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Colour Doppler and Histopathological Findings of Inguinoscrotal Swellings: Prospective Observational Study

Mukteshwar Kumar, Arpan Yadav, Kanishka Kumar and Ishwar Ram Dhayal*

Department of Urology and Renal Transplant, Dr RMLIMS, Lucknow, India

**Corresponding e-mail: ish23456@gmail.com*

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ABSTRACT

Background: *The diagnosis of the inguinoscrotal pathologies primarily rests upon clinical history and careful physical examination. We tried to study the colour doppler characteristics of these swellings in a tertiary care institutional setting.* ***Methods:*** *This prospective observational study was carried out from January 2020 to December 2021. In this study of total 55 patients from all age groups with signs and symptoms related to inguinoscrotal diseases were included.* ***Results:*** *Maximum number of cases i.e. 23 (41.8%) cases were seen in the third decade of life. The most common symptom was scrotal swelling in 70.9% of the cases followed by pain in the testis in 51% of patients. 8 cases were diagnosed as varicocele by colour doppler demonstrating a sensitivity of 100%. In acute inflammation, acute epididymo-orchitis was present in 38.1% of cases while in chronic inflammation chronic epididymo-orchitis was the most common pathological finding (85%) followed by chronic epididymitis 71%. Colour doppler was about 85% sensitive for diagnosing chronic conditions.* ***Conclusions:*** *Colour Doppler imaging has a significant role in differentiating inguinal swellings from scrotal pathologies and also correlates well with histopathological findings of inguinoscrotal lesions.*

Keywords: Inguinoscrotal swellings, Colour doppler findings, Scrotal lesions

INTRODUCTION

The diagnosis of the inguinoscrotal pathologies primarily rests upon clinical history and careful physical examination. However, in many patients, clinical symptoms are non-specific and often misleading. Definitive diagnosis is not possible, especially in patients with marked inflammatory reactions of the testis and/or its surrounding structures which further limit the proper physical examination. Various imaging modalities have been tentatively used to complement the physical findings and clinical presentation in the differential diagnosis of inguinoscrotal pathologies. The present study is undertaken to assess the usefulness of sonography both Grey Scale and colour Doppler, in various inguinoscrotal lesions and to correlate these features with surgical/histopathological findings wherever possible.

Objectives

- To evaluate the Colour Doppler Flow Imaging (CDFI) features of inguinoscrotal lesions.
- To classify scrotal lesions into testicular, extra testicular, and inguinal lesions.
- To correlate colour doppler features of various scrotal disorders with surgical/histopathological findings,
- To evaluate surgical aspects and outcomes of the diseases.

MATERIALS AND METHODS

A total of 55 patients were included in this prospective observational study carried out from January 2020 to December

2021. Patients from all age groups with signs and symptoms related to inguinoscrotal diseases were included in this study.

Thorough clinical examination was done in all the patients and relevant clinical investigations such as X-ray chest, urine-routine/microscopic examination and culture, ESR, and ELISA for tuberculosis were done. USG was performed as per requirement and a comparison with CDFS done as per requirement. Colour Doppler Flow Imaging (CDFI) of inguinoscrotal lesions was carried out. These examinations were carried out on a Vingmed System-5 scanner computed colour doppler ultrasonography system using a 10 Mhz handheld linear array transducer. The scrotum was scanned from anterior, lateral, and inferior surfaces in the longitudinal and transverse planes. The examination was continued to evaluate the spermatic cord and groin region when required. In cases of varicocele, the examination was performed in the supine posture, erect posture, and Valsalva maneuver to confirm it.

In patients with suspicion of testicular tumors, the kidney, liver, and paraaortic regions were scanned to look for the presence of secondaries and any back pressure changes in the kidneys. In the case of varicocele also, the kidneys especially the left were scanned to rule out a renal mass.

