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Evaluation of the Histomorphological Analysis of Testicular Lesions

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ABSTRACT

Background and aim: The normal adult testis is a paired organ in the scrotum, suspended by the spermatic cord. Both non-neoplastic and neoplastic conditions can impact it. Non-neoplastic causes include cryptorchidism, testicular torsion, atrophy, epididymo-orchitis, and testicular cysts. Neoplastic lesions of the testis are rare, representing about 1% of all male cancers. The aim is to review the histomorphological features of all testicular lesions and their incidence, age distribution, and laterality.

Material and methods: This retrospective study was conducted over 18 months, from December 2022 to May 2024, in the histopathological section of the pathology department at RNT Medical College, Udaipur. One hundred forty orchidectomy specimens were received, and histopathological slides were prepared and examined.

Results: Of the 140 cases studied, 131 were non-neoplastic (93.6%), and nine were neoplastic (6.4%). Non-neoplastic lesions of the testis were most prevalent across all age groups, whereas malignancies were more common in the third decade of life. Among the non-neoplastic testicular lesions, 67 cases were due to prophylactic orchidectomy (47.9%), followed by 40 cases of testicular torsion (28.6%). Among the neoplastic lesions, the most common was mixed germ cell tumors (55.5%). The majority of cases were bilateral prophylactic orchidectomies; however, right-sided testicular lesions were more common when only a single testis was involved.

Conclusions: Non-neoplastic lesions were more common across all age groups, whereas testicular neoplastic lesions were more frequently found in younger individuals.

1. Introduction

The normal adult testis is a paired organ in the scrotum, suspended by the spermatic cord.[1] The testis can be affected by both non-neoplastic and neoplastic conditions. These lesions can occur in various age groups, from pediatric to adult population.[2] There is a major geographical variation in the incidence of testicular cancers.[3] Non-neoplastic causes include cryptorchidism, testicular torsion, atrophy, epididymal-orchitis, and testicular cyst.[2] Neoplastic lesions of the testis are rare, accounting for approximately 1% of all male cancers.[4] Cryptorchidism is a significant risk factor for the development of testicular cancer.[5] Testicular carcinoma follows a reverse pattern, decreasing incidence with increasing age, unlike most other carcinomas.[6] Surgical removal of the testes, known as orchidectomy, is indicated for both non-neoplastic and neoplastic conditions of the testis. Additionally, bilateral orchidectomy may be performed to evaluate the spread of malignancy from adjacent organs, such as the prostate or penis.[7] This study aims to examine the diverse histo-morphological features of the testis' non-neoplastic and neoplastic lesions and to correlate these findings with incidence, age distribution, and laterality of the lesions.

2. Material and methods

This descriptive cross-sectional study was conducted over 18 months, from December 2022 to May 2024, in the histopathology section of the Pathology Department at RNT Medical College, Udaipur. Before the study, the Institutional Ethics Committee approved it. During this period, 140 orchidectomy specimens were received. For each specimen, detailed clinical information was obtained from the pathology requisition forms provided by the attending clinicians. The process of histopathological examination began with the proper fixation of the orchidectomy specimens, typically in 10% formalin, to preserve tissue integrity. After fixation, the specimens were grossed to assess their size, appearance, and any notable macroscopic features. Tissue samples from the specimens were then processed through a series of steps, including dehydration, clearing, and infiltration with paraffin wax. Once embedded in paraffin, thin tissue sections were cut using a microtome and mounted onto glass slides. The prepared slides were stained with hematoxylin and eosin (H&E) for routine examination. The histopathological slides of all orchidectomy specimens were examined under

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a light microscope, and the findings were carefully recorded and categorized based on the nature of the lesions.

3. Results

All orchidectomy specimens were analyzed and categorized into non-neoplastic and neoplastic lesions. As described in Fig. 1, out of 140 orchidectomy specimens, nine were neoplastic (6.4%), and the remaining 131 were non-neoplastic (93.6%). The cases ranged in age from a 2-month-old child to a 91-year-old adult.

