

Original article:

Role of high frequency ultrasound and color Doppler examination in scrotal lesions

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Abstract:

Introduction: The purpose of present study was to establish the role of high frequency ultrasound and color Doppler examination in the diagnosis of various scrotal lesions.

Materials and methods:50 cases with history and clinical manifestations of any scrotal pathologies who presented to OPD & IPD of MMIMSR,Maullana,Ambala in the departments of general surgery, paediatrics and medicine were enrolled for study for period of one year from January 2011 to December 2011.Patients having past history of scrotal surgery were excluded from the study.Scrotal sonography was performed by using a handheld 8.2-11 MHz linear array transducer on LOGIQ 500 (GE) pro ultrasound machine and HD 6(PHILIPS).

Results: In our study, different pathologies of scrotum were included out of which inflammatory lesion (42%) accounts for maximum no of cases followed by hydrocele (30%),epididymal cysts(22%),torsion(8%),tumors and hydrocele(6%) each,varicocele (4%)and funiculitis(2%).Most of the patients were aged between 31-40 yrs with chief complaints of scrotal swelling and pain(46%) followed by swelling scrotum(22%).Acute epididymoorchitis(18 %) alone was the most common inflammatory lesion.

Conclusion: USG was found to be a safe ,simple, rapidly performed modality with a high accuracy in diagnosing scrotal pathologies¹⁰. It provides meaningful pre-operative diagnosis.Hence the present study, recommends the use of USG (especially with high frequency probes for better resolution) for the evaluation of scrotal pathologies.

Key words:USG, scrotum, pathology,imaging

Introduction

Disease states involving the testes and epididymis , may have a variety of etiologies including developmental , genetic , endocrinal, inflammatory, infective ,obstructive ,traumatic or neoplastic.

The diagnosis of intrascrotal pathological conditions traditionally has been based upon the careful history and clinical examination, but frequently these were not specific.¹

Testicular scintigraphy allowed precise evaluation of testicular perfusion and thus redefined the indications for surgery^{2,3}.Radionucleide testicular scanning has been shown to be helpful to distinguish ischaemic from non-ischaemic testis.⁴

Scrotal imaging took off when scintigraphy began to establish itself.It was used to evaluate patients with acute scrotum in which clinical evaluation of the patient was very difficult because of tender and swollen scrotum.

The use of high resolution real time ultrasound system permitted improved examination of scrotum and could detect clinically inapparent lesion as small as 1 cm. It could differentiate and characterize testicular and extratesticular pathologies.

The Doppler allows simultaneous display of real time gray scale images and color encode flow data from vessel within the entire field of view and offers a great potential for rapid evaluation of perfusion. Colour Doppler can also be used confidently and reliably to identify the blood flow in testicular blood vessels.⁵

At present juncture ,High resolution ultrasound scan , judiciously supplemented with color Doppler is the modality of choice in investigating scrotal lesions.

The present study was done to establish the role of high frequency ultrasound and color Doppler examination in the diagnosis of various scrotal lesions.

Sonographic anatomy of scrotum and testis

Normal testis are homogenous. Any inhomogenous finding on USG is considered abnormal until proven otherwise. Structures to be demonstrated are: the mediastinum of the testis, rete testis, head of the epididymis and testis. Mediastinum of the testis is often seen as an echogenic linear band with longitudinal imaging of the testicle. The rete testis is visualized as hypoechoic or septated cystic area near the head of epididymis.

The normal arterial Doppler waveform will have a low impedance for the testicular artery and a large amount of end diastolic flow within the artery. High resistance shows a high systolic and low diastolic flow.

Aims and objectives

1)To assess the role of High frequency real time ultrasonography in accurately distinguishing

between testicular and extra testicular scrotal lesions.

2)To assess the role of color Doppler sonography in evaluation of scrotal lesions.

3)To further characterize lesions detected on sonography including color Doppler into benign and malignant.

4)To compare the provisional diagnosis made on sonography with FNAC/ Biopsy/ Histopathologic findings wherever clinical follow up is possible.

Materials and methods

The present prospective study was carried out in patients attending the out patient department and indoor patients in the department of general surgery, paediatrics and general medicine spread over a period of one year from January 2011 to December 2011. The patients who were suspected to have scrotal pathologies were subjected to gray scale ultrasound and color Doppler sonography in the department of Radiodiagnosis, Maharishi Markandeshwar Institute of Medical Sciences And Research, Mullana, Ambala.

Selection of cases

A total of 50 patients presenting with scrotal lesions in the out patient department or admitted in the wards were included in the present study.

Inclusion criteria

The patients who have complaints related to scrotum and its contents were included in the present study.