The following doppler parameters were studied in each case:

- Position of the testes.
- Vascular anatomy with quantitative and qualitative data: grades of vascularity, the pattern of blood flow, PSV, EDV, and RI.
- Echo texture and size of the epididymis
- Intra-tumoral flow

RESULTS

In this study out of a total of 55 patients, 4 (7.2%) cases were encountered up to 5 years of age. 6-10 years of age group 2 (3.6%) cases were reported while 12 (21.8%) cases were seen in the 11-20 years of age group. A maximum number of cases i.e. 23 (41.8%) cases were seen in the third decade of life while 7 (12.6%) cases were encountered in the fourth decade. In the fifth decade, 4 (7.2%) cases and 2 (3.6%) cases were seen in the sixth decade of life. Only 1 (1.8%) case belonged to the seventh decade of life. The youngest patient was of 2 years of age while the oldest was 62 years of age. Maximum numbers of patients were seen in the age group of 21-30 years (41.8%) and a total of 63% of patients belonged to the second and third decade of life (Table 1).

Table 1 Distribution of patients according to the age of onset of disease (in decade)

Age of Onset (inguinoscrotal diseases)	No. of Patients
First Decade	6
Second Decade	12
Third Decade	23
Fourth Decade	7
Fifth Decade	4
Sixth Decade	2
Seventh Decade	1
Total	**55**

In the present study 6 (10.9%) patients presented with symptoms of scrotal discomfort while 28 (50.9%) presented with scrotal pain. Of 39 (70.9%) had scrotal swelling, 15 (26%) had a fever while 14 (24%) presented with urinary symptoms. 2 (3.6%) patients presented as cases of infertility with small testicular size. 4 (7%) patients had undescended testis while 3 (5.4%) had a history of trauma to the testis. The most common symptom was scrotal swelling in 70.9% of the cases followed by pain in the testis in 51% of patients. Epididymal swelling was present in 12 (21.8%) cases, scrotal swelling with tenderness in 21 (38.2%), and scrotal swelling with other signs of inflammation in 12 (21.8%)

cases. The abdominal or inguinal lump was encountered in 6 (10.9%) cases while serpiginous cord-like extra testicular scrotal structure could be palpated in 4 (7.2%) cases. Impulse on coughing was presented in 2 (3.6%) cases. The most common clinical sign was scrotal swelling with tenderness in 21 (38.2%) cases. In the present study, 8 cases of varicocele were included. They comprise 14.4 % of the total number of cases and 11.4% of the total number of pathological lesions. In 2 (25%) patients varicocele scattered flow was present while in 6 (75%) continuous flow was present during the CDFI study. Grade II and Grade III flow was present in all cases. All cases demonstrated some amount of reflux. Thus detection of reflux was found to be sensitive for diagnosing varicocele. In the present study, all 8 cases were diagnosed as varicocele by colour doppler demonstrating a sensitivity of 100%. 21 (38.1%) patients with acute inflammation of epididymis and testis were noted. At the final diagnosis, 14 (66.6%) cases had epididymal involvement while 11 (52.3%) cases showed testicular involvement. Unilateral epididymo-orchitis was found in 21 (38%) cases while bilateral epididymo-orchitis in 2 (9.5%) cases. Acute epididymitis alone was found in 4 (19%) cases while 1 (5.2%) case had orchitis. Some of these patients had more than one of the above pathological lesions in different combinations. Acute epididymo-orchitis was the most common pathology (38%) followed by acute epididymitis 19%. The epididymis was the most common anatomical structure involved in acute inflammation 66.6% followed by the testis 52.8%. Doppler sonography shows increased blood flow in affected epididymis and testis (100% accuracy). In the present study 10 cases of testicular torsion were encountered which represents 18.1% of the total number of cases and 14.2% of the total number of pathological lesions. In the majority of cases, 70% were between 11-20 years of age. Total 2 patients with funiculitis were included which showed grade 3rd (continuous flow) flow on the doppler study. Total 4 cases of the epididymal cyst were involved in our study which constituted 7.2% of the total number of cases and 5.7% of total pathological lesions. The study comprises 4 cases of undescended testis i.e. 7.2% of total cases and 5.7% of total pathological lesions. All the patients had unilateral undescended testis, 3 (75%) were situated in the inguinal region while 1 (25%) had abdominal testis. 2 cases of testicular atrophy were included in the study which represents 3.6% of a total number of cases and 2.8% of the total number of pathological lesions. In the CDFI study grade, 1st flow or much-reduced flow was observed. 2 cases of inguinal hernias were included in this study. An incidence of 3.6% among all cases was noted. In this study, 2 cases of testicular tumors were included; they represented 3.6% of the total number of cases and 2.8% of the total number of pathological lesions. Both cases were encountered in the 21-40 years of age group and confirmed as non-seminomatous germ cell tumors, teratocarcinoma. 1 (50%) case also had abdominal lumps. On CDFI both lesions demonstrated unevenly distributed vessels with multiple scattered flows. 1 case of testicular abscess and another of the extra testicular abscess were also included in this study. CDFI study showed rim hyperemia with no flow into complex cystic mass. 3 cases of trauma to testis were included in the study which accounted for 5.4% of the total cases and 4.3% of the total pathological lesions. All the cases had a history of trauma and hematocoele was present in 2 cases (66.6%).

