

Diagnostic Challenge of Epididymal Tuberculosis with Non-Specific Manifestation in a Low-Resource Setting: Case Report and Literature Review

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Abstract: Epididymal tuberculosis is a form of genitourinary tuberculosis (GUTB) that presents with nonspecific clinical manifestations and may closely mimic other scrotal diseases, including malignancy. In low-resource settings, the lack of advanced imaging, cytopathology, and molecular testing complicates early diagnosis and often leads to unnecessary surgical exploration.

Objective: This case report aims to describe the diagnostic pathway of a patient with epididymal tuberculosis whose clinical and sonographic findings closely mimicked epididymal malignancy at a hospital with limited diagnostic resources, and to review the diagnostic performance of available laboratory, radiological, and histopathological modalities. **Methodology:** This study used a descriptive case report design combined with a narrative literature review. Data were collected retrospectively from the patient's history, physical examination, Doppler ultrasonography, chest radiograph, intraoperative findings, and histopathological examination, and were analyzed using a descriptive-narrative approach supported by a literature search of PubMed/NCBI and Scopus. **Findings:** A 66-year-old man presented with a unilateral scrotal mass and weight loss without constitutional tuberculosis symptoms or prior tuberculosis history. Doppler ultrasonography showed an irregular, hypoechoic, hypervascular lesion with calcification, raising suspicion for malignancy; CT and MRI were unavailable. Surgical exploration revealed a localized mass at the cauda epididymis with a normal testis, and incision yielded thick caseous pus. Histopathology confirmed granulomatous inflammation with central caseous necrosis, epithelioid cells, and Langhans giant cells. The patient improved significantly on anti-tuberculosis therapy. **Implications:** This case emphasizes that epididymal tuberculosis should remain part of the differential diagnosis of a scrotal or epididymal mass even in the absence of classic constitutional symptoms, and that diagnostic strategy must be adapted to locally available resources. **Originality:** This report illustrates a diagnostic dilemma in which sonographic findings strongly suggested malignancy, yet the final diagnosis relied entirely on intraoperative and histopathological findings, highlighting the practical limits of imaging-based diagnosis in a low-resource setting.

Keywords: *Scrotal Mass; Epididymal Tuberculosis; Diagnostic Accuracy; Case Report; Literature Review.*

INTRODUCTION

Tuberculosis (TB) remains one of the leading infectious causes of morbidity and mortality worldwide ([World Health, 2024](#)). The genitourinary tract is among the most common sites of extrapulmonary involvement ([Mantica et al., 2021](#); [Muneer et al., 2019](#)). Genitourinary tuberculosis (GUTB) results predominantly from hematogenous seeding of *Mycobacterium tuberculosis* from a primary pulmonary focus, although a substantial proportion of patients have no clinical or radiographic evidence of active or prior pulmonary disease at presentation ([Figueiredo et al., 2017](#); [Muneer et al., 2019](#)). Within the genitourinary tract, the epididymis is a frequent site of involvement in men, either in isolation or together with the testis, giving rise to epididymo-orchitis ([Figueiredo et al., 2017](#); [Trojian et al., 2009](#)).

Epididymal tuberculosis typically presents as a slowly enlarging, firm, and often painless or minimally tender scrotal mass, sometimes accompanied by constitutional symptoms such as weight loss, low-grade fever, or night sweats ([Mantica et al., 2021](#); [Trojian et al., 2009](#)). However, its clinical presentation is frequently nonspecific and overlaps considerably with other causes of scrotal swelling, including bacterial epididymo-orchitis, epididymal cysts, and, most critically, testicular or paratesticular malignancy ([Jetley et al., 2017](#)). This diagnostic overlap poses a substantial challenge for clinicians, particularly in settings where cross-sectional imaging, mycobacterial culture, and cytopathology services are not readily available ([Kulchavenya et al., 2020](#); [Solovic et al., 2013](#)).

In high-resource settings, a structured diagnostic algorithm incorporating scrotal ultrasonography, contrast-enhanced CT or MRI, tumor markers, fine-needle aspiration cytology (FNAC), and molecular or microbiological testing (such as urine tuberculosis polymerase chain reaction) can often distinguish tuberculous epididymitis from malignancy without resorting to surgery ([Denkinger et al., 2014](#); [European Association of, 2026](#); [Stephenson et al., 2024](#)). Where these modalities are unavailable however, surgical exploration may become the most readily available means of obtaining tissue for a definitive diagnosis, with the attendant risks, costs, and delays that surgery entails ([Kulchavenya et al., 2020](#)).

We report a case of epididymal tuberculosis in a 66-year-old man managed at a hospital with limited diagnostic resources in Padang, Indonesia, whose clinical and

sonographic findings closely mimicked epididymal malignancy and in whom the diagnosis was established after surgical exploration and histopathological examination. We also reviewed the literature on the diagnostic performance of laboratory, radiological, and histopathological modalities for epididymal tuberculosis, with the aim of proposing a pragmatic diagnostic approach for clinicians working in facilities with similar resource constraints.

