography and color duplex sonography [4] as a non invasive imaging modality, the availability of good doppler equipment in the institute and high incidence of scrotal pathologies, we decided in favour of usefulness of this study as first line non invasive investigation.

The study was carried out with following aims and objectives.

- To determine the imaging characteristics of scrotal lesions.
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Material and Methods

The present study was done in the Department of Radiodiagnosis, G.R. Medical College and J.A. group of hospitals, Gwalior (M.P.) in USG Machine SSD 4000SV (Aloka Trivitron Pvt. Ltd., Tokyo, Japan) from August 2015 to Nov. 2016.

Inclusion Criteria

The group under study was comprised of 68 patients of all age groups attending the various outdoor and indoor departments of his hospital with signs and symptoms related to scrotal diseases.

1. Patient presenting with acute scrotal pain.
2. Scrotal trauma.

3. Patient presenting with painless or painful scrotal swelling.

Method

The examination was conducted in the manner described below and details were recorded as per the master chart.

Clinical assessment: Relevant history was taken about clinical symptoms and the presenting complaints. Bimanual palpation was performed in all cases in order to determine status of scrotal contents. Fluctuation, reducibility and trans-illumination tests were done as and when required.

Radiological examinations

Sonography Equipment: Real time Grey scale ultrasound and Color Doppler study was done on USG Machine SSD 4000SV (Aloka Trivitron Pvt. Ltd., Tokyo, Japan) using high frequency 7-12 MHz linear array transducer as when as required 3.5 transducer was also used for adequate penetration, particularly in case of large scrotal swelling. The selected images in different planes were stored on hard disc of machine.

Technique

The patient was asked to lie supine, with the legs slightly separated. A towel sling was placed beneath the scrotum for support [5]. The penis was elevated on to anterior abdominal wall and covered by drape. Examination began with careful palpation of the scrotum contents. Aqua sonic gel was applied to the scrotum skin in adequate amount to avoid pressure and pain. The scrotum was scanned from anterior, lateral and inferior surfaces in longitudinal and transverse plane [6]. Examination was further continued to evaluate the spermatic cord and groin region when required. In cases of varicocele, examination was performed in supine posture, erect posture and with Valsalva maneuver to confirm it. Masses were imaged in multiple planes and documented. For Grey scale imaging meticulous attention was given to set gains and time gain compensation (TGC) to prevent masking of pathology and to maximize contrast resolution respectively [7]. Comparison with contra lateral testis was helpful to demonstrate subtle changes in

echo texture. Thereafter, color Doppler was performed to depict flow in the vessels. The testicular artery, capsular arteries, intra testicular vessels and cremastic vessels were identified wherever possible. The Doppler controls were optimized to detect low flow [8]. Thereafter, power doppler mode was applied to the area of interest. The power Doppler settings were adjusted to that scale or PRF was low, Color window small and the color gain just below that which induced background noise [9]. Sometimes, it was helpful to perform power Doppler spectral analysis. In such cases, the examination was aimed such that angle of insinuation beam was minimal and without steering. Comparison of symptomatic side was done with the asymptomatic side and findings were analyzed. In patients with suspicion of testicular tumors, the kidney, liver and para-aortic regions were scanned to look for the presence of secondaries and any back pressure changes in the kidneys [10].

The following sonographic parameters were studied in each case:

- Scrotal skin-thickening or swelling, if any.
- Position of the testes.
- Size of the testes with regards to transverse, antero-posterior and superio-inferior measurements.
- Echo pattern of the testes.
- Position, Size and echo pattern of the epididymis.
- Fluid collection: its echo morphology and its relation to testes.
- Presence of mass lesion.
- Inguino-scrotal region: for evidence of any varicocele or hernia.
- Vascular anatomy with quantitative and qualitative data: pattern of blood flow, PSV, EDV and RI.

➤ **The vascularity of the lesion was evaluated with both color and power doppler as follows:**

Grade 0: No doppler signals in the evaluated scrotal

structure/mass.

Grade 1: Spotty Doppler signals in the evaluated scrotal structure/mass (<2 vascular signals per 10mm).

Grade 2: Scattered Doppler signals in the scrotal structure/mass.

Grade 3: Continuous flow (uninterrupted vessels >25mm in length).

➤ **Chest radiograph (pa view)**

X-ray chest was taken in a suspected case of tubercular epididymitis and in a case suspected to be having a testicular tumor in order to look for metastases.

