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Primary Spermatic Cord Mesothelioma: A Rare Case Report with Review of Literature

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ABSTRACT

Background: Paratesticular malignant mesothelioma is an uncommon and aggressive tumor. While most originate from the tunica vaginalis, involvement of the spermatic cord is exceedingly rare. Its nonspecific presentation and ability to mimic benign scrotal disorders often results in delayed diagnosis and advanced disease at presentation.

Case Presentation: We report a 54-year-old man with diabetes mellitus who presented with a four-year history of progressive penoscrotal swelling, initially misdiagnosed as benign conditions. Examination revealed diffuse induration involving the scrotum, penile shaft, and spermatic cords. MRI demonstrated a large infiltrative lesion, while biopsy with immunohistochemistry (WT1, calretinin positive; CK20, PAX8 negative) confirmed malignant mesothelioma. He underwent total scrotectomy, penile skin excision, and left orchidectomy with graft reconstruction. Within one month, he developed local recurrence with nodal, pulmonary, hepatic, and mediastinal metastases. Despite systemic chemotherapy and subsequent chemoradiotherapy, the disease progressed, highlighting its aggressive course and poor prognosis.

Discussion: Spermatic cord mesotheliomas are infrequently diagnosed preoperatively and often pose a diagnostic challenge due to nonspecific clinical features and overlapping differentials. Radical surgical excision remains the cornerstone of management given the aggressive biological nature of the disease; however, recurrence rates and disease-related mortality remain high, particularly in advanced stages. Multimodal adjuvant therapies provide only limited benefit but may play a supportive role, with overall prognosis remaining poor.

Conclusion: Spermatic cord mesothelioma is a rare paratesticular malignancy, often diagnosed at an advanced stage, and continues to pose a therapeutic challenge with generally unfavourable outcomes.

Keywords: Mesothelioma, Paratesticular, Spermatic Cord, Case Report

INTRODUCTION

Background: Paratesticular malignant mesothelioma (MMT) is a rare and aggressive neoplasm, accounting for approximately 0.3-1.4 % of all malignant mesothelioma cases, with fewer than 300 documented cases in the literature [1]. The tunica vaginalis gives origin to a majority, while a meagre proportion arises from the epididymis and spermatic cord [2]. This condition notably affects middle-aged men with a unique ability to mimic benign disorders and an inconsistent association with asbestos exposure [1,2]. We aim to present a rare case of MMT of the spermatic cord with a brief discussion on the management challenges associated with this uncommon entity.

Case Presentation: A 54-year-old diabetic male presented with a long-standing history of diffusely thickened nodular carpet-like skin lesions involving the penoscrotal region for four years duration. The patient also gave a history of multiple medical consultations spanning various specialties, being treated on different lines with various presumed diagnoses. Some of the entertained diagnoses over the years were filariasis, cutaneous tuberculosis, idiopathic scrotal calcinosis, and scrotal malignancies. Multiple skin biopsies were performed during these consultations, all revealing either inconclusive impressions or benign histology like fibrohistiocytoma. The patient started ignoring the symptomatology as he had no relief with any of the attempted management strategies until he observed a rapid, painful increase in the size of the lesion over the past year. Clinical examination at presentation revealed a diffusely indurated nodular lesion involving the entire scrotal skin extending upto the distal penile shaft bordering the coronal sulcus (Figure 1A). The testes were not palpable separately owing to the thickened scrotal skin with bilateral irregularly thickened spermatic cords felt at the inguinal region. Small mobile inguinal lymph nodes were palpable in the bilateral inguinal regions.

