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Pathology Section

# Clinicopathological Study of Scrotal Lesions at a Tertiary Care Hospital: A Cross-sectional Study

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## ABSTRACT

**Introduction:** Scrotal masses, encompassing a range of benign and malignant conditions, present a significant clinical challenge due to their varied etiology and potential impact on male reproductive health. The evaluation and management of these masses require a comprehensive approach, integrating clinical, radiological, and histopathological assessments to ensure accurate diagnosis and optimal treatment.

**Aim:** To evaluate the histomorphological spectrums of neoplastic and non neoplastic lesions of the scrotum.

**Materials and Methods:** A retrospective, five-year cross-sectional study was conducted at the Department of Pathology at Hindu Hridaysamrat Balasaheb Thackeray (H.B.T) Medical College and Dr. Rustom Narsi Cooper Municipal General Hospital, Mumbai, Maharashtra, India, over a period of one year from January 2018 to December 2022. A sample size of 129 cases was obtained according to the inclusion and exclusion criteria. The specimens received in the Pathology laboratory were examined grossly and microscopically. Special stains were performed as per the requirement. Relevant clinical data (age, presenting complaints, duration, clinical diagnosis, laterality, nature of specimen, whether biopsy or resection) were obtained from the requisition forms submitted with the surgical specimens. All the findings were entered into a master chart, which was later used for further statistical evaluation with the help of Microsoft Excel 2007.

**Results:** A total of 129 cases of testicular and scrotal lesions were received in the surgical histopathology section from 21787 cases over five years, which accounts for 0.59%. Only one case was with genital ambiguity, while the rest of the cases (n=128) were males. Out of 129 cases, 115 cases (89.14%) were non neoplastic, while only 14 cases (10.85%) were neoplastic. The maximum number of cases (50 cases, 38.75%) was seen in the age group of 16 to 35 years. Seventy seven cases (59.68%) had lesions of the testicular parenchyma and epididymis, 28 cases (21.7%) from the paratestis and the tunica and 24 cases (18.6%) from the scrotal sac. Right-sided involvement (63cases, 48.83%) was more common than the left side (57 cases, 44.18%).

**Conclusion:** Non neoplastic lesions are commoner than neoplastic masses. Most of the non neoplastic lesions present similarly on physical examination, so radiological findings help in differentiating various lesions and guide further treatment. At times, neoplastic masses can mimic non neoplastic lesions. Accurate radiological intervention, history taking and clinical details can aid in diagnosis and appropriate surgical management.

**Keywords:** Epididymis, Paratestis, Scrotum, Testis, Torsion, Tumour

## INTRODUCTION

Histopathological evaluation plays a pivotal role in the diagnostic pathway of scrotal masses, providing definitive insights into the nature of the lesions [1]. This examination involves the microscopic analysis of tissue samples obtained through biopsy or surgical excision, allowing pathologists to identify cellular characteristics, tissue architecture, and specific markers indicative of various benign or malignant conditions.

Testes, paratesticular region and scrotum are affected by various non neoplastic and neoplastic diseases at various stages of life. Cryptorchidism, otherwise known as undescended testes, is one of the congenital malformations seen in approximately 1% of one-year-old boys [2]. Other non neoplastic lesions include inflammatory lesions like acute and chronic epididymo-orchitis, vascular lesions like torsion of the testis, atrophy with maturation arrest of spermatogenesis. Testicular lesions usually present as a scrotal mass, pain in the groin, or an abdominal mass [3].

Neoplastic lesions of the testis are rare tumours accounting for approximately 1% of all male cancers [4]. They are present in a younger age group between 15-35 years and it shows an inverse relationship to the age of occurrence [5-8]. There is a great geographical variation in the incidence of testicular cancers [9].

Tertiary hospitals, equipped with advanced diagnostic facilities and specialised expertise, serve as critical centres for the evaluation and management of complex scrotal masses. These institutions typically handle a higher volume of cases, providing valuable data for understanding the prevalence, types, and outcomes of scrotal masses within diverse patient populations. The role of tertiary hospitals extends beyond diagnosis to include multidisciplinary treatment planning, which may involve surgery, chemotherapy, radiation therapy, and ongoing patient monitoring.