RESEARCH METHOD

The unit of analysis in this study was a single adult male patient with a scrotal mass ultimately diagnosed as epididymal tuberculosis. This case was selected because its clinical and sonographic presentation closely mimicked epididymal malignancy, illustrating a diagnostic dilemma that may arise in facilities with limited diagnostic resources.

This study combined a single-institution case report with a narrative literature review, using a descriptive approach appropriate for presenting a rare and diagnostically challenging clinical condition in detail. Primary data were obtained through history taking, physical examination, and direct clinical observation during patient care. Secondary data were obtained from the patient's medical record at Dr. Reksodiwiry Hospital, Padang, West Sumatra, Indonesia, including laboratory results, Doppler ultrasonography, chest radiograph, intraoperative findings, and histopathological examination, following the patient's informed consent for publication of anonymized clinical data and images.

In this report, the term “low resource setting” refers to the diagnostic capacity available at our institution at the time the patient was evaluated, rather than to healthcare facilities in general. Dr. Reksodiwiry Hospital is a Level III Military Hospital in Padang, West Sumatra, which also serves civilian patients. At the time of evaluation, the following investigations were available on site: complete blood count, scrotal doppler ultrasonography, chest radiography and histopathological examination. Rapid molecular testing (Xpert MTB/RIF) and mycobacterial culture were available through the national tuberculosis program, but were not performed in this patient because the surgical specimen had been fixed in formalin for histopathology. The following were not available: magnetic resonance imaging (MRI), serum tumor markers (AFP, β -hCG, and LDH), cytopathology services including FNAC, and core needle biopsy. Some of the unavailable investigations

could theoretically have been obtained by referral to another facility, however the patient refused the referral.

A literature search was conducted on 12 May 2026 in two electronic databases, PubMed/NCBI and Scopus, using the same search string: (tuberculosis OR tuberculos OR tuberculoses) AND epididym. Truncation was used to retrieve word variations. The search was limited to articles published in English, with no restriction on publication date. Original research articles, case reports, and case series discussing the diagnostic process of epididymal tuberculosis were included, whereas review articles, commentaries, editorials, conference abstracts, articles that did not discuss the diagnostic tools used, and articles in languages other than English were excluded. The eligible articles were selected and synthesized to contextualize the present case. Data were analyzed using a descriptive-narrative approach, integrating the patient's history, physical examination, imaging, intraoperative findings, and histopathological results, and comparing them with the reviewed literature. Data validity was maintained through source triangulation across history taking, physical examination, operative findings, and histopathological confirmation.

Ethical considerations: This case report was prepared with attention to patient confidentiality. Identifiable patient information was removed, and written informed consent was obtained from the patient for publication of anonymized clinical data and images.

RESULT

A 66-year-old man presented to the urology outpatient clinic with a chief complaint of scrotal discomfort and a unilateral scrotal mass for 6 months before coming to the polyclinic, accompanied by unintentional weight loss of approximately 5 kg. He denied fever, night sweats, cough, or any other constitutional symptoms suggestive of active tuberculosis, and he had no personal history of pulmonary tuberculosis or known tuberculosis contact. There was no history of trauma, dysuria, hematuria, or lower urinary tract symptoms.

On physical examination, the affected hemiscrotum showed an irregular, indurated, and nodular swelling that was firm on palpation, with the ipsilateral testis difficult to

delineate separately from the mass. There was no overlying skin erythema, sinus tract, or discharge, and the contralateral scrotal contents were unremarkable.

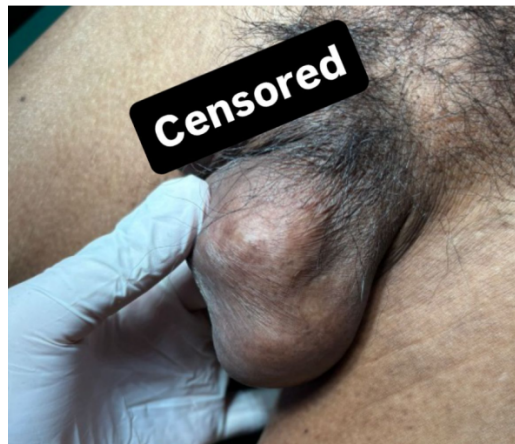


Figure 1. Physical examination showing an irregular, nodular swelling of the affected hemiscrotum.

Routine hematological work-up, including a complete blood count, was unremarkable and did not point toward a specific etiology. Doppler ultrasonography of the scrotum was performed and demonstrated an irregular, hypoechoic, hypervascular lesion with foci of calcification centered on the epididymis, measuring approximately 2.6 x 1.5 cm, a pattern that raised strong suspicion for epididymal malignancy rather than an infective or inflammatory process.

