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Original Research Article

DIAGNOSTIC EVALUATION OF SCROTAL DISEASES BY HIGH RESOLUTION GRAY- SCALE AND DOPPLER ULTRASONOGRAPHY

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ABSTRACT

Background: The scrotum is a fibromuscular cutaneous bag that houses the testicles, epididymis, and the lowest half of the spermatic cord. Pathological conditions affecting these structures include congenital, simple inflammatory, and neoplastic diseases. Sonography is simple to conduct, quick, noninvasive, affordable, easily repeatable, and generally available, and it does not need gonad irradiation. To identify testicular torsion, an emergency scrotal Doppler scan is sometimes necessary. **Materials and Methods:** A hospital based observational study was done on 50 patients who presented to the general surgery and urology Shri Ramkrishna Institute of Medical Sciences and Sanaka Hospitals, Durgapur, West Bengal with pain, swelling, or clinically nonpalpable testis. After physical examinations, the patients were referred to the Department of Radiodiagnosis, Shri Ramkrishna Institute of Medical Sciences and Sanaka Hospitals, Durgapur, West Bengal for USG examination of the scrotum. This study was conducted between January 2024 to December 2024. Ethical committee permission was obtained from the hospital. Informed and written consent was taken from patients before examinations. Gray scale real-time imaging and color Doppler were done routinely. **Results:** A total of 50 patients were included in the study. The age of the patients ranged from 23-42 years with a mean age of 36.8 years. In our study, out of 50 cases, 12 cases were detected to have inflammatory scrotal pathology in the high-frequency US. Acute epididymo-orchitis was the commonest inflammatory pathology detected followed by acute epididymitis. Among non-inflammatory scrotal swellings, hydrocele is the commonest pathology followed by scrotal hernia and undescended testis. **Conclusion:** Non-invasiveness, absence of ionizing radiation, simplicity, wide availability, cost-efficiency, and repeatability are all advantages of high-frequency US. This is quite sensitive in distinguishing between solid and cystic scrotal tumors.

INTRODUCTION

The scrotum is a fibromuscular cutaneous bag that houses the testicles, epididymis, and the lowest half of the spermatic cord. Pathological conditions affecting these structures include congenital, simple inflammatory, and neoplastic diseases.[1] The first lines of imaging modalities for scrotal disorders include ultrasound (US) with color Doppler, magnetic resonance imaging, testicular angiography, and radioisotope studies. Patients who present with significant scrotal pain, edema, or both require prompt diagnosis in order to differentiate the lesions that require emergency surgical treatment from the lesions that may be treated medically.[2] The introduction of a sonogram with a high-frequency linear transducer and color Doppler is a significant step forward in assessing scrotal diseases. CT scans expose the testicles to radiation, and MRI is not widely accessible.[3]

Though the testis is readily available for clinical examination, the acute scrotum is a tough diagnostic challenge due to the nonspecific character of symptoms and the difficulties in fully assessing the sensitive, swollen scrotum. The clinical history may be essential in determining the etiology of acute scrotal illnesses.[4] Although epididymitis is the most common cause of acute scrotal discomfort, testicular torsion is the most critical diagnosis to establish since it needs rapid surgical correction to maintain testicular viability and function. As a result, assessing testicular perfusion is the essential prerequisite for

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any imaging modality employed in this clinical setting.[5]

Ultrasonography (USG) has been shown to be an excellent gold-standard diagnostic technique for a variety of scrotal diseases and disorders. It offers 100% sensitivity in diagnosis and can discriminate a range of disorders affecting the testis, epididymis, and scrotum with comparable clinical symptoms because of its great spatial resolution. USG in grayscale in conjunction with color or power Doppler imaging is a widely used tool for evaluating scrotal lesions and testicular perfusion. USG is an excellent tool for studying the scrotum and its contents. Sonography is simple to conduct, quick, noninvasive, affordable, easily repeatable, and generally available, and it does not need gonad irradiation. To identify testicular torsion, an emergency scrotal Doppler scan is sometimes necessary.[6]

MATERIALS AND METHODS

A hospital based observational study was done on 50 patients who presented to the general surgery and urology Shri Ramkrishna Institute of Medical Sciences and Sanaka Hospitals, Durgapur, West Bengal with pain, swelling, or clinically nonpalpable testis. After physical examinations, the patients were referred to the Department of Radiodiagnosis, Shri Ramkrishna Institute of Medical Sciences and Sanaka Hospitals, Durgapur, West Bengal for USG examination of the scrotum. This study was conducted between January 2024 to December 2024. Ethical committee permission was obtained from the hospital. Informed and written consent was taken from patients before examinations. Gray scale real-time imaging and color Doppler were done routinely. The data was transferred to a Microsoft Excel 2010 sheet (Microsoft Corporation, Redmond, Washington), and statistical analysis was done using SPSS (Statistical Package for the Social Sciences) software for Windows, version 22.0 (IBM Corp., Armonk, NY).

Scanning technique

Scrotal USG is frequently conducted with the patient in a reclining position with their legs slightly spread, their scrotum supported by a rolled towel or pillow, and their penis wrapped in a towel and positioned on the abdominal wall. Scanning is normally done with a high-frequency transducer (8-MHz); however, an edematous scrotum requires a low-frequency transducer. Echogenicity, scrotal wall thickness, and flow symmetry are assessed by scanning the sagittal and transverse planes as well as transverse side-by-side planes of both testes. Additional methods, including standing and the Valsalva movement, were used to examine a varicocele.

RESULTS

A total of 50 patients were included in the study. The age of the patients ranged from 23-42 years with a mean age of 36.8 years. In our study, out of 50 cases, 12 cases were detected to have inflammatory scrotal pathology in the high-frequency US. Acute epididymo-orchitis was the commonest inflammatory pathology detected followed by acute epididymitis. Among non-inflammatory scrotal swellings, hydrocele is the commonest pathology followed by scrotal hernia and undescended testis. Neoplastic testicular tumors, scrotal filariasis, testicular microcalcification, testicular torsion, etc. are other non-inflammatory scrotal pathologies. The incidence of non-neoplastic scrotal swellings is very much high compared to neoplastic swellings. The incidence of extra-testicular swellings is more compared to that of intra-testicular swellings.

Table 1: Distribution of patients based on their age and USG findings

	Number (percentage)
Age of the patient	
0-10 years	7 (14%)
11-20 years	5 (10%)
21-40 years	21 (42%)
41-60 years	10 (20%)
>61 years	7 (14%)
Inflammatory pathology	
Acute epididymo-orchitis	4 (33.3%)
Acute epididymo	2 (16.7%)
Chronic epididymo-orchitis	2 (16.7%)
Funiculitis	1 (8.3%)
Cellulitis	1 (8.3%)
Testicular abscess	1 (8.3%)
Epididymal abscess	1 (8.3%)
Non-inflammatory pathology	
Hydrocele	23 (40.4%)
Scrotal hernia	14 (24.5%)
Undescended testis	5 (8.8%)
Epididymal cyst	5 (8.8%)
Varicocele	4 (7.1%)
Neoplasia	2 (3.5%)
Small testis	1 (1.8%)
Scrotal filariasis	1(1.8%)
Testicular microcalcification	1(1.8%)
Testicular cyst	1(1.8%)

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DISCUSSION

The scrotal contents are appropriate for sonographic evaluation due to their superficial position. High-frequency real-time USG has improved the diagnostic accuracy of scrotal sonographic tests. Scrotal USG has matured to the point that it can be used as the first and only imaging examination required to evaluate the scrotal contents.

In our investigation, hydrocele was the most prevalent disease followed by an inguinal hernia, undescended testis, varicoceles, epididymal cyst, acute epididymo-orchitis, and scrotal neoplastic tumors. Gajbhiye et al. conducted prospective research with 200 patients, which was compatible with our results. The most prevalent disease in our analysis was hydrocele, which is consistent with the previous studies.[7]

Vishnu et al. discovered that color Doppler sonography is 100% sensitive and 95% specific for the detection of testicular torsion [8]. When compared to physical examination, research by Gajbhiye et al. reveals 100% sensitivity for color Doppler.[7] Doppler assessment was proven to be 100% sensitive and 100% specific for the detection of testicular torsion in research by Middleton and Melson.[9] Burks et al. discovered that color Doppler sonography was 86% sensitive and 100% specific in the diagnosis of testicular torsion. This research looked at seven patients who had verified testicular torsion.[10] One case of testicular torsion was seen in our study, which showed absent blood flow and twisting of blood vessels on color Doppler, consistent with previous similar studies.

In our investigation, 12 out of 50 subjects were found to have inflammatory scrotal disease on high-frequency US imaging. Acute epididymo-orchitis was the most prevalent inflammatory pathology seen, with five instances. Power Doppler analysis can be used to establish the lack of testicular perfusion in situations of suspected torsion as well as to improve traditional color Doppler results of hyperemia in testicular and epididymal inflammation. This is consistent with the findings of Farriol et al. and Luker et al.[11,12] Blood flow is seen in the typical adult epididymis when it is evaluated with a color and power Doppler. Only the asymmetric flow pattern in relation to the normal side might be used to diagnose epididymitis. This agreed with the findings of Keener et al.[13] Our findings were compared to those of Petros et al. and Arger et al.[14,15]

CONCLUSION

Non-invasiveness, absence of ionizing radiation, simplicity, wide availability, cost-efficiency, and repeatability are all advantages of high-frequency US. This is quite sensitive in distinguishing between solid and cystic scrotal tumors. High-frequency real-time sonography is clearly superior to clinical diagnosis in identifying scrotal masses as testicular or extra-testicular masses. We conclude that high-frequency USG is particularly useful tool in assessing scrotal and testicular diseases.

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