Section: Pathology

Original Research Article

HISTOPATHOLOGICAL SPETRUM OF SCROTAL MASSES

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ABSTRACT

Background: Scrotal masses encompass a wide range of pathological entities, including both benign and malignant lesions. Histopathological examination remains the gold standard for definitive diagnosis, which is essential for appropriate management and prognosis. **Objective:** To analyze the histopathological spectrum of scrotal masses and correlate lesion types with demographic characteristics.

Materials and Methods: A retrospective cross-sectional study was conducted on 136 patients presenting with scrotal masses. Histopathological specimens were reviewed, and lesions were classified into neoplastic and non-neoplastic categories. Age distribution, specimen types, and diagnostic subtypes were analyzed.

Results: Non-neoplastic lesions constituted 91.9% (125 cases), predominantly inflammatory conditions (60.3%) such as epididymo-orchitis and orchitis. Neoplastic lesions accounted for 8.1% (11 cases), primarily germ cell tumors and lymphomas. The mean age for non-neoplastic lesions was significantly higher (49.8 years) than for neoplastic lesions (36.5 years) ($p = 0.022$).

Conclusion: The majority of scrotal masses are non-neoplastic inflammatory lesions. Histopathological assessment is vital for accurate diagnosis and effective clinical management, with distinct age patterns observed between neoplastic and non-neoplastic lesions.

Keywords: Scrotal masses; Histopathology; Germ cell tumors.

INTRODUCTION

Scrotal masses constitute a significant clinical presentation encountered by urologists and pathologists worldwide. These masses encompass a wide spectrum of pathological entities ranging from benign, non-neoplastic lesions such as orchitis torsion malignant neoplastic lesions including germ cell tumors and rare stromal tumors. Proper diagnosis and management of these lesions are crucial owing to the varied prognostic implications and therapeutic strategies involved.[1]

The scrotum is a complex anatomical structure housing the testes, epididymis, spermatic cord, and associated soft tissues. Pathologies affecting these structures may present clinically as swelling, pain, or asymptomatic masses. While many scrotal swellings are benign and manageable with conservative treatment, malignant lesions necessitate prompt diagnosis and intervention to improve patient outcomes.[2]

Non-neoplastic lesions of the scrotum are often related to inflammatory, infectious, or cystic processes. Hydrocele, characterized by the accumulation of serous fluid within the tunica vaginalis, is one of the most common benign scrotal masses. Epididymal cysts and spermatoceles arise from dilatation of epididymal ducts or tubules, usually presenting as painless, cystic swellings. Other benign conditions include varicoceles, which result from dilated pampiniform plexus veins and may cause discomfort or infertility.[3]

Conversely, neoplastic lesions of the scrotum primarily involve the testis and are dominated by germ cell tumors, which are the most frequent malignancies in young adult males. These include seminomas and non-seminomatous germ cell tumors such as embryonal carcinoma, yolk sac tumors, and choriocarcinomas. Early diagnosis of these tumors is vital due to their aggressive nature and potential for metastasis. In addition to germ cell tumors, other rare neoplasms such as lymphoma, stromal tumors (Leydig and Sertoli cell tumors), and metastatic lesions may involve the scrotal contents.[4]

Diagnostic evaluation of scrotal masses relies on a combination of clinical examination, radiological imaging, and histopathological assessment. Ultrasonography remains the imaging modality of choice due to its non-invasive nature and high sensitivity in differentiating intra-testicular from extra-testicular masses. Color Doppler ultrasonography adds further detail by assessing vascularity, which helps in distinguishing benign from malignant lesions.[5]

Histopathological examination remains the gold standard for definitive diagnosis. It provides critical information on the nature, grade, and extent of the lesion, thereby guiding appropriate therapeutic decisions. Moreover, immunohistochemical studies complement morphological evaluation in cases where diagnosis is challenging.[6]

The management of scrotal masses varies significantly depending on the diagnosis. Benign conditions like hydroceles may be treated conservatively or with simple surgical procedures. Malignant tumors require radical orchiectomy followed by adjuvant chemotherapy or radiotherapy based on staging and histology. Regular follow-up is essential to monitor treatment response, detect recurrence, and manage complications.[7]

Aims and Objectives

1. To diagnose various non-neoplastic and neoplastic lesions in scrotal masses using histopathological methods.
2. To conduct follow-up evaluations for appropriate management and assessment of prognosis in patients with scrotal masses.

MATERIALS AND METHODS

Source of Data

The study utilized archived and prospectively collected data from patients presenting with scrotal masses at the Department of Pathology at tertiary care center.

Study Design

This was a descriptive, observational, cross-sectional study analyzing histopathological specimens from patients with scrotal masses.