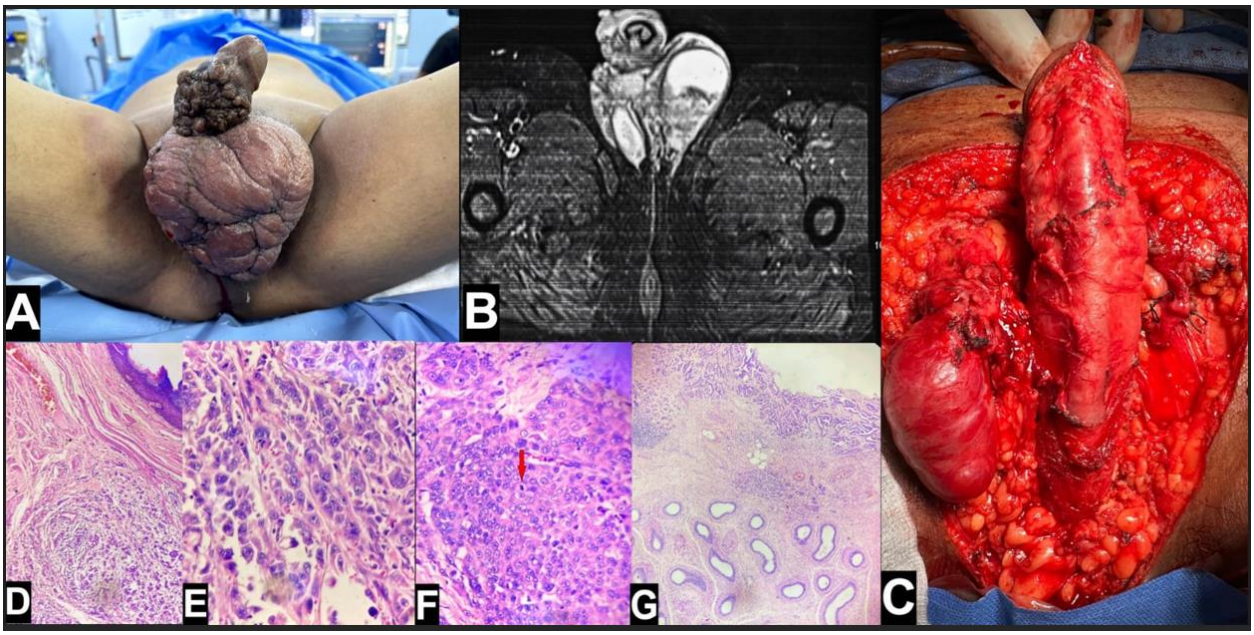

Figure 1: Clinical, radiological, intraoperative, and histopathological findings of spermatic cord malignant mesothelioma.

Figure A: Local Examination findings suggestive of diffusely indurated nodular lesions involving the entire scrotal skin extending upto the distal penile shaft bordering the coronal sulcus

Figure B: MRI T2W images of the perineum reveals an ill-defined, irregularly marginated lesion involving the scrotal skin and extending into the penile skin with suspected invasion of the corpora cavernosa

Figure C: Intraoperative picture after Radical scrotal and penile skin excision with left orchiectomy

Figure D: Low power view of markedly cellular tumor underlying the scrotal skin.

Figure E: Haematoxylin & Eosin Image with 40x Magnification reveals tumour cells displaying moderate nuclear pleomorphism and hyperchromasia arranged in glands and papillae.

Figure F: Haematoxylin & Eosin Image with 40x magnification reveals tumour cells displaying brisk mitotic activity.

Figure G: Haematoxylin & Eosin Image with 100x magnification reveals tumour cells invading the testicular parenchyma with adjacent normal epididymis.

Scrotal ultrasound revealed normal appearing bilateral small testes with bilateral Spermatic cords noted to be diffusely thickened. Serum alpha-fetoprotein (AFP), beta-human chorionic gonadotropin (β-HCG), and lactate dehydrogenase (LDH) were within normal limits. Magnetic resonance imaging (MRI) of the pelvis revealed an ill-defined, irregularly marginated lesion measuring 60 × 51 mm, involving the scrotal skin and extending into the penile skin with suspected invasion of the corpora cavernosa (Figure 1B). Bilateral spermatic cords also appeared to be infiltrated by the mass, with testicular architecture appearing relatively preserved.