The objective of the study is to analyse the histopathological findings of scrotal masses evaluated at a tertiary hospital, aiming to delineate the spectrum of lesions encountered, their relative frequencies, and the associated outcomes. Through this investigation, we hope to provide clinicians with robust data to guide the management of scrotal masses, ensuring timely and accurate diagnoses that are crucial for effective treatment and prognosis.

## MATERIALS AND METHODS

A retrospective, cross-sectional study was performed at the Department of Pathology, at H.B.T Medical College and Dr. R.N. Cooper Hospital, Mumbai, Maharashtra, India, for a period of five years from January 2018 to December 2022 and it was analysed over a period of one year in 2023, after the Institutional Ethics Committee approval (HBTMC/IEC/13-23). Patient participation was entirely confidential and the privacy of data was maintained.

**Inclusion criteria:** Orchidectomy specimens, biopsy samples, and scrotal specimens received at the histopathology lab were included in the study.

**Exclusion criteria:**

1. Biopsy sampling, which was done for evaluation of the cause of infertility.
2. Specimen which was not received in formalin.

**Sample size:** A sample size of 129 cases was obtained based on the aforementioned inclusion and exclusion criteria (no calculation was done; consecutive samples were selected within 5 years by convenience sampling.).

### Study Procedure

Clinical details of the patients were collected from the requisition forms received in the Surgical Pathology section. Relevant data were collected, including age, gender, presenting symptoms, duration of disease, clinical diagnosis, nature of specimen, laterality, gross and microscopic examination, and histopathological diagnosis. The received specimens were fixed overnight in 10% neutral buffer formalin. The routine stain used was Haematoxylin and Eosin (H&E). Special stains and Immunohistochemistry {(IHC for Calretinin, Cytokeratin 20 (CK20) and Carcinoembryonic Antigen (CEA)} were performed whenever required to confirm the diagnosis of malignancy.

## STATISTICAL ANALYSIS

Data were entered into Microsoft Excel 2007 and analysed using descriptive statistics. Categorical variables such as age groups, laterality, and the distribution of neoplastic and non neoplastic lesions were expressed as frequencies and percentages.

## RESULTS

In the present study, out of 129 cases, there were 128 males and 1 case with genital ambiguity whose specimens have been studied. In 2018, out of 5846 samples received for histopathology, 36 (0.62%) were samples from the scrotum and the testis. Among the 23 cases (0.44%) out of 5244 in 2019; 15 cases (0.64%) out of 2329 in 2020; 20 cases (0.55%) out of 3656 in 2021, and 35 cases (0.74%) out of 4712 cases in 2022. A total of 129 cases were studied from 21787 cases, which accounts for 0.59% of the relative incidence of testicular and scrotal lesions. The dip in samples in the year 2020 corresponds to the Coronavirus Disease 2019 (COVID-19) pandemic period. (Elective or planned surgeries were cancelled during the COVID-19 pandemic period).

The youngest patient in the present study was a three-year-old and the oldest was an 85-year-old male. The majority of the cases were seen in the age group of 16 to 25 years. It is followed by the age range 26 to 35 years, showing 22 cases (17.05%), [Table/Fig-1]. A total of 115 cases (89.14%) were non neoplastic, while 14 cases (10.85%) were neoplastic, [Table/Fig-2]. Out of the total 115 cases in the non neoplastic category, 25 cases (21.73%) were seen in the age group of 16 to 25 years. A total of 5 cases (35.71%) of the neoplastic category were seen in the age group of 26 to 35 years, followed by 3 cases (21.42%) in the age range 16 to 25 and 46 to 55 years of age. No neoplastic cases were reported in the age group less than 15 years in the present study.

Out of 129 cases, 77 cases (59.68%) had pathology of the testicular parenchyma and epididymis, 28 from the paratestis and the tunica (21.7%) and 24 cases (18.6%) from the scrotal sac. Out of the 14 neoplastic cases, five cases were benign and nine cases were malignant [Table/Fig-3].

