

Role of ultrasound and colour doppler imaging in the diagnosis of scrotal disorder

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Abstract

Background: Scrotal disorders can be divided into three groups which are extra-testicular lesion, intra-testicular lesion and traumatic lesions. Scrotal ultrasound has proven to be accurate in the evaluation of many scrotal diseases. Its clinical application is on the increase owing to recent technical advances in high resolution real-time and color Doppler imaging.

Objective: To evaluate the sonographic appearances and role of colour Doppler imaging in diagnosis of scrotal disorders.

Materials and methods: The present prospective observational study was done among 300 patients referred to the department of Radio-diagnosis, Indira Gandhi Government medical college, Nagpur with acute and/or chronic scrotal pain and /or scrotal swelling from various clinical departments during September 2017 to July 19. Patients with primary and secondary infertility and varicocele and degloving injury resulting into scrotal skin avulsion were excluded. Patient details, detailed September 2018. Clinical history was obtained along with thorough physical examination before subjecting the patients for ultrasound examination. The Grey scale & color Doppler ultrasound routinely performed in all these patients.

Results: Out of 300 patients, highest number of cases presented were in the age group of 31 to 40 years (23.67%). Commonest clinical presentation was combination of symptoms like, pain and scrotal swelling (34.67%), only swelling (23.67%). Inflammatory pathology was detected in 96 (32%) cases followed by hydrocele which was noted in 87 (29%) cases, undescended testis was noted in 25 (8.33%) cases, inguinal hernia was noted in 32 (10.67%) cases, epididymal cysts were noted in 20 (6.67%) cases, scrotal neoplastic lesions were noted in 7 (2.3%) cases. Torsion of the testis was detected in 1 (0.33%) cases, varicocele was detected in 11 (3.67%) cases. Few of the pathologies were overlapping like Orchitis with Epididymal cyst. Ultrasound demonstrated scrotal disease in 93%. Scrotal disease was most prevalent in the 20-40 age group constituting 46% of the total cases. The most common presenting complaint was scrotal swelling accounting for 68%. Epididymo-orchitis was the most common finding at sonography, seen in 63% of cases followed by Hydrocele.

Conclusion: Ultrasound plays a vital role in evaluation of scrotal disease and is one stop shop investigation for scrotal disorders.

Keywords: ultrasound, colour doppler, scrotal disorders

Introduction

The scrotum is a superficial structure separated by a midline septum, with each half of the scrotum containing testis, the epididymis and the lower part of the spermatic cord. Normal testes are paired organs with a symmetrical fine homogenous echotexture; each testis has a volume of 12–20 cc. It is usually difficult to decide whether a palpable scrotal mass is arising from the testes itself or from the extra testicular elements. In addition, the normal examination may overlook significant pathology and physical signs elicited may be improperly interpreted [1]. Acute scrotum is a medical emergency defined as scrotal pain, swelling, and redness of acute onset [2, 3]. The differential diagnosis includes torsion, infection, trauma, tumor, and other rarer causes. Scrotal abnormalities can be divided into two groups, which are extra-testicular and intra-testicular lesion. Causes of scrotal pain include inflammation (Orchitis, epididymitis, Epididymo-orchitis, funiculitis, abscess), testicular torsion, testicular trauma, and testicular cancer [4, 5]. Sonography plays a vital role in the evaluation of testes obscured from palpation by large hydrocele and accurately separates intra testicular from extra testicular masses, even

