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Doppler ultrasound in acute scrotal pain

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Abstract

Background and objective: Acute scrotal pain is an emergency. To evaluate the efficacy of Doppler ultrasound in correctly diagnosing acute scrotal conditions.

Materials and methods: A cross sectional analytical study carried out in the Department of Radiodiagnosis, JNIMS, Imphal from February 2015 to March 2018 among 240 patients with acute scrotal pain referred from Surgery OPD. Toshiba Xario USG color doppler machine was used for the study. First scan by gray scale ultrasound to see any parenchymal pathology then set color flow to see the changes of perfusion or vascularity. Ethical clearance was taken from the institutional ethical committee prior to the study, informed consent taken and confidentiality was maintained.

Results and observations: Mean age was 26.57 years with a standard deviation of 11.88 years in this study with acute scrotal pain. There was increased detection rate of inflammatory lesions and testicular torsion when gray Ultrasonography was combined with doppler.

Conclusion: Combination of gray-scale and color Doppler imaging is superior than gray scale imaging in acute scrotal pain.

Keywords: Acute scrotal pain, color doppler, gray ultrasound

Introduction

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]

Epididymitis is an inflammation of the epididymis, usually resulting from bacterial infection. The incidence is 30% to 35% in patients with acute scrotal pain and 75% of

acute intra scrotal inflammatory process.[2] Testicular torsion results when testis twists within the scrotum. The incidence of testicular torsion is 1 in 160 patients (0.6%), present with acute scrotal pain that is difficult to differentiate from epididymo-orchitis.[3]

This appropriate discussion, however, will be limited to patients with acute pain who have no history of trauma and no history of a mass before the onset of pain. There is, however, overlap in the clinical presentation of the different causes of acute scrotal pain. Imaging in clinically equivocal cases may lead to an early diagnosis of testicular torsion, and thus, decrease the number of unnecessary surgeries.[4] The accuracy of USG was only 72.7% in testicular torsion, but is good in epididymitis.[5] In another study combined gray scale and colour Doppler ultrasound showing 100% specificity for testicular torsion and 86% for epididymo-orchitis. [6]Testicular radionuclide scintigraphy, MRI, real time sonography, and doppler sonography have been used to increase the accuracy of distinguishing between infection and torsion.[7]

Examination of the acute scrotum should not be undertaken unless Doppler capability is available because the evaluation of blood flow is such an important part of diagnosis, of testicular torsion, epididymitis, epididymo orchitis, orchitis, trauma and hemorrhage into a mass. Misdiagnosing testicular torsion can lead to organ loss, cosmetic deformity, and compromised fertility.[8] Doppler study is an upcoming imaging modality of choice for distinguishing between infection and torsion. So, this study was undertaken to determine the relative importance of color Doppler over gray scale ultrasound in the evaluation of acute scrotal pain by ultrasound.

Materials and Methods

This is cross sectional analytical study carried out in the Department of Radiodiagnosis, JNIMS, Imphal from February 2015 to March 2018. Sample size was 240 patients with acute scrotal pain calculated from prevalence of torsion of testis of 0.6%[3] and absolute error of one. All those patients with acute scrotal referred from surgery OPD within the study period were included. Patient with scrotal mass was excluded. History taking and physical examination were done first, then high resolution gray scale ultrasound and color Doppler study were done in all the cases by using 7.5 MHz linear array probe. Toshiba Xario USG color doppler machine was used for the study. First scan by gray scale ultrasound to see any parenchymal pathology then set color flow to see the changes of perfusion or vascularity. The following outcome variables were studied-age, side of scrotum, structure of the scrotal content, echogenecity of the lesion and finally color flow characteristics of the lesion. Data were collected in a pre-designed structured proforma. The result of gray-scale, and Doppler diagnosis was compared with each other and finally discrepancy between them was shown. Mean and percentages were used to describe the finding. The results were presented in tables and figures. Test of significance was performed using chi-square test and p-value of <0.05 was taken as significant. Ethical clearance was taken from the institutional ethical committee prior to the study and confidentiality was maintained.

Results and observations

In this study majority of the patients coming with acute scrotal pain was from the age group 21-30 years in 35.8% and 31-40 years in 30% of cases. Mean age was 26.57 years with a standard deviation of 11.88 years. Age ranges from 5 years to 56 years (table 1).