Exclusion criteria

Patients with a past history of surgery in the scrotal region were excluded from this study. A complete history of patients was taken and detailed clinical examination was performed in all cases. Relevant laboratory/ radiological investigations were carried out. The findings of general physical examination and various investigations were duly recorded on the attached proforma.

Procedures

Instrumentation, Patient positioning and Scrotal Survey Techniques

Scrotal sonography examination was performed using a handheld 8.2-11 MHz linear array transducer on LOGIQ 500 (GE) pro ultrasound machine. Targeted real time sonography was performed to examine scrotum and its contents.

Technique of scrotal sonography:

After obtaining written informed consent, scanning was routinely performed in supine position, after elevating scrotum using a towel draped over thighs,

and penis was placed on the patients abdomen and covered with a towel. Both hemiscrotum were examined in transverse, saggital and oblique planes. Additional scans of spermatic cord in the region of scrotal neck and inguinal canal were also obtained in special circumstances such as undescended testis, encysted hydrocele of cord and varicocele. Scanning was also done with the patient in upright position and patient was asked to perform Valsalva manoeuvre, if varicocele was suspected.

During ultrasound scan, on a routine basis following parameters were evaluated:

- 1) Testicular dimension and size
- 2) Testicular contour
 - Normal
 - Diffuse enlargement
 - Focal enlargement
- 3) Testicular echogenecity
 - Normal
 - Focal abnormality
 - Hypoechoic
 - Hyperechoic
 - Heterogenous
 - Areas of calcification - Microlithiasis
 - Coarse calcification
 - Diffuse abnormality
 - Hypoechoic
 - Hyperechoic
 - Heterogenous
- 4) Epididymis
 - Enlargement
 - Diffuse
 - Focal --- Head,body,tail
 - Echogenicity
 - Focal abnormality ---Hypoechoic
 - or ---Hyperechoic
 - Diffuse ---Heterogenous
- 5) Scrotal wall thickness
- 6) Presence or absence of any collection in scrotal sac
- 7) Presence or absence of any dilated veins
- 8) Doppler assessment of Testes, Epididymis and Vascular structures
- 9) Presence of any anomalies in scrotum.

Depending upon B mode and color Doppler ultrasonographic findings, provisional diagnosis was made on clinical history and physical examination and compared with FNAC/ Biopsy/ Histopathologic findings to make a final diagnosis.

Observations

Table -1 Distribution of cases according to various age groups

S. no.	Age group (years)	No. of cases	Percentage (%)
1	0 – 20	9	18 %
2	21 - 30	9	18 %
3	31 - 40	12	24 %
4	41 - 50	6	12 %
6	51 - 60	10	20%
7	=> 70	4	8 %
Total		50	100 %

Table-1 shows the age distributions of cases, which varied from 8 years to 75 years. Highest number of cases presented were in the age group of 31

to 40 years (12 cases – 24%), followed by 51 to 60 years (10 cases – 20%).

Only 4 patients(8%) included in this study were more than 60 years of age group.

TABLE - 2 CLINICAL PRESENTATION AND FREQUENCY OF SYMPTOM

SYMPTOMS	NO OF CASES (50)
1. Pain and Scrotal Swelling	23(46%)
2. Scrotal Swelling	11(22%)
3. Pain in scrotum	9(18%)
Acute onset	5(10%)
Chronic onset	4(8%)
5. Infertility	2(4%)
6. Trauma	2(4%)
7. Dysuria	3(6%)
8. Discharging wound on scrotal skin	2(4%)

Various clinical presentations as depicted in table-2. Most of the cases Clinically presented with combination of multiple symptoms.Pain and scrotal swelling were the most common presenting symptoms.

TABLE - 3 SCROTAL AND TESTICULAR DISEASES:

SNO	PATHOLOGY	NO OF CASES	PERCENTAGE
1	INFLAMMATORY DISEASE	21	42
2	EPIDIDYMAL CYST	11	22
3	TUMORS	3	6
4	HYDROCELE	15	30
5	HEMATOCELE	3	6
6	VARICOCELE	2	4
7	TORSION	4	8
8	FUNICULITIS	1	2

Table shows final diagnosis on the basis of USG/FNAC/HPE/FU.Study of bilateral testis making 100 cases.

TABLE - 4 HIGH FREQUENCY USG FINDINGS

FINDINGS	ECHOGENECITY			
	RIGHT		LEFT	
	NO OF CASES	PERCENTAGE (%)	NO OF CASES	PERCENTAGE (%)
HETEROGENOUS	5	10	6	12
HYPOECHOIC	10	20	12	24
ISOECHOIC	1	2	2	4
NORMAL	34	68	30	60
TOTAL	50	100	50	100

High frequency USG was done in total 100 testis in 50 patients.Normal echopattern of testis was seen in 68% in right and 60% in left testis.Altered echotexture was seen in total 60% patients.