when the location is equivocal on physical examination [6]. Sonography is simple to perform, rapid, noninvasive relatively inexpensive, easily reproducible, widely available investigation and does not involve irradiation of gonads. The safest imaging modality to diagnose scrotal abnormalities is ultrasound (USG). Testicular ultrasound is a useful and readily available noninvasive tool in both adult and pediatric patient. It acts as a good screening and diagnostic method and helps transcribe further confirmation or exclude the clinical diagnosis. Scrotal ultrasonography has different applications, varying from acute testicular pain to chronic and asymptomatic diseases. Doppler ultrasound is a noninvasive medical imaging technique which is highly sensitive in the detection of scrotal abnormalities [7]. Ultrasound deservedly became the first choice to detect scrotal abnormalities especially emergency cases because it is easy, simple, rapid, relatively inexpensive and widely available [8]. Scrotal ultrasound (USG) shows detailed anatomy of scrotum without the associated risk of any ionizing radiation, with relatively low cost, easy portability without the need for sedation. Thus, Ultrasound is an ideal imaging modality for the evaluation of scrotum in pediatric

patients. [9, 10] Scrotal ultrasound can differentiate between solid and cystic masses and localize the mass as either testicular or Para testicular [11] The present study was aimed to know role of ultrasound and color Doppler imaging in the diagnosis of scrotal disorders.

Aims and objectives

To study role of ultrasound and color Doppler imaging in the diagnosis of scrotal disorders and to evaluate the sonographic appearances of spectrum of scrotal disorders.

Materials and Methods

It was prospective study conducted at Government Medical College & Hospital. We observed total 300 patients referred to the department of Radiodiagnosis for scrotal ultrasonography and Doppler study by the department of Surgery.

Prior to ultrasound examination, patient details, detailed clinical history was obtained along with thorough physical examination. Subsequently these cases were followed up and correlated with histopathology report, fine needle aspiration cytology results, surgical findings, response to treatment. Follow up scans were done in cases wherever applicable. Abdominal ultrasound scan was done in conjunction with scrotal scans in cases of undescended testis to look for ectopic testis, in tubercular Epididymo orchitis cases to look for abdominal tuberculosis and metastatic nodes in cases of malignancy.

Approval of ethical committee was taken and informed patient consent of all the patients was taken prior to collecting the data.

Equipment used was high-resolution real time gray scale ultrasonography and Doppler study of scrotum was carried out using 7.5 to 10 MHz linear transducer, abdominal ultrasonography in required cases was done using curvilinear probe of 2–5 Mhz transducer of PHILIPS HD 11XE ultrasound machine.

Data collected in the study was analyzed by SPSS software for windows version 21. The categorical data was expressed as rates, ratios and proportions and comparison was done using chi-square test or Fisher's exact test. A probability value (p value) of less than or equal to 0.05 at 95% confidence interval was considered as statistically significant.

Results

In the present study out of 300, maximum i.e. 71 (23.67%) patients were ranged in age from 31 to 40 years. Pain with scrotal swelling was seen in 104 (34.67%) while unilateral and bilateral scrotal swelling seen in 53 (17.67%) and 18 (6.33%) study subjects respectively. It was observed that majority of cases had inflammatory lesion (32%) followed by hydrocele (29%), hernia (10.67%), undescended testis (8.33%) and scrotal tumors (2.33%). In majority of cases left side involved (36.67%) followed by right side (32.54%) while 89 cases (30.80%) bilateral side involved. (Table no.01)

Out 87 cases with hydrocele, secondary hydrocele was present among 54 (64.29%) cases followed by primary hydrocele. (20.24%). Among 96 cases inflammatory scrotal pathology acute epididymo orchitis was present among 29 (30.21%) cases followed by acute epididymitis 24 (25%) and acute orchitis in 16 (16.67%) study subjects. (Table no.02)

With color doppler appearance of inflammatory scrotal pathology we found that there were 29 cases of acute epididymo orchitis, 19 cases with diffuse increase in vascularity. Among 7 cases of chronic epididymo- orchitis, 6 cases showed increase in vascularity.

