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Original Research Article

High Resolution Ultrasound and Colour Doppler in the Diagnosis and Distinction of Various Scrotal Diseases.

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Abstract

Aims: To classify (etiologically) and to evaluate various scrotal pathologies using ultrasonography and describe the role of High resolution ultrasound and colour doppler in their diagnosis and differentiation.

Methods: A prospective study was conducted in the Department of Radiology VIMS Pawapuri, Nalanda, Bihar, India, for 1 year. The 100 patients with clinical features of scrotal diseases were include in this study. All the patients included in the study underwent scrotal ultrasonography using 7.0- 12.0 MHZ high frequency linear array transducer coupled with Colour Doppler in Esaote My Lab 40 and Phillips affinti 70G equipments.

Results: The patients most commonly involved were those belonging to the age group of 30 to 40 years (38%). The least number of patients belonged to the age group of 0-10 years (4%). On USG, the total number of lesions detected were 120. The most common cause of scrotal pathologies was hydrocele (n=31, 25.83%) followed by epididymal cyst (n= 20, 16.67%), epididymo-orchitis (n =16, 13.33%), epididymitis (n = 9; 7.5%), funiculitis (n=8, 6.67%), varicocele (n = 7, 5.83%), pyocele (n= 6, 5%), testicular torsion (n=5, 4.17%), testicular abscess (n = 5, 4.17%), inguino-scrotal hernia (n = 4, 3.33%), testicular microlithiasis (n= 3, 2.5%), testicular tumour (n=3, 2.5%) and tubercular epididymo-orchitis (n=3, 2.5%) . The number of scrotal lesions seen on the left side were 45(37.5%), on the right side were 35 (29.17%) and in bilateral locations were 20(16.67%). Associated symptoms included swelling, pain, fever and infertility. Almost all the scrotal pathologies were associated with scrotal swelling (n=97, 97%) except in 3 cases. Epididymal cysts were seen in 20 patients, Acute epididymo-orchitis(n=16) was most commonly seen on the left side. Hydrocele (n=31) was the most common scrotal pathology detected in this study.

Conclusion: High frequency ultrasonography with Color Doppler study serves as an excellent diagnostic imaging modality in the evaluation of scrotal diseases. It is the investigation of

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choice since it is highly sensitive, easy to perform, widely available, repeatable and involves no risk of ionizing radiation.

Keywords: Torsion; Epididymo-orchitis; Varicocele; Hydrocele; Epididymitis; Pyocele; Testicular microlithiasis; Epididymal Cyst; Testicular Tumour.

Introduction

The ability to confidently establish a surgical versus a nonsurgical diagnosis for acute scrotal pain is important. The benefits of early surgery for testicular salvage in ischemic disease, primarily torsion of the testis, are well-known; but must be balanced against the costs of operating unnecessarily on a large number of patients with nonsurgical disease, primarily acute epididymo-orchitis. Acute scrotum is defined as acute pain with or without scrotal swelling, may be accompanied by local signs or general symptoms. The most common differential diagnoses of the acute scrotum include: i) Torsion of the spermatic cord and ii) acute epididymitis or epididymo-orchitis. Less common diagnoses include: Strangulated hernia, segmental testicular infarction, testicular tumor, and idiopathic scrotal edema[1] A sudden onset of pain in the scrotum may be due to very serious cause such as Torsion of testis or Epididymitis. Torsion may need surgical intervention while epididymitis needs an antibiotic course. If left untreated torsion may lead to permanent damage to testis and if it is inflammatory cause it may lead to abscess formation.[2] In patients with scrotal mass, we can determine sonographically whether the mass is Intratesticular or Extratesticular. Also, nature of mass can be well ascertained whether it is cystic or solid or complex. The advantages of ultrasonography in the evaluation of scrotal diseases are – non-invasive, easy reproducibility, rapid evaluation with real time examination capability, easy availability, economical and the lack of radiation. Computed tomography has the disadvantage of ionising radiation to the gonads, requirement for contrast media and is a relatively expensive modality. Magnetic Resonance Imaging (MRI) is also expensive and not readily available, even though it provides improved cross-sectional information. Therefore, USG is the undisputed first choice investigation for scrotal pathologies.[3]

Ultra sound with Color Doppler, Magnetic resonance imaging, testicular angiography and radioisotope studies are now first line of investigations used mainly to investigate various scrotal pathologies.[4] The development of sonogram with high frequency linear transducer and color Doppler is an important mile stone in evaluating scrotal pathologies. Computed tomography exposes testicles to the radiation and MRI is not so easily available.[5] So ultrasound with color Doppler is best suited for evaluation of scrotal pathologies. It is simple, noninvasive, reproducible, widely available, relatively inexpensive investigation that does not expose the testis to radiation.[6] So we have conducted this study to classify (etiologically) and to evaluate various scrotal pathologies using ultrasonography and describe the role of High resolution ultrasound and colour Doppler in their diagnosis and differentiation.