Table 1: Distribution of patients by age

Age in years	Frequency	Percentage
0-10	13	5.4
11-20	21	8.8
21-30	86	35.8
31-40	72	30.0
41-50	34	14.2
>50	14	5.8
Total	240	100.0
Mean ± SD	26.57 ± 11.88	

Pain was associated with fever in 35% of cases, fever along with swelling in 21% of cases and only with swelling in 12% of cases.

In grey scale USG out of 240 cases abnormal finding was noted in 207 cases (86.2%) but when it was combined with doppler the number of abnormal finding was increased to 97.1% i.e. increased detection rate. This finding was statistically significant ($p<0.05$). So, there is significance discrepancy between gray scale and combined gray scale & color Doppler diagnosis. There was increased rate of detection with the involvement of doppler in most of conditions except orchitis, scrotal trauma and hernia but all were statistically insignificant ($p>0.05$).

In most of the inflammatory condition such as epididymitis, epididymo-orchitis and orchitis gray scale ultrasound showed enlargement and hypoechogenicity or heterogeneously hypoechogenicity of the involved epididymis and testis and color Doppler ultrasound showed increased blood flow within the lesion of affected testis and epididymis. Some figures of the study finding are shown below. (Fig 1-7)

In this study, 24 (10.0%) patients diagnosed as normal in gray scale ultrasound but diagnosed as epididymo-orchitis in 16 cases, 6 cases for orchitis and 2 cases for epididymitis when combined with doppler. Two cases each of epididymitis and epididymo-orchitis misdiagnosed each other. Two cases of torsion of testis was misdiagnosed as epididymo-orchitis. (table 3)

Table 2: Comparison between gray scale and combined grey scale and colour doppler

Finding	Grey scale n (%)	Combined grey scale and colour doppler	Chi-square test/fisher exact test
Normal	33(13.9)	9(3.8)	Value=15.029 df-1 p-0.0001
Abnormal	207(86.2)	231(96.3)	
Epididymo-orchitis	119(49.6)	129(53.8)	Value=0.834 df-1 p-0.361
Epididymitis	14(5.8)	20(8.5)	Value=1.14 df-1 p-0.285
Orchitis	58(24.3)	64(26.6)	Value=0.396 df-1 p-0.529
Epididymal abscess	2(0.8)	2(0.8)	Value=0.0 df-1 p-1.0
Testicular abscess	5(2.0)	5(2.0)	Value=0.0 df-1 p-1.0
Testicular torsion	3(1.2)	5(2.0)	Value=0.508 df-1 p-0.476
Scrotal trauma	4(1.6)	4(1.6)	Value=0.0 df-1 p-1.0
Hernia (stranglulated)	2(0.8)	2(0.8)	Value=0.0 df-1 p-1.0
Total	240(100.0)	240(100.0)	

Table 3: Discrepancy between gray scale and combined grey scale and colour doppler

Gray scale diagnosis	Percentage	Gray scale & Color doppler diagnosis
Normal (24)	10.0	Epididymo-orchitis-16 Epididymitis-2 Orchitis-6
Epididymo-orchitis (2)	0.8	Epididymitis
Epididymitis (2)	0.8	Epididymo-orchitis
Torsion of testis (2)	0.8	Epididymo-Orchitis
Total	30(12.4)	

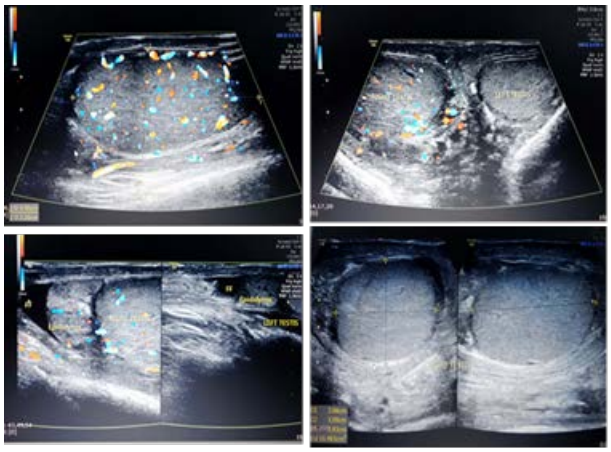

Fig 1: Increased in size and vascularity of right testis and epididymis (Rt sided epididymo-orchitis)