Out of 32 cases of inguino-scrotal hernia, 23 cases shows omentocele, while majority were on right side (17), 04 on left side and 02 were bilateral. There were 09 cases of enterocele with 06 on right and 03 were on left side. (Table no.03)

Among 107 cases of non-neoplastic cystic swellings of scrotum 87 cases were of hydrocele (81.30%) followed by 20 cases of epididymal cyst (18.69%) (Table no. 04). Neoplastic scrotal swellings were seen in 07 cases. Out of 7 cases, 4 cases were of seminoma (57.14%) followed by yolk sac tumor (42.86%). (Table no.04)

Discussion

The clinical presentation is nonspecific and clinical examination alone is not sufficient for diagnosis and management. Superficial location of the scrotal contents makes them ideal for sonographic examination. The development of high frequency electronic linear probes; real time sonography with colour Doppler has enhanced the diagnostic accuracy of scrotal sonographic examinations. Scrotal ultrasound has reached a level of maturity that allows the technique to be the first and only imaging examination necessary to evaluate the scrotal contents.

In our study highest number of cases presented were in the age group of 31 to 40 years (23.67%), followed by 41 to 50 years (15.33%). Similar observations were reported by Thinyu *et al* [12], Syed Amjad Ali Rizvi *et al* [13].

Acute epididymo orchitis was present among 29 (30.21%) cases followed by acute epididymitis 24 (25%) and acute orchitis in 16 (16.67%) study subjects. Similar findings were observed in S Thinyu *et al* [12] in which 52 (47.27%) out of 110 cases had inflammatory lesion. These findings comparable to the finding of Horstman *et al* [14], Donald P Orr *et al* [15], Farriol *et al* [16].

We found 87 cases (29%) of hydroceles out of which secondary hydrocele was commonest (54 cases; 62.1%), followed by 17 cases (19.5%) of primary hydroceles, followed by 11 cases (12.6%) of congenital hydrocele, followed by 03 cases (3.4%) of funicular hydrocele, followed by 02 cases (2.3%) of encysted hydrocele. Dohrethy FJ (1991) [17] in their study of 70 patients with hydrocele noted in 62% of cases. According to Sarah S Tumeh (1991) [18] the presence of septae or debris is highly suggestive of a pyocele. Shanthi Krishnaswami *et al* [19] in a study to find role of nonpalpable, cryptorchid testicles among children observed low sensitivity of USG which can be increased with help of Scintigraphy to 90-100%.

Out of the 25 referral, high frequency US could localize testis in 23 cases (92%) of undescended testes, out of 23 in 16 cases (69.6%) testis were in the inguinal region while in 6 cases (26.1%). Testis were located intra abdominally at different sites (across the posterior abdominal wall) and in three cases testis could not be located.

Inguinal hernia was the next most common pathology, the side of involvement and contents of sac. Omentocele is most common type and right side is most common 17 cases (73.91%) out of total 23 cases. In our study, five patients (21.7%) with obstructed hernia were present showing thickening of the hernial sac, presence of dilated bowel

loops with omentum within the herniated sac which were showing sluggish peristalsis and mild free fluid in herniated sac which was operated immediately.

In present study, two patients (8.7%) were diagnosed as strangulated and obstructed hernia, showing dilated bowel loops within the herniated sac which were showing sluggish peristalsis, no vascularity in the bowel wall and mild free fluid in herniated sac which was operated immediately because of acute bowel obstruction.

A study conducted by Subramanyam *et al* [20], on 65 patients with clinical diagnosis of primary scrotal mass, concluded that Sonography is effective in evaluation of primary scrotal masses, in the differentiation of scrotal hernia from other extra testicular or testicular masses by scanning the inguinal region in addition to the scrotum. They also established sonographic criteria to reliably differentiate between scrotal hernias from primary scrotal pathology.

We noted 20 cases (6.67%) of epididymal cysts. Out of 20 cases of epididymal cysts, 13 (65%) were unilateral, 5 (25%) were bilateral and 2 cases (10%) showed multiple cysts. Leung *et al* [21] in their study of 40 subjects, detected 29 cases (72.5%) of epididymal cysts and Spermatoceles.