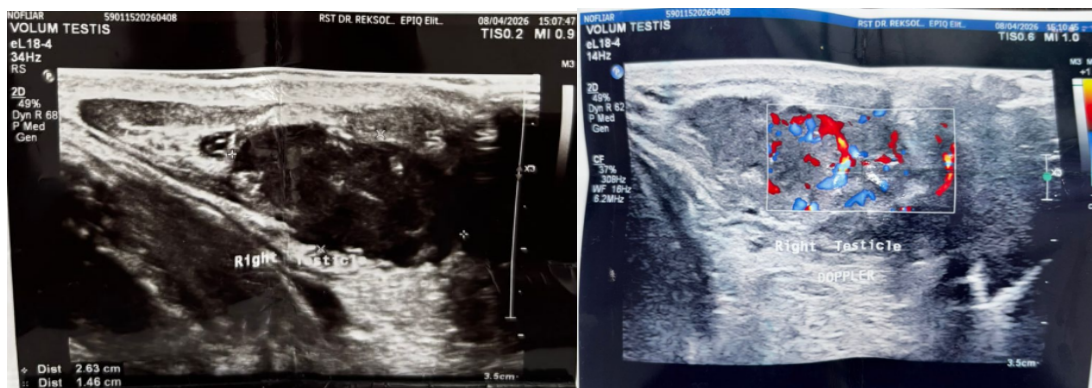


Figure 2. Doppler ultrasonography demonstrating an irregular, hypoechoic, hypervascular lesion with calcification at the epididymis, suspicious for malignancy.

A chest radiograph was obtained to screen for pulmonary tuberculosis and showed no evidence of active or previously healed tuberculous disease. Notably, a normal chest radiograph does not exclude genitourinary tuberculosis, because a substantial proportion of patient with genitourinary tuberculosis have no radiographic evidence of pulmonary

disease at presentation. Sputum and urine testing for Mycobacterium Tuberculosis (Xpert MTB-RIF, Culture, AFB) was not performed before surgery, as the patient had no pulmonary or urinary symptoms and the chest radiograph was normal, and tuberculosis was not considered a leading diagnosis at the time ([Figueiredo et al., 2017](#); [Muneer et al., 2019](#)).

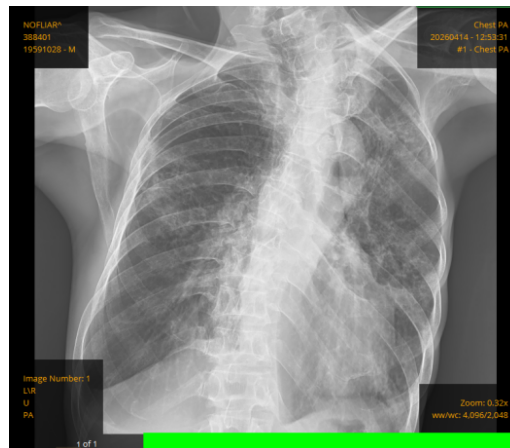


Figure 3. Chest radiograph showing no radiographic evidence of pulmonary tuberculosis.

Based on these findings, the preoperative differential diagnosis included a primary epididymal or paratesticular neoplasm, chronic or granulomatous epididymitis (including tuberculous epididymitis) and epididymal abscess. Malignancy was considered the leading diagnosis because the lesion had an uneven, irregular, and nodular surface on palpation; the ipsilateral testis could not be clearly delineated from the mass; the lesion was irregular, hypoechoic and hypervascular with foci of calcification on ultrasonography; and the patient was an older man with unintentional weight loss. In contrast, features that would have favored an infective process were absent: there was no fever, overlying erythema, sinus tract, discharge, or urinary symptoms; the complete blood count was unremarkable; and there was no history of tuberculosis or tuberculosis contact, with a normal chest radiograph. On this basis, bacterial epididymitis and abscess were considered less likely, and tuberculous epididymitis was not considered a leading possibility.

Given the sonographic appearance suggestive of malignancy and the unavailability of CT, MRI, tumor markers, and cytopathology services at our facility, the clinical decision was made to proceed directly to surgical exploration via an inguinal approach for a

presumed epididymal malignancy, following the same oncologic principles used for suspected testicular tumors (Liu et al., 2022; Yang et al., 2025).

Intraoperatively, a discrete, localized mass was identified at the cauda (tail) of the epididymis, while the testis itself appeared grossly normal and was preserved. During the surgery we performed a total epididymectomy on the nodular mass. On incision, the mass yielded thick, yellowish, caseous purulent material rather than the solid, fleshy tissue typically expected of a malignant tumor, prompting a strong intraoperative suspicion of an infective, and specifically tuberculous, process. The specimen was sent for histopathological examination.

Histopathological analysis confirmed granulomatous inflammation with central caseous necrosis, composed of epithelioid histiocytes and multinucleated Langhans-type giant cells surrounded by a rim of lymphocytes findings highly suggestive of tuberculous granulomatous disease. Microbiological or molecular confirmation of *Mycobacterium tuberculosis* was not performed because the submitted specimen had already been fixed in formalin.