A scrotal skin biopsy was performed, which demonstrated large pleomorphic round-to-ovoid tumor cells arranged in an acinar pattern, with prominent eosinophilic nucleoli and a high mitotic rate, hinting at the diagnosis of an adenocarcinoma. Immunohistochemistry (IHC) was reactive for Wilm's tumor 1 (WT1), cytokeratin 7 (CK7), and calretinin, and negative for prostate-specific antigen (PSA) and cytokeratin 20 (CK20), reinforcing the histological diagnosis. Cross-sectional imaging of the abdomen, pelvis, and chest, and pan-gastrointestinal endoscopy were unremarkable. Hence, a diagnosis of primary scrotal wall adenocarcinoma was considered, and the patient was planned for wide local excision and skin grafting. During total scrotectomy and penile skin excision, the left spermatic cord was found to be indurated in its entirety with bilateral normal appearing testes. Hence, a left radical orchiectomy was coupled with the procedure, and wound reconstruction was performed using split-thickness skin grafting (Figure 1C). To our surprise, the final histopathological analysis revealed the diagnosis of MMT displaying sheets of large tumor cells with increased cellularity, cytoplasmic vacuolation, pleomorphic nuclei, prominent eosinophilic nucleoli, and brisk mitotic activity. Tumor infiltration into the spermatic cord and tunica albuginea was noted with clear excision margins (Figure 1D-G). On IHC, tumor cells were diffusely positive for WT1 and calretinin and negative for CK7, CK20, Paired-Box gene 8 (PAX8), and estrogen receptor (ER), supporting the diagnosis of MMT.

One month postoperatively, the patient developed a 1 × 1 cm firm, nodular lesion at the graft site near the right inguinal region, accompanied by bilateral palpable inguinal lymphadenopathy. Excisional biopsy of the lesion and fine-needle aspiration cytology (FNAC) of the lymph nodes confirmed tumor recurrence. An 18F-fluorodeoxyglucose positron emission tomography-computed tomography (18F-FDG PET-CT) scan demonstrated FDG-avid ill-defined lesions

near the penile shaft, with FDG-avid lymphadenopathy involving the left common iliac, bilateral external iliac, and inguinal regions (Figure 2A-C). After multidisciplinary tumor board review, the patient was initiated on systemic chemotherapy with six cycles of Pemetrexed (800 mg) and Carboplatin (600 mg). The local recurrence continued to progress, forming multiple nodular lesions that coalesced together and began to ulcerate, requiring regular wound care (Figure 2D). Follow-up PET-CT post chemotherapy demonstrated significant progression, with increased metabolic activity at the operative bed and inguinopelvic lymph nodes with appearance of new pulmonary, mediastinal and hepatic metastases (Figure 2E-H). In view of disease progression, the tumor board recommended second-line chemotherapy in combination with radiotherapy.

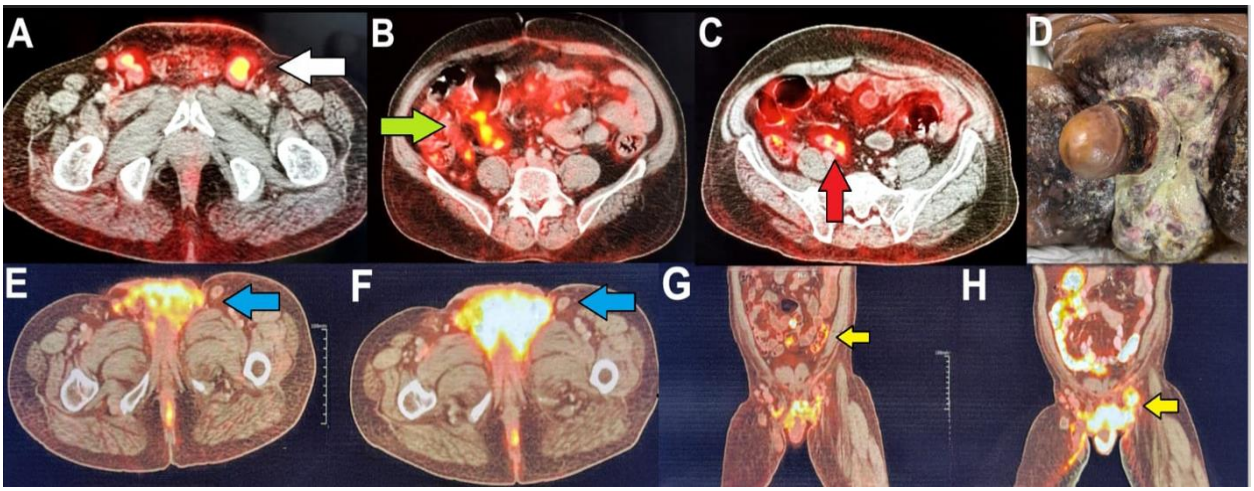

Figure 2: Postoperative recurrence and metastatic progression on 18F-FDG PET/CT.