We diagnosed 7 cases of neoplasm, all of them were intra testicular. The testicular tumors include most frequently seminoma 4 cases (57%), next was three cases (43%) of yolk sac tumor, which could be diagnosed ultrasound by its solid and cystic components. In all cases testis showed ill-defined lobulated heterogeneously hypoechoic mass lesion entirely occupying the scrotal sac, causing enlargement of the testis and displacement of the normal testicular parenchyma at the periphery.

In the few cases mass lesion was huge and heterogenous reaching upto 10 cm in size, causing moderate enlargement of the scrotal sac.

In few cases mass lesion was infiltrating the epididymis in this cases on screening abdomen there were significant pre and paraaortic lymph nodes.

All the tumors were almost accurately diagnosed by ultrasound. Rickfeld and Middleton (1992) [22] described the features of seminoma on ultrasound as, homogenous, hypoechoic, oval shaped or round, sharp demarcation, possible multifocal involvement. These features were correlating with our study.

In our study total 11 cases were detected as torsion. 10 patients (90.9%) presented with acute severe pain. One patient presented as acute severe pain earlier followed by decrease in intensity of pain. 6 cases (54.5%) were right sided. 5 (45.5%) were left sided.

Ten of these 11 patients presented early, between 1 and 4 hours after the onset of pain. US gave correct diagnosis leading to prompt surgical correction and the testes were salvaged in 8 patients. The other one patient came late, between 4 and 7 days after their symptoms appeared. Orchiectomy was performed after diagnosis of torsion. The testicular salvage rate is 80% to 100% if surgery is performed within 5 to 6 hours, but the rate decreases to approximately 20% if detorsion is performed after 12 hours following the onset of symptoms.

Similar findings were observed in S Thinyu *et al* [12] study to determine the role of ultrasonography in diagnosis of scrotal disorders were out of 122 cases 4 cases of torsion testis were present.

In our study total 11 cases were detected as varicocele. 10 patients (90.9%) presented with acute severe pain. one

patient presented as scrotal swelling. 3 cases were right sided. 4 were left sided. 4 cases were bilateral.

Conclusion

High-frequency ultrasonography enables in clear demonstration of morphological alterations associated with acute scrotal inflammatory diseases, and color Doppler sonography is highly sensitive in diagnosing acute scrotal pathology. In addition, Color Doppler sonography accurately differentiates between testicular ischemia and torsion from acute inflammatory diseases in acute painful scrotal conditions. It is an extremely valuable tool and can be one stop shop in evaluation of scrotal and testicular pathologies.

Table 1: Scrotal and testicular diseases: types of pathology detected

Type of pathology	No Of Cases (n=300)	Percentage
Inflammatory	96	32.00
Hydrocele	87	29.00
Undescended testis	25	08.33
Epididymal cyst	20	06.67
Hernia	32	10.67
Scrotal tumors	07	02.33
Torsion testis	11	03.67
Varicocele	11	03.67
Normal	11	03.67
Total	300	100

Table 2: Inflammatory scrotal pathology distribution

Sr. No.	Pathology	No Of Cases	Percentage
1	Acute epididymitis	24	25.00
2	Acute epididymo orchitis	29	30.21
3	Acute orchitis	16	16.67
4	Chronic epididymitis	06	06.25
5	Chronic epididymo orchitis	07	07.29
6	Scrotal wall cellulitis with pyocele	05	05.21
7	Scrotal filariasis	03	03.13
8	Funiculitis	02	02.08
9	Tubercular epididymo orchitis	02	02.08
10	Epididymal and testicular abscess	02	02.08
	Total	96	100

Table 3: Showing inguino-scrotal hernia with side

SIDEDNESS	CONTENT	
	OMENTOCLE	ENTEROCLE
Right	17	06
Left	04	03
B/L	02	00
Total	23	09