Study Location

The study was conducted at the Department of Pathology, which receives clinical samples from the outpatient department, inpatient wards, and surgical units of the affiliated hospital.

Study Duration

The study spanned a period of two years.

Sample Size

A total of 136 cases of scrotal masses were included in the study.

Inclusion Criteria

- Patients presenting with scrotal swelling or masses clinically suspected to be neoplastic or non-neoplastic.
- All age groups.
- Patients undergoing surgical excision or biopsy of the scrotal mass with available tissue specimens.
- Patients providing informed consent for participation in the study and follow-up.
- Exclusion Criteria
- Cases with inadequate or insufficient tissue samples for histopathological evaluation.
- Patients who did not consent to participate in the study.
- Recurrent lesions previously diagnosed and treated elsewhere without available prior histopathology reports.

Procedure and Methodology

All patients presenting with scrotal masses were clinically evaluated with detailed history taking and physical examination. Relevant laboratory investigations and imaging studies, primarily ultrasonography of the scrotum, were performed to assess the size, location, and characteristics of the mass.

Surgical excision or biopsy of the mass was carried out under appropriate anesthesia depending on the clinical scenario. The collected tissue specimens were immediately fixed in 10% neutral buffered formalin and sent to the pathology laboratory.

Sample Processing

Tissue samples were processed according to standard histopathological protocols. After fixation, tissues were grossly examined, and representative sections were selected for paraffin embedding. Thin sections (3-5 microns) were cut using a microtome and stained with Hematoxylin and Eosin (H&E). Special stains were employed as needed to aid in diagnosis.

Microscopic examination was conducted by experienced pathologists who documented morphological features and rendered a diagnosis based on the latest WHO classification guidelines.

Statistical Methods

Data were entered and analyzed using statistical software SPSS version [version]. Descriptive statistics including frequency, percentage, mean, and standard deviation were calculated for demographic variables and histopathological diagnoses.

The association between different variables was analyzed using Chi-square tests for categorical data and t-tests for continuous variables. A p-value of

less than 0.05 was considered statistically significant.

RESULTS

Table 1: Age Distribution

Age Group (years)	n	%
<20	7	5.1%
21-30	9	6.6%
31-40	18	13.2%
41-50	32	23.5%
51-60	27	19.9%
>60	43	31.6%

Table 1 describes the age distribution of the study population, showing that the largest proportion of patients were above 60 years old, accounting for 31.6% (43 cases). This was followed by the age groups 41-50 years (23.5%, 32 cases) and 51-60 years (19.9%, 27 cases). Younger age groups were less represented, with only 5.1% (7 cases) below 20 years and 6.6% (9 cases) in the 21-30 years range.

Table 2: Specimen Types

Specimen Type	n	%
Left orchidectomy	35	25.7%
Right orchidectomy	28	20.6%
Testis (unspecified/biopsy)	15	11.0%
Scrotal mass/exploration	12	8.8%
Bilateral orchidectomy	2	1.5%
Hernia-related	4	2.9%
Other/Combined procedures	9	6.6%
Not specified	31	22.8%

Table 2 outlines the types of specimens received for analysis. The most common specimen type was left orchidectomy, constituting 25.7% (35 cases), followed by right orchidectomy at 20.6% (28 cases). Unspecified testis or biopsy specimens accounted for 11.0% (15 cases), while scrotal mass explorations made up 8.8% (12 cases). Other categories such as bilateral orchidectomy, hernia-related specimens, and combined procedures were less frequent. Notably, 22.8% (31 cases) of the specimens were not specifically categorized.

Table 3: Histopathological Diagnosis Spectrum

Diagnostic Category	n (%)	Subtypes (n)
Non-neoplastic Lesions	**125 (91.9%)**	
- Inflammatory	82 (60.3%)	Epididymo-orchitis (46), Orchitis (19), Pyocele (17)
- Torsion/Infarction	14 (10.3%)	Testicular torsion (9), Hemorrhagic infarction (5)
- Atrophy	13 (9.6%)	Testicular atrophy
- Tuberculosis	6 (4.4%)	Tuberculous epididymo-orchitis
- Other	10 (7.4%)	Calcification/gangrene (4), Filariasis (2), Normal tissue (4)
Neoplastic Lesions	**11 (8.1%)**	
- Germ cell tumors	8 (5.9%)	Mixed germ cell tumor (6), Seminoma (2)
- Lymphoma	3 (2.2%)	Non-Hodgkin's lymphoma

Table 3 presents the spectrum of histopathological diagnoses. Non-neoplastic lesions dominated the findings, comprising 91.9% (125 cases) of the total. Among these, inflammatory conditions were the most prevalent (60.3%, 82 cases), primarily epididymo-orchitis (46 cases), orchitis (19 cases), and pyocele (17 cases). Other non-neoplastic conditions included torsion and infarction (10.3%), atrophy (9.6%), tuberculosis (4.4%), and miscellaneous conditions such as calcification and filariasis. Neoplastic lesions were relatively rare, accounting for 8.1% (11 cases). Within this group, germ cell tumors constituted the majority (5.9%, 8 cases), predominantly mixed germ cell tumors and seminomas, followed by non-Hodgkin's lymphoma (2.2%, 3 cases).