TABLE 5 COLOR DOPPLER FINDINGS OF TESTIS:

PATTERN	VASCULARITY			
	RIGHT		LEFT	
	NO	PERCENTAGE	NO	PERCENTAGE
DECREASED	1	2	6	12
a)diffuse				
b)focal	3	6	8	16
INCREASED	2	4	2	4
a)diffuse				
b)local	8	16	3	6
NORMAL	36	72	31	62
TOTAL	50	100	50	100

Color flow pattern was altered in 33 testis.

TABLE NO 6: HIGH FREQUENCY USG FINDINGS IN EPIDIDYMIS

FINDINGS	ECHOGENECITY					
	RIGHT		LEFT		BILATERAL	
	NO	PERCENTAGE	NO	%	NO	%
HETEROGENOUS	6	12	5	10	4	8
HYPOECHOIC	3	6	1	2	-	-
CYSTIC(ANECHOIC)	5	10	4	8	4	8
COMPLEX CYSTIC (ABSCESS)	-	-	2	4	--	-
NORMAL	36	72	38	76	42	84
TOTAL	50	100	50	100	50	100

Table shows distribution of patients according to echotexture in 50 patients.

TABLE 7 COLOR DOPPLER FINDINGS OF EPIDIDYMIS

PATTERN	VASCULARITY			
	RIGHT		LEFT	
	NO	PERCENTAGE	NO	PERCENTAGE
DIFFUSE INCREASE IN VASCULARITY	12	24	8	16
DIFFUSE DECREASE	1	2	2	4
FOCAL AVASCULAR LESION	-	-	2	4

NORMAL	37	74	38	76
TOTAL	50	100	50	100

Table no 7 shows vascular pattern on color Doppler in 50 cases in epididymis.

TABLE NO 8 EXTRA-TESTICULAR AND ASSOCIATED PATHOLOGIES DETECTED ON HIGH FREQUENCY USG

SNO	PATHOLOGY	NO OF CASES	PERCENTAGE
1	HYDROCELE	15	57.6
2	PYOCELE	3	11.5
3	HEMATOCELE	3	11.5
4	VARICOCELE	2	7.6
5	BPH	2	7.6
6	PSOAS ABSCESS	1	3.8
7	TOTAL	26	100

Table shows extra-testicular and associated pathologies detected on high frequency USG.

TABLE NO 9 COMPARISON OF CLINICAL,USG AND FINAL DIAGNOSIS

CLINICAL DIAGNOSIS	NO	USG N COLOR DOPPLER	NO	FNAC/ HPE	MM	FINAL DIAGNOSIS
ORCHITIS	1	ORCHITIS	2	-	M	ORCHITIS
EPIDIDYMO ORCHITIS	18	EPIDIDYMO ORCHITIS	19	FNA	M	EPIDIDYMO ORCHITIS
TORSION	5	TORSION	4	-	S	TORSION
TESTICULAR MASS	4	TESTICULAR MASS	3	FNA/ HPE	M	SEMINOMA
VARICOCELE	2	VARICOCELE	2	-	S	VARICOCELE
HYDROCELE	11	HYDROCELE	15	-	S	HYDROCELE

Table shows comparison of clinical, USG and final diagnosis.

Results

In our study, different pathologies of scrotum were included out of which inflammatory lesion (42%) accounts for maximum no of cases followed by hydrocele (30%),epididymal cysts(22%), torsion(8%), tumors and hydrocele(6%) each, varicocele (4%)and funiculitis(2%).Most of the patients were aged between 31-40 yrs with chief complaints of scrotal swelling and pain(46%)

followed by swelling scrotum(22%).Acute epididymoorchitis(18 %) alone was the most common inflammatory lesion. Cases of undescended testis were correctly localized. All cases of testicular torsion and trauma were correctly diagnosed by USG where clinical examination was not possible due to severe tenderness.

Testicular tumour was found in 3(6%) cases and were correctly diagnosed on USG, while it could not be designated specific type though diagnosed as malignancy on sonography.