Material and Methods

A prospective study was conducted in the Department of Radiology VIMS, Pawapuri , Nalanda, Bihar, India, for 1 year, after taking the approval of the protocol review committee and institutional ethics committee.

The 100 patients with clinical features of scrotal diseases were include in this study .

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Inclusion Criteria
Patients of all age groups with clinical manifestations of non-traumatic scrotal diseases.

Exclusion Criteria
Post-operative cases
All the patients included in the study underwent scrotal ultrasonography using 7.0- 12.0 MHZ high frequency linear array transducer coupled with Colour Doppler in Esaote My Lab 40 and Phillips affinti 70G equipments. Baseline demographic data were recorded, which included the patient's age, symptoms and clinical diagnosis. The ultrasound findings were analyzed with regard to the location and type of the abnormality which included- hydrocele, varicocele, testicular abscess, extra-testicular abscess, epididymal cyst, epididymitis, orchitis, testicular torsion, tumours, scrotal wall thickening, inguino-scrotal hernia and calcifications if any. Subsequently, these cases were followed up and confirmed with either surgical findings, histopathology reports, response to treatment or follow up scans wherever applicable.

Results

Table 1: Age of patients

Age	N=100	%
Below 10	4	4
10-20	11	11
20-30	34	34
30-40	38	38
Above 40	13	13

The study included a total of 100 patients. The patients most commonly involved were those belonging to the age group of 30 to 40 years (38%). The least number of patients belonged to the age group of 0-10 years (4%).

Table 2: USG diagnosis of various causes of scrotal pathologies

	N=120	%
Hydrocele	31	25.83
Epididymal cyst	20	16.67
Epididymo-orchitis	16	13.33
Epididymitis	9	7.5
Funiculitis	8	6.67
Varicocele	7	5.83
Pyocele	6	5
Testicular torsion	5	4.17
Testicular abscess	5	4.17
Inguino-scrotal hernia	4	3.33
Testicular microlithiasis	3	2.5
Testicular tumour	3	2.5
Tubercular epididymo-orchitis	3	2.5

On USG, the total number of lesions detected were 120. The most common cause of scrotal pathologies was hydrocele (n=31, 25.83%) followed by epididymal cyst (n= 20, 16.67%),

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epididymo-orchitis (n =16, 13.33%), epididymitis (n = 9; 7.5%), funiculitis (n=8, 6.67%), varicocele (n = 7, 5.83%), pyocele (n= 6, 5%), testicular torsion (n=5, 4.17%), testicular abscess (n = 5, 4.17%), inguino-scrotal hernia (n = 4, 3.33%), testicular microlithiasis (n= 3, 2.5%), testicular tumour (n=3, 2.5%) and tubercular epididymo-orchitis (n=3, 2.5%) (table 2). The number of scrotal lesions seen on the left side were 45(37.5%), on the right side were 35 (29.17%) and in bilateral locations were 20(16.67%). Associated symptoms included swelling, pain, fever and infertility. Almost all the scrotal pathologies were associated with scrotal swelling (n=97, 97%) except in 3 cases.