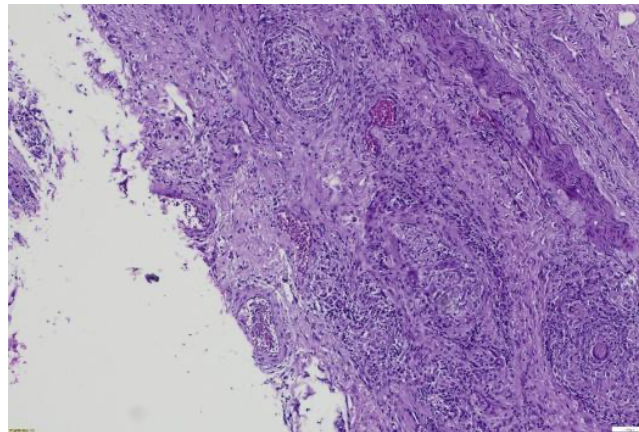


Figure 4. Histopathological examination showing granulomatous inflammation with central caseous necrosis, epithelioid cells, and Langhans giant cells surrounded by lymphocytes, confirming the diagnosis of tuberculosis.

Based on the combination of clinical manifestations, physical examination, intraoperative findings, and histopathological findings, the patient was diagnosed with epididymal tuberculosis and started anti-tuberculosis treatment with a fixed-dose combination (FDC) regimen according to the patient's body weight, consisting of three tablets of rifampicin, isoniazid, pyrazinamide, and ethambutol daily during the intensive phase for two months, followed by rifampicin and isoniazid during the continuation phase

for seven months ([Ikatan Ahli Urologi, 2020](#)). The patient was followed up for two months after surgery, and demonstrated significant clinical improvement, with resolution of scrotal discomfort and no evidence of disease recurrence. After surgery, a follow-up physical examination of the scrotum was performed. No palpable masses or tenderness were found, and there were no signs of inflammation. The patient had no complaints and was referred back to the primary healthcare facility.

The clinical course of the patient is summarized in Table 1.

Table 1. Timeline of the clinical course

Time point	Event	Key findings / decision
October 2025	Symptom onset	Scrotal discomfort, unilateral scrotal mass, unintentional weight loss approximately 5 kg for 6 months
6 April 2026	First presentation to the urology outpatient clinic	Irregular, indurated, nodular hemiscrotal swelling; ipsilateral testis difficult to delineate; complete blood count unremarkable
7 April 2026	Scrotal Doppler ultrasonography	Irregular, hypoechoic, hypervascular epididymal lesion with calcification; epididymal tumor suspicious for malignancy
7 April 2026	Chest radiography	No evidence of active or healed pulmonary tuberculosis
14 April 2026	Multidisciplinary decision	CT, MRI, tumor markers, and cytopathology unavailable; the patient refused referral to higher-level hospital. Inguinal exploration planned for presumed epididymal malignancy
20 April 2026	Surgical exploration	Localized mass at the cauda epididymis; testis grossly normal and preserved; thick caseous pus on incision. The patient underwent an epididymectomy. Tissue was sent for pathology examination with formalin fixation
30 April 2026	Histopathology report	Granulomatous inflammation with central caseous necrosis, epithelioid histiocytes, and Langhans giant cells
1 May 2026	Initiation of anti-tuberculosis therapy	The patient was diagnosed with epididymal tuberculosis and started anti-tuberculosis treatment with a fixed-dose combination (FDC) regimen according to the patient's body weight, consisting of three tablets of rifampicin, isoniazid, pyrazinamide, and ethambutol daily during the intensive phase for two months
1 July 2026	Follow-up after intensive phases	The patient was followed-up for two months after surgery, and demonstrated significant clinical improvement, with resolution of scrotal

Time point	Event	Key findings / decision
		discomfort and no evidence of disease recurrence. After surgery, a follow-up physical examination of the scrotum was performed. No palpable masses or tenderness were found, and there were no signs of inflammation. The patient had no complaints and was referred back to the primary healthcare facility.

DISCUSSION

This case illustrates the central diagnostic dilemma of epididymal tuberculosis: its clinical and sonographic presentation can be virtually indistinguishable from that of a primary epididymal or paratesticular malignancy. This ambiguity is particularly pronounced when characteristic systemic symptoms of tuberculosis, a history of prior exposure, and abnormal chest radiographic findings are entirely absent, as observed in our patient ([Cesilia et al., 2024](#); [Jetley et al., 2017](#)). The following discussion focuses on four lessons from this case: why epididymal tuberculosis mimicked malignancy in this patient, the limitations of ultrasonography, the minimally invasive investigations that might have avoided surgery, and a realistic diagnostic strategy for facilities with limited resources.