Scrotal complaints are a common reason for urologic consultation. Although history and physical examination are important, the findings are often equivocal and imaging is required to establish the diagnosis. The introduction of high resolution USG has provided a rapid ,non ionizing and non invasive means of diagnosing scrotal pathology(Krone et al,1985)¹.This study was undertaken to evaluate the role of USG and color Doppler in diagnosis of scrotal pathologies.In our study ,the most common presenting feature was pain and scrotal swelling (46%) followed by scrotal swelling(22%).In our study ,inflammatory lesions accounts for maximum no of cases (42%), which correlated with the previous studies done by Showker et al, 1976, Gottesman et al,1977.^{6,7}The USG findings were evaluated in view of clinical findings and then these USG findings were correlated with the final diagnosis.The final diagnosis was confirmed by surgery and FNAC and follow up scan in the rest of patients after conservative treatment.

Discussion

Inflammatory lesions on USG were seen as enlarged epididymis with decreased echogenicity and coarse pattern.

Hydrocele was seen in 15 cases (30 %).Out of which 13 cases were unilateral and 2 cases were bilateral. comparable to

There were 3 cases (6%) of testicular neoplasm in our study.Among benign lesions hydrocele(30%) was most common lesion followed by epididymal cyst(22%).Testicular malignancy was diagnosed by b- USG in 3 cases. All of them were found to be seminomas.On USG enlargement was irregular in 2 and regular in 3rd patient.On high frequency USG

heterogenous echotexture was seen in 1(33%) cases and hypoechoic in 2 (66.6%) cases of tumour.Color Doppler showed focal increase in v: 362 in all cases of tumours.

The age ranges from 8 to 75 yrs .

There were 4 cases of scrotal trauma (8%) which were correctly diagnosed by sonography. Prompt diagnosis of a ruptured testis is crucial because of the direct relationship between early surgical intervention and testicular salvageability. Approximately 90% of ruptured testicles can be saved if surgery is performed within first 72 hours, whereas only 45% may be salvaged after 72 hours. Clinical diagnosis is often impossible because of marked scrotal pain and swelling, and sonography can be valuable in the assessment of tunica albuginea integrity and the extent of testicular haematoma⁸.There were 4 of cases of testicular torsion (8%)which were also correctly diagnosed in present study. Cases showed heterogenous echotexture on grey scale imaging.3 cases of torsion showed absence of blood flow on color Doppler imaging and one case showed reduced vascularity.Similar finding was seen by Vijayaraghavan SB,2006⁹.

In present study ,60 pathologies were found in 100 testis (50 patients).Sonographic diagnosis of inflammatory scrotal pathology was made in 42% patients with 34% having pyogenic pathology.Remaing 8% patients had tubercular pathology ,that was confirmed by cytology.

22% had epididymal cyst , out of which 9 had unilateral and 2 had bilateral cyst.

Hydrocele was found in 30% cases ,out of which 26% had unilateral and 4% had bilateral hydrocele. 2 cases presenting with infertility had varicocele on color Doppler , one with unilateral and one with bilateral varicocele.

One case had funiculitis that was detected on high frequency USG.

Conclusion

USG was found to be a safe ,simple, rapidly performed modality with a high accuracy in diagnosing scrotal pathologies¹⁰. It provides

meaningful pre-operative diagnosis.Hence the present study, recommends the use of USG (especially with high frequency probes for better resolution) for the evaluation of scrotal pathologies.

References

- 1) Krone KD, Carroll BA, Scrotal ultrasound. Radiol Clin North Am.1985;23:121-39.
- 2) Nadal NS, Gitter MH, Hahn LC.Preoperative diagnosis of testicular torsion.Urology 1973;1:478-9
- 3) Hitch DC, Gilday DL, Shandling B and Savage JP.A new approach to the diagnosis of testicular torsion .J Paediatr Surg 1976;11:573-41
- 4) Dewire DM, Begun FP ,Lawson FP, Fitzgerald S and Wolley ND.Color Doppler ultrasonography in the evaluation of acute scrotum.J Urol 1992; 147:89-91
- 5) Merrit CRD.Doppler color flow imaging .Journal Clinical Ultrasound 1987;15:591-97
- 6) Shawker TH.B-mode ultrasonic evaluation of scrotal swellings.Radiology.1976;118(2):417-9.
- 7) Gottesman JE,Sample WF,Skinner DG,Ehrlich RM.Diagnostic ultrasound evaluation in the evaluation of scrotal masses.J Urol.1977;118(4):601-3.
- 8) Hederstrom E, Forsberg L,Kullendroff CM.Ultrasonography of the undescended testis. Acta Radiol Diagn(Stockh).1985;26(4):453-6
- 9) Vijayaraghavan SB.Sonographic differential diagnosis of acute scrotum ;real-time whirlpool sign,a key sign of torsion. J Ultrasound Med.2006;25(5):563-74.
- 10) Agarwal MB , Ramteke HB, Wagh DD.Study and Management of Undescended Testes. Int J of Biomed& Adv Res.2013;4:11.