Table 3: number of scrotal lesions on the basis of side

	N=120	%
left side	45	37.5
right side	35	29.17
bilateral locations	20	16.67

Epididymal cysts were seen in 20 patients, 8 patients had right epididymal cysts (40%), 9 patients had left epididymal cysts (45%) and 3 patients had bilateral epididymal cyst (15%). Only 8 patients had complaints of pain and the size of the cysts in these patients was more than 3 cm. The largest epididymal cyst measured 5.5 cm in maximum dimension causing distortion of the adjacent testis. Acute epididymitis(n=9) was more common on the right side. All the patients had enlarged epididymis with hypoechoic echotexture with diffusely increased vascularity. Acute epididymo-orchitis(n=16) was most commonly seen on the left side. Majority of the patients had enlarged testis and epididymis with decreased echotexture and increased vascularity. Epididymis was enlarged in 13 cases (81.25%), normal in size in 3 cases (18.75%). The epididymis showed decreased echopattern in 13 cases (81.25%) and increased echopattern in 3 cases (18.75%). Diffuse increase in vascularity of epididymis was noted in 14 cases (81.72%). Testis was enlarged in 9 cases (56.25%), normal in size in 5 cases (31.25%) and decreased in size in 2 cases (12.5%). Testis was hypoechoic in 14 cases (81.25%) and showed normal echotexture in 2 cases (18.75%). Vascularity of testis was increased in 11 cases (68.75%), decreased in 4 cases (25%) and normal in 1 cases (6.25%). Hydrocele (n=31) was the most common scrotal pathology detected in this study. Among the study population, 13 patients (41.94%) had right sided hydrocele, 9 patients (29.03%) had left sided hydrocele and 9 patients (29.03%) had bilateral hydrocele. Among them, 2 patient was detected to have encysted hydrocele of the right spermatic cord. Hydrocele, as an isolated finding was seen in only 13 subjects. Varicocele 7 patients was most commonly seen on the left side. 4 patients had large varicocele and 3 patients had moderate varicocele. There were 3 patients with complaints of infertility and all 4 had left sided large varicoceles. These patients had dilated tortuous pampiniform plexus with reflux on Valsalva manoeuvre. Patients with large varicocele had a mean pampiniform plexus vein diameter of 6.2 mm on the affected side during standing posture. On Valsalva, the diameter increased by 1.6 mm. Those patients with moderate varicocele had a mean diameter of 4.4 mm in standing position and increased by 1.4 mm on Valsalva manoeuvre.

Pyocele was seen in 6 patients. Majority of the patients (n = 5, 83.33%) had mildly enlarged ipsilateral testis and epididymis. Chronic epididymo-orchitis was seen in 3 patients. 2(66.67%) subjects had right sided involvement. Heterogeneous echopattern with hyperechoic areas, enlarged epididymis and testis with increased vascularity were seen in all cases. Scrotal wall thickening was seen in all the patients. All 3 patients had history of systemic tuberculosis. 1 patient had associated testicular abscess, pyocele with internal septations and echogenic debris.

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All three subjects were subjected to USG following initiation of ATT. All of them showed good interval response to treatment. Testicular torsion was detected in 5 (n = 5) patients. 3 (n=3, 60%) patients had right testicular torsion. In all the cases, the testis was hypoechoic, showing reversed orientation with the absence of colour flow. Testicular abscess was seen in four (n=5) subjects. Right testis was involved in 3 subjects. All the patients had enlargement of the testis, epididymis with increased vascularity. Hypoechoic areas with internal echoes were noted within the testis. There was an extension of the abscess into the tunica vaginalis in one case. Minimal fluid collection was seen in tunica vaginalis in two cases, likely due to inflammatory reaction. Follow-up USG revealed good response to antibiotics in all patients. Scrotal tumours were seen in 3 patients, all involving the right testis.

Discussion

The most commonly involved age group of 30 to 40 years (38%). The least number of patients belonged to the age group of 0-10 years (4%). A similar age group distribution of scrotal disorders was also reported by Thinyu et al[7] in their study of 110 cases. Common symptoms were swelling, pain, fever and infertility among which swelling was the most common symptom. There was a total of 120 lesions detected. On USG, the most common cause scrotal pathology was hydrocele (n=31, 25.83%). Arjhansari K, Vises N et al[8] had performed a retrospective study in 72 cases of extra testicular lesions and 48 cases of intratesticular lesions to find out the causes of intra-scrotal disease in which it was reported that hydrocele was the most common pathology. In our study of 100 patients, 97 patients (97%) had complaints of scrotal swelling, the most common cause being hydrocele. The second most common symptom was pain which was seen in 60 patients (60%). Our study showed similar results when compared to the observations made in other studies where the incidence of scrotal pain in patients with scrotal pathologies ranged from 62 to 76%.[9,10]

