Magna Neurologica Vol. 3, No. 1, January 2025

https://journal.uns.ac.id/magna-neurologica
DOI: 10.20961/magnaneurologica.v3i1.1782
e-ISSN 2985-3729 p-ISSN 2963-6027

CASE REPORT **OPEN ACCESS**

A 22-YEARS-OLD MALE WITH TUBERCULOMA OF THE BRAIN AND SPINAL CORD WITH MILIARY TUBERCULOSIS

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Article History:
Received: August 6, 2024
Accepted: October 3, 2024
Published: January 1, 2025

Cite this as:
Simamora RD, Retnaningsih. Pasmanasari ED, Muhartomo H. A 22-Years-Old Male with Tuberculoma of the Brain and Spinal Cord with Miliary Tuberculosis. Magna Neurologica. 3(1) January 2025: 39-43. 10.20961/magnaneurologica.v3i1.1782

ABSTRACT

Background: Tuberculosis (TB) remains a significant health issue in Indonesia. Central nervous system (CNS) tuberculoma is one of the extrapulmonary TB diseases and accounts for approximately 1% of all cases. The emergence of this disease is primarily associated with a weakened immune system. However, several other factors, such as comorbidities, a history of inadequate TB treatment, and poor nutrition, also play a role in the development of tuberculoma.
Case: A 22-year-old male complained of weakness in all four limbs for the past month, accompanied by tingling and numbness from both feet up to the T10-11 dermatome level. The patient has a history of seizures from one year ago, interrupted treatment for military tuberculosis, and malnutrition. An MRI of the head and whole spine with contrast revealed tuberculomas. The patient was treated with medication, including intravenous dexamethasone 5 mg every 8 hours, oral phenytoin 200 mg every 24 hours, and anti-tuberculosis therapy.
Discussion: Tuberculoma in the central nervous system is rare, especially multiple tuberculomas co-occurring in the brain and spinal cord. MRI is a sensitive tool for diagnosing tuberculomas, characterized by the presence of a target sign. The combination of corticosteroids, antiepileptic drugs, and an entire course of anti-tuberculosis medications aims to address both the immediate neurological symptoms and the underlying infection.
Conclusion: TB can present as lesions in the brain and spinal cord, requiring the ability to correlate clinical manifestations and radiological features to establish a diagnosis and necessitating adequate therapy.

Keywords: central nervous system, seizure, tuberculoma

Introduction

Tuberculosis (TB) remains a major global health issue, with millions affected each year. According to the World Health Organization (WHO) estimates, in 2018, approximately 10.4 million people worldwide were infected with TB.[1] While pulmonary TB is the most common form, extrapulmonary TB can also occur, affecting various parts of the body, including the central nervous system (CNS). While tuberculosis of the central nervous system is widely recognized, the occurrence of intramedullary tuberculomas is uncommon, and the simultaneous presence of both intramedullary and intracranial tuberculomas is exceedingly rare, with only five cases reported in the literature.[2,3] Among the most severe forms of extrapulmonary TB are tuberculomas, which can affect both the brain and spinal cord. A brain tuberculoma is a localized, granulomatous lesion caused by Mycobacterium tuberculosis. It typically develops in the brain parenchyma and is a serious condition requiring prompt medical attention.[4]

CNS Tuberculoma can occur in both the brain and spinal cord, with a lower prevalence compared to other TB manifestations. The occurrence of tuberculoma in

the head or brain is often found in patients with compromised immune systems, particularly those with HIV or other comorbidities that affect the body's immunity. Multiple tuberculomas involving both the brain and spinal cord simultaneously are extremely rare. The complexity of this infection's spread is related to a hematogenous mechanism, where bacteria spread from the primary focus to various parts of the central nervous system. However, tuberculomas tend to localize in one area, making the involvement of multiple regions, such as the brain and spinal cord, uncommon. Diagnosing such cases is also challenging due to the variable clinical symptoms, ranging from headaches and seizures to neurological deficits associated with the location of the lesion in the CNS.[2,3]

Intramedullary tuberculomas typically present in a subacute manner, with symptoms of spinal cord compression that progressively worsen. Because spinal intramedullary tuberculomas are so rare, an established treatment protocol for this condition does not exist.[5] CNS TB is associated with high morbidity and mortality, necessitating early diagnosis and treatment. A definitive diagnosis of CNS TB is achieved by detecting TB bacilli in cerebrospinal fluid or tissue cultures. Risk factors for CNS TB include children, malnutrition, alcoholism, malignancies, and immunosuppressed states.[6,7]

Case Report

A 22-year-old male complains of weakness in all four limbs for the past month, which is continuous and progressively worsening. The limbs can only resist gravity, accompanied by tingling and numbness from both feet up to the level of the navel, pain like a tight band two fingers above the navel, and headaches. He often experiences fluctuating fever and feels thinner compared to before. The patient has a history of pulmonary miliary tuberculosis treatment but discontinued the medication, malnutrition, a history of seizures, and has been diagnosed with a brain tuberculoma no history of malignancy, diabetes, or other immunocompromising diseases. The patient received the BCG vaccine during infancy.

On physical exam, the patient was weak, tired-looking, and tired. The general examination was regular. In the motor neurological examination, weakness was observed in all four limbs, with motor strength in the upper limbs at 333/433 and the lower limbs at 333/433. Muscle tone was increased, and physiological reflexes were heightened (+++). Pathological reflexes, such as Hoffman and Babinsky, were present. In the sensory and physical examination, hypoesthesia was noted from the tips of the toes up to the C3-4 dermatomes. The patient also experienced axial pain at the T10-11 level. Vegetatively, the patient had difficulty with bowel and bladder control.

In the laboratory examination, the patient showed mild leukocytosis with a white blood cell count of 12,200 /uL and normal blood glucose levels. HIV was tested negative for the patient, but randomly distributed miliary nodules in both lung fields were revealed by her chest CT scan, which is highly suggestive of miliary pulmonary tuberculosis. Tumor marker tests were conducted, and the results were expected. On the contrast-enhanced head MRI, multiple intra-axial lesions with well-defined round borders were found in the right frontal lobe, right and left parietal lobes, left temporal lobe, and left cerebellar hemisphere. Post-contrast injection, rim enhancement was observed (Figure 1).