In this patient, several clinical features pointed toward malignancy, whereas none clearly pointed toward infection. The lesion was firm, irregular, and nodular; the ipsilateral testis could not be clearly delineated; and the patient was an older man with unintentional weight loss. Conversely, the features that usually prompt consideration of an infective process, such as fever, local inflammatory signs, sinus formation, urinary symptoms, a history of tuberculosis, or an abnormal chest radiograph, were absent. In retrospect, however, weight loss is itself a recognized manifestation of epididymal tuberculosis ([Mantica et al., 2021](#); [Trojian et al., 2009](#)), and neither the absence of constitutional symptoms nor a normal chest radiograph excludes genitourinary tuberculosis, because a substantial proportion of patients have no clinical or radiographic evidence of pulmonary disease at presentation ([Figueiredo et al., 2017](#); [Muneer et al., 2019](#)). As detailed in the Literature Review, constitutional symptoms and abnormal chest imaging were present in only a minority of patients in published series. The absence of pulmonary findings should therefore not be interpreted as evidence against epididymal tuberculosis, particularly in a tuberculosis-endemic country such as Indonesia ([World Health, 2024](#)).

Doppler ultrasonography was useful chiefly for localizing the lesion to the epididymis rather than the testis proper. This distinction is important because primary intratesticular masses carry a substantially higher pretest probability of malignancy than paratesticular or epididymal masses ([Frates et al., 1997](#); [Hamm, 1997](#)). However, even after the lesion had been localized to the epididymis, the irregular, hypoechoic, hypervascular pattern with calcification observed in this patient lacked sufficient specificity for etiological differentiation. The vascular pattern of tuberculous epididymitis reported in the literature is variable, and neither increased nor decreased vascularity can independently establish or exclude the diagnosis (see Literature Review). Ultrasonography alone, regardless of the location of the lesion, therefore cannot reliably differentiate a tuberculous process from a neoplastic one ([Chung et al., 1997](#); [Liu et al., 2024](#); [Muttarak et al., 2001](#)). In this patient, the absence of clinical and radiological indicators pointing toward tuberculosis, combined with the nonspecific sonographic appearance, prevented a preoperative diagnosis of tuberculosis.

At our facility, FNAC, core needle biopsy, NAAT such as GeneXpert, CT, and MRI were unavailable at the time this patient was evaluated (see Research Method). As summarized in the Literature Review and Table 2, FNAC, core needle biopsy, and molecular testing of tissue have established the diagnosis of epididymal tuberculosis without open surgery in several published series, and Xpert MTB/RIF has been evaluated for the diagnosis of extrapulmonary tuberculosis ([Denkinger et al., 2014](#)). Urine-based testing is more widely obtainable but has limited sensitivity for localized genital disease. Had a cytological, histological, or molecular diagnosis been obtained preoperatively, anti-tuberculosis therapy could have been initiated without surgical exploration, potentially sparing the patient an operation.

Serum tumor markers (AFP, β -hCG, and LDH) were also unavailable. Although they could have supported the preoperative assessment for a germ-cell tumor, their diagnostic value is established primarily for testicular germ-cell tumors rather than isolated epididymal lesions ([Boccellino et al., 2017](#)). Normal tumor-marker levels would therefore not have excluded an epididymal neoplasm and would not have established or excluded epididymal tuberculosis.

In this patient, surgical exploration was chosen because, at our facility and at that time, no locally available investigation could provide a tissue or microbiological diagnosis before surgery, while malignancy could not be excluded. The inguinal approach would

have allowed oncological principles to be followed had malignancy been confirmed ([European Association of, 2026](#); [Stephenson et al., 2024](#)) and exploration also provided tissue for histopathological examination. Once the intraoperative findings suggested an infective process, the testis was preserved. These benefits must be weighed against the risks inherent to surgery and anesthesia, the associated costs, and the possibility that the operation might have been avoided had a minimally invasive diagnosis been available. This decision reflects the specific circumstances of this patient and our facility and should not be generalized to all low-resource settings; where FNAC, core needle biopsy, or molecular testing is available on site or through timely referral, these investigations should be considered before open exploration

Furthermore, diagnostic evaluation in our setting was constrained by the unavailability of advanced diagnostic modalities, including fine-needle aspiration cytology (FNAC), nucleic acid amplification testing (NAAT, such as GeneXpert), computed tomography (CT), and magnetic resonance imaging (MRI). This limitation directly informed our clinical decision-making: in the absence of a safe, non-invasive, and accessible means to establish a definitive preoperative diagnosis, surgical exploration was pursued as the most expedient and appropriate pathway to establish diagnosis and deliver definitive treatment in the event of malignancy.

Ultimately, this case underscores the pivotal role of preoperative diagnostic precision. Had a definitive diagnosis of epididymal tuberculosis been established preoperatively through molecular or cytological confirmation, initiating targeted anti-tuberculosis therapy could potentially have resolved the lesion and spared the patient an unnecessary surgical procedure. Furthermore, in a setting where more advanced diagnostic modalities are not fully available, this experience reinforces the importance of maintaining a high index of suspicion for tuberculosis, even in the absence of classic constitutional symptoms or a positive chest radiograph, whenever a scrotal or epididymal mass is encountered in a tuberculosis-endemic region ([Cesilia et al., 2024](#); [Jetley et al., 2017](#)).

