A rare malignant mesothelioma of the tunica vaginalis testis: A case report

YIQIAN JIANG[1], YONG CAI[2], XIAOPING XU[1], XIANGYANG KONG[1] and JIANHUA CAO[3]

Departments of [1]Radiotherapy, [2]Pediatrics and [3]Respiratory and Critical Care Medicine, Xiaoshan Affiliated Hospital of Wenzhou Medical University, Hangzhou, Zhejiang 311200, P.R. China

Received June 13, 2023; Accepted February 13, 2024

DOI: 10.3892/ol.2024.14305

Abstract. Malignant mesothelioma of the tunica vaginalis testis is a rare, highly invasive urogenital malignant tumor with no specific clinical manifestations. Reported cases of this disease are limited. Therefore, an early preoperative diagnosis is difficult. The current study presents a case of malignant mesothelioma of the tunica vaginalis testis and a literature review. A 52-year-old man was admitted to Xiaoshan Affiliated Hospital of Wenzhou Medical University (Hangzhou, China) in December 2022 and underwent radical resection of the right testicle and epididymis but did not undergo radiotherapy or chemotherapy. The patient was followed up for 5 months, and no recurrence or metastasis was found. The rarity of testicular mesothelioma poses a challenge to its etiology and diagnosis, which is rarely achieved preoperatively. Malignant mesothelioma of the testicular tunica vaginalis has a poor prognosis and is not sensitive to radiotherapy or chemotherapy, requiring close postoperative follow-up. This condition is rare in clinical practice; therefore, it needs to be reported to aid clinicians' decision-making regarding diagnosis and treatment.

Introduction

Malignant mesothelioma of the tunica vaginalis testis is a rare tumor that accounts for <1% of all mesothelioma cases (1,2). It can occur at any age; however, the majority of patients are between 55 and 75 years of age, with occasional cases in adolescents (3). Since its first recording in 1957, <300 cases have been reported worldwide (4,5). The most common clinical manifestation of this disease is scrotal enlargement with an unexplained hydrocele; a small number of patients present with internal scrotal masses and pain in the inguinal area (6). Early preoperative diagnosis is challenging (7,8). This disease is associated with difficulty in diagnosis, high malignancy, easy recurrence, poor prognosis and unclear epidemiological and risk factors (2,9,10), The present study reports a case of malignant mesothelioma of testicular sheath.

Correspondence to: Dr Jianhua Cao, Department of Respiratory and Critical Care Medicine, Xiaoshan Affiliated Hospital of Wenzhou Medical University, 199 Shixin South Road, Xiaoshan, Hangzhou, Zhejiang 311200, P.R. China
E-mail: caojianhua7781@163.com

Key words: malignant mesothelioma, tunica vaginalis, testis

Case report

A 52-year-old man was referred to the Department of Urology of Xiaoshan Hospital, Affiliated with Wenzhou Medical University (Xiaoshan, China) in December 2022, complaining of swelling and pain in the right testis for 2 months. The patient had a previous history of hypertension, and blood pressure was well controlled. Moreover, the patient had no known exposure to asbestos. In December 2022, the pre-admission computed tomography (CT) scan of the patient showed significant hydrocele of the right testicular tunica vaginalis, suggesting epididymitis (Fig. 1). After admission, B-ultrasound revealed a cyst in the right epididymis head and significant hydrocele in the right testicle. Meanwhile, tumor indicators did not show any abnormalities. After excluding contraindications, the right testicular sheath reversal and right testicular sheath lesion resection were performed under general anesthesia, and the procedure went smoothly.