Among all the 129 cases studied, pathology was found on the right side in 63 cases (48.83%) followed by the left side with 57 cases (44.18%) [Table/Fig-4]. The pathology involved the bilateral scrotum in 9 cases (6.97% cases). Out of 77 cases involving the testicular parenchyma and the epididymis. There were 25 cases (32.46%) of ischaemia secondary to torsion, followed by acute inflammatory pathology with 21 cases (27.27%). Atrophy was seen in 16 cases (20.77%). Miscellaneous cases include filarial orchiditis, benign epididymal cyst and a normal for age histology of testis in a known

| Age (in years) | n (%) |
|---|---|
| 1-15 | 13 (10.07) |
| 16-25 | 28 (21.7) |
| 26-35 | 22 (17.05) |
| 36-45 | 17 (13.17) |
| 46-55 | 19 (14.72) |
| 56-65 | 19 (14.72) |
| >66 | 11 (8.52) |
| Total | 129 (100) |

**[Table/Fig-1]:** Showing age-wise distribution of cases.

| Nature of lesion | n (%) |
|---|---|
| Non neoplastic | 115 (89.14) |
| Neoplastic | 14 (10.85) |
| Total | 129 (100) |

**[Table/Fig-2]:** Showing distribution of cases according to the pathology.

| | Non neoplastic | Neoplastic - benign | Neoplastic - malignant | n (%) |
|---|---|---|---|---|
| Testis and epididymis | 71 | 1 | 5 | 77 (59.68) |
| Paratestis and tunica | 22 | 4 | 2 | 28 (21.7) |
| Scrotal sac | 22 | - | 2 | 24 (18.6) |
| Total | 115 | 5 | 9 | 129 (100) |

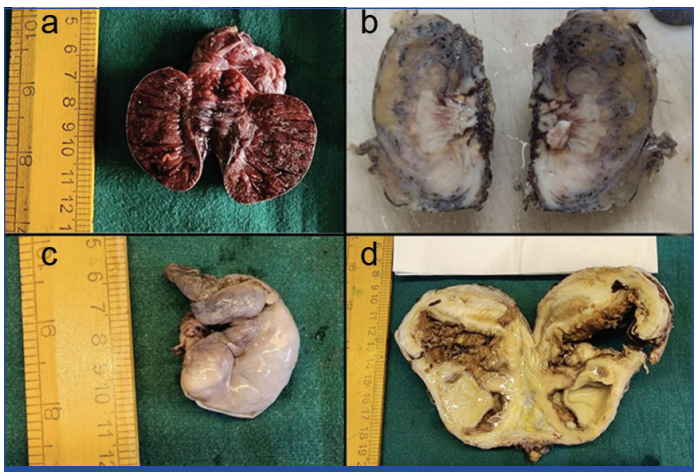
**[Table/Fig-3]:** Showing distribution of cases according to the site.

| Laterality | n (%) |
|---|---|
| Right | 63 (48.83) |
| Left | 57 (44.18) |
| Bilateral | 9 (6.97) |
| Total | 129 (100) |

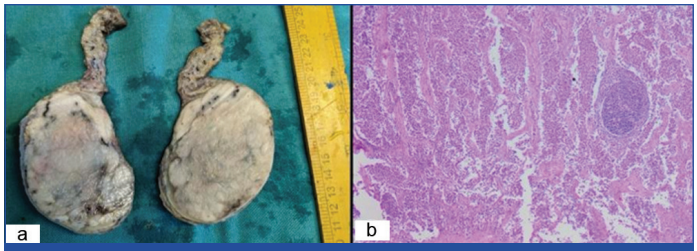
**[Table/Fig-4]:** Showing distribution of cases according to the laterality.

case of carcinoma prostate [Table/Fig-5]. One case (1.2%) of Sertoli cell adenoma was found in the benign neoplastic category. Five cases of malignancy were found out of which 3 cases (3.8%) were of Classic Seminoma and 2 cases (2.5%) of mixed germ cell tumour [Table/Fig-6].

