

Intramedullary Spinal Tuberculosis Mimicking Neoplasm with Ocular Involvement in an Adolescent: A Case Report

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ABSTRACT

Tuberculosis (TB) continues to represent one of the key health problems of high-burden nations. The childhood population is particularly vulnerable to extrapulmonary TB. Spinal intramedullary TB is extremely uncommon and can imitate neoplastic conditions, leading to a late diagnosis with fatal outcome. The current research intends to present a complex case of multisystem TB with intramedullary spinal infection that was incorrectly diagnosed and treated as a neoplasm in a pediatric patient and demonstrate the negative consequences of such misinterpretation. The authors report on a 16-year-old patient who had a low socioeconomic status and suffered from progressive bilateral lower-extremity paresis, vision problems, and multisystemic involvement. MRI demonstrated an intramedullary mass at T5–T6 with syringomyelia, para-aortic lymphadenopathy, and hepatosplenomegaly, initially suspected to be a spinal tumor. During hospitalization, he developed hydrocephalus, seizures, and respiratory failure. He underwent ventriculoperitoneal shunting and excision of the spinal lesion. Histopathology confirmed intramedullary spinal TB. Despite maximal supportive management, he deteriorated and ultimately progressed to brainstem death due to multisystem complications. This case emphasizes the need to consider TB in the differential diagnosis of spinal cord masses in children from endemic regions, particularly when ocular or systemic involvement is present. Early recognition and prompt initiation of anti-TB therapy are essential to prevent irreversible morbidity and mortality.

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Introduction

Tuberculosis (TB) is among the serious public health threats and primarily impacts children living in high-prevalence nations. Based on the Global TB Report 2024, the prevalence of TB in Indonesia is the second-highest in the world after India, with an approximate number of 1,090,000 TB patients, and

about 135,000 are children (1). Extrapulmonary tuberculosis (EPTB) makes up 11–20% of all TB cases in Indonesia; some frequent sites include the lymph nodes, pleura, bones, GIT, and the Central nervous system (CNS), retaining the highest rates of morbidity and mortality (2).

Spinal cord disease is extremely rare and accounts for less than 0.2% of cases of CNS TB (3). The

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intramedullary tuberculomas mimic tumors in neuroimaging studies, and their diagnosis typically involves histopathological examination (3,4). In addition to the diagnostic difficulties in these patients, lack of access to care leads to delayed diagnosis and poor outcomes.

This study presents the case of a 16-year-old boy with intramedullary spinal TB initially misdiagnosed as a spinal tumor, accompanied by ocular and systemic manifestations. This case underscores the complexity of multisystem pediatric TB, highlights the diagnostic challenges posed by atypical presentations, and illustrates the severe consequences of delayed or missed diagnosis.

Case presentation

A 16-year-old boy from a low socioeconomic background, living with his family in a crowded household on the outskirts of a densely populated city, presented with a one-month history of progressive bilateral lower limb weakness and visual disturbances. At the age of 14, he had experienced blurred vision and ocular redness in the right eye, which gradually deteriorated to complete blindness, while the left eye developed persistent blurred vision. Ophthalmological evaluation revealed posterior uveitis with complications, including papilledema, complicated cataract, vitreous opacity, and secondary angle-closure glaucoma.

Patient and family denied any known close contact with people having active TB or with any symptoms suggestive of TB. The patient was very malnourished (marasmus type) and complained of gradual weakness of both legs (right > left), unsteady gait, fatigue, paresthesia, and pain during ambulation. There were no other chronic illnesses and no previous use of steroids or any other immunosuppressive medications. Even though there was no work-up done for any immunodeficiency status such as HIV, no risk factors for HIV were found in his history. His neurological examination revealed that he was completely alert and had normal cranial nerves. His muscle strength in the upper limbs was normal, but muscle strength in the lower limbs was diminished (4/5 bilaterally). Spastic paraparesis with hyperactive deep tendon reflexes (patellar and Achilles +2/+4) and clonus were observed. There were positive Babinski, Chaddock, and Oppenheim signs. All other sensory modalities were normal. Magnetic Resonance Imaging (MRI) of the whole spine demonstrated a solid intradural intramedullary mass at the T5–T6 level, measuring 1.2 × 0.8 × 0.9 cm, isointense on T1WI and hypointense on T2WI/STIR, with contrast enhancement, accompanied by syringomyelia from T2 to T4. Multiple para-aortic lymphadenopathies and hepatosplenomegaly were also

present (Figures 1–2). Based on these findings, an initial diagnosis of intramedullary spinal tumor (suspected ependymoma or astrocytoma) was made, with associated posterior uveitis, absolute glaucoma in the right eye, and severe malnutrition.