Based on this case and the reviewed literature, we suggest the following pragmatic approach for a suspicious epididymal mass in facilities with limited resources. This approach represents the authors' interpretation, derived from a single case and heterogeneous literature, and has not been formally validated. First, epididymal tuberculosis should remain in the differential diagnosis in tuberculosis-endemic regions,

regardless of the presence of constitutional symptoms or chest radiographic findings. Second, scrotal ultrasonography should be used to localize the lesion, recognizing its limited etiological specificity. Third, inexpensive tests that may provide microbiological evidence, such as urine testing for acid-fast bacilli or *M. tuberculosis*, should be considered, bearing in mind their limited sensitivity. Fourth, where available on site or through referral, FNAC or core needle biopsy, with AFB staining and molecular testing of the specimen, should be considered before open surgery. Finally, when these investigations are unavailable and malignancy cannot be safely excluded, inguinal exploration remains a reasonable option, and intraoperative specimens should be sent not only for histopathology but also, whenever possible, for AFB staining, culture, or molecular testing. In resource-rich settings, by contrast, suspicious epididymal lesions can undergo targeted ultrasonography followed, when indicated, by FNAC or core biopsy and molecular testing, with MRI reserved for selected indeterminate cases. This case therefore illustrates not only the diagnostic mimicry of epididymal tuberculosis but also the practical consequences of unequal diagnostic capacity across healthcare settings.

The diagnosis of epididymal tuberculosis remains challenging because its clinical manifestations are frequently nonspecific and may overlap with chronic epididymitis, abscess, granulomatous disease, and epididymal or testicular malignancy. The reviewed literature demonstrates considerable heterogeneity in presentation. In the series by ([Sah et al., 2006](#)), all 40 patients with tuberculous epididymitis or epididymo-orchitis presented with epididymal and/or testicular swelling, whereas only three had constitutional symptoms suggestive of tuberculosis. Similarly, ([Man et al., 2020](#)) reported painless scrotal swelling or scrotal pain as the predominant manifestations among 47 histologically diagnosed cases, while only 17.0% had positive chest imaging. These findings are consistent with the findings in the present 66-year-old patient, who presented with a unilateral scrotal mass and weight loss but had no fever, night sweats, respiratory symptoms, or radiographic evidence of pulmonary tuberculosis.

Physical examination may provide suggestive but insufficient evidence. Beaded or nodular epididymal enlargement, poorly defined epididymal–testicular borders, tenderness, sinus formation, and abscesses have been described. ([Man et al., 2020](#)) found beaded epididymal enlargement in 25.5%, an ill-defined epididymal–testicular border in 44.7%, and sinus formation in 12.8% of patients. ([Yang et al., 2025](#)) similarly reported

nodular or bead-like lesions in 71.4% of patients. However, these findings are neither sufficiently sensitive nor specific to establish epididymal tuberculosis.

Table 2. Diagnostic Modalities for Epididymal Tuberculosis

Diagnostic modality	Findings/evidence in reviewed literature	Strength	Main limitation	Relevance to present case
Clinical history & examination	Scrotal swelling/pain, nodular or beaded epididymis, sinus or abscess; constitutional symptoms may be absent	Widely available and useful for raising suspicion	Nonspecific; cannot reliably distinguish TB from malignancy	Mass and weight loss were present, but no classic TB manifestations
CBC/ESR/CRP	CBC often nonspecific; elevated ESR reported in 14/40 cases by Sah et al. ¹⁹	Inexpensive supportive assessment	Poor diagnostic specificity	CBC was unremarkable
Serum tumor markers (AFP, β -hCG, LDH)	Used principally in suspected testicular germ-cell tumors; AFP and β -hCG may support diagnosis, while LDH provides less specific information ¹⁸	Widely available, minimally invasive, useful as an adjunct in suspected testicular malignancy and for subsequent monitoring	Not specific for malignancy; evidence is primarily established for testicular germ-cell tumors and not isolated epididymal lesions; normal results do not exclude malignancy	Could have supplemented the preoperative malignancy assessment, but would not have reliably distinguished epididymal TB from neoplasia
Chest radiography	Abnormal/previous TB findings in a minority of patients; 17% positive in Man et al. ²⁰	Low-cost assessment of pulmonary focus	Normal radiograph does not exclude genital TB	No pulmonary abnormality
Scrotal US/Doppler	Enlarged, heterogeneous or hypoechoic epididymal lesion; lesions may involve tail; calcification, necrotic/cystic areas and altered vascularity may occur	First-line, accessible, localizes lesion and detects abscess	Considerable overlap with malignancy/chronic inflammation	Hypoechoic, irregular, hypervascular lesion with calcification mimicked malignancy
FNAC	Epithelioid granulomas, caseous necrosis and Langhans giant cells; AFB identified in 60% in Sah et al. ¹⁹	Minimally invasive; can establish diagnosis and avoid surgery	Sampling error; AFB sensitivity limited	Unavailable locally
Core needle biopsy	Histopathology sensitivity 86.49%, specificity 100% in Liu et al. (2022) ²²	Tissue diagnosis with less morbidity than surgery	Requires pathology service and appropriate sampling	Unavailable