➤ **Computed Tomography**

CT abdomen was done in patients with testicular tumors to detect retroperitoneal lymph nodes and metastases.

➤ **Laboratory Investigations**

Relevant investigations, like urine-routine/microscopic examination and culture, ESR and ELISA for tuberculosis were done as required [11]. Finally, collected data were analysed to arrive at definitive diagnosis. Ultrasonography findings were correlated with clinical and lab picture to arrive at final diagnosis. Accuracy of ultrasonography diagnosis was decided against this final diagnosis. All the cases were properly followed up sonographically/ medically/ surgically/pathologically as per indication, to arrive at the final diagnosis.

Observation

The present study was conducted in the department of Radio-diagnosis, Gajra Raja medical college and J.A. Group of Hospitals, Gwalior; from August 2010 to Nov. 2011. A total of 68 patients with clinical symptoms pertaining to the scrotal pathology, referred from outpatient department, were assessed by high resolution ultrasound. Observations are follows:

S. No.	Age	No. Of Cases	Percentage
1	10-Jan	4	5.90%
2	20-Nov	11	16.20%
3	21-30	16	23.50%
4	31-40	19	27.90%
5	41-50	8	11.80%
6	51-60	7	10.30%
7	61-70	3	4.40%

Table 1: Age Distribution of Cases (N=68)

Majority of the patients were between 21-40yrs of age (51.4%) and the predominant group in the study was 31-40yrs comprising of 19 patients (27.9%).

S. No.	Side Of Involvement	No. Of Cases(N=68)	Percentage
1.	Left	31	45.6%
2.	Right	23	33.9%
3.	Bilateral	14	20.5%

Table 2: Side of Involvement

Unilateral scrotal swelling was the most common presentation.

S. No.	Symptoms	No. Of Cases	Percentage
1.	Scrotal Swelling	48	70.6%
2.	Scrotal Pain	31	45.6%
3.	Fever	21	30.9%
4.	Scrotal Discomfort	5	7.3%
5.	Infertility	2	2.9%
6.	Urinary Symptoms	7	10.3%
7.	Extrascrotal Pain	6	8.8%
8.	Small Testis	2	2.9%
9.	Trauma Testis	3	4.4%
10.	Extra Scrotal Swelling	5	7.3%
11.	Absent Testis Scrotal Sac	3	4.4%

Table 3: Clinical Symptoms (N=68)

Commonest presenting complaint was that of scrotal swelling in 48 patients (70.6%) followed by scrotal pain in 31 patients (45.6%).

S. No.	Clinical Signs	No. Of Cases	Percentage
1.	Positive Trans Illumination Test	24	35.2%
2.	Tenderness Of Scrotal Swelling	21	30.8%
3.	Fluctuation	12	17.6%
4.	Localised Epididymal Swelling	10	14.7%
5.	Abdominal/Inguinal Lump	6	8.8%
6.	Serpigenous Cord Like Extra Testicular Scrotal Structure On Palpation	2	2.9%
7.	Reducibility	6	8.8%
8.	Impulse On Coughing	6	8.8%

Table 4: Clinical Signs (N=68)

Positive transillumination suggestive of fluid collection was seen in 24 patients (35.3%) while tenderness of scrotal swelling was noted in 21 patients (30.9%).

S. NO.	Final Diagnosis	No of Cases	Percentage	
1	Hydrocele	10	14.70%	
2	Ac. Inflammation	Acute Orchitis	3	4.40%
		Acute Epididymitis	6	8.80%
		Acute Epididymo-Orchitis	3	4.40%
		Epididymo Orchitis Funiculitis	2	2.90%
3	Ch. Inflammation	Acute Orchitis	1	1.40%
		Acute Epididymitis	3	4.40%
		Acute Epididymo-Orchitis	2	2.90%
4	Varicocele	8	11.80%	
5	Torsion Testis	2	2.90%	
6	Epididymal Cyst	3	4.40%	
7	Testicular Tumor	1	1.40%	
8	Undescended Testis	3	4.40%	
9	Scrotal Hernia	6	8.80%	
10	Testicular Atrophy	2	2.90%	
11	Extra-Testicular Abscess	2	2.90%	
12	Ectasia Of Rete Testis & Spermatocele	4	5.80%	
13	Hematocele	2	2.90%	
14	Testicular Trauma	1	1.40%	
15	Pyocele	2	2.90%	
16	Testicular Abscess	1	1.40%	
17	Fournier's Gangrene	1	1.40%	

Table 5: Final Diagnosis (N=68).