The patient was admitted for scheduled surgery about a month after the development of his symptoms. While admitted, he had a 5-minute episode of generalized tonic-clonic seizure. His cranial computed tomography (CT) scan showed ventriculomegaly (VSI 28%, callosal angle 113%), subacute infarcts in the left posterior internal capsule, lentiform nucleus, thalamus, and posterior external capsule, along with a heterogeneous mass in the right eye having elements of hemorrhage and calcification consistent with a retinoblastoma (Figure 3). The patient had a ventriculoperitoneal (VP) shunt inserted on an urgent basis due to hydrocephalus, followed by surgical removal of the intramedullary spinal lesion of T5–T6. Following surgery, the patient had increased spasticity in his bilateral lower limbs. After a few days, he became short of breath due to pneumonia, necessitating intubation. The patient had no abnormalities on his baseline posterior-anterior chest X-ray, which was done in August 2024 and on 10 January 2025. The first radiological finding indicating pneumonia was made on 21 January 2025 (Figure 4). His condition deteriorated further with electrolyte imbalances, metabolic alkalosis, and elevated inflammatory markers C-reactive protein and procalcitonin. Subsequently, he became comatose with fixed dilated pupils and absent corneal reflexes. Despite maximal supportive care, brainstem death was confirmed by a multidisciplinary team.

Histopathological examination of the excised intramedullary specimen revealed epithelioid histiocytes surrounded by lymphocytes forming granulomas, multinucleated Langhans-type giant cells, and necrotic foci without evidence of malignancy, confirming the diagnosis of intramedullary spinal TB. This case was finally diagnosed as intramedullary spinal TB complicated by posterior uveitis with blindness, hydrocephalus, malnutrition, nosocomial pneumonia with acute respiratory distress syndrome, and eventual brainstem death.

Discussion

EPTB typically arises from hematogenous dissemination of *Mycobacterium TB* following primary infection or reactivation of latent foci. EPTB constitutes about 16% of all notified TB cases worldwide (5). Notably, significant differences have been reported between pediatric and adult EPTB. The overall proportion of children with extrapulmonary disease (45.76%) is considerably higher than in adults

(37.44%), with differences also observed in the distribution of pulmonary, extrapulmonary, and combined TB forms (5). In children, the most frequently affected sites include lymph nodes, pleura,

bones, the gastrointestinal tract, and the central nervous system, with TB meningitis carrying the highest risk of morbidity and mortality (6).



Figure 1. Solid intradural intramedullary mass (IDIM) centrally located at the T5-T6 vertebrae, isointense on T1WI, hypointense on T2WI/STIR, with post-contrast enhancement, measuring approximately 1.2 x 0.8 x 0.9 cm.

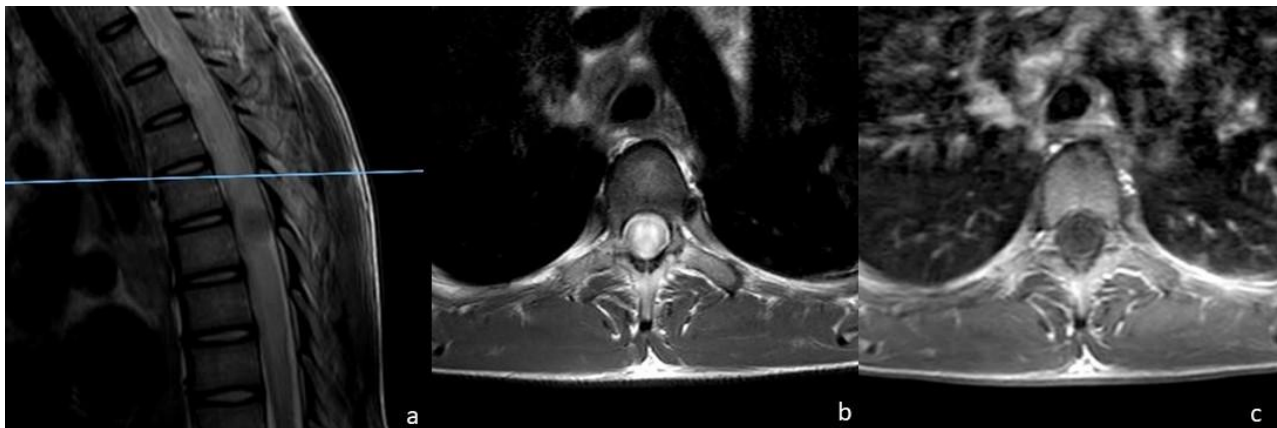


Figure 2. Hypointense lesion on T1WI and hyperintense on T2WI/T2FS in the central canal of the spinal cord extending from T2 to T4.