Acute epididymitis(n=9) was more common on the right side. All the patients had enlarged epididymis with hypoechoic echotexture with diffusely increased vascularity .Other features such as reactive hydrocele and scrotal wall thickening further augment the diagnosis of epididymitis. A similar study done by Smith et al[11] reported increased incidence with respect to the enlarged epididymis (71.5%), however hyper-vascular epididymis was reported in 72.9% of the cases and associated scrotal wall thickening in 11.3% cases. There were 16 patients with acute epididymo-orchitis. Accurate diagnosis of acute epididymo-orchitis was done in all cases. The patients were followed up following administration of systemic antibiotic and there was resolution of ultrasound features in all cases. USG features contributing to the diagnosis were bulky testis and epididymis showing hypoechoic echopattern and increased vascularity in a majority of the cases.Chronic tubercular epididymo-orchitis was diagnosed in 2 patients. Heterogeneous echopattern with hyperechoic areas, enlarged epididymis and testis with increased vascularity were seen in all cases. Compared to similar cross-sectional studies done by Horstman et al[12] and Farriol et al[13] in which acute epididymo-orchitis constituted about 40% of the scrotal pathologies, our study demonstrated acute epididymo-orchitis in only 2.5% of the study population. Reduced monetary input, limited accessibility to ultrasound and medical facilities compared to the western population and the lack of awareness could be the possible factors for the reduced detection of subjects with epididymo-orchitis inspite of poor socioeconomic status, reduced hygiene in rural areas and increased prevalence of sexually transmitted infections. Testicular abscess was seen in 5 subjects. Right testis was involved in 3 subjects. All the patients had enlargement of the testis, epididymis with increased vascularity. Hypoechoic areas with internal echoes were noted within the testis. Our results are similar to the studies performed by Luker and Siegel.[14] Hydrocele was the most common lesion detected

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in our study accounting to about 32.5% of the total lesions which is comparable to the findings from many other studies, where the incidence of hydrocele has been reported to be about 25.83%. Hydrocele (n=31) was the most common scrotal pathology detected in this study. Hydrocele (n=31) was the most common scrotal pathology detected in this study. Among the study population, 13 patients (41.94%) had right sided hydrocele, 9 patients (29.03%) had left sided hydrocele and 9 patients (29.03%) had bilateral hydrocele. Among them, 2 patient was detected to have encysted hydrocele of the right spermatic cord. Hydrocele, as an isolated finding was seen in only 13 subjects. Varicocele 7 patients was most commonly seen on the left side. 4 patients had large varicocele and 3 patients had moderate varicocele. There were 3 patients with complaints of infertility and all 4 had left sided large varicoceles. USG features were dilated tortuous pampiniform plexus with reflux of blood on Valsalva manoeuvre. Similar studies reported incidence of varicocele at 9.1%, 10.9% and 13.1% by Tinthyu M et al[7] , D'Andrea et al[15] and Rizvi et al[6] respectively. All the three studies reported that 20 to 30 years as the most common age-group for varicoceles which is similar to our study. Testicular torsion was detected in 5 (n = 5) patients. 3 (n=3, 60%) patients had right testicular torsion. In all the cases, the testis was hypoechoic, showing reversed orientation with the absence of colour flow. Vijayraghavan S et al[16] conducted a prospective study of 211 patients with acute scrotum and had concluded that the sonographic real-time whirlpool sign is the most specific and sensitive sign of torsion, both complete and incomplete. Scrotal tumours were seen in 3 patients, all involving the right testis. On histopathological examination, they turned out to be seminoma, mixed germ cell tumour and teratoma. The ultrasound findings in our study are similar to those performed by Grantham et al.[17] Micallef M and Torreggiani WC et al[18] in their study on scrotal swellings concluded that ultrasound examination distinguishes extra-testicular (almost always benign) from intratesticular (potentially malignant) causes of scrotal swelling. Infection, trauma, and torsion mimic the ultrasound appearance of a tumour as do rare benign entities. 3 cases of bilateral testicular microlithiasis were detected as incidental findings. There were no associated testicular masses detected. They were found as incidental lesions. In the pediatric population, Goede et al[19] noted that the prevalence of testicular microlithasis was 2.4% in asymptomatic male patients belonging to the 0–19 years age group, with an increase in prevalence noted with increasing patient age. Cast et al[20] calculated a 21.6-fold relative risk of a concurrent tumour in patients with testicular microlithiasis. Isolated TM has been reported to be associated with germ cell tumours. However further longitudinal studies are required to firmly establish the relationship between testicular microlithiasis and germ cell tumours. Limitations of the study Follow up of few cases pertaining to inflammatory causes of scrotal pathology were not possible.

Conclusion

High frequency ultrasonography with color Doppler study serves as an excellent diagnostic imaging modality in the evaluation of scrotal swellings. It is the investigation of choice as it is highly sensitive, easy to perform, widely available, repeatable and involves no risk of ionizing radiation, especially to radiosensitive parts like testis. It helps to arrive at an accurate diagnosis in a majority of patients with scrotal swellings, thus guiding further management. When USG findings are inconclusive MRI may be useful. Periodic follow-up USG studies are recommended for all patients with inflammatory scrotal lesions for monitoring response to treatment or to reveal development of complications.