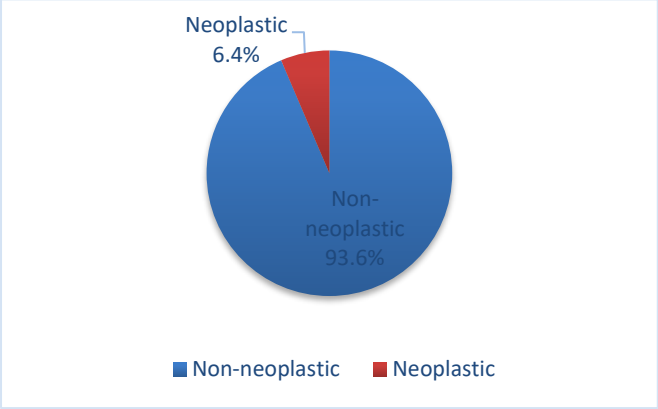

Fig. 1. Type of testicular lesions (Neoplastic vs. Non-neoplastic).

Neoplastic lesions of the testis (Table 1), five cases were of mixed germ cell tumor (Fig. 1) (55.6%), three cases were of Seminoma (33.3%) (Fig. 2), and only one case was of teratoma (11.1%).

Table 1. Neoplastic Testicular Lesion.

Neoplastic Testicular Lesion	Cases
Mixed germ cell tumor	5
Seminoma	3
Teratoma	1
Grand Total	9

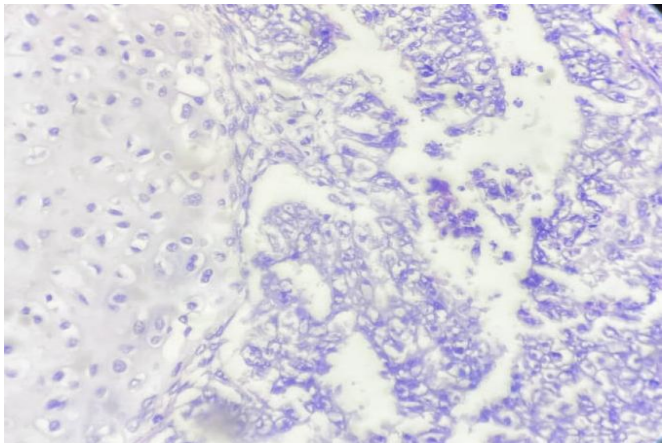

Fig. 1. shows features of embryonal cell carcinoma +Teratoma (cartilage) (H&E, X400).

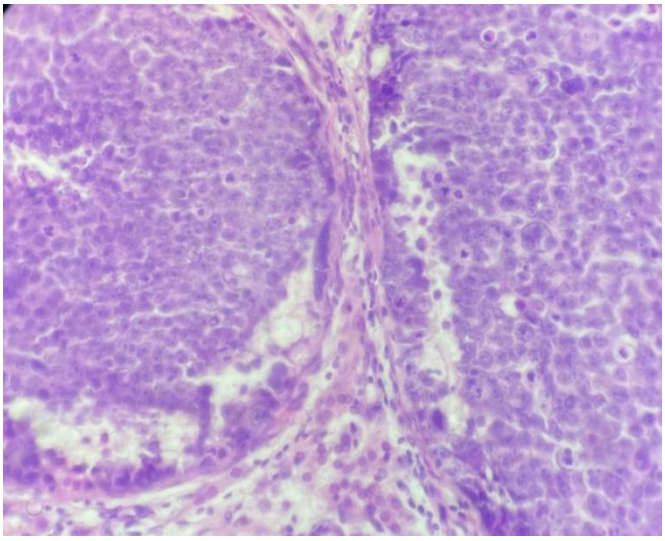

Fig. 2. Shows a compact nest of tumor cells separated by fibrous septa infiltrated by lymphocytes. (H&E, X400).

Non-neoplastic testicular lesions (Table 2) included 40 cases of testicular torsion, 67 cases of prophylactic orchidectomy, six cases of atrophic testis, five cases of cryptoorchidism, 4 cases of epididymoorchitis (Fig. 3), three cases each of testicular cyst and varicocele. However, a single case of gangrenous testis, inguinoscrotal hernia, and vanishing testis were noted.

Table 2. Non-neoplastic Testicular Lesions.