Postoperative pathological microscopic observations revealed two forms, epithelial and sarcomatoid, and reciprocal migration between the two was observed. The epithelial components were characterized by small tubular, papillary and solid arrangements. The tumor cells were cubic, flattened or low-columnar in shape, with eosinophilic cytoplasm and round nuclei with visible nucleoli. Sarcomas were comprised of spindle-shaped cell clusters arranged in bundles or mats with spindle-shaped nuclei and visible nucleoli (Fig. 2). Immunohistochemical and specific staining results were as follows: Calretinin(+) (Fig. 3), carcinoembryonic antigen(-), cytokeratin (CK)5/6(+) (Fig. 4), D2-40(+), Wilms' tumor 1 (WT-1)(+) (Fig. 5), human bone marrow endothelial cell marker-1(+), Gata-3(+), vimentin(+),desmin+), Ki-67(10%+), CD15(-), CD34(-) and smooth muscle actin(+). The antibody list and detailed information sources are as follows. ZM-0036 is a mouse anti-human Calretinin monoclonal antibody (isoform, IgG1; clone number, OTI1D5) purchased from Beijing Zhongshan Jinqiao Biotechnology Co., Ltd. WT-1 antibody (cat. no. MAB-0678; clone no. MX012) and CK5/6 antibody (cat. no. MAB-0744; clone no. MX040) were purchased from

Fuzhou Maixin Biotechnology Development Co., Ltd. The pathological diagnosis was a biphasic mesothelioma. The patient recovered well postoperatively and was discharged 7 day after admission.

Due to the high recurrence rate of bidirectional mesothelioma, the patient was readmitted for right orchiectomy in March 2023. The following postoperative pathology was observed: Testicular (right) and partial scrotal resection specimens below the skin, testis and epididymis were observed; fibrous tissue hyperplasia; lymphocyte infiltration; and a large number of foreign body giant cell aggregates and line knot reactions. No definite tumor residue was found, consistent with the changes observed after tumor resection, and the spermatic margin was negative. The patient recovered well after surgery and was closely followed up.

Discussion

Malignant mesothelioma occurs most frequently in the pleura or peritoneal cavity; testicular sheath malignant mesothelioma is rare, accounting for <5% of all cases (11). Since Barbera and Rubino first reported malignant mesothelioma of the testicular sphincter in 1957 (12), to the best of our knowledge, the total number of cases reported in national and international literature has not exceeded 100 to date (2). The annual incidence of malignant mesothelioma in the United States is ~11 cases per million individuals (3). Plas *et al* (13) analyzed the ages of 74 patients with malignant mesothelioma of the tunica vaginalis and found that the age distribution was between 7 and 87 years, mostly occurring in middle-aged and older adult individuals. Nearly half of the patients were aged 55-75 years old, 75% were >45 years and only 10% were <25 years old.

There are several risk factors for malignant mesothelioma of the testis. Asbestos exposure is the main risk factor for pleural and peritoneal mesotheliomas. However, the association between asbestos and tunica vaginalis tumors remains unclear (2,14). Spiess *et al* (15) reported that 4 of 5 patients with mesothelioma had a history of asbestos exposure. A 10-fold increase in the risk of malignant mesothelioma has been reported among the immediate family members of patients with a history of asbestos exposure (16). In addition, conditions such as an old testicular injury, hiatal hernia and long-term syringomyelia may also be predisposing factors for the development of this disease (1,17,18). The current patient had no clear history of asbestos exposure; however, the patient had a long history of hydrocele.

The rarity of testicular mesothelioma poses a challenge for its diagnosis, which is rarely achieved preoperatively. More than 50% of malignant testicular mesothelioma cases are characterized by testicular hydrocele, testicular mass, epididymitis, hernia and semen cysts (4). Preoperative diagnosis is difficult because of the lack of specific symptoms and diagnostic tests (19). A detailed history, physical examination, imaging, laboratory tests and pathological findings are key to diagnosing malignant mesothelioma of the testis (6,20). Plas *et al* (13) concluded that the diagnosis was confirmed preoperatively in only 3 of 74 patients and that 97.3% of patients were confirmed by pathological examination due to the discovery of a bloody effusion, papillary mass on the tunica vaginalis or fibrous thickening of the tunica vaginalis during surgery.