Figure A to C: Immediate post-surgery PET-CT reveals FDG-avid lymphadenopathy involving the inguinal regions (white arrow), common and external iliac regions (red and green arrows).

Figure D: Local wound status after 1st line chemotherapy.

Figure E to H: Post 1st line chemotherapy PET-CT demonstrated significant progression, with increased metabolic activity at the operative bed (blue arrow) and inguinopelvic lymph nodes (yellow arrow) with appearance of multiple distant FDG avid metastatic deposits.

DISCUSSION

MMT originates mesothelial lining of coelomic cavities such as the pleura, peritoneum, or pericardium, with the tunica vaginalis being a site of notable rarity [2]. Earliest descriptions of this pathology date back to the 1700s, while the causal relationship with asbestos exposure was established as late as 1960 by Wagner et al., reiterating its rarity [3]. Paratesticular MMT occurs with a peak incidence in the 6th to 8th decades [1], with the proposed risk factors including asbestos exposure, prior trauma, chronic hydrocele, herniorrhaphy, Simian virus 40, and radiation [3,4]. Unlike the MMTs occurring at thoracoabdominal sites, paratesticular MMTs have a less clear causal relationship with asbestos exposure as visualized in case series [5].

Clinically, these tumors have sinister tendencies to camouflage their presentation in similar lines to benign pathologies like hydroceles, spermatoceles, chronic epididymitis or chronic orchialgia, contributing to their delayed and advanced

stage detection [4]. Only a seldom cases have an established diagnosis preoperatively. Our patient experienced a similar course, evidenced by his history replete with multiple diagnoses, consultations, and management attempts before presenting to our hospital. Hence, understandably, their diagnosis relies on a combination of clinical assessment with high suspicion, aggressive prompt imaging, and post-surgical histopathology.

Cross-sectional radiological imaging is seldom timely in the diagnostic setting, with most applications utilized for metastatic screening post-histological diagnosis. Spermatic cord MMTs have no standardized management guidelines owing to disease rarity, with the high inguinal orchiectomy with clear margins being the treatment of choice in localized disease. Despite no suggestable evidence, most published cases received multimodality treatment, with the more recent reports favoring systemic chemotherapy with pemetrexed/raltitrexed combined with cisplatin (Table 1). Complexities arise in cases of locally advanced and metastatic disease presentations, a common occurrence considering that spermatic cord MMTs demonstrate extensive local, lymphatic, and hematogenous spread. Recurrence rates can reach 57% within two years [3]. Given the limited case numbers, calculating accurate mortality rates for primary Spermatic cord MMTs is not feasible. Overall, paratesticular MMTs carry a median survival of 24 months and a mortality of approximately 30%, with advanced-stage presentation portending poor outcomes, as seen in our patient with widespread local and systemic recurrence despite adjuvant therapy [4].

Table 1: Published literature on similar presentations of spermatic cord mesothelioma

Authors	Age (Years)	Laterality	Presentation	Symptom Duration (Months)	Stage at Presentation	Management Strategy	Pathology	Follow up
Kozlowski H et al, 1968 **[8]**	68	Left	Inguinal Mass	3	N/S	Surgical Excision	Mixed/ Biphasic	N/S
Arlen M et al, 1969 **[9]**	40	Left	Inguinal Mass	1	RNM	Surgical Excision with RPLND	N/S	Doing well at 18 years
Pizzolato P et al, 1976 **[10]**	57	Right	Inguinal Hernia	N/S	Localized Disease	Surgical Excision, CRT for nodal recurrence	Epithelioid	Local Recurrence at 1year Death at 3.5 years
Blitzer PH et al, 1981 **[11]**	74	Left	Scrotal Mass	12	Localized Disease	Surgical Excision	Mixed/ Biphasic	Doing well at 2.5 years
Carp NZ et al, 1990 **[12]**	54	Left	Groin Mass	N/S	Locally Advanced Disease	Surgical Excision with CRT	Epithelioid	Death at 64 months
Leiber C et al, 2000 **[13]**	46	Right	Inguinal Mass	24	N/S	Surgical Excision	Mixed/ Biphasic	Death at 8 months
Torbati PM et al, 2005 **[2]**	52	Right	Scrotal Mass	N/S	Localized Disease	Surgical Excision, CRT for nodal recurrence	Epithelioid	Doing well at 3 years