Table 4: Non-neoplastic cystic swellings of scrotum: types of pathology detected

Sr. No.	PATHOLOGY	NO OF CASES	% OF CASES
1	Hydrocele	87	81.30
2	Epididymal cyst	20	18.69
	Total	107	100

Images of cases

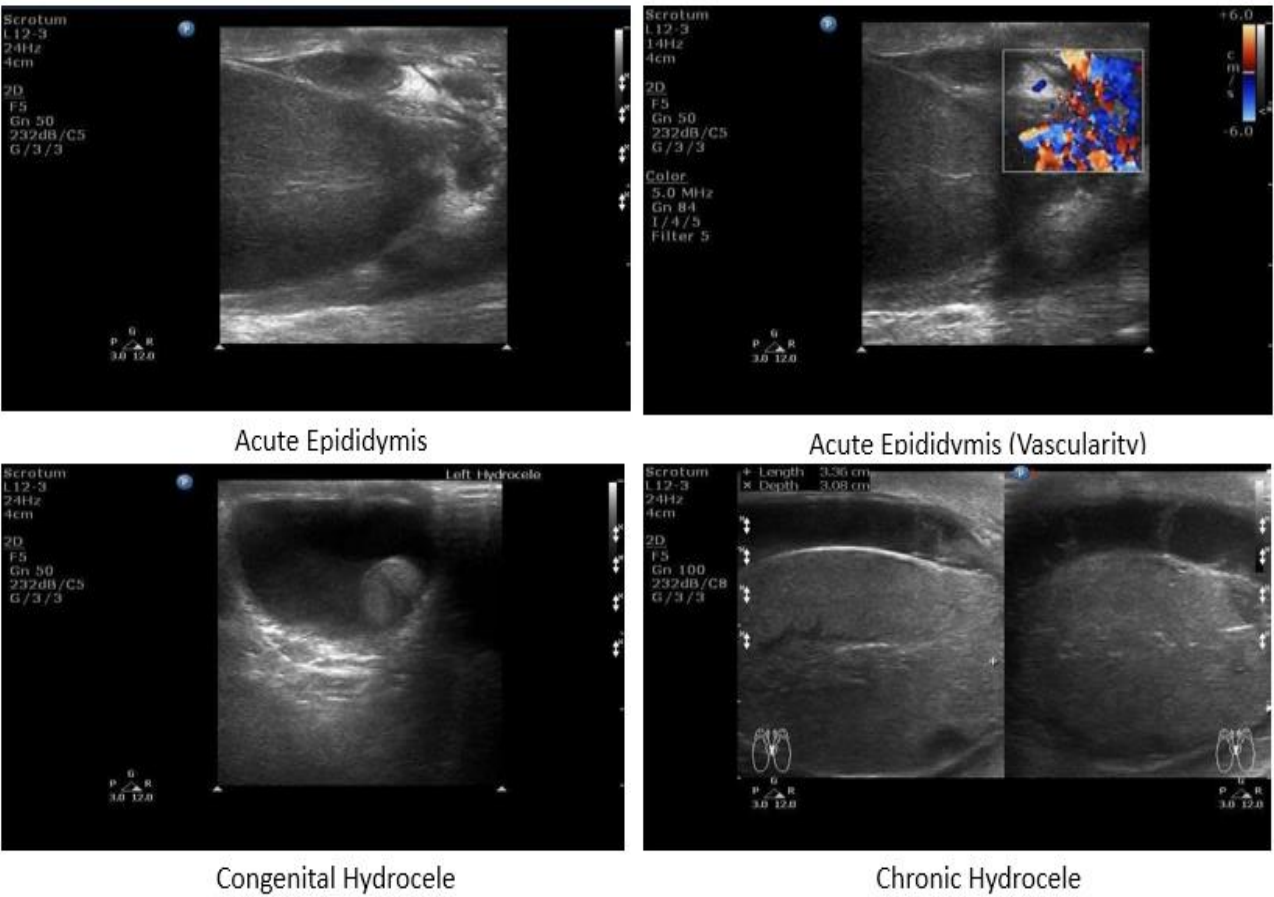


Fig 1

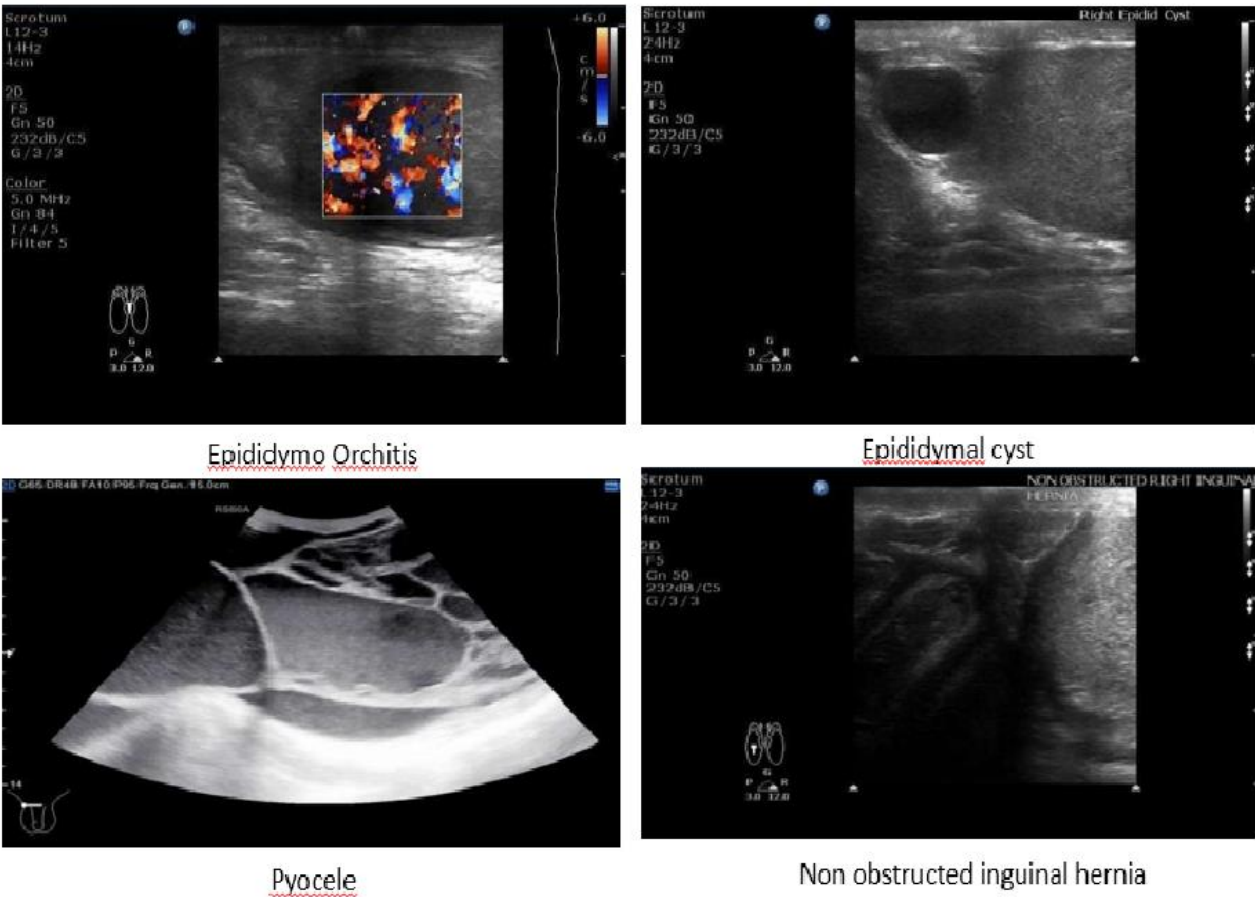


Fig 2

References

1. Karmazyn B. Scrotal ultrasound. *Ultrasound Clin.* 2010; 5(1):61-74.
2. Siegel MJ, Coley BD. Scrotal anatomy. In: Siegel IM J (ed): *Pediatric Sonography*, edition 3 Philadelphia, PA, Lippincott Williams & Wilkins. 2002; 580-581.
3. Barbara A Carroll, David M Gross. High-Frequency Scrotal Sonography. *AJR.* 1983; 140:511-515.
4. Miskin M, Bain J. B-mode ultrasonic examination of the testes. *Journal of Clinical Ultrasound* 1974; 2:307-311.
5. Doherty FJ. Ultrasound of the acute scrotum. *Semin Ultrasound CT MR.* 1991; 12:131-156.
6. Cook JL, Dewbury K. The changes seen on high-resolution ultrasound in orchitis. *Clin Radiol.* 2000; 55:13-18.
7. O'Mara EM, Rifkin MD. Scrotum and contents. In: Resnick MI, Rifkin MD, eds. *Ultrasound of the Urinary Tract*, 3rd ed. Baltimore: Williams & Wilkins. 2006:386-435.