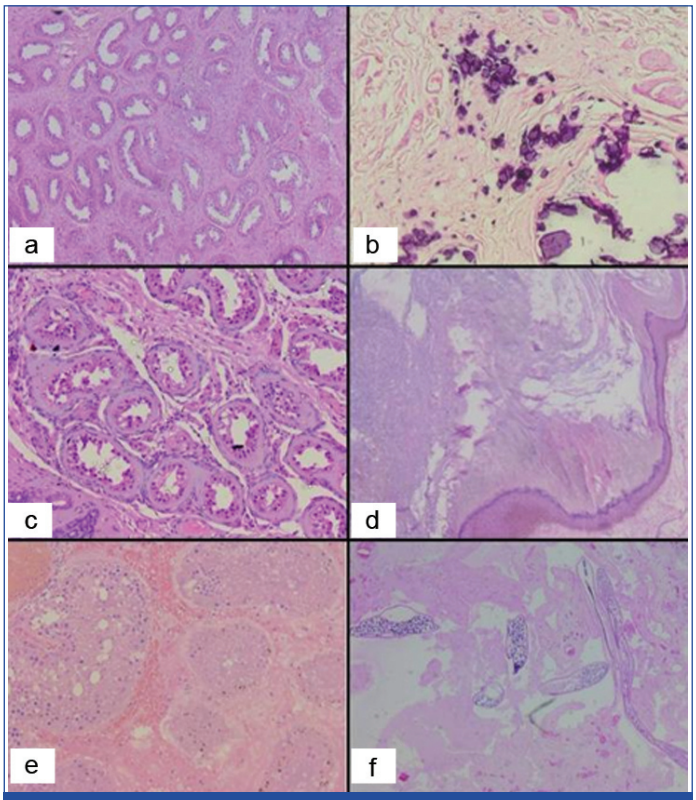
Out of 28 cases from the paratestis and the tunica, 22 cases (78.57%) were non neoplastic and included hydrocoele and pyocele with 8 cases each (28.57%) followed by varicocele with 4 cases (14.28%), [Table/Fig-7]. Haematocele and lymphangiectasia show one case each (3.57%). There were 2 cases (7.14%) of cord lipoma and 1 case each (3.57%) of leiomyoma and fibroepithelial




**[Table/Fig-5]:** a) Gross appearance of specimen of torsion testis, b) Gross appearance of specimen of epididymo-orchitis, c) Gross appearance of atrophied testis in Cryptorchidism, d) Gross appearance of Fournier's gangrene of scrotum.



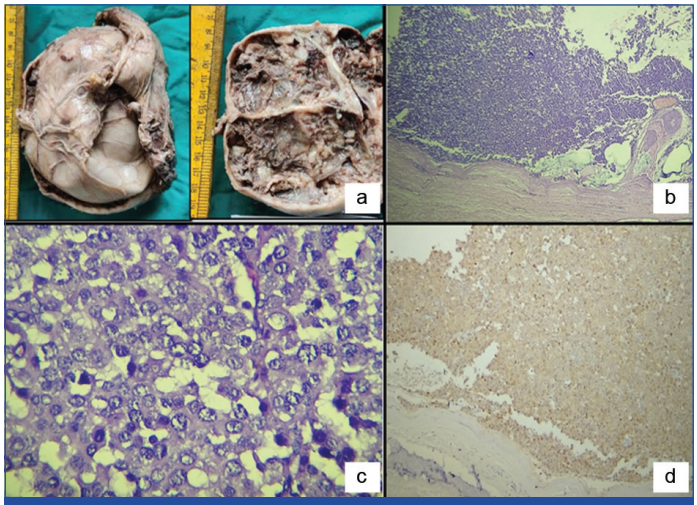

**[Table/Fig-6]:** a) Gross appearance of Seminoma testis, note the solid grey white tumour, b) Microphotograph of Seminoma testis, H&E, 40x.




**[Table/Fig-7]:** a) Microphotograph of Epididymo-orchitis, H&E, 10x, b) Microphotograph of Scrotal calcinosis cutis, H&E, 40x, c) Microphotograph of Crytorchid testis, note atrophy and absence of spermatogenesis, H&E, 40x, d) Microphotograph of epidermoid inclusion cyst, H&E, 40x, e) Microphotograph of torsion testis, H&E, 10x, f) Microphotograph of filarial orchitis showing fragments of adult worm, H&E, 10x.

polyp. One case (3.57%) of malignant mesothelioma (Calretinin positive, CEA and CK20 negative) was also found in the present study [Table/Fig-8].

Out of 24 cases from the scrotal sac, 22 cases (91.66%) were non neoplastic. Fournier's gangrene comprised 10 cases (41.66%).