Schure PJ et al, 2006 **[14]**	35	Left	Inguino-scrotal Mass	1	Locally Advanced Disease	Hemi-Scrotectomy	N/S	Death at 2 Months
Schure PJ et al, 2006 **[14]**	45	Left	Scrotal Mass	1	Locally Advanced Disease	Hemi-Scrotectomy	N/S	Doing well at 4 years
Hai B et al, 2011 [**15]**	26	Left	Inguino-scrotal Mass	N/S	RNM	Surgical Excision with Inguinal LND	Epithelioid	Doing well at 2 years
Hai B et al, 2011 **[15]**	57	Right	Inguino-scrotal Mass	N/S	Metastatic (Lung)	Surgical Excision with CRT	Epithelioid	Doing well at 2 years but with local recurrence being managed by RT
Park YJ et al, 2011 **[1]**	65	Left	Inguinal Mass	2	Metastatic (Peritoneal)	Surgical Excision with CT	Mixed/ Biphasic	Death at 6 Months
Meng X et al, 2013 **[16]**	45	Left	Inguinal Mass	4	Localized Disease	Surgical Excision	Epithelioid	Doing well at 6 months
D'Antonio et al, 2013 **[17]**	80	Right	Inguinal Mass	N/S	Localized Disease	Surgical Excision	Epithelioid	Doing well at 12 months
Ahmed Z et al, 2016 **[6]**	45	Right	Inguino-scrotal Mass	12	Locally Advanced Disease	Surgical Excision with RT	Mixed/ Biphasic	N/S
Yang G et al, 2016 **[3]**	66	Left	Inguinal Mass	3	Metastatic (Lung)	Surgical Excision with CT	Mixed/ Biphasic	Death at 2 Months
Singh I et al, 2020 **[4]**	39	Left	Inguino-scrotal Mass	12	Metastatic (Peritoneal)	Surgical Excision with CT	Mixed/ Biphasic	Doing well at 12 months
Kobayashi Y et al, 2020 **[7]**	82	Right	Inguinal Mass	3	Localized Disease	Surgical Excision	Epithelioid	Doing well at 24 months
Current Case	54	Left	Scrotal Mass	48	Localized Disease	Surgical excision with CT	Epithelioid	Local recurrence and distant metastasis at 6 months Planned for 2nd line CT
Key: N/S – Not Specified, RNM – Regional Nodal Metastasis, RPLND – Retroperitoneal Lymph Node Dissection, CT – Chemotherapy, RT – Radiotherapy, CRT – Chemo-Radiotherapy, LND – Lymph Node Dissection.								

Histologically, MMTs typically express CK7, calretinin, WT-1, Epithelial Membrane Antigen (EMA), thrombomodulin, with variable vimentin positivity, and are negative for CK20, Carcinoembryonic Antigen (CEA), BRST3, Ber-EP4, and BRCA1-associated protein 1 (BAP1) [1,6,7]. In our case, calretinin and WT-1 were strongly positive. Calretinin, a calcium-binding protein related to S100 and inhibin, demonstrates diffuse nuclear and cytoplasmic staining in nearly all epithelioid mesotheliomas whereas, WT-1 shows nuclear positivity in 70–95% of

cases. Exclusion markers such as Desmin, Human Melanoma Black-45 (HMB-45), S100, Melan-A, Cluster of Differentiation 31/34 (CD31 and CD34) could also assist in ruling out sarcomas and melanocytic tumors [3].

Young patients and those with well-differentiated papillary histology generally have a more favorable prognosis, whereas lymph node involvement or systemic metastasis portends a poor outcome [3]. Early recognition and timely intervention are critical, as patient age at diagnosis remains the strongest prognostic factor [3]. This case highlights the need for urologists to maintain a high index of suspicion for spermatic cord swellings, particularly when persistent despite standard therapy. Such masses may mimic benign lesions but can represent aggressive spermatic cord MMTs, which often arise without classical risk factors and are frequently diagnosed at advanced stages due to delayed recognition.

CONCLUSION

Spermatic cord MMTs is an exceptionally rare, frequently misdiagnosed paratesticular malignancy with a sinister tendency to mimic its more benign counterparts. Early, accurate recognition is critical, with radical excision, adjunctive therapy and vigilant follow up forming the cornerstone of management, with delayed diagnosis frequently resulting in recurrence, systemic spread, and poor survival.

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