Non-neoplastic Testicular Lesions	Cases
Atrophic testis	6
Cryptorchidism	5
Epididymo-orchitis	4
Gangrenous testis	1
Inguinoscrotal hernia	1
Normal testicular tissue (Prophylactic orchidectomy)	67
Testicular cyst	3
Testicular torsion	40
Vanishing testis	1
Varicocele	3
Grand Total	131

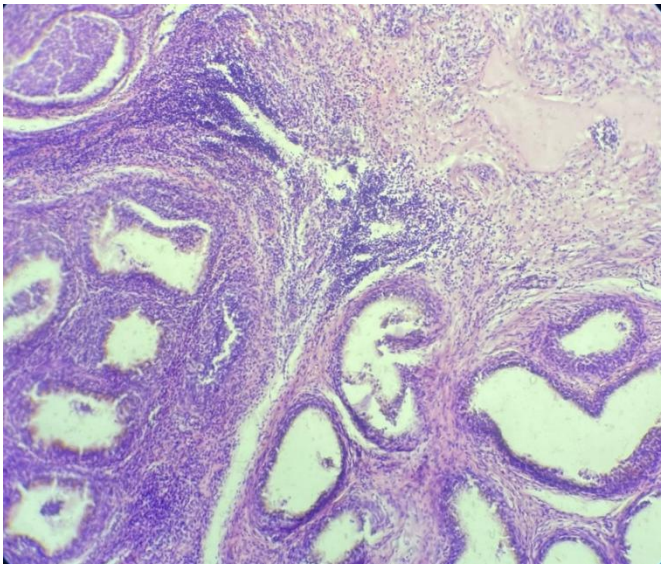

Fig. 3. section of testis showing chronic inflammatory infiltrate in epididymis and septa suggestive of Epididymo-orchitis (H&E, X100).

In our study, most cases were of bilateral orchidectomies(47.9%), of which only one was neoplastic (Table 3). However, among all cases, right-sided testicular involvement was more common when a single testis was involved.

Table 3. Laterality of Testicular Lesions.

Laterality of Lesions	Neoplastic Lesions	Non-neoplastic Lesions	Grand Total
Bilateral testis	1	66	67
Left testis	3	29	32
Right testis	5	36	41
Grand Total	9	131	140

Non-neoplastic testicular lesions were seen across all age groups (Table 4). The youngest case was a 2-month-old child of cryptorchidism, whereas the eldest (91 years) was a case of prophylactic orchidectomy. Prophylactic orchidectomies were mainly clustered in the 60-80 age group, with 48 out of 67 cases (71.6%); the remainder were distributed among all age groups. Testicular torsion primarily occurred in the 11-20 age group, with 21 out of 40 cases (52.5%), while cases were also seen from 0 to 70. Three out of five cases (60%) of cryptorchidism were noted in the same age group, i.e., 11-20 years. Additionally, two out of six cases (33.3%) of atrophic testis were recorded in the 41-50 years age group, and two out of four cases (50%) of epididymal-orchitis were noted in the 71-80 years age group. However, as shown in Table 5, five cases(55.5%) of neoplastic testicular lesions were from the third decade, three cases(33.3%) from the fourth decade, and only one case (11.1%) from the eighth decade.

Table 4. Age-wise distribution of remaining non-neoplastic testicular lesions is as follows.

	Non-neoplatic Testicular Lesions-age Distribution										
Age Group	Atrophic Testis	Cryptorchidism	Epididymo-Orchitis	Gangrenous Testis	Inguinoscrotal Hernia	Normal Testicular Tissue	Testicular Cyst	Testicular Torsion	Vanishing Testis	Varicocele	Grand Total
0-10	1	1	-----	1	-----	-----	-----	3	-----	-----	6
11-20	-----	3	-----	-----	-----	-----	-----	21	1	-----	25
21-30	1	1	1	-----	-----	1	-----	6	-----	2	12
31-40	1	-----	-----	-----	-----	1	-----	2	-----	-----	4

41-50	1	-----	-----	-----	1	3	-----	4	-----	1	10
51-60	2	-----	-----	-----	-----	7	-----	1	-----	-----	10
61-70	-----	-----	1	-----	-----	26	2	2	-----	-----	31
71-80	-----	-----	2	-----	-----	22	1	1	-----	-----	26
81-90	-----	-----	-----	-----	-----	6	-----	-----	-----	-----	6
91-100	-----	-----	-----	-----	-----	1	-----	-----	-----	-----	1
Grand Total	6	5	4	1	1	67	3	40	1	3	131