S. No.	Diagnosis	No. Of Findings	% Of Total Sonographic Findings (N=96)	% Of Total No. Of Cases (N=68)
1.	Hydrocele	26	27.08%	38.2%
2.	Ac. Inflammation	14	14.6%	20.6%
3.	Varicocele	8	8.3%	11.7%
4.	Ch. Inflammation	6	6.25%	8.8%
5.	Torsion	2	2.08%	2.9%
6.	Epididymal Cyst	5	5.2%	7.3%
7.	Testicular Tumor	1	1.04%	1.47%
8.	Spermatocele	3	3.12%	4.4%
9.	Undescended Testis	3	3.12%	4.4%
10.	Hernia	6	6.25%	8.8%
11.	Testicular Atrophy	2	2.08%	2.9%
12.	Extra-Testicular Abscess	2	2.08%	2.9%
13.	Testicular Cyst	2	2.08%	2.9%
14.	Ectasia Of Rete Testis	4	4.16%	5.9%
15.	Hematocele	2	2.08%	2.9%
16.	Testicular Trauma	1	1.04%	1.47%
17.	Testicular Microlithiasis	1	1.04%	1.47%
18.	Scrotolith	1	1.04%	1.47%
19.	Pyocele	5	5.2%	7.3%
20.	Testicular Abscess	1	1.08%	1.47%
21.	Fournier's Gangrene	1	1.08%	1.47%

Table 6: Spectrum of Sonographic Findings in All Patients with Scrotal Pathology (N=96)

In sonographical findings hydrocele was present in 26(38.2%) cases; followed by acute inflammation in 14(20.5%) cases closely followed by varicocele.

S. No.	Extra-Testicular Pathology	No. Of Cases	Percentage
1.	Hydrocele	26	33.7%
2.	Acute Epididymitis	11	14.3%
3.	Varicocele	8	10.3%
4.	Chronic Epididymitis	5	6.5%
5.	Epididymal Cyst	5	6.5%
6.	Spermatocele	3	3.9%
7.	Hernia	6	7.8%
8.	Hematocele	2	2.6%
9.	Extra-Testicular Abscess	2	2.6%
10.	Funiculitis	2	2.6%
11.	Scrotolith	1	1.3%
12.	Pyocele	5	6.5%
13.	Fournier's Gangrene	1	1.3%

Table 7: Extra-Testicular Lesions (N=77)

There were 96 various sonographical findings in total, at final diagnosis, as some of the patients had more than one finding. Out of these, 80.2% of the findings were extra testicular and 29.1% were testicular in origin.

S. No.	Intra-Testicular Pathology	No. Of Cases	Percentage
1.	Acute Orchitis	8	28.5%
2.	Torsion	2	7.14%
3.	Testicular Tumor	1	3.57%
4.	Chronic Orchitis	3	10.7%
5.	Testicular Atrophy	2	7.14%
6.	Undescended Testis	3	10.7%
7.	Testicular Cyst	2	7.14%
8.	Ectasia Of Rete Testis	4	14.2%
9.	Testicular Microlithiasis	1	3.57%
10.	Testicular Trauma	1	3.57%
11.	Testicular Abscess	1	3.57%

Table 8: Intra-Testicular Lesions (N=28)

S. No.	Ultrasound Features	Hydrocele (N=26)	%	Hematocele (N=2)	%
I	SITE				
	Tunica Vaginalis Cavity	24	92.3%	2	100%
	Encysted In Spermatic Cord	2	7.7%	0	0%
II.	Size				
	Minimal	12	46.1%	1	50%
	Moderate	8	30.7%	1	50%
	Large	6	23%	0	0%
III.	Internal Echoes				
	Present	10	38.5%	2	100%

	Absent	16	61.5%	0	0%
IV.	Septations				
	Absent	18	69.2%	2	100%
	Present	8	30.8%	0	0%
V.	Associated Finding				
	Inflammatory Disease	12	46.1%	0	0%
	Hernia	4	15.3%	0	0%
	Torsion	1	3.8%	0	0%

Table 9: Sonographic Features of Fluid Collections in Tunica Vaginalis Sac (N=28).

Fluid collections were the commonest abnormality detected on sonography. Hydrocele was seen in 26(38.2%) cases and was the most frequent fluid collection.