8. Blaivas M, Sierzenski P, Lambert M. Emergency evaluation of patients presenting with acute scrotum using bedside ultrasonography. *Acad Emerg Med.* 2001; 8(1):90-93.
9. Martin B, Conte J. Ultrasonography of the acute scrotum. *J Clin Ultrasound.* 1987; 15(1):37-44.
10. Vijayaraghavan SB. Sonographic differential diagnosis of acute scrotum. *J Ultrasound Med.* 2006; 25:563-574.
11. Woodward PJ, Scwab CM, *et al*: From the archives of the AFIP: Extratesticular scrotal masses-Radiologic-pathologic correlation. *Radiographics.* 2003; 23:215-240.
12. Thinyu S, Muttarak M. Role of ultrasonography in diagnosis of scrotal disorders: a review of 110 cases. *Biomed Imaging Interv J.* 2009; 5(1):2.
13. Syed Amjad Ali Rizvi, Ibne Ahmad, Mohammed Azfar Siddiqui, Samreen Zaheer, Kaleem Ahmad. Role of Color Doppler Ultrasonography in Evaluation of Scrotal Swellings Pattern of Disease in 120 Patients with Review of Literature *Urol J.* 2011; 8:60-5.
14. William G Horstman, William D Middleton, G Leland Melson. Scrotal inflammatory disease: color Doppler US findings, *Radiology.* 1991; 179:55-59.