Children are particularly vulnerable to severe TB compared with adults, due to their immature immune systems and increased risk of dissemination. Risk factors consistently associated with pediatric TB include close exposure to an infectious TB case, household crowding and other poverty-related living conditions, exposure to tobacco smoke or household air pollution, and malnutrition (6). In addition, Asian children have been reported to have higher rates of extrapulmonary and drug-resistant TB compared to children from other regions, consistent with World Health Organization (WHO) data identifying Asia as home to most high-burden countries. The studied patient, a 16-year-old boy, lived in a crowded household on the outskirts of a densely populated Indonesian city with limited socioeconomic conditions and was severely malnourished, exemplifying these vulnerabilities.

Malnutrition, specifically the marasmus type, which is the case here, is a vital factor in the progression of TB. Malnutrition affects cellular immunity, allowing for spread, while TB further affects nutrition through systemic inflammation, anorexia, and catabolism (7). In this patient, severe malnutrition likely accelerated disease progression and exacerbated complications, highlighting the bidirectional relationship between TB and undernutrition.

Multisystem involvement is more common in children than in adults because of their higher risk of lymphohematogenous spread (8). In this case, ocular manifestations preceded the onset of myelopathic symptoms. However, cranial computed tomography demonstrated a heterogeneous intraocular mass with calcified components, radiologically suggestive of retinoblastoma. Therefore, the ocular pathology was considered a coincidental comorbidity rather than ocular TB. Ocular biopsy and microbiological testing

were not performed, so a tuberculous ocular etiology remained unconfirmed.

In addition to his ocular condition, this patient was also reported to have neurologic symptoms due to intramedullary spinal TB. He developed progressive spastic paraparesis, and MRI revealed a contrast-enhancing intramedullary lesion at T5–T6, accompanied by syringomyelia, lymphadenopathy, and hepatosplenomegaly. These findings strongly

suggested systemic involvement. However, the imaging mimicked a spinal tumor, leading to an initial misdiagnosis of ependymoma or astrocytoma. Histopathology later confirmed TB through the presence of granulomatous inflammation with Langhans giant cells. This case demonstrates the well-documented challenge of spinal TB, which often masquerades as neoplastic lesions and delays initiation of appropriate therapy.