Diagnostic modality	Findings/evidence in reviewed literature	Strength	Main limitation	Relevance to present case
Xpert MTB/RIF / NAAT	Sensitivity 62.16%, specificity 100% in Liu et al. ²² ; GeneXpert positivity 86.7% in Cui J et al. ²³	Rapid molecular confirmation; can detect rifampicin resistance	Availability/cost; negative result does not exclude TB	Unavailable
Tissue PCR	Chawla et al. ²⁴ reported sensitivity 87.5% and specificity 86.7% against histopathology	Rapid molecular evidence from tissue	Performance depends on reference standard and specimen quality	Unavailable
Culture/AFB	Microbiological confirmation; urine AFB detected in only 11/40 cases in Sah et al. ¹⁹	Definitive microbiological evidence and allows susceptibility testing	Low sensitivity and prolonged turnaround time	Not performed because the tissue was fixed in formalin
MRI	Predominant epididymal involvement, T2 hypointensity, restricted diffusion, enhancement, abscess/fistula may suggest genital TB ²¹	Superior soft-tissue characterization and potentially useful for TB–malignancy differentiation	Expensive and unavailable in many low-resource settings	Unavailable
Histopathology	Caseous necrosis surrounded by epithelioid granulomas, Langhans giant cells and lymphocytes ²⁰	Highly characteristic tissue diagnosis	Usually requires invasive sampling; granulomatous inflammation is not absolutely specific	Confirmed diagnosis after exploration

Serum tumor markers may provide complementary information when an epididymal or scrotal mass raises concern for malignancy. In the evaluation of testicular germ-cell tumors, AFP, β -hCG, and LDH are the principal serum markers used for diagnosis, prognostic assessment, and follow-up (Boccellino et al., 2017). However, their applicability to isolated epididymal tuberculosis is indirect because these markers are primarily established for testicular germ-cell tumors rather than paratesticular disease. Furthermore, AFP and β -hCG may be elevated in non-germ-cell malignancies and other conditions, while LDH lacks specificity (Boccellino et al., 2017). Consequently, tumor markers should be regarded as an adjunctive component of the evaluation of a suspicious scrotal mass rather than a definitive discriminator between epididymal tuberculosis and malignancy.

Ultrasonography remains the most practical initial imaging modality. (Yang et al., 2001) found enlargement and decreased echogenicity of the epididymis in all 12 cases, predominantly involving the tail, although internal vascularity was generally absent or limited to peripheral signals. (Li et al., 2021), however, reported heterogeneous or homogeneous hypoechoic enlargement in most cases and found no significant difference in sonographic characteristics between tuberculous epididymitis and other etiologies. (Mondal et al., 2020) further described discrete hypoechoic lesions containing punctate sonolucent areas corresponding to caseation, but acknowledged substantial overlap with chronic epididymitis. (Cui et al., 2023) likewise reported heterogeneous epididymal lesions, predominantly involving the tail, with reduced Doppler flow, which was attributed to caseous necrosis and calcification.

The present case demonstrates an important limitation of these findings: the lesion was irregular, hypoechoic, hypervascular, and calcified, leading to a preoperative impression of malignancy. Thus, although ultrasonography effectively localized the lesion to the epididymis, its etiological specificity was insufficient. This is particularly important because the vascular pattern described in the literature is variable, and neither increased nor decreased vascularity can independently establish or exclude epididymal tuberculosis.

Microbiological and molecular investigations can improve diagnostic certainty. (Sah et al., 2006) detected urinary acid-fast bacilli by smear and/or culture in only 11 of 40 patients, illustrating the limited sensitivity of urine-based testing for localized genital disease. In contrast, (Cui et al., 2023) reported GeneXpert MTB/RIF positivity in 86.7% of suspected epididymal tuberculosis cases, compared with 33.3% for mycobacterial culture and 26.7% for acid-fast staining. (Liu et al., 2022) reported a sensitivity of 62.16% and specificity of 100% for Xpert MTB/RIF performed on core-needle biopsy specimens. (Chawla et al., 2012), evaluating tissue from patients with suspected genitourinary tuberculosis, found tissue PCR sensitivity of 87.5% and specificity of 86.7% when compared with histopathology. These findings indicate that molecular testing can substantially shorten the diagnostic pathway, although a negative molecular result cannot reliably exclude disease.

Tissue-based diagnosis remains particularly valuable when imaging is indeterminate. FNAC demonstrated granulomas, caseous necrosis, and Langhans giant cells in most cases reported by (Sah et al., 2006), with AFB detected in 60% of aspirates. Viswaroop et al.