Most common type of hydrocele was the one with the

fluid being confined to tunica vaginalis cavity (92.3 %). Focal anechoic collection superior to the testis and epididymis, suggestive of encysted hydrocele of the spermatic cord was noted in 2 cases (7.7%).

S. No.	Ultrasound Features	No. Of Cases (N=8)	%
1.	Maximum Diameter Of Spermatic/ Intratesticular Veins		
	2-3 Mm	2	25%
	3-4 Mm	3	37.5%
	> 4 Mm	3	37.5%
2.	Tortuosity		
	Present	6	75%
	Absent	2	25%
3.	Accentuation On		
	Valsalva	8	100%
	Erect Posture	7	87.5%
4.	Color Doppler (Cd)		
	Grade 0 : No Flow	0	0%
	Grade 1 Spotty Flow	0	0%
	Grade 2 Scattered Flow	2	25%
	Grade 3 Continuous Flow	6	75%
5.	Power Doppler (Pd)		
	Grade 0 : No Flow	0	0%
	Grade 1 Spotty Flow	0	0%
	Grade 2 Scattered Flow	2	25%
	Grade 3 Continuous Flow	6	75%

Table 10: Sonographic Features of Varicocele (N=8)

Varicocele comprised 11.8% of total number of cases and 8.3% of total pathological lesions.

The maximum vessel diameter was more than 4 mm in

3 cases (37.5%) in erect posture while tortuosity of vessels was noted in 6 cases (75%). All cases demonstrated accentuation on valsalva maneuver and on assuming erect posture.

S. NO.	Ultrasound Features	Testis (N=8)		Epididymis (N=11)		Spermatic Cord (N=2)	
		CASES	%	CASES	%	CASES	%
I.	Side						
	Unilateral	5	62.5%	7	63.7%	1	50%
	Bilateral	3	37.5%	4	36.3%	1	50%

II.	Size						
	Normal	2	25%	1	9.09%	0	0%
	Increased	6	75%	10	90.9%	2	100%
	Decreased	0	0%	0	0%	0	0%
III.	Echotexture						
	Normal	2	25%	0	0%	0	0%
	Hypoechoic	6	75%	4	36.3%	0	0%
	Hyperechoic	0	0%	5	45.4%	0	0%
	Heterogeneous	0	0%	2	18.2%	2	100%
IV.	Involvement Pattern						
	Focal	0	0%	6	54.5%	0	0%
	Diffuse	8	100%	5	45.4%	2	100%
V.	Associated Findings						
	Involvement Of Epididymis	5	62.5%	-	-	2	100%
	Involvement Of Testis	-	-	5	45.4%	2	100%
	Involvement Of Spermatic Cord	2	25%	2	18.2%	-	-
	Peritesticular Fluid	7	87.5%	9	81.8%	2	100%

Table 11: Grey Scale Features Of Acute Inflammation (N=14)

At final diagnosis, there were 8 cases of orchitis (57.1%), 11 cases of epididymitis (78.6%) and 2 cases (14.3%) of finicalities in these 14 patients, as some of the

patients had more than one of the above three pathologies in different combinations.

S. NO.	Cdfi And Pd Features	Testis (N=3)		Epididymis (N=5)	
		CASES	%	CASES	%
I.	Side				
	Unilateral	2	66.6%	4	80%
	Bilateral	1	33.3%	1	20%
II.	Size				
	Normal	2	66.6%	2	40%
	Increased	1	33.3%	3	60%
	Decreased	0	0%	0	0%
III.	Echo texture				
	Normal	0	0%	1	20%
	Hypo echoic	2	66.6%	1	20%
	Hyper echoic	0	0%	0	0%
	Heterogeneous	1	33.3%	3	60%
IV.	Calcification				
	Present	2	66.6%	2	40%
	Absent	1	33.3%	3	60%
V.	Per testicular Fluid				
	Present	1	33.3%	2	40%
	Absent	2	66.6%	3	60%

Table 12: Grey Scale Features Of Chronic Inflammation (N=6)

At final diagnosis, testes were involved in 3 cases (50%) and epididymis in 5 cases (83.33%).

epididymis was heterogeneous inechotexture (60%) followed by hypoechoic echotexture in one case (20%) and normal echotexture in one case (20%). Calcifications seen in 2 cases of each epididymitis and orchitis.