**[Table/Fig-8]:** a) Gross appearance of malignant mesothelioma showing a solid cystic tumour, b) Microphotograph of malignant mesothelioma showing tumour in solid sheets H&E, 4x, c) Microphotograph of malignant mesothelioma showing cellular details, H&E, 40x, d) Microphotograph of malignant mesothelioma, diffusely positive for calretinin immunohistochemistry, 40x.

Chronic inflammatory pathology was found in 3 cases (12.5%). Miscellaneous cases include epidermal inclusion cyst, scrotal calcinosis and condyloma accuminata. Two cases (8.33%) of squamous cell carcinoma of the scrotal sac were also seen.

## DISCUSSION

During the study period of five years, 21787 surgical specimens were received. Out of these, testicular specimens received were 129, accounting for 0.59% of all surgical specimens. A relative incidence of 1.49% is reported by Jakkulwar SB and Sonwane BR, [10]. In the present study, the most common age group was 16 to 25 years (21.7% cases). It is similar to studies conducted by Sharma M et al., (11-20 years, 30.19%), Dhawle M et al., (11-20 years, 24.56%), Jaiswal S and Jaiswal S (11-30 years, 33.76%) [9,11,12]. However, Jakkulwar SB and Sonwane BR, found that the most common age group was 31-40 years [10]. The study published by Desai A and Wilkinson A, found the most common age group to be 51 to 60 years [13]. This is most likely due to differences in epidemiological factors and different histopathological diagnoses.

Out of the 129 cases studied, 115 (89.14%) cases were non neoplastic while 14 cases (10.85%) were neoplastic. The distribution is similar to most of the other studies where non neoplastic lesions form a major share of the pathologies affecting the scrotum and the testis. The findings are consistent with the studies by, Jakkulwar SB and Sonwane BR, Dhawle M et al., Jaiswal S and Jaiswal S and Tekumalla A et al., [Table/Fig-9] [10-12,14].

| Study | Non neoplastic | Neoplastic |
|---|---|---|
| Jakkulwar SB and Sonwane BR [10] 2020 | 69.04% | 30.95% |
| Dhawle M et al., [11] 2019 | 81.42% | 18.58% |
| Jaiswal S and Jaiswal S [12] 2022 | 90.1% | 9.9% |
| Tekumalla A et al., [14] 2019 | 81.25% | 18.75% |
| Present study 2025 | 89.12% | 10.88% |

**[Table/Fig-9]:** Showing comparison of nature of lesions among different studies.

Jaiswal S and Jaiswal S showed 52.94% of the lesions on the right side and 47.05% on the left side. Only 0.01% pathologies were bilateral [12]. Jakkulwar SB and Sonwane BR reported 53.57% lesions on the right side and 46.42% on the left side [10]. No lesions with bilateral involvement were reported. Right testis involvement (51.25%) was more common than the left side (31.25%) in a study conducted by Tekumalla A et al., [14]. Only 17.5% cases were bilateral. This is consistent with the present study, where right-sided pathologies were 48.83% and left-sided side were 44.18%. Bilateral involvement was noted in 6.97% cases only. In the studies done by Jakkulwar SB and Sonwane BR, Jaiswal S and Jaiswal S and Tekumalla A et al., right-sided lesions were more common than the left-side [Table/Fig-10] [10,12,14].

| Laterality | Jakkulwar SB and Sonwane BR [10] 2020 | Jaiswal S and Jaiswal S [12] 2022 | Tekumalla A et al., [14] 2019 | Present study 2025 |
|---|---|---|---|---|
| Right | 53.57% | 52.94% | 51.25% | 48.83% |
| Left | 46.42% | 47.05% | 31.25% | 44.18% |
| Bilateral | -- | 0.01% | 17.50% | 6.97% |