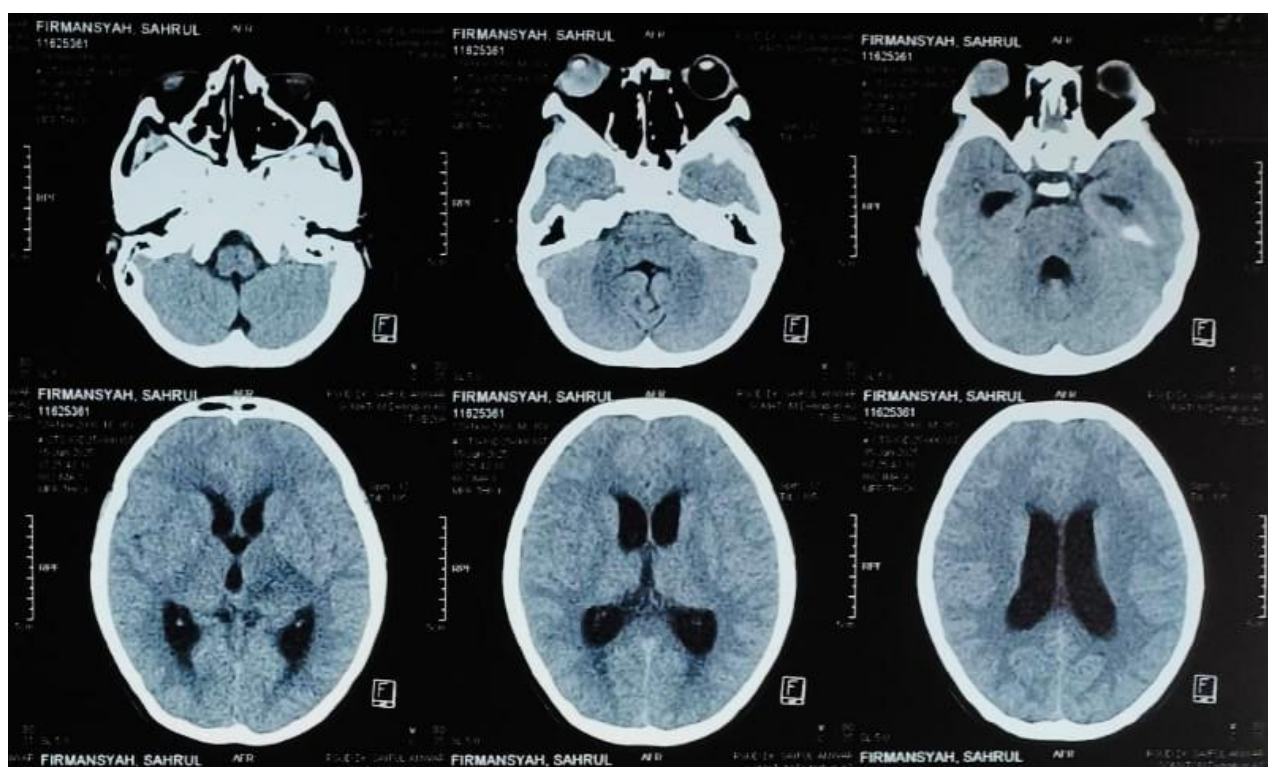


Figure 3. Cranial CT scan post-seizure, revealing evidence of communicating hydrocephalus.

Delays in diagnosis are a persistent problem in pediatric TB, both at the population and individual levels. At the community level, diagnostic delays in Indonesia average 48 days, driven by factors such as atypical extrapulmonary presentations, false-negative Mantoux tests, fragmented health-seeking behavior, and stigma (8). Such delays worsen prognosis and contribute to the spread of multidrug-resistant TB. At the clinical level, our case illustrates how spinal TB may mimic neoplastic lesions, delaying recognition and initiation of anti-TB therapy until histopathological confirmation. These two forms of diagnostic delay together underline the difficulty of timely diagnosis in pediatric TB.

The neurological course in this case was complicated by seizures, hydrocephalus, and cerebral infarctions, most likely secondary to TB-related vasculitis. Such complications are well described in the literature and are associated with poor prognosis (9). Cerebrospinal fluid analysis would have been

informative. However, lumbar puncture was not pursued initially because the working diagnosis favored an intramedullary neoplasm. Additionally, no clinical features suggestive of meningitis were reported. After the onset of hydrocephalus with raised intracranial pressure, lumbar puncture became contraindicated because of concern for cerebral herniation. Similarly, molecular testing with the WHO-recommended Xpert MTB/RIF Ultra was not performed. While this assay is highly sensitive in pulmonary and cerebrospinal fluid samples, intramedullary spinal lesions require tissue specimens. In the studied patient, no biopsy material was available before surgery, leaving no safe or adequate sample for early testing.

Management of spinal and CNS TB requires prompt anti-TB chemotherapy and, when indicated, surgical intervention for diagnosis and/or decompression. WHO guidance for drug-susceptible TB recommends standard first-line therapy and acknowledges that

longer durations are commonly used for TB meningitis and for osteoarticular TB (including spinal disease); in children and adolescents with TB meningitis, a 12-month regimen (2HRZE/10HR) is recommended (10). In the present case, therapy was not initiated preoperatively because the diagnosis was established only histologically. This reflects documented cases of

intramedullary tuberculoma, which frequently radiologically resembles an intramedullary tumor, resulting in surgical biopsy or excision for conclusive diagnosis and the subsequent commencement of anti-TB therapy (4). Diagnostic delays may lead to adverse neurological outcomes.