In majority of these cases (3 out of 5 cases), involved

S. NO.	Ultrasound Features	Total Cases (N=2)	
		No. Of Cases	%
I.	Size		
	Normal	0	0%
	Increased	2	100%
	Decreased	0	0%
II.	Echo texture		
	Normal	0	0%
	Hypo echoic	1	50%
	Hyper echoic	0	0%
	Heterogenous	1	50%
III.	Per testicular Fluid		
	Absent	1	50%
	Present	1	50%
IV.	Colour Doppler		
	Grade 0 : No Flow	2	100%
	Grade 1 Spotty Flow	0	0%
	Grade 2 Multiple Scattered Flow	0	0%
	Grade 3 Continuous Flow	0	0%
V.	Power Doppler		
	Grade 0 : No Flow	2	100%
	Grade 1 Spotty Flow	0	0%
	Grade 2 Multiple Scattered Flow	0	0%
	Grade 3 Continuous Flow	0	0%

Table 13: Sonographic Features of Torsion Testis (N=2)

S. No.	Ultrasound Features	Spermatocoele (N=3)		Epididymal Cyst (N=5)	
		CASES	%	CASES	%
I.	Side				
	Small < 2 Cm	0	0%	4	80%
	Medium 2-4 Cm	1	33.3%	1	20%
	Large > 4 Cm.	2	66.6%	0	0%
II.	Number				
	Single	1	33.3%	1	20%
	Multiple	2	66.6%	4	80%
III.	Location				
	Head	3	100%	5	100%
	Tail	0	0%	0	0%
	Body	0	0%	0	0%

IV.	Cyst Contents				
	Anechoic	3	100%	5	100%
	Echogenic	0	0%	0	0%
V.	Septations				
	Absent	1	33.3%	5	100%
	Present	2	66.6%	0	0%

Table 14: Sonographic Features of Epididymal Cyst And Spermatocele (N=8)

Both epididymal cysts and spermatoceles were common in the head of epididymis. The contents were echogenic in none of the cases of spermatoceles; it was same in all cases of epididymal cysts (100%). Septations were noted in two cases (66.6%) of spermatoceles and not seen in cases of epididymal cyst.

S. NO.	Sonography Feature	Omentocele (N=2)		ENTEROCELE (N=4)	
		CASES	%	CASES	%
I.	Number	2	33.3%	4	66.6%
II.	Echo pattern				
	Normal	0	0%	0	0%
	Hypo	0	0%	4	100%
	Hyper	2	100%	0	0%
III.	Cdfi (With In Mass)				
	Gr - 0	0	0%	2	50%
	Gr -1	0	0%	2	50%
	Gr -2	2	100%	0	0%
	Gr -3	0	0%	0	0%
IV.	Associated Findings				
	Hydrocele	0	0%	4	100%

Table 15: Sonographic Features In Scrotal Hernia (N=6)

Omentum was seen herniating into the inguinoscrotal region in 2 cases while bowel loops in 4 cases. Thus an incidence of scrotal hernia was noted 10%.

S. NO.	Sonographic Features	N=3	Percentage
I.	Location		
	Inguinal Canal	2	66.6%
	Abdominal	1	33.3%
II.	Size (Compared To Normal Side)		
	Normal	0	0%
	Decreased	3	100%
	Increased	0	0%
III.	Echo Pattern		
	Normal	0	0%
	Hypo echoic	3	100%

Table 16: Sonographic Features of Mal Positioned Testis (N=3)

S. NO.	Sonographic Features	No. Of Cases (N=2)	Percentage
I.	Laterality		
	Unilateral	2	100%
	Bilateral	0	0%
II.	Size Of Testis		
	Normal	0	0%
	Decreased	2	100%
III.	Echo pattern		
	Normal	0	0%
	Hypo	1	50%
	Hyper	1	50%
IV.	Infertility		
	Absent	0	0%
	Present	2	100%
V.	Cdfi		
	Gr - 0 No Flow	2	100%
	Gr - 1 Spotty Flow	0	0%
	Gr - 2 Multiple Spotty Flow	0	0%
	Gr - 3 Continuous Flow	0	0%
VI.	Pd		
	Gr - 0 No Flow	2	100%
	Gr - 1 Spotty Flow	0	0%
	Gr - 3 Multiple Spotty Flow	0	0%
	Gr - 3 Contin Uous Flow	0	0%

Table 17: Sonographic Features in Testicular Atrophy (N=2)

2 patients were diagnosed on the basis of testicular volumes to have testicular atrophy. Testicular volume on the affected side was reduced by 50% or more in all cases. Both of these patients presented with infertility.