Figure 1. Computed tomography scan showed significant hydrocele of the right testicular tunica vaginalis (arrow).

The main diagnostic basis was the postoperative pathological results. Malignant mesotheliomas are divided into three histological types: Epithelioid, sarcomatoid and biphasic (21). Paratesticular malignant mesothelioma is usually the epithelioid histological subtype (~75% of cases), whereas the rest are biphasic or sarcomatoid histological subtypes (22,23). Since the morphology of epithelial mesothelioma is consistent with that of adenocarcinoma on hematoxylin-eosin staining, it should be differentiated from adenocarcinoma and diagnosed by immunohistochemistry (2). The most reliable immune marker is calretinin, which is highly sensitive and specific to mesothelioma. It is positive in malignant mesothelioma and negative in adenocarcinoma (2). In addition, the immunohistochemical markers CK5/6 and WT-1 have guiding significance in diagnosing mesothelioma (19,24). In the present case, the histological characteristic of this disease was bidirectional differentiation of tumor cells containing both epithelial and interstitial components. Meanwhile, immunohistochemical indicators such as calretinin, CK5/6 and WT-1 were positive. However, a lack of confirmation of calretinin, CK5/6 and WT-1 through mRNA expression experiments (such as RT-PCR) is a limitation of the present study.

Owing to the small number of cases of malignant testicular mesothelioma, no exact treatment guidelines have been established. Radical resection is the first choice for treating paratesticular malignant mesotheliomas (25). Inguinal lymph node dissection is recommended in patients with suspected lymph node metastasis (26). The use of radiotherapy and chemotherapy for pleural mesothelioma has been suggested for malignant testicular mesothelioma (27). Cisplatin and pemetrexed can be used as chemotherapy drugs for testicular mesothelioma (28); Zhang *et al* (3) reported a case of testicular mesothelioma treated with pemetrexed and cisplatin for six cycles of chemotherapy with stable disease and no signs of recurrence or metastasis. However, this remains controversial because there are few reported cases of this disease and no clear

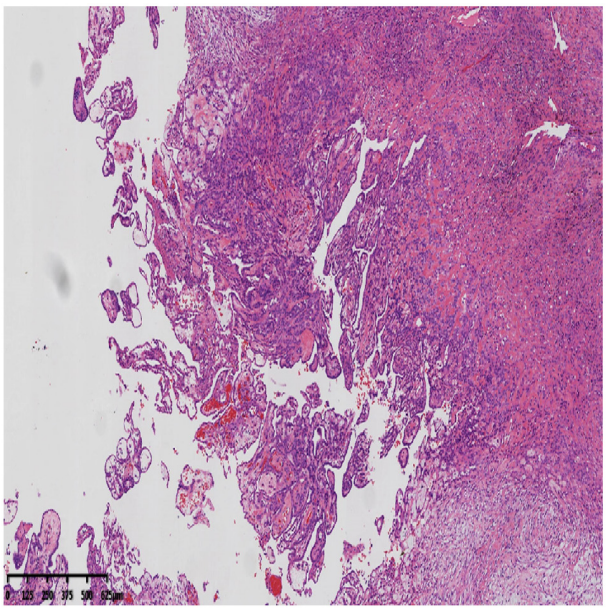

Figure 2. Histological characteristics of malignant mesothelioma of the testicular tunica vaginalis under light microscopy (hematoxylin and eosin; magnification, x100).