Table 5. Age-wise distribution of neoplastic testicular lesions

Neoplastic Testicular Lesion-Age Distribution

Age Group	Mixed Germ Cell Tumor	Seminoma	Teratoma	Grand Total
21-30	3	1	1	5
31-40	2	1	-----	3
71-80	-----	1	-----	1
Grand Total	5	3	1	9

4. Discussion

Testis is affected by both neoplastic and non-neoplastic lesions. Our study comprised 140 orchidectomy specimens studied over 18 months. Most cases were non-neoplastic lesions, as opposed to neoplastic lesions, with our findings showing that 93% were non-neoplastic. These results are consistent with those of Patel et al.[4] (80%), Tekumalla et al.[7] (81.25%), Devi et al.[8] (94.20%), Harikrishnan et al.[9] (86%), and Sruthiksha et al.[10] (95%) (Table 6 and Fig. 4).

Table 6. Comparison of non-neoplastic and neoplastic lesions with other studies.

Table	Non neoplastic lesion	Neoplastic lesion
Patel et al. 2015 [4]	80%	20%
Tekumalla et al. 2019 [7]	81.25%	8.75%
Devi et al. 2015 [8]	94.20%	5.80%
Harikrishnan et al. 2022 [9]	86%	14%
Sruthiksha et al. 2024 [10]	95%	5%
Present study	93%	7%

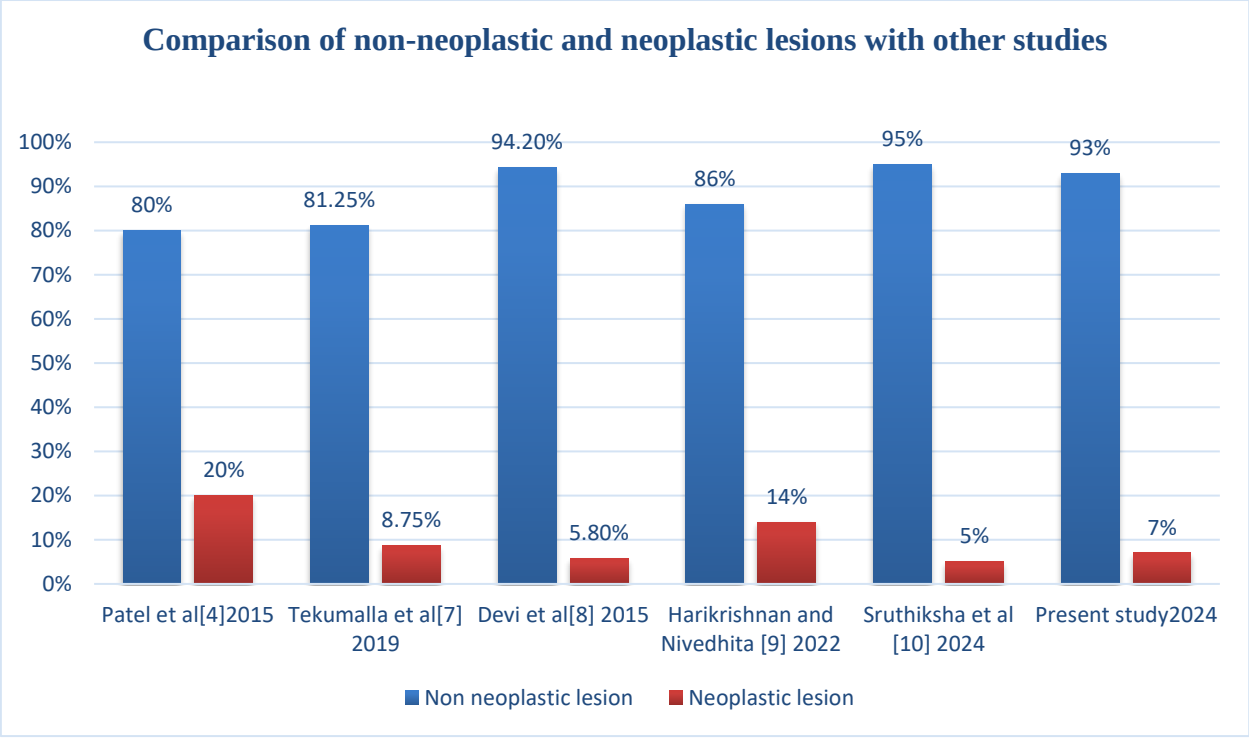

Fig. 4. Comparison of the non-neoplastic and neoplastic lesions with other studies.