Discussion

The present study was undertaken to evaluate the role of high resolution sonography, color doppler flow index and power doppler in the evaluation of scrotal pathology. A total of 68 patients from all age groups with signs and symptoms related to scrotal diseases have been included in this study. All the cases were properly followed up sonographically/medically/surgically /pathologically wherever indicated to arrive at a final diagnosis. There were 96 various sonographical findings in total, at final diagnosis, as some of the patients had more than one finding. Out of these, 80.2% of the findings were extra testicular and 29.1% were testicular in origin.

Age Distribution

The youngest patient in this study was 18 days old and the oldest was 66 years old. Majority of the patients were between 21-40yrs of age (51.4%) and the predominant

group in the study was 31-40yrs comprising of 19 patients (27.9%). This is probably because of the repeated minor trauma to the testes due to the strenuous activity performed by the persons in this age group and also because, both the inflammatory and neoplastic diseases of the scrotum are more common in this age group.

Clinical Features

Commonest presenting complaint was that of scrotal swelling in 48 patients (70.5%) followed by scrotal pain in 31 patients (45.6%). Unilateral scrotal swelling was the most common presentation. Other symptoms were bilateral swelling and infertility. Few patients presented with a combination of symptoms, the most common one being pain and swelling (48). Positive transillumination suggestive of fluid collection was seen in 24 patients (35.3%) while tenderness of scrotal swelling was noted in 21 patients (30.9%). In sonographical findings hydrocele was present in 26(38.2%) cases; followed by acute inflammation in 14(20.5%) cases closely followed by varicocele. Other pathologies were chronic inflammation, torsion, testicular tumors. Epididymal cysts, spermatoceles, testicular cysts, scrotal hernia, testicular atrophy, testicular trauma, ectasia of rete testes, extra

testicular abscesses, hematoceles, testicular microlithiasis, scrotoliths and undescended testis were encountered occasionally.

Fluid Collections

Fluid collections were the commonest abnormality detected on sonography. Hydrocele was seen in 26(38.2%) cases and was the most frequent fluid collection. These were subsequently proved on aspiration and cytology. Thus, accuracy of 100% was achieved in diagnosing hydrocele on sonography. Most common type of hydrocele was the one with the fluid being confined to tunica vaginalis cavity (92.3 %). Focal anechoic collection superior to the testis and epididymis, suggestive of encysted hydrocele of the spermatic cord was noted in 2 cases (7.7%). Hydrocele presented as anechoic collection surrounding the testis. In 12 cases (46.1%) the fluid was minimal while it was large only in 6 cases (23%). The fluid was anechoic in 16 cases (61.5 %) and without any septa in 18 cases (69.2%). Associated abnormality was noted only in 17 cases (65.4%) of hydroceles, and of these, 12 cases (70.5%) occurred in inflammatory diseases of scrotum. Two cases of hematoceles were diagnosed, which showed fluid with internal echoes. Both cases of hematoceles occurred following direct scrotal trauma.

Acute Inflammation

In the present study 14(20.5%) patients with acute inflammation of scrotal structures were noted. Out of these, most patients were in age group 21 to 40 years, i.e. young sexually active males. At final diagnosis, there were 8 cases of orchitis (57.1%), 11 cases of epididymitis (78.6%) and 2 cases (14.3%) of funiculitis in these 14 patients, as some of the patients had more than one of the above three pathologies in different combinations. 5 of the patients had simultaneous involvement of testis and epididymis and were diagnosed as case of epididymo-orchitis. 6 cases of orchitis showed enlargement and decreased echogenicity of the involved testis. However, similar sonographic features were also noted in torsion of the testis on Grey scale sonography and thus, Grey scale sonography could not reliably differentiate acute orchitis from testicular torsion. Epididymis was the most common anatomical structure involved in acute inflammation (11 out of 14 cases (78.6%). Grey scale sonography demonstrated abnormality in all these cases (100% accuracy). In 10 out of 11 cases of epididymitis (91%), epididymis was enlarged in size. It showed focal change in echo texture in 6 cases (54.5%) and diffuse involvement in 5 cases (45.5%). In general, altered echo texture of the involved epididymis was more significant a criterion than

variation in size for the diagnosis of acute inflammation. Enlargement of epididymis (78%) with altered echo texture (100%) was the commonest pattern of involvement. Doppler sonography showed increased blood flow in the affected epididymes and testes (100% accuracy). There was hyperemia in the affected structure. Thus, Doppler sonography proved to be better than Grey scale sonography in diagnosis of acute inflammatory conditions.