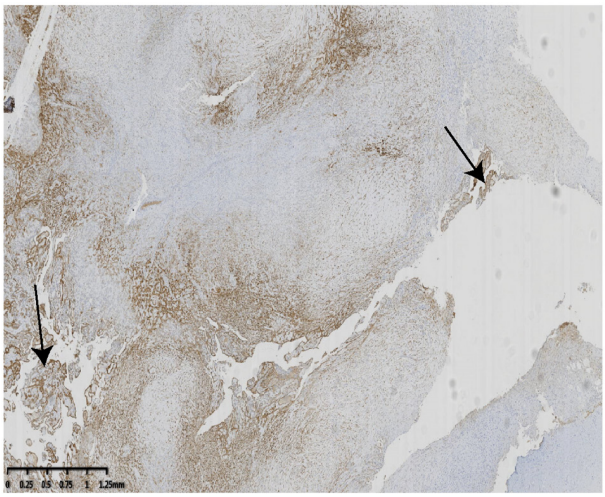

Figure 3. High magnification of Calretinin-positive (magnification, x200) immunohistological chemistry, with cancerous tissue on the left and normal mesothelial tissue on the right.

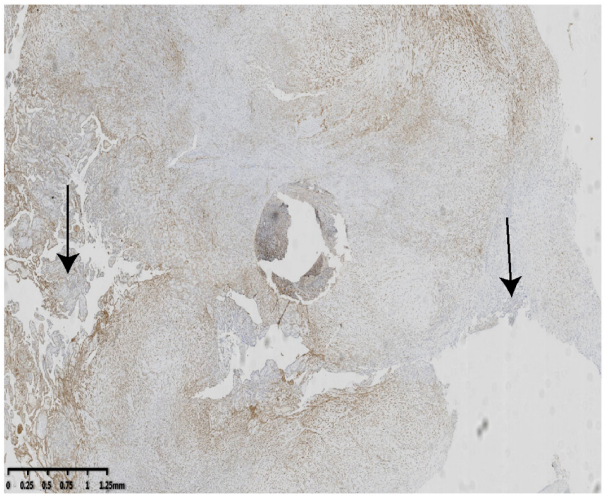

Figure 4. High magnification of cytokeratin 5/6-positive (magnification, x200) immunohistological chemistry, with cancerous tissue on the left and normal mesothelial tissue on the right.

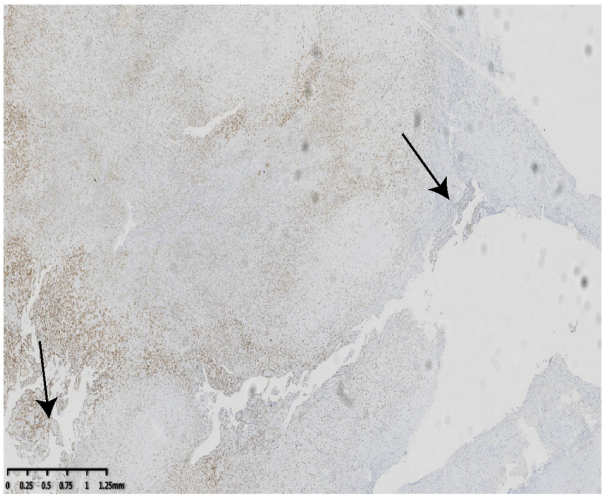

Figure 5. High magnification of Wilms' tumor-1-positive (magnification, x200) immunohistological chemistry, with cancerous tissue on the left and normal mesothelial tissue on the right.

outcomes (29). Malignant mesothelioma of the tunica vaginalis of the testis, similar to other malignant mesotheliomas, is highly invasive in all subtypes (2). Tumors can invade tissues surrounding the scrotum, causing lymph node metastasis and distant organ metastasis, such as to the lungs and liver. The most common site of metastasis is the retroperitoneal lymph node (8). Therefore, close postoperative follow-up is required. In the present case, the patient was followed up once, and no abnormalities were observed. If progress is found during follow-up, we will provide the necessary radiotherapy or chemotherapy according to the location of recurrence and metastasis.