In our study, the majority of cases showed bilateral testicular involvement. However, when a single testis was affected, right-sided testicular lesions (29.3%) were more common. This finding aligns with the studies of Patel et al.[4] (59%), Tekumalla et al.[7] (51.25%), and Harikrishnan et al.[9] (58.5%). In contrast, Sruthiksha et al.[10] reported a higher prevalence of left-sided testicular involvement (58%) (Table 7 and Fig. 5).

Table 7. Comparison of laterality of testicular lesions with other studies.

Table	Right Testicular Lesion	Left Testicular Lesion	Bilateral Testicular Lesion
Patel et al. 2015 [4]	59%	39%	2%
Tekumalla et al. 2019 [7]	51.25%	31.25%	-----
Harikrishnan et al. 2022 [9]	58.50%	37.10%	4.20%
Sruthiksha et al. 2024 [10]	42%	58%	-----
Present study	29.30%	22.10%	47.90%

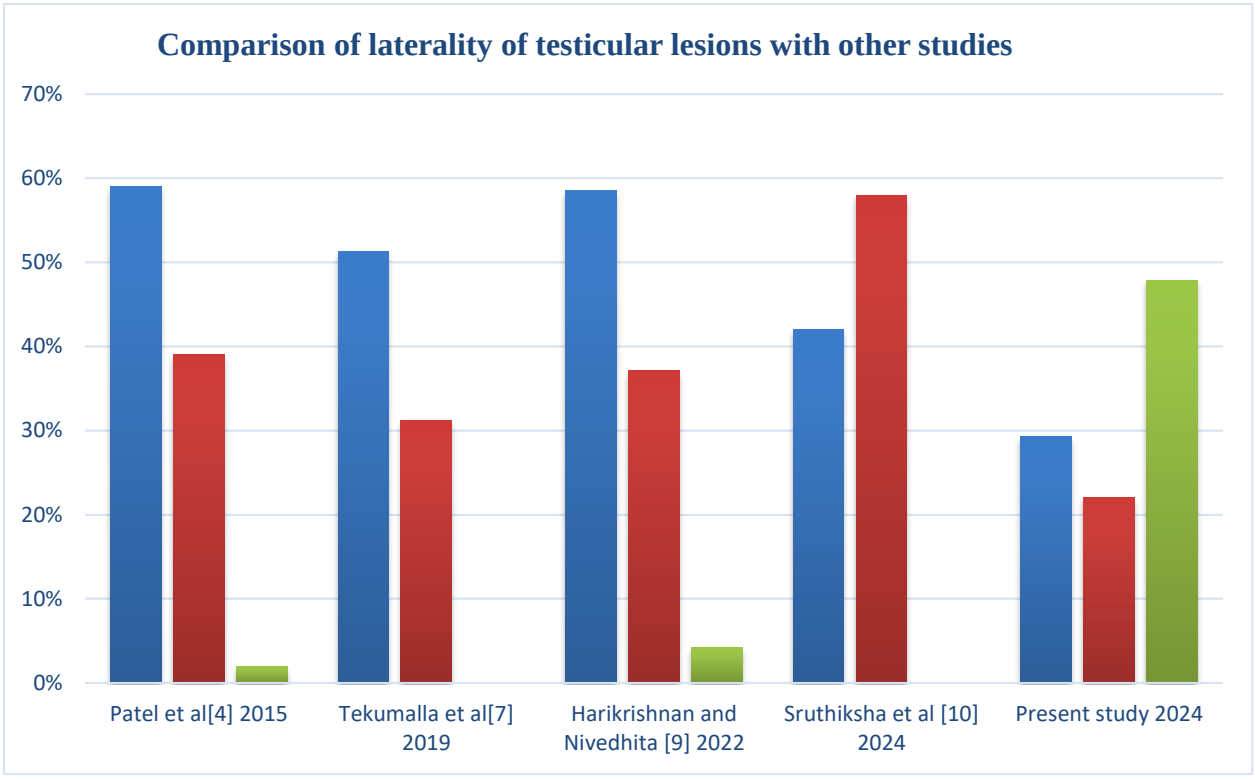

Fig. 5. Comparison of laterality of testicular lesions with other studies.