Chronic Inflammation

6 patients with chronic inflammation of scrotal structures were included in the study. Majority of the patients were in the age group of 21 to 40 years. At final diagnosis, testes were involved in 3 cases (50%) and epididymis in 5 cases (83.33%), of which 1 case of orchitis and 4 cases of epididymitis were proved to be tuberculous in nature. Out of the 5 cases of epididymitis, Grey scale and Doppler sonography could diagnose abnormality in four cases and failed to detect chronic inflammatory changes in epididymis in one case of non-tuberculous chronic epididymo-orchitis. In majority of these cases (3 out of 5 cases), involved epididymis was heterogeneous in echo texture (60%) followed by hypo echoic echo texture in one case (20%) and normal echo texture in one case (20%). Tuberculous epididymitis demonstrated heterogeneous echo texture of the involved epididymis along with interspersed hypo echoic nodules.

Varicoceles

In this series eight cases of varicoceles were included. All of these cases were correctly diagnosed. They comprised 11.8% of total number of cases and 8.3% of total pathological lesions.

On spectral analysis these vessels demonstrated venous flow pattern with a characteristic venous waveform which showed flow reversal and persistent increase in blood flow on performing Valsalva. Grade III reflux on Valsalva maneuver was noted in 4 cases (50%). All cases demonstrated some amount of reflux. Thus detecting reflux was found to be sensitive criteria to diagnose varicoceles.

Scrotal Hernias

6 cases of scrotal hernias were noted in the study. Omentum was seen herniating into the inguinoscrotal region in 2 cases while bowel loops in 4 cases. Thus an incidence of 10% (10/60) was noted.

Epididymal cysts and spermatoceles: 3 cases of spermatoceles and 5 cases of epididymal cysts were identified and confirmed on aspiration.

Malpositioned Testes

Scrotoliths: Scrotoliths is also known as scrotal calculi or scrotal pearls. Scrotoliths were seen in one case in this study. On grey scale sonography, they were seen as multiple echogenic foci within the scrotal wall with posterior acoustic shadowing. They may result from inflammation of tunica vaginalis or torsion of appendix testis or epididymis.

Tubular Ectasia of Rete Testis: Ectasia of Rete Testis Was Noted In 4 Patients. It Was Unilateral In All.

Testicular microlithiasis: In our study testicular microlithiasis was encountered in one case with an incidence of 1.4% (1/68). They were observed as multiple small (1-2mm) diffusely scattered hyper echoic foci within testicular parenchyma without acoustic shadowing. The exact prevalence of testicular tumors associated with testicular micro calcifications is unknown. Currently, there is no evidence that testicular micro calcifications is either a premalignant condition or a causative agent in testicular neoplasia; however, in view of its reported associations with testicular neoplasia, annual us follow-up is recommended for at least several years after the diagnosis.

Testicular Atrophy: 2 patients were diagnosed on the basis of testicular volumes to have testicular atrophy. Testicular volume on the affected side was reduced by 50% or more in all cases. Both of these patients presented with infertility. One patient had gynecomastia with poor sexual development suggesting hormonal deficiency.

Summary & Conclusions

This Study Was Undertaken To Evaluate The Multifold Data Obtained By High-Resolution Grey Scale Sonography, Cdfi And Pd In The Evaluation Of Scrotal Pathology. A Total Of 68 Patients From All Age Groups With Signs And Symptoms Related To Scrotal Diseases Have Been Included In This Study.