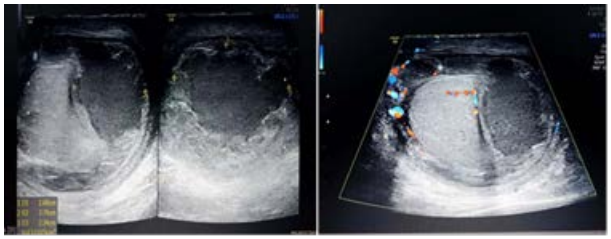

Fig 2: Irregular thick walled heterogenous collection in right epididymal tail region without vascularity (epididymal abscess)

Fig 3: Testicular Trauma (haematoma)

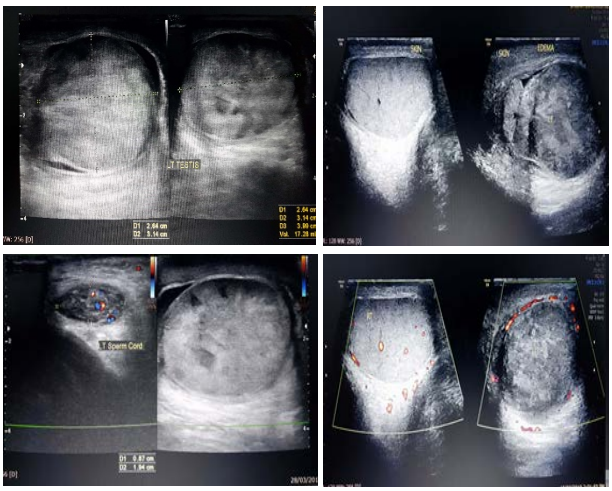

Fig 4: Bulky left testis with heterogenous echotexture and without colour uptake and vascularity on colour doppler study (Acute left testicular torsion)

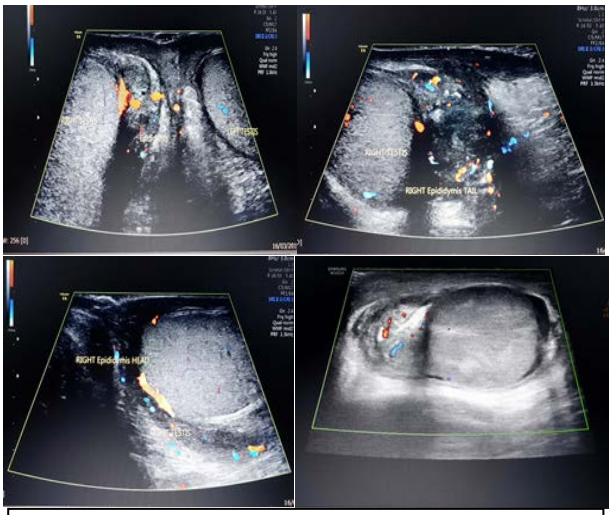

Fig 5 :Bulky right epididymis with increased vascularity (Epididymitis)

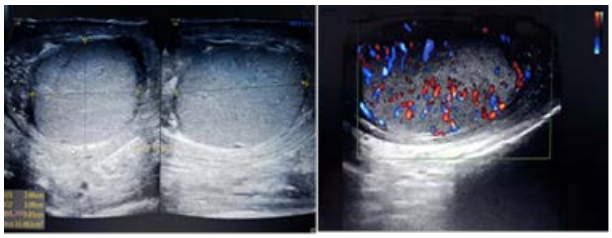

Fig 6: Slightly bulky right testis with increased vascularity (orchitis)