15. Donald Orr, Skonlunick ML: Sonographic evaluation of the abnormal scrotum. *Clinical Radiology.* 1980; 31:109-113.
16. Victoria Garriga Farriol. Gray-scale and power Doppler sonographic appearances of acute inflammatory diseases of the scrotum, *Jof Clin Ultrasound.* 2000; 28:67-72.
17. Doherty FJ: Ultrasound of non-acute scrotum. *Semin in US, CT and MR.* 1998; 32:216-19.
18. Tumeh SS, Benson CV, Ritchie JP: Acute diseases of the scrotum. *Semin in US, CT and MR.* 1991; 2:115-130.
19. Krishnaswami S, Fonnesbeck C, Penson D, McPheeters ML. Magnetic resonance imaging for locating nonpalpable undescended testicles: a meta-analysis. *Pediatrics.* 2013; 131(6):e1908-e1916.
20. Bala RS Ubramanyam. Sonographic diagnosis of Scrotal Hernia, *AJR.* 1982; 139:535-538.
21. Leung ML, Gooding GA, Williams RD. High-resolution sonography of scrotal contents in asymptomatic Subjects, *AJR.* 1984; 143:161-164.
22. William G Horstman, William D Middleton, G Leland Melson. Scrotal inflammatory disease: color Doppler US findings, *Radiology.* 1991; 179:55-59.