The scrotal pathologies were seen to be commonest in young males. The chief complaint was scrotal swelling followed by scrotal pain. All the 68 patients were properly followed up sonographically/medically/surgically/pathologically as per indication, to arrive at a final diagnosis. There were 96 pathological lesions in total at the final diagnosis, as some of the patients had more than one lesion. Out of these, majority of the lesions were extra testicular in origin (80.2%). The final diagnosis was extra-testicular fluid collection in 28 cases, acute inflammation in 14 cases, chronic inflammation in 6 cases, testicular tumor in 1 case, torsion of testis in 2 cases, testicular and epididymal cysts in 7

cases, varicocele in 8 cases. The rest of the lesions included malpositioned testis, testicular trauma, testicular atrophy, scrotal hernia, testicular microlithiasis, scrotoliths and scrotal wall thickening. Extra testicular fluid collection was the most common scrotal pathology noted. Of this, idiopathic hydrocele was the commonest abnormality observed. It featured mostly as an anechoic collection in the tunica vaginalis cavity. All cases of hydrocele were correctly diagnosed on Grey Scale sonogrExtra testicular fluid collection following trauma and infection depicted septations. As a result, Grey scale sonography could not reliably distinguish between hematocele and extra testicular abscess. In 14 patients with acute inflammation, at the final diagnosis there were 8 cases of orchitis (57.1%), 11 cases of epididymitis (78.6%) and 2 cases (14.3%) of funiculitis, as some of the patients had more than one of the above three pathologies in different combinations. Doppler sonography showed increased blood flow in the affected epididymes and testes and thus showed 100% accuracy in diagnosis of acute inflammation. The commonest pattern was enlarged epididymis with altered echo texture. PD proved to be more sensitive than Color Doppler in detecting inflammatory pathology. PSV more than 15 cm/sec. and RI less than 0.5 were complementary to the diagnosis of acute inflammation. Grey scale ultrasound could not well differentiate acute torsion from acute orchitis, as both the conditions showed hypo echoic testis. The most important role of CDFI and PD was noted to differentiate equivocal Grey scale sonographic features of testicular torsion and acute inflammations. With CDFI, symptomatic testes showed absence of vascular signals in all cases of testicular torsion (100% sensitivity).

Chronic Inflammation

Including tuberculous epididymo-orchitis was observed in 6 patients. In these cases epididymal involvement was observed to be far more common than involvement of testis. Tail of the epididymis was most frequently involved and mostly showed heterogenous echo texture. At final diagnosis, testes were involved in three cases (50%) and epididymes in 5 cases (83.33%), of which 1 case of orchitis and 4 cases of epididymitis were proved to be tuberculous in nature. Out of the 5 cases of epididymitis, Grey Scale and CDUS could diagnose abnormality in 4 cases and failed to detect chronic inflammatory changes in epididymis in one case of non-tuberculous chronic epididymo-orchitis and one case of tuberculous epididymitis. The epididymal lesions were hyper vascular on CDFI and PD in nearly 40% of cases. Eight cases of varicocele were seen. However, Grey scale sonography could diagnose only 6 cases (75%

sensitivity). It failed to diagnose 2 cases of sub clinical varicocele in infertile males, in which the venous diameter of pampiniform plexus was 2-3mm. However, Color and Pulse Doppler accurately diagnosed all cases of varicocele (100% sensitivity).

Undescended Testis

Undescended testis was noted in 3 cases. In all cases, condition was unilateral and testis was located in the inguinal canal and right iliac fossa. In all cases undescended testis was smaller and hypoechoic. In total there were 8 cases of cysts in the head of epididymis, subsequently proved to be 5 cases of epididymal cyst and 3 cases of spermatocele at final diagnosis. Ultrasound showed specificity of 75% and sensitivity of 100% for diagnosis of epididymal cyst and sensitivity of 66.6% in diagnosis of spermatocele. Two cases of testicular cysts were also seen. Of the 6 cases of scrotal hernia, omentocele was seen in 2 case and enterocele in 4 cases. One case of testicular microlithiasis, one case of scrotoliths and 4 cases of tubular estasia of rete testis were seen. In our study, most of the observations and results matched the earlier studies. However, there were few results which did not match the literature. This may be due to very small sample size of any particular scrotal pathology in our study, which is primarily due to the fact that the aim of the study was to evaluate sonographic features in 70 cases in total, with any type of scrotal pathology in general, and not anyone pathology in particular. To summarize, an excellent correlation was seen in the diagnosis of scrotal lesions between sonography (grey scale, cdfi and pd) and histopathology/surgery/ treatment response. Sonography (grey scale and doppler together) was found to be 93.33% sensitive in the diagnosis of scrotal pathology. The present study concludes that high resolution sonography, along with color doppler flow imaging and power doppler should be used as first line imaging modality in evaluation of scrotal pathologies. Color doppler flow imaging and power doppler and useful information and complement grey scale sonography in reaching a correct diagnosis.

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