Table 4: Age Distribution by Lesion Type

Lesion Type	n	Mean Age (SD)	p-value*
Non-neoplastic	125	49.8 (17.6)	0.022
Neoplastic	11	36.5 (18.2)	
*Independent t-test (t=2.36, df=134)			

Table 4 compares the age distribution between patients with non-neoplastic and neoplastic lesions. Patients with non-neoplastic lesions had a significantly higher mean age of 49.8 years (SD

17.6) compared to those with neoplastic lesions, who had a mean age of 36.5 years (SD 18.2). This difference was statistically significant (p = 0.022), indicating that neoplastic scrotal masses tended to occur in a younger population within the study group.

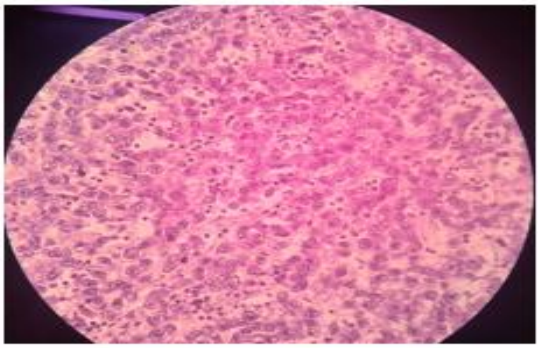

Figure 1: Seminoma

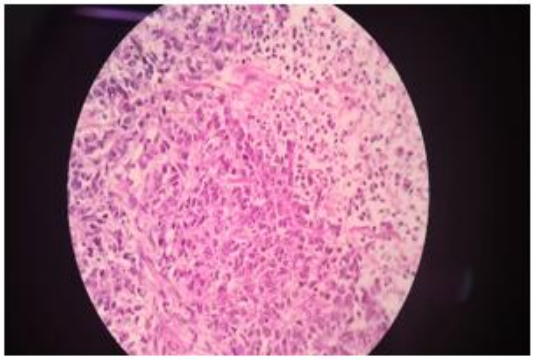

Figure 2: Mixed germ cell tumor

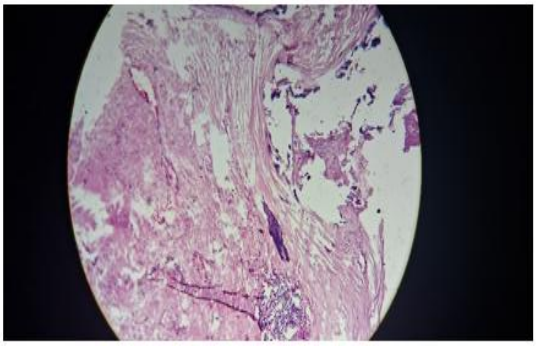

Figure 3: Scrotal calcinosis

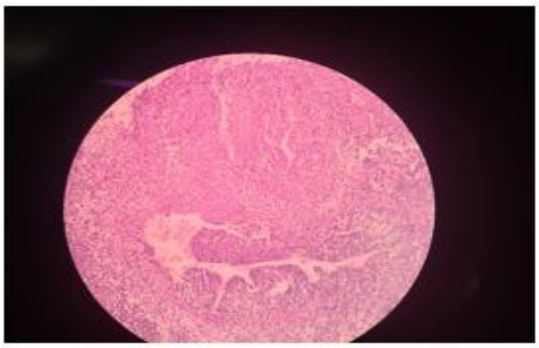

Figure 4: Mixed germ cell tumor

Figure 5: Mixed germ cell

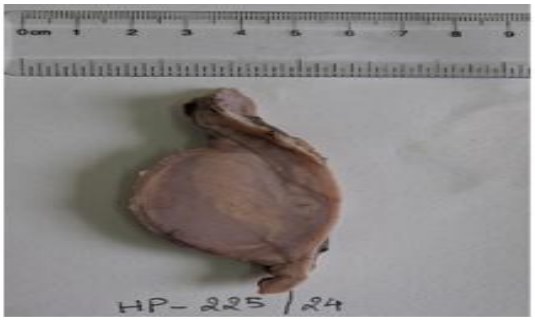

Figure 6: Filarial infestation

Figure 7: Torsion testis

Figure 8: Tuberculous epididymoorchitis

DISCUSSION

The age distribution of patients with scrotal masses in the present study (Table 1) shows that the majority of cases were seen in the older age groups, with 31.6% of patients aged above 60 years and 23.5% in the 41-50 years group. Younger patients below 30 years comprised only 11.7% of the study population. This finding aligns with several previous studies where the incidence of scrotal pathologies,