**[Table/Fig-10]:** Showing comparison of laterality among different studies [10,12,14].

Testicular torsion typically presents with a sudden and intense pain in one testicle, often accompanied by nausea and vomiting. There is typically a four- to eight-hours window before significant ischaemic damage occurs, manifested by morphologic changes in testicular histopathology and deleterious effects on spermatogenesis [15]. Out of 129 cases, 25 cases (19.37%) were cases of ischaemia

secondary to torsion in the present study. In the study conducted by Athira KP et al., 25 cases of testicular torsion were seen out of the total 139 cases [16]. Out of 129 cases in the present study, the authors encountered 21 cases (16.27%) of acute epididymo-orchitis. Dhawle M et al., found 20 out of 70 cases (35.08%) of epididymo-orchitis (n=20), followed by torsion 10 (17.54%) [11]. Out of 129, 16 (12.40%) cases of atrophy were due to cryptorchidism. Jaiswal S and Jaiswal S conducted a retrospective study of 77 cases where cryptorchid testis comprised the most common non neoplastic lesion, with 24 cases (46.1%) of the total orchidectomy specimens, followed by torsion, which had eight cases (15.3%) [12]. A comparison of studies with respect to non neoplastic lesions is described on [Table/Fig-11].

Miscellaneous cases (n=9) included were genital filariasis (n=3), benign epididymal cyst (n=3) and normal testes (n=3). The most common presentation of the genital filariasis is hydrocele, which is caused by blockage or lymphatic channel malfunction. Wuchereria bancrofti is the cause of more than 90% of cases globally with *Brugia malayi* and *Brugia timori* following closely behind and is seen in states like Tamil Nadu, UP, Bihar, Jharkhand, and Odisha where it is endemic [17]. Epididymal cysts are not uncommon and most of them occur in relation to any inflammation. The major concern is the possibiltiy of presence of neoplastic etiology in its content [18]. In the cases of carcinoma prostate, testes are removed as a part of therapy and invariably they are unremarkable on histopathology.

In the neoplastic masses, seminoma was commonly seen (n=3) in the present study. The tumour is most commonly seen in patients between 30 and 50 years of age and presents with progressive, painless enlargement of the testis [19]. Studies conducted by Sharma M et al., (one case, N=53), Jaiswal S and Jaiswal S (four cases, N=77), Tekumalla A et al., (six cases, N=80), Athira KP et al., (three cases, N=139), Beigh A et al., (15 cases, N= 37) and Fatima S et al., (10 cases, N=91) also found similar results with respect to neoplastic conditions especially seminoma [9,12,14,16,20,21]. A single case of Androgen Insensitivity Syndrome (AIS) was diagnosed in a 16-year-old case with genital ambiguity [cytogenetically (46XY) and phenotypically female], who presented with primary amenorrhoea. On radiological investigations, it was found to have bilateral gonadal enlargement. Histopathology revealed the presence of a sertoli cell tumour with the absence of spermatogenesis. There was no evidence of ovarian parenchyma. Available literature on AIS has proved that this syndrome is associated with tumours like seminoma, sertoli cell tumour and gonadoblastoma [22]. In the present study, there were two cases of mixed germ cell tumour, and the findings are comparable with studies conducted by Sharma M et al., Dhawle M et al., and Tekumalla A et al., [Table/Fig-11] [9,11,14].

In the present study, 28 cases were seen to involve paratesticular region, out of which 22 cases were benign. Majority of the cases comprised hydrocoele and pyocele each with eight cases. A study done by Khandeparkar SG and Pinto RG, found cases of fibromatous peri-orchitis (n=2) and mesothelial cyst (n=1) [23]. Bangar AS et al., reported 20 cases of pyocele [24]. In the neoplastic category, there were two cases of cord lipoma and one case of leiomyoma and fibroepithelial polyp. Two malignant cases were liposarcoma and malignant mesothelioma. Beigh A et al., reported leiomyosarcoma of paratesticular region [20]. Sanjay M and Sushma HM, reported one case each of adenomatoid tumour and rhabdomyosarcoma of the paratestis [25]. Ikeri N et al., reported one case of embryonal rhabdomyosarcoma [26]. Paul Pam et al., found that lipoma was the most common tumour of the paratestis (n=16) [27]. Other benign tumours were adenomatoid tumour, cellular angiofibroma and haemangioma. Two cases of rhabdomyosarcoma and a case of malignant mesothelioma was also reported in the same study [28]. Khandeparkar SG and Pinto RG, also found that lipoma was the most common benign tumour (n=3) [23]. The malignant tumours were malignant fibrous histiocytoma, well-differentiated liposarcoma, myxoid liposarcoma and malignant mesothelioma, one case of each entity [23].