(2005)²⁸ similarly demonstrated that FNAC established the diagnosis in 26 patients, while epididymal biopsy established the diagnosis in nine additional patients. Liu et al. (2022)²² reported higher diagnostic performance for histopathological analysis than Xpert in their core-biopsy cohort.

Histopathology therefore provides a critical diagnostic endpoint when non-invasive modalities remain inconclusive. (Man et al., 2020) described pale gray caseous nodules macroscopically and central caseous necrosis surrounded by epithelioid cells, Langhans giant cells, and lymphocytes microscopically. The present case showed the same characteristic tissue pattern, while the intraoperative discovery of thick caseous material provided an additional independent diagnostic clue. The convergence of clinical history, examination, imaging, operative findings, and histopathology strengthens diagnostic validity through source triangulation.

MRI may provide additional diagnostic information where available. (Yang et al., 2025) described predominant epididymal involvement, T2 hypointensity, restricted diffusion, heterogeneous annular enhancement, hydrocele, and occasional abscess or fistula formation as features suggestive of genital tuberculosis. Nevertheless, MRI findings may still overlap with malignancy, and its limited availability makes it less applicable to resource-constrained environments.

This literature review has several limitations. First, the review was narrative rather than systematic and therefore may be subject to selection and reporting bias. Second, the available evidence on epididymal tuberculosis is limited and heterogeneous, consisting predominantly of case reports, case series, and small retrospective studies, with substantial variation in patient populations, diagnostic criteria, and reference standards. Consequently, diagnostic performance estimates reported across studies cannot be directly compared or interpreted as pooled estimates of sensitivity or specificity. In addition, several studies evaluated broader genitourinary tuberculosis or epididymo-orchitis rather than isolated epididymal tuberculosis, potentially limiting their applicability to the present case. These limitations should be considered when interpreting the comparative diagnostic findings and the proposed pragmatic diagnostic approach.

Collectively, the literature supports a pragmatic diagnostic hierarchy. In resource-rich settings, suspicious epididymal lesions should undergo targeted ultrasonography followed, when indicated, by FNAC or core biopsy and molecular testing, with MRI reserved for

selected indeterminate cases. In low-resource settings, the diagnostic strategy must instead maximize the information obtained from inexpensive modalities. A normal chest radiograph, nonspecific laboratory findings, and absence of constitutional symptoms should not exclude epididymal tuberculosis in an endemic setting. When FNAC, molecular testing, culture, CT, or MRI are unavailable and malignancy cannot be safely excluded, surgical exploration may remain necessary. However, the literature indicates that expanding access to minimally invasive tissue sampling and rapid molecular testing could reduce diagnostic uncertainty and potentially prevent avoidable surgery. The present case therefore illustrates not merely the diagnostic mimicry of epididymal tuberculosis, but the practical consequences of unequal diagnostic capacity across healthcare settings.

CONCLUSION

This case report demonstrates that epididymal tuberculosis can closely mimic malignancy, even in the absence of typical constitutional symptoms, a history of tuberculosis, or abnormal chest radiographic findings. In this 66-year-old patient, an irregular, hypoechoic, hypervascular epididymal mass with calcification raised suspicion of malignancy, leading to inguinal surgical exploration and epididymectomy. Histopathological examination revealed granulomatous inflammation with caseous necrosis and Langhans-type giant cells, strongly supporting the diagnosis of epididymal tuberculosis. Following the initiation of antituberculosis therapy, the patient demonstrated significant clinical improvement during the two-month follow-up. The principal scientific contribution of this report is its illustration of the diagnostic challenges associated with epididymal tuberculosis in resource-limited healthcare settings and its integration of clinical findings with published evidence to propose a pragmatic diagnostic approach.

These findings emphasize the importance of considering tuberculosis in the differential diagnosis of suspicious epididymal masses, particularly in tuberculosis-endemic regions, and prioritizing minimally invasive tissue sampling and molecular testing when available to improve diagnostic accuracy and potentially avoid unnecessary surgery. Nevertheless, this report is limited by its single-case design, the absence of microbiological or molecular confirmation of *Mycobacterium tuberculosis*, the unavailability of several preoperative

diagnostic modalities, and the short follow-up period, which prevented assessment of long-term treatment outcomes and recurrence.

Furthermore, the accompanying narrative literature review included heterogeneous studies, limiting the generalizability and validation of the proposed diagnostic approach. Future multicenter studies with larger patient populations, standardized diagnostic protocols, microbiological confirmation, and extended follow-up are recommended to evaluate the diagnostic performance, clinical utility, and cost-effectiveness of minimally invasive diagnostic strategies for epididymal tuberculosis in resource-limited settings.

Conflict of Interest

The authors declare no conflict of interest relevant to this case report.

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Patient Consent

Written informed consent was obtained from the patient for the publication of this case report and any accompanying clinical images.

Limitation of the Article

A limitation of this study is the heterogeneity of the included literature, which may have affected the comparability of the findings and introduced variability in the reported outcomes.

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