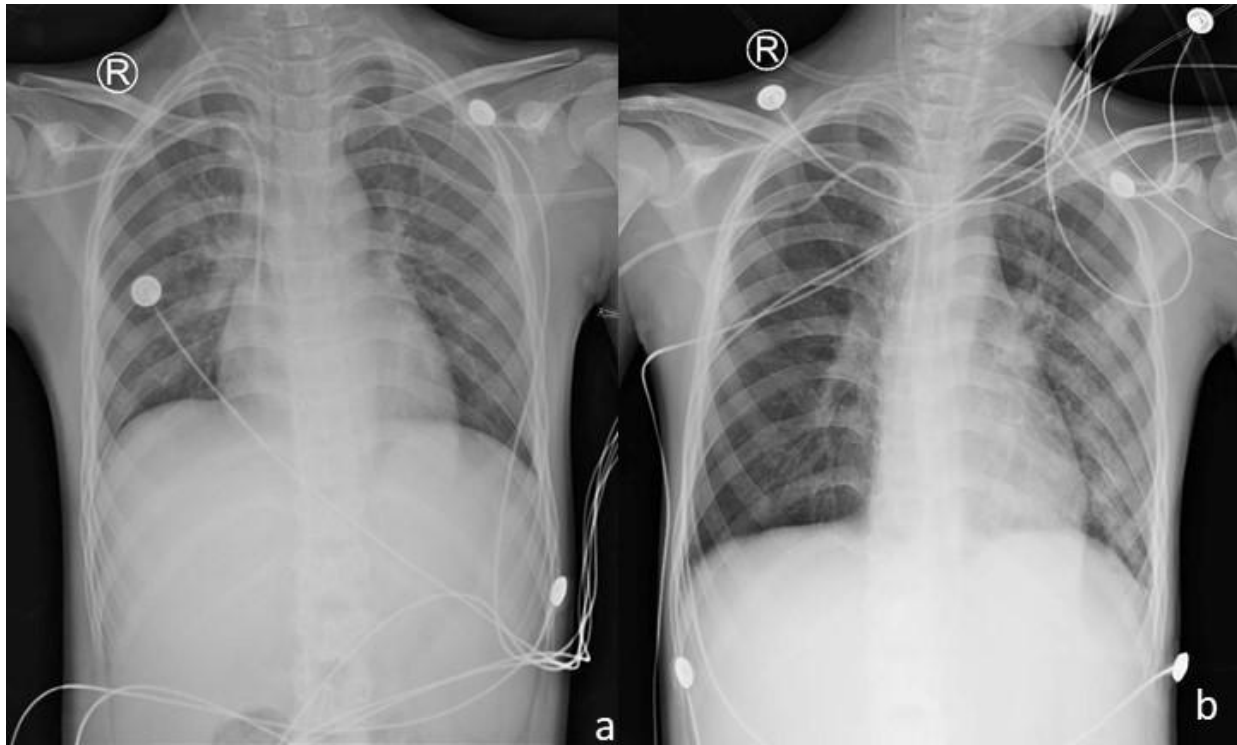


Figure 4. Chest X-ray (a), when pneumonia was first diagnosed, and (b), when the patient's respiratory condition deteriorated. Pulmonary infection was suspected to be nosocomial, as there were no abnormalities on the initial chest X-ray or respiratory clinical examination upon hospital admission 11 days earlier.

CNS TB, particularly TB meningitis, remains one of the most devastating forms of pediatric TB, with substantial mortality and a high burden of neurological sequelae among survivors, specifically when diagnosis and treatment are delayed (9). The outcome of the studied patient, who deteriorated with pneumonia, acute respiratory distress syndrome, electrolyte disturbances, and ultimately brainstem death, reflects this unfavorable prognosis and underscores the devastating potential of delayed or missed diagnosis.

In Conclusion

Overall, the present case highlights the intricate association of epidemiological risks, malnutrition, involvement of multiple systems, and diagnostic difficulties associated with the problem of pediatric extrapulmonary TB. Physicians need to realize that a high possibility of the presence of TB exists among patients with atypical symptoms, such as involvement of the ocular or spinal systems, along with various risk

factors, such as malnutrition or poverty. Prompt recognition and early treatment of TB, even prior to diagnosis through histopathological examination, are extremely crucial in these vulnerable individuals.

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Authors' Contributions

Tommy Alfandy Nazwar: Conceptualization, surgical management, supervision, data curation, writing – original draft.

Nasim Amar: Clinical data acquisition, literature review, investigation, writing – review & editing.

Shelby Amrus Ernanda: Clinical data acquisition, literature review, investigation, writing – review & editing.

Farhad Bal'afif: Supervision, resources, validation.

Donny Wisnu Wardhana: Supervision, resources, validation.

Fachriy Bal'afif: Supervision, resources, validation.

Christin Panjaitan: Literature review, patient follow-up, administrative support, writing – review & editing.

Indri Febriani: Literature review, patient follow-up, administrative support, writing – review & editing.

Conflict of Interest

The authors declare no conflicts of interest.

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