In summary, the present study reported a case of testicular mesothelioma. The rarity of testicular mesothelioma poses a challenge to its etiology and diagnosis, which is rarely achieved preoperatively. Malignant mesothelioma of the testicular tunica vaginalis has a poor prognosis and is not sensitive to radiotherapy or chemotherapy, requiring close postoperative follow-up. Furthermore, the analysis of clinical signs and immunohistochemistry deepens our understanding of malignant mesothelioma of the testicular tunica vaginalis and provides a diagnostic reference for clinicians who encounter these conditions in the future.

Acknowledgements

Not applicable.

Funding

This study was financially supported by the Science and Technology Project of the Xiaoshan District (grant no. 2021306).

Availability of data and materials

The datasets used and/or analyzed during the paper are available from the corresponding author on reasonable request.

Authors' contributions

YJ and JC performed case data collection, drafting of the manuscript and conception of the study. YC, XK and XX analyzed, interpretated and discussed the data. YJ and JC confirm the authenticity of all the raw data. All authors read and approved the final manuscript.

Ethics approval and consent to participate

An ethical statement was obtained from Xiaoshan Hospital of Wenzhou Medical University, which agreed to publish the case.

Patient consent for publication

The patient has given consent for the case to be published publicly.

Competing interests

The authors declare that they have no competing interests.