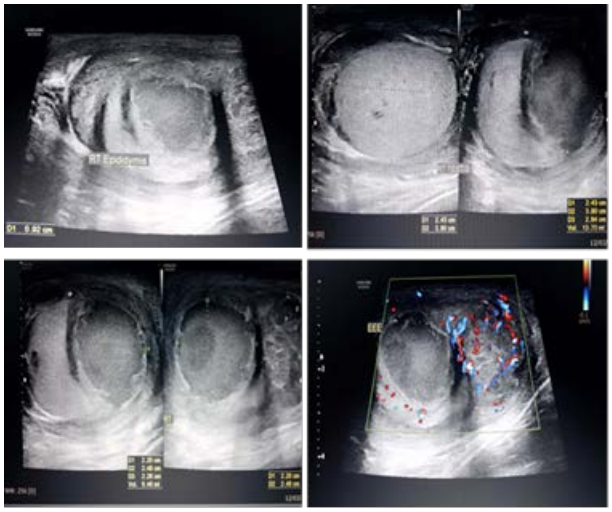

Fig 7: Right testicular abscess with epididymis

Discussion

Many disease processes, including inflammation, testicular torsion, testicular trauma, and testicular cancer, may have similar clinical presentation as acute scrotum. Differentiation of these disease processes is important for proper management. High resolution gray scale ultrasound helps to better characterize the scrotal lesions. Color Doppler ultrasound demonstrates perfusion of the lesions which aids in reaching a specific diagnosis.[3] A study including 240 patients with acute scrotal pain was conducted to observe the effectiveness between gray scale ultrasound and Color Doppler ultrasound in diagnosing these pathologies.

Majority of the patients were in the age group 20-30 years and the mean age was 26.57 ± 11.88 years. This finding was in concordance with the finding by Salahuddin G et al[9] where peak age was 21-30 years and mean age was 28 ± 3.2 years.

In grey scale USG out of 240 cases, abnormal finding was noted in 207 cases (86.2%) but when it was combined with doppler the number of abnormal finding was increased to 97.1% i.e. increased detection rate. This finding was statistically significant ($p<0.05$). So, there is significant discrepancy between gray scale and combined gray scale & color Doppler diagnosis. There was increased rate of detection with the involvement of doppler in most of conditions. Same finding was noted in the study by Salahuddin G et al[9]. In that study in gray scale USG out of 150 cases 54% cases were epididymitis, 16.66% were epididymo orchitis, 2% were testicular abscess, 4% were trauma, 2% orchitis, 1.33% torsion, 2% tumor, 2% hernia and 16% were normal. And in combined gray scale & color Doppler diagnosis out of 150 cases, 58% cases were diagnosed as epididymitis, 22% were epididymo-orchitis, 2% were testicular abscess, 4% were trauma, 2% orchitis, 2% torsion, 2% tumour, 2% hernia and 6% were diagnosed as normal.

The above explains that there was increased pick up rate to inflammation by doppler ultrasound. In the study by Pepe P et al[10], in the presence of orchiepididymitis, the sensitivity and specificity of the physical exam in association to colour doppler USG was equal to 100%.

In the study by Salahuddin G et al[9], 15 (10%) patients diagnosed as normal in gray scale ultrasound but diagnosed as epididymitis (12), epididymo-orchitis (3). Six (4%) patients in gray scale USG diagnosed as epididymitis but in color Doppler USG diagnosed as epididymo-orchitis. Another 1 (.66%) patient in gray scale USG diagnosed as epididymo orchitis but in doppler study diagnosed as testicular torsion. Total 14.66% of gray scale diagnosis become another diagnosis in the doppler study.

In this study, 24 (10.0%) patients diagnosed as normal in gray scale ultrasound but diagnosed as epididymo-orchitis in 16 cases, 6 cases for orchitis and 2 cases for epididymitis when combined with doppler. Two cases each of epididymitis and epididymo-orchitis misdiagnosed each other. Two cases of torsion of testis was misdiagnosed as epididymo-orchitis.

A study evaluating 77 cases of suspected testicular torsion by physical examination and history. Only nine of the 77 patients had torsion; 63 patients had findings that were normal or consistent with epididymitis or orchitis. Five patients had other diagnoses such as mass or testicular fracture that necessitated surgical exploration at a later time.[11]

In the study by Blaivas M et al[12], three testicular torsions were diagnosed out of which two of the torsions were confirmed by radiology color Doppler ultrasound. Also in the study by Yagil Y et al[13], testicular torsion was doppler ultrasonographically suspected in 20 patients and confirmed in 18.

Conclusion

Gray scale ultrasound dissipated only the morphological changes of the lesion. Colour Doppler showes the pattern of vascularity and helps to definitive diagnosis in relation to inflammation and torsion of testis. So, it can be concluded that combination of gray-scale and color Doppler imaging is superior than gray scale imaging. But due to unavailability of final result from surgery, FNAC, biopsy and result of medical management there was some lacking in the analysis. So, further studies including this can better confirm this study findings.

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