Among the neoplastic cases, the most common lesion was Mixed Germ Cell Tumor (MGT), accounting for 55.5% of cases, followed by Seminoma at 33.3%cases (Table 8 and Fig. 6). This concurs with the study by Reddy et al.,[2] where MGT comprised 43% of cases, followed by Seminoma at 42.3%. In contrast, other studies reported seminoma cases as the most common neoplastic lesion, with Patel et al.[4] and Tekumalla et al.[7] observing Seminoma in 40% of cases. Sruthiksha et al.[10] reported a different distribution, with seminoma cases at 28.5%, MGT cases at 14.3%, and other tumors at 42.9%. The variation may be due to geographical region and other predisposing factors.

Table 8. Comparison of neoplastic lesions with other studies.

Table	Mixed Germ Cell Tumor	Seminoma	Teratoma	Others
Reddy et al. 2016 [2]	43%	42.90%	-----	7.20%
Patel et al. 2015 [4]	-----	40%	33.30%	26.60%
Tekumalla et al. 2019 [7]	33.30%	40%	13.30%	13.26%
Sruthiksha et al. 2024 [10]	14.30%	28.50%	14.30%	42.90%
Present study	55.60%	33.30%	11.10%	-----

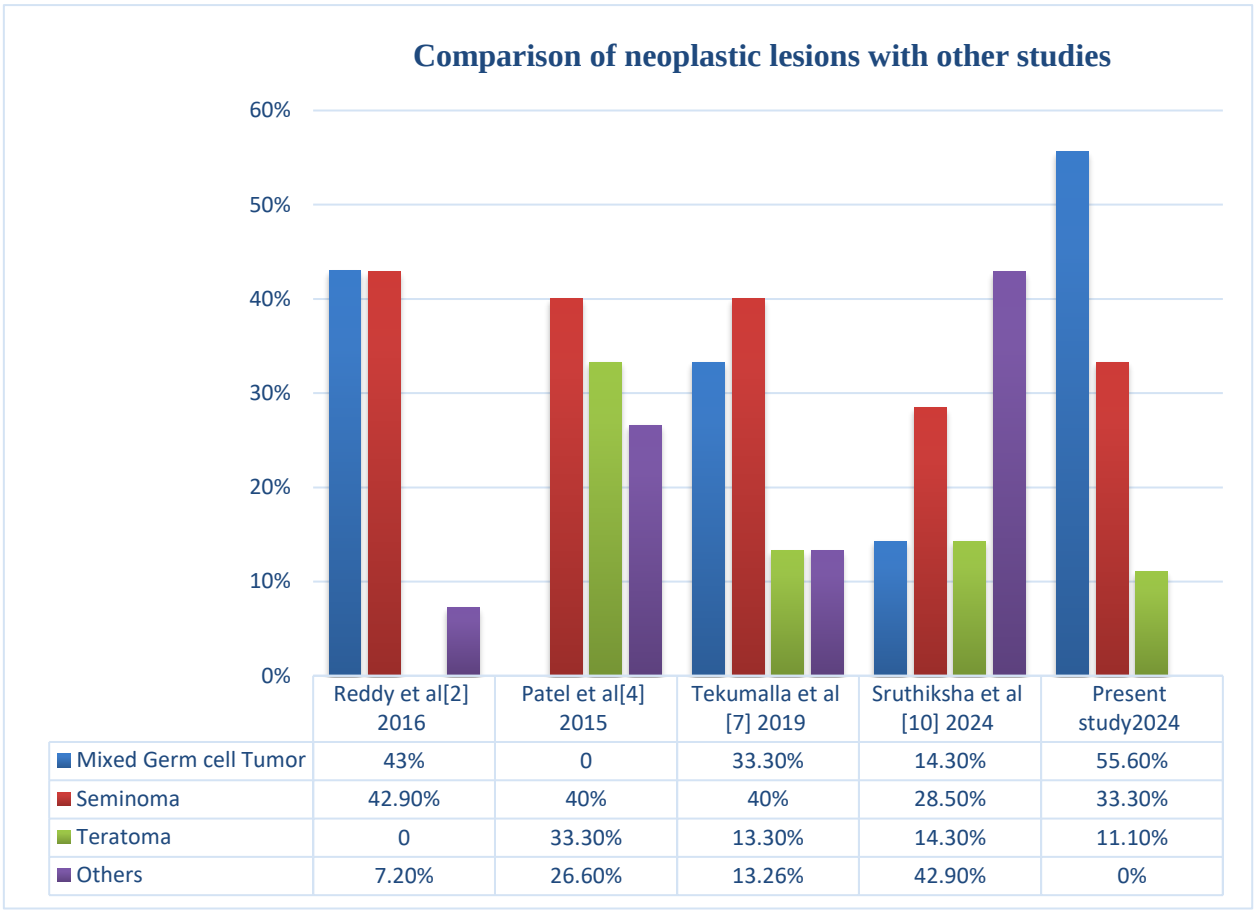

Fig. 6. Comparison of neoplastic lesions with other studies.

In our study, the most common non-neoplastic lesion was testicular torsion (30.5% cases), followed by atrophic testis (4.5% cases) (Table 9). This is consistent with the findings of Reddy et al.[2] who reported 22.1% cases of torsion and 19.8% cases of atrophic testis. However, studies by Tekumalla et al.,[7] Devi et al.,[8] and Sruthiksha et al.[10] found that epididymo-orchitis was more prevalent, accounting for 38%, 39.28%, and 67.2% of cases, respectively. In the Tekumalla et al.[7] study, atrophic testis was the second most common lesion (23.08% cases), accounting for only 4.5% of our study. Additionally, 55.1% of cases in our study showed normal testicular architecture, similar to the findings of Tekumalla et al.[7] (21.5% cases) and Devi et al. 8(22.3% cases). Sruthiksha et al.[10] observed equal cases of testicular torsion and atrophic testis (11.5% cases each). In comparison, our study showed a higher incidence of torsion (30.5% cases) and a lower incidence of atrophic testis (4.5% cases).