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References

1. Remer EM, Casalino DD, Arellano RS, Bishoff JT, Coursey CA, Dighe M, et al. ACR Appropriateness Criteria ® acute onset of scrotal pain-without trauma, without antecedent mass. Ultrasound Q. 2012;28:47–51.
2. Leopold GR, Woo VL, Scheible FW, Nachtsheim D, Gosink BB .High-resolution ultrasonography of scrotal pathology. Radiology.1979; 131: 719-722.
3. Rizvi SA, Ahmad I, Siddiqui MA, Zaheer S, Ahmad K. Role of color Doppler ultrasonography in evaluation of scrotal swellings: pattern of disease in 120 patients with review of literature. Urol J 2011;8(5):60-5.
4. Mirochnik B, Bhargava P, Dighe MK, Kanth N Ultrasound evaluation of scrotal pathology Radiol Clin North Am. 2012 Mar;50(2):317-32, vi. doi:10.1016/j.rcl.2012.02.005.
5. Wright S, Hoffmann B. Emergency ultrasound of acute scrotal pain. Eur J Emerg Med. 2015 Feb;22(1):2-9. doi: 10.1097/MEJ.0000000000000123.
6. Sommers D, Winter T .Ultrasonography evaluation of scrotal masses. Radiol Clin North Am. 2014 Nov;52(6):1265-81. doi: 10.1016/j.rcl.2014.07.014
7. Thinyu S, Muttarak M. Role of ultrasonography in diagnosis of scrotal disorders: A review of 110 cases. Biomed Imaging Interv J 2009;5(2):e2.
8. Arjhansiri K, Vises N, Kitsukjit W. Sonographic evaluation of the intrascrotal disease. J Med Assoc Thai 2004;87 Suppl 2:S161-7.
9. Siddiqui EH, Siddiqui S, Rasool G, Khan N. Scrotal Pathologies: Role of high resolution & Doppler ultrasound in evaluation. Professional Med J 2013;20(4):924-28.
10. Agarwal Am, Tripathi PS, Shankwar A, Naveen C. Role of Ultrasound with Color Doppler in Acute Scrotum Management. J Family Med Prim Care 2014;3(6):409- 12.
11. Smith RP, Tracy CR, Kavoussi PK, Witmer MT, Costabile RA. The impact of color Doppler ultrasound on treatment patterns of epididymitis in a universitybased healthcare system. Indian J Urol 2013;29(5):22-6.
12. Horstman WG, Middleton WD, Melson GL. Scrotal inflammatory disease: Color Doppler US findings. Radiology 1991;179(3):55-9.
13. Farriol VG, Comella XP, Agromayor EG, Creixams XS, Martinez De La Torre IB. Gray-scale and power Doppler sonographic appearances of acute inflammatory diseases of the scrotum. J Clin Ultrasound 2000;28(1):67-72.
14. Luker GD, Seigel MJ. Color Doppler sonography of the scrotum in children. AJR Am J Roentgenol 1994;163(3):649-55.
15. D'Andrea A, Coppolino F, Cesarano E, Russo A, Cappabianca S, Genovese EA, et al. US in the assessment of acute scrotum. Crit Ultrasound J 2013;5:Suppl 1:S8.
16. Vijayraghavan S. Sonographic differential diagnosis of acute scrotum: real time whirlpool sign, a key sign of torsion. J Ultrasound Med 2006;25(6):563–574.
17. Grantham JG, Charboneau JW, James EM, Kirschling RJ, Kvols LK, Segura JW, et al. Testicular neoplasms: 29 tumors studied by high-resolution US. Radiology 1985;157(4):775-80.
18. Micallef M, Torreggiani WC, Hurley M, Dinsmore WW, Hogan B. The ultrasound investigation of scrotal swelling. Int J STD AIDS 2000;11(5):297-302.
19. Goede J, Hack WW, van der Voort-Doedens LM, Sijstermans K, Pierik FH. Prevalence of testicular microlithiasis in asymptomatic males 0 to 19 years old. J Urol 2009;182(5):1516–1520.
20. Cast JE, Nelson WM, Early AS, Biyani S, Cooksey G, Warnock NG, et al. Testicular microlithiasis: prevalence and tumour risk in a population referred for scrotal sonography. AJR Am J Roentgenol 2000;175(1):1703– 1706.