especially non-neoplastic conditions like chronic inflammatory diseases and degenerative changes, tends to increase with age. Horta M et al.(2015),[8] reported a higher prevalence of scrotal swellings in older men, mainly due to inflammatory and vascular conditions. Conversely, neoplastic conditions such as testicular germ cell tumors are typically more common in younger males, particularly in the 15-35 years age bracket Hu R et al.(2019),[9] & Hoyt B et al.(2014).[10] This contrast in age distribution underscores the importance of considering age as a key factor in differential diagnosis.

Table 2 presents the types of specimens received, with left orchidectomy and right orchidectomy comprising nearly half of the cases (46.3%). This pattern reflects the clinical emphasis on surgical excision as both a diagnostic and therapeutic approach in managing scrotal masses. The relatively high percentage of unspecified testis biopsies and scrotal explorations indicates that minimally invasive diagnostic procedures and exploratory surgeries continue to play a vital role in cases where the clinical and imaging findings are inconclusive. Similar specimen distributions were noted by Sharma M et al.(2017),[11] who highlighted orchidectomy as the predominant surgical intervention for both neoplastic and complicated non-neoplastic scrotal masses.

The histopathological spectrum detailed in Table 3 reveals that non-neoplastic lesions overwhelmingly predominate (91.9%), with inflammatory lesions constituting the largest subgroup (60.3%). Epididymo-orchitis, orchitis, and pyocele together form the bulk of these inflammatory pathologies. These findings are consistent with the epidemiology reported by Khandeparkar SG et al.(2015),[12] where infectious and inflammatory processes were the leading causes of scrotal swellings. Testicular torsion and hemorrhagic infarction accounted for 10.3%, emphasizing the need for urgent diagnosis due to the risk of testicular loss. Tuberculous epididymo-orchitis, although less common at 4.4%, remains a significant concern in endemic regions, as also documented by Sharbidre KG et al.(2020).[13] On the neoplastic front, germ cell tumors constituted 5.9% of cases, with mixed germ cell tumors being the most frequent subtype. This distribution mirrors global patterns where germ cell tumors are the most common testicular malignancies. The occurrence of Non-Hodgkin's lymphoma, though rare (2.2%), highlights the spectrum of malignancies that can affect the testis, as noted by Mittal PK et al.(2018).[14]

Table 4 compares the age distribution by lesion type, revealing that patients with non-neoplastic lesions had a significantly higher mean age (49.8 years) compared to those with neoplastic lesions (36.5 years), with the difference being statistically significant (p=0.022). This is in agreement with findings from Desai A et al.(2024),[15] who reported younger age at presentation for testicular cancers compared to benign scrotal conditions. The age disparity supports the clinical approach where younger patients presenting with scrotal masses warrant prompt evaluation for neoplasia, whereas in older patients, chronic inflammatory or degenerative conditions are more likely.

CONCLUSION

The histopathological evaluation of scrotal masses in this study demonstrated a predominance of non-neoplastic lesions, particularly inflammatory conditions such as epididymo-orchitis and orchitis. Neoplastic lesions, although less frequent, primarily consisted of germ cell tumors and lymphomas. Age distribution varied significantly between lesion types, with neoplastic masses presenting at a younger age compared to non-neoplastic ones. This spectrum underscores the importance of histopathological diagnosis for accurate classification, guiding appropriate clinical management, and prognostication of scrotal masses. Early identification and differentiation between neoplastic and non-neoplastic lesions remain critical for improving patient outcomes.

Limitations of The Study

Several limitations were noted in this study. Firstly, the sample size, though adequate, was limited to a single tertiary care center, which may restrict the generalizability of the findings to broader populations. Secondly, the retrospective design and reliance on available histopathological records may have introduced selection bias. Thirdly, limited clinical follow-up data were available, restricting the ability to correlate histopathological findings with long-term prognosis and treatment outcomes. Finally, the lack of advanced molecular or immunohistochemical studies in some cases may have limited the precision of certain diagnoses, particularly among neoplastic lesions.

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