Fournier's gangrene is a synergistic polymicrobial necrotising fasciitis of the perineum, scrotum and penis. Many conditions are believed to contribute to the development of the disease, are diabetes mellitus, alcoholism, immunosuppression, local trauma, genitourinary infections, acquired immunodeficiency syndrome, malignant neoplasms, liver and renal disease. In all these conditions, there was a decrease in the host immunity. Diabetes mellitus is the most commonly associated co-morbid condition [28]. In the present study, authors encountered a total of 10 cases (7.75%) out of the total of 129 cases in the current study. There was no history of co-morbidities in the present study. As per the study conducted by Arora A et al., the mean age at presentation was 53±16 years, which is similar to our study, where the average age is 49.2 years [29]. Other entities included were chronic inflammatory pathology, epidermal inclusion cysts, scrotal calcinosis and condyloma acuminata. Patidar N et al., found Fournier's gangrene (n=38) and scrotal abscess (n= 35) [30]. These lesions were associated with Lower Urinary Tract Symtoms (LUTS) and poor personal hygiene. Kumar R et al., found Fournier's gangrene in 18% cases and it was associated with LUTS [31].

| Study | Sharma M et al., [9] 2017 | Dhawle M et al., [11] 2019 | Jaiswal S and Jaiswal S [12] 2022 | Tekumalla A et al., [14] 2019 | Sanjay M and Sushma Hm [25] 2016 | Present study 2025 |
|---|---|---|---|---|---|---|
| Torsion | 18.86% | 17.54% | 15.3% | 12.03% | - | 21.73% |
| Epididymo-orchitis | | 35.08% | | 38.5% | 12.19% | 18.2% |
| Cryptorchid | 39.62% | 7.01% | 46.1% | 4.6% | - | 13.91% |
| Filariasis | | | | | - | 7.8% |
| Atrophy | 16.98% | 15.78% | 9.09% | 23.08% | - | |
| Abscess | 5.66% | 14.03% | 7.6% | | - | |
| Normal | | | | 21.5% | - | 2.6% |
| Granulomatous orchitis | 3.77% | | 2.59% | | 2.44% | |
| Seminoma | 25% | 30.76% | 7.6% | 40% | 38.9% | 50% |
| Mixed germ cell tumour | 25% | 46.15% | | 33.33% | 33.33% | 33.33% |
| Sertoli cell adenoma | | | | | | 16.66% |
| Embryonal carcinoma | | 15.38% | | | | |
| Teratoma | 25% | | | 13.33% | 11.11% | |
| Yolk sac tumour | 25% | | 1.92% | 6.66% | 5.5% | |
| Others | | | | 6.66% | 11.11% | |

**[Table/Fig-11]:** Showing comparison of non neoplastic and neoplastic cases among different studies[9,11,12,14,25].

Squamous carcinoma of the scrotum is not unusual. Despite the low incidence, Squamous Cell Carcinoma (SCC) remains the most common scrotal malignancy with a propensity for recurrence and metastasis [32]. No longer are occupational exposures to carcinogens the major aetiology of scrotal SCC. Rather, in contemporary times, common risk factors include Human Papilloma Virus (HPV) infection, immunocompromised states, and chronic scrotal inflammatory conditions [33]. The mean age at presentation was 55 years (range, 30 to 74 years) [33]. This is consistent with the findings of the present study.

### Limitation(s)

In the present study, all attempts were made to correlate histopathological, clinical and microbiological findings. However, there were certain limitations. The acute inflammatory lesions of testes and epididymis and Fournier's gangrene encountered in the present study did not have a full microbiological work-up. The underlying co-morbid conditions were also not available due to a lack of follow-up.

## CONCLUSION(S)

Non neoplastic lesions of the testes, paratestis and scrotum are most common than neoplastic masses. Even in the non neoplastic lesions, it is important to differentiate them from each other since they have similar clinical presentations. This is because not every lesion requires surgical treatment. Some of them only require observation, and when required, surgical excision is often curative. Adequate radiological intervention, especially in cystic masses, meticulous sampling and histopathology can aid in definitive diagnosis. In the era of precision medicine and with upcoming molecular studies, new treatment modalities have emerged which provide minimally invasive procedures for diagnosis and treatment. Understanding these facets not only aids in clinical decision making but also highlights the evolving landscape of managing neoplastic and non neoplastic scrotal masses with a focus on personalised care.

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