References

1. Iczkowski KA: Malignant mesothelioma of tunica vaginalis testis: Update for 2022. Adv Anat Pathol 30: 259-261, 2023.
2. Drevinskaite M, Patasius A, Kevlicius L, Mickys U and Smailyte G: Malignant mesothelioma of the tunica vaginalis testis: A rare case and review of literature. BMC Cancer 20: 162, 2020.
3. Zhang N, Fu N, Peng S and Luo X: Malignant mesothelioma of the tunica vaginalis testis: A case report and literature review. Mol Clin Oncol 7: 1053-1056, 2017.
4. von Amsberg G, Sehovic M, Hartmann M and Bokemeyer C: Diagnosis and treatment of rare testicular tumors using the example of malignant mesothelioma of the tunica vaginalis testis and Sertoli cell tumors. Urologe A 60: 872-879, 2021 (In German).
5. de Sá Barrêto Callou Peixoto M, Bernardo Soares MK, Libânio BB, Albuquerque KS and Bacchi CE: Malignant mesothelioma of the tunica vaginalis testis: A rare cause of hydrocele. Urol Case Rep 43: 102048, 2022.
6. Park YJ, Kong HJ, Jang HC, Shin HS, Oh HK and Park JS: Malignant mesothelioma of the spermatic cord. Korean J Urol 52: 225-229, 2011.
7. Oshima J, Inoue H, Fukuda S, Nishimura K and Hara T: Malignant mesothelioma of the tunica vaginalis testis: A case report. Hinyokika Kiyo 65: 215-218, 2019 (In Japanese).
8. Baqui AA, Boire NA, Baqui TT and Etwaru DJ: Malignant mesothelioma of the tunica vaginalis Testis-A Malignancy associated with asbestos exposure and trauma: A case report and literature review. J Investig Med High Impact Case Rep 7: 2324709619827335, 2019.
9. Mezei G, Chang ET, Mowat FS and Moolgavkar SH: Comments on a recent case-control study of malignant mesothelioma of the pericardium and the tunica vaginalis testis. Scand J Work Environ Health 47: 85-86, 2021.
10. Arda E, Arıkan MG, Cetin G, Kuyumcuoğlu U and Usta U: Malignant mesothelioma of tunica vaginalis testis: Macroscopic and microscopic features of a very rare malignancy. Cureus 9: e1860, 2017.
11. Yang LH, Yu JH, Xu HT, Lin XY, Liu Y, Miao Y, Wang L, Fan CF, Jiang GY, Ding SL, *et al*: Mesothelioma of the tunica vaginalis testis with prominent adenomatoid features: A case report. Int J Clin Exp Pathol 7: 7082-7087, 2014.
12. Barbera V and Rubino M: Papillary mesothelioma of the tunica vaginalis. Cancer 10: 183-189, 1957.
13. Plas E, Riedl CR and Pflüger H: Malignant mesothelioma of the tunica vaginalis testis: Review of the literature and assessment of prognostic parameters. Cancer 83: 2437-2446, 1998.
14. Trenti E, Palermo SM, D'Elia C, Elia C, Comploj E, Pycha A, Carella R and Pycha A: Malignant mesothelioma of tunica vaginalis testis: Report of a very rare case with review of the literature. Arch Ital Urol Androl 90: 212-214, 2018.
15. Spiess PE, Tuziak T, Kassouf W, Grossman HB and Czerniak B: Malignant mesothelioma of the tunica vaginalis. Urology 66: 397-401, 2005.
16. Karabacakoğlu B, Kısa E, Özbilen MH, Karademir B, Yardım S, Çelik O, Süelözgen T and İlbey YÖ: Malignant mesothelioma of tunica vaginalis: Two extremely rare case reports. Urologia 90: 422-425, 2023.
17. Chys B, De Graeve N and Merckx L: Well differentiated papillary mesothelioma of the tunica vaginalis: Case report. Acta Chir Belg 123: 555-558, 2023.
18. Mezei G, Chang ET, Mowat FS and Moolgavkar SH: Epidemiology of mesothelioma of the pericardium and tunica vaginalis testis. Ann Epidemiol 27: 348-359.e11, 2017.
19. Kazaz IO, Teoman AS and Mungan S: Mesothelioma of the tunica vaginalis testis: A case report. Indian J Pathol Microbiol 63: 475-477, 2020.
20. Ahmed Z, Singh S, Mangal A and Mittal A: Primary malignant mesothelioma of the spermatic cord. BMJ Case Rep 2016: bcr2016214602, 2016.
21. Hai B, Yang Y, Xiao Y, Li B and Chen C: Diagnosis and prognosis of malignant mesothelioma of the tunica vaginalis testis. Can Urol Assoc J 6: E238-E241, 2012.
22. Chekol SS and Sun CC: Malignant mesothelioma of the tunica vaginalis testis: Diagnostic studies and differential diagnosis. Arch Pathol Lab Med 136: 113-117, 2012.
23. Nazemi A, Nassiri N, Pearce S and Daneshmand S: Testicular mesothelioma: An analysis of epidemiology, patient outcomes, and prognostic factors. Urology 126: 140-144, 2019.
24. Guney N, Basaran M, Karayigit E, Müslümanoglu A, Guney S, Kilicaslan I and Gulbarut S: Malignant mesothelioma of the tunica vaginalis testis: A case report and review of the literature. Med Oncol 24: 449-452, 2007.
25. Candura SM, Canto A, Amatu A, Gerardini M, Stella G, Mensi M and Poggi G: Malignant mesothelioma of the tunica vaginalis testis in a petrochemical worker exposed to asbestos. Anticancer Res 28: 1365-1368, 2008.
26. Arslan A, Ozcakir-Tomruk C, Deniz E and Akin O: A case report of metastasis of malignant mesothelioma to the retromolar trigone. World J Surg Oncol 14: 188, 2016.
27. Recabal P, Rosenzweig B, Bazzi WM, Carver BS and Sheinfeld J: Malignant mesothelioma of the tunica vaginalis testis: Outcomes following surgical management beyond radical orchiectomy. Urology 107: 166-170, 2017.
28. Ceresoli GL, Zucali PA, Mencoboni M, Botta M, Grossi F, Cortinovis D, Zilembo N, Ripa C, Tiseo M, Favaretto AG, *et al*: Phase II study of pemetrexed and carboplatin plus bevacizumab as first-line therapy in malignant pleural mesothelioma. Br J Cancer 109: 552-558, 2013.
29. Borrelli EP and McGladrigan CG: A review of pharmacologic management in the treatment of mesothelioma. Curr Treat Options Oncol 22: 14, 2021.