Table 9. Comparison of non-neoplastic lesions with other studies.

Lesions	Reddy et al. 2016 [2]	Tekumalla et al. 2019 [7]	Devi et al. 2015 [8]	Sruthiksha et al. 2024 [10]	Present Study
Cryptorchidism	1.40%	4.60%	-----	3.50%	3.80%
Torsion	22.10%	12.03%	17.85%	11.50%	30.50%
Normal study	-----	21.50%	22.30%	-----	51.50%
Atrophic Testis	19.80%	23.08%	14.28%	11.50%	4.50%
Epididymo-orchitis	3.50%	38.50%	39.28%	67.20%	3.10%

Our study found that 93% of cases were non-neoplastic, with testicular torsion being the most common non-neoplastic lesion (30.5%), which is higher than other studies. This contrasts with the higher prevalence of epididymoorchitis seen in studies like Sruthiksha et al. (67.2%). In terms of neoplastic lesions, mixed germ cell tumor (MGT) was the most common (55.6%), followed by seminoma (33.3%), reflecting a shift in tumor patterns compared to other studies, where seminoma was more prevalent. These findings suggest regional differences and changing patterns in testicular lesions, possibly reflecting variations in patient demographics, diagnostic approaches, or healthcare practices.

5. Conclusion

Non-neoplastic lesions were more common across all age groups, whereas testicular neoplastic lesions were more frequently found in younger individuals. Despite the advancements in imaging techniques and tumor marker assays, the diagnosis of testicular lesions still primarily depends on histopathological examination. This examination is crucial for providing an accurate diagnosis of testicular lesions. It plays an important role in the grading and staging of testicular tumors, essential for determining the appropriate treatment approach.

Conflict of Interest

The authors declared that there is no conflict of interest.

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