DISCUSSION

In 1974, Miskin and Bain first reported the use of B-mode ultrasound to examine the testis and scrotum [1]. Gray Scale sonography is currently the primary imaging modality for the assessment of inguinoscrotal diseases.

The addition of Colour Doppler Ultrasound (CDUS) and Pulsed Doppler sonography has further increased the diagnostic accuracy of the acute scrotum by providing information about morphology and perfusion. CDUS is the first and initial technique in place of radionuclide imaging in the assessment of acute testicular torsion and has limited many other invasive studies for the evaluation of scrotal lesions. To date, the superficial organ on which CDUS has the greatest impact is the testis. It has narrowed the number of clinical diagnostic possibilities considered in the differential diagnosis of various scrotal lesions and thus, has limited the need for the surgical exploration of the scrotum and helped to make a specific diagnosis in cases of acute scrotal pain. The most common indications for Doppler sonography are acute testicular torsion, inflammation, infertility, undescended testis, and scrotal trauma. Leopold, et al. utilized a 10 MHz high-resolution real-time system permitting an improved examination of scrotal contents [2]. Real-time features provided rapid screening of the entire scrotum. In 1989, Middleton, et al. pioneered the study of the normal testis with Colour Doppler Ultrasound (CDUS) [3]. They performed Colour Doppler Ultrasound with point spectral analysis on 30 testes in 15 asymptomatic volunteers. In the present study, 8 cases of varicocele were included. They comprise 14.4 % of the total number of cases and 11.4% of the total no of pathological lesions. Varicocoele has been reported to be present in 10%-16% of adult men by Berger, et al. [4]. Most of the patients (37%) were from the 11-20 years age group. Varicocoele was present on the left side in all the cases. One case of Intra testicular varicocele (1.4% among

all scrotal lesions was also encountered). Das, et al. in their studies on 1040 patients reported an incidence of 1.9% of intra-testicular varicocele among patients with scrotal lesions [5]. All cases of varicocele demonstrated accentuation of blood flow in testicular/spermatic vessels on Valsalva maneuver while 7 (87.5%) cases showed accentuation on erect posture. Hoeksera and Witt also found similar findings [6]. All cases demonstrated some amount of reflux. Thus detection of reflux was found to be sensitive for diagnosing varicocele. Greenberg et al. found reflux in all 75 men with varicocele [7]. The epididymis was the most common anatomical structure involved in acute inflammation 66.6% followed by testis 52.8%. Horstman, et al. reported 42%-55% involvement of testis in epididymo-orchitis [8]. The Head of the epididymis was the most common part of the epididymis to be involved in acute inflammation. Rifkin, et al. also described similar findings [9]. In the present study 10 cases of testicular torsion were encountered which represents 18.1% of the total number of cases and 14.2% of the total number of pathological lesions. In the majority of cases, 70% were between 11-20 years of age. Tumeh, et al. described torsion of the testis to occur mainly between 12-18 years of age [10]. The basis for the diagnosis of torsion of the testis is the absence or decreased flow in the symptomatic testis compared with the asymptomatic testis. On CDFI blood flow was absent in 100% of cases. Bird et al. described similar findings [11]. In our study, 2 patients with funiculitis were included. All cases showed grade 3rd (continuous flow). Increased flow in the doppler study on funiculitis was also described by Mevorach, et al. in his study [12]. 4 cases of the epididymal cyst were involved in our study which constituted 7.2% of the total number of cases and 5.7% of total pathological lesions. 72% of cysts were found in the head of the epididymis while 25% were encountered in the tail. No flow was detected in 3 (75%) cases and spotty flow with septillions in 1 (25%) case in a small circumscribed area while the rest of epididymis has normal flow. Krone et al. described similar findings with a greater number of cysts in the head region [13]. Hamm, et al. reported an incidence of 4% of testicular cysts [14]. In our study, the incidence was 6% (2 out of 55 cases). CDFI study shows no flow in a small circumscribed area with the normal flow in the rest of the testis. These findings correlate with findings described by Gordon, et al. [15]. The study comprises 4 cases of undescended testis i.e. 7.2% of total cases and 5.7% of total pathological lesions. This was more than observed by Scorer, et al. (2%) [16]. All the patients had unilateral undescended testis, 3 (75%) were situated in the inguinal region while 1 (25%) had abdominal testis. Kleinteisn, et al. reported location of undescendent testis in inguinal canal in 72%, 20% pre-scrotal and 8% in abdomen [17]. 3 (75%) cases showed grade 1 vascular signal and 1 (25%) showed grade 2nd flow. In all cases, grade 2nd flow is present on the contralateral side. Madrazo et al. described similar findings of increased flow on the contralateral side [18]. 2 cases of testicular atrophy were included in the study which represents 3.6% of the total number of cases and 2.8% of the total number of pathological lesions. On CDFI study grade 1st flow or much-reduced flow was observed. A similar finding on CDFI was found by Cass, et al. [19]. Both patients showed bilateral atrophied testis and 1 had infertility with poor secondary sexual characteristics. 2 cases of inguinal hernias were included in this study. An incidence of 3.6% among all cases was noted. An incidence of 5.4% was noted by Subramanyam, et al. in their study [20]. In this study, 2 cases of testicular tumors were included; they represented 3.6% of the total number of cases and 2.8% of the total number of pathological lesions. Both cases were encountered in the 21-40 years of age group and confirmed as non-seminomatous germ cell tumors, teratocarcinoma. 1 (50%) case also had an abdominal lump. On CDFI both lesions demonstrated unevenly distributed vessels with multiple scattered flows. The distributions of blood vessels within the tumor were random and disorganized in all the cases. A similar finding of teratocarcinoma was described by Krone, et al. and Gergathy, et al. [13,21]. A single case of testicular abscess and another extra testicular abscess were also included in this study. CDFI study showed rim hyperemia with no flow into complex cystic mass. A similar finding was described by Horstman, et a1. [22]. 3 cases of trauma to testis were included in the study which accounted for 5.4% of the total cases and 4.3% of the total pathological lesions. All the cases had a history of trauma and hematocoele was present in 2 cases (66.6%). Jeffery et al. described the hematocoele in 10 out of 12 cases (83%) in their study of testicular trauma [23]. On CDFI no vascular signal was found in 2 cases and grade 1st flow in one case.

CONCLUSION

The Colour Doppler flow imaging study is a useful tool in the diagnosis of inguinoscrotal lesions. It is 100% sensitive in diagnosing torsion of testis and epididymal-orchitis which makes it mandatory in all suspected cases of torsion of testis thereby eliminating the chances of unnecessary negative exploration and timely intervention in torsion of testis leading to more salvage of testis. Colour Doppler study shows no flow in hematocoele and abscess shows rim hyperemia. Therefore surgical measures like drainage of abscesses are done immediately.

DECLARATIONS

Conflict of Interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.e.

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