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## A retrospective research to investigate the usefulness of high resolution ultrasonography and color Doppler in diagnosis and differentiating of scrotal diseases

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### Abstract

**Aims:** To assess the role of high resolution ultrasound and colour Doppler in diagnosis and differentiation of scrotal pathologies.

**Material and methods:** A retrospective study was conducted in the Department of Radiology in Maharishi Markandeshwar Medical College & Hospital, Kumarhatti, Solan (H.P.), from October 2019 to October 2020. The 30 patients with clinical features of scrotal diseases were included in this study. All the patients included in the study underwent scrotal ultrasonography with color Doppler.

**Results:** The study included a total of 30 patients. The patients most commonly involved were those belonging to the age group of 30 to 40 years (n = 16; 53.3%). The most common cause of scrotal pathologies was hydrocele (n=12, 25.5%) followed by epididymal cyst (n= 8, 17%), epididymo-orchitis (n =4, 8.5%), epididymitis (n = 4; 8.5%). The number of scrotal lesions seen on the left side was 22 (46.8%), on the right side were 21 (44.6%) and in bilateral locations were 4 (8.5%).

**Conclusion:** High frequency ultrasonography with colour Doppler studies is a great tool for diagnosing scrotal disorders. It is the preferred method because of its great sensitivity, ease of use, availability, repeatability, and lack of ionising radiation. Patients with inflammatory scrotal lesions should have periodic USG scans to assess therapy response and detect complications.

**Keywords:** Torsion; epididymo-orchitis; varicocele; hydrocele; epididymitis

### Introduction

The scrotum contains the testes, epididymis, and appendages. In the absence of disease, these structures are easily accessible. Most scrotal disorders cause swelling and pain, making it difficult to distinguish between intra-testicular and extra-testicular lesions, benign and malignant. Accurate identification of the underlying disease is further hampered by overlapping clinical symptoms in acute painful disorders like acute testicular torsion and acute epididymo-orchitis [1]. High-frequency ultrasound is an outstanding modality to evaluate the scrotal wall, epididymis, testes and their appendages as it provides high-quality anatomical detail. High-frequency ultrasound, coupled with color flow Doppler imaging help in determining the viability and vascularity of the testes, thereby assisting in providing an accurate diagnosis in perplexing situations [2]. 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, time consuming even though it provides improved cross-sectional information. Therefore, USG is the undisputed first choice investigation for scrotal pathologies [3].

Ultrasound 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, non-invasive, reproducible, widely available, relatively inexpensive investigation that does not expose the testis to radiation [6].

So we have conducted this retrospective study to classify (etiologically) and evaluate various scrotal pathologies using ultrasonography and describe the role of High resolution ultrasound and color Doppler in their diagnosis and differentiation.

### Material and Methods

The present retrospective study was conducted in the Department of Radiology, Maharishi Markandeshwar Medical College and Hospital, Kumarhatti, Solan, Himachal Pradesh, from October 2019 to October 2020.

### Inclusion Criteria

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

### Exclusion Criteria

Post-operative cases.

### Methodology

After taking the approval of the protocol review committee and institutional ethics committee the data of 30 patients from the hospital record were included in this study.

All the patients included in the study underwent scrotal

ultrasonography using.

Philips Affinity 70G machine with linear array transducer with frequency 5-12Hz 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, epididymo-orchitis testicular torsion, tumours, scrotal wall thickening, inguinoscrotal hernia and calcifications if any.

### Results

**Table 1:** Age of patients

Age	N=30	%
Below 10	2	6.7
10-20	3	10
20-30	8	26.7
30-40	16	53.3
Above 40	11	36.7

The study included a total of 30 patients. The patients most commonly involved were those belonging to the age group of 30 to 40 years (n = 16; 53.3%). The least number of patients belonged to the age group of 0-10 years (n = 2; 6.7%).

**Table 2:** USG diagnosis of various causes of scrotal pathologies

Diagnosis	N=47	%
Hydrocele	12	25.5
Epididymal cyst	8	17.0
Epididymo-orchitis	4	8.5
Epididymitis	4	8.5
Funiculitis	3	6.3
Varicocele	3	6.3
Pyocele	2	4.2
Testicular torsion	2	4.2
Testicular abscess	2	4.2
Inguinoscrotal hernia	1	2.1
Testicular microlithiasis	1	2.1
Testicular tumour	1	2.1
Tubercular epididymo-orchitis	1	2.1

On USG, the total numbers of lesions detected were 47. The most common cause of scrotal pathologies was hydrocele (n=12, 25.5%) followed by epididymal cyst (n= 8, 17%), epididymo-orchitis (n=4, 8.5%), epididymitis (n = 4; 8.5%), funiculitis (n=3, 6.3%), varicocele (n = 2, 6.3%), pyocele (n= 2, 4.2%), testicular torsion (n=2, 4.2%), testicular abscess (n = 2, 4.2%), inguinoscrotal hernia (n = 1, 2.1%), testicular microlithiasis (n= 1, 2.1%), testicular tumour (n=1, 2.1%) and tubercular epididymo-orchitis (n=1, 2.1%) (Table 2).

**Table 3:** Number of scrotal lesions on the basis of side

Side involved	N=47	%
left side	22	46.8
right side	21	44.6
bilateral locations	4	8.5

The number of scrotal lesions seen on the left side was 22 (46.8%), on the right side were 21 (44.6%) and in bilateral locations were 4 (8.5%). Associated symptoms included

swelling, pain, fever and infertility. Almost all the scrotal pathologies were associated with scrotal swelling except in two cases.

### Discussion

The patients most commonly involved were those belonging to the age group of 30 to 40 years (n = 16; 53.3%). The least number of patients belonged to the age group of 0-10 years (n = 2; 6.7%). 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 were a total of 47 lesions detected. On USG, the most common cause scrotal pathology was hydrocele (n=12, 25.5%). 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 30 patients, 28 patients (93.3%) had complaints

of scrotal swelling, the most common cause being hydrocele. The second most common symptom was pain which was seen in 50 patients (62.5%). The most common cause of pain was infective/ inflammatory etiology (n = 40, 80%). 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 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 4 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. 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. 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 in spite of poor socioeconomic status, reduced hygiene in rural areas and increased prevalence of sexually transmitted infections. Our results are similar to the studies performed by Luker and Siegel [14]. Hydrocele was the most common lesion detected in our study accounting to about 25.5% 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 26% [6]. Hydrocele was most commonly seen in the age group of 30 to 40 years. Testicular torsion was detected in 2 patients. In all the cases, the testis was hypoechoic, showing reversed orientation with the absence of colour flow. Vijayraghavan S *et al.* [15], 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. The ultrasound findings in our study are similar to those performed by Grantham *et al.* [16]. Micallef M and Torreggiani WC *et al.* [17] 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. 1 case 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.* [18] noted that the prevalence of testicular microlithiasis 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.* [19] 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 colour Doppler studies serves as a good diagnostic imaging technique in the examination of scrotal swellings. It is the research of choice since it is very sensitive, straightforward to execute, widely accessible, reproducible and poses no danger of ionising radiation, particularly to radiosensitive areas like testis. It helps to arrive at an appropriate diagnosis in a majority of patients with scrotal swellings, therefore directing subsequent care. When USG results are unclear MRI may be beneficial. Periodic follow-up USG tests are advised for all patients with inflammatory scrotal lesions for evaluating response to therapy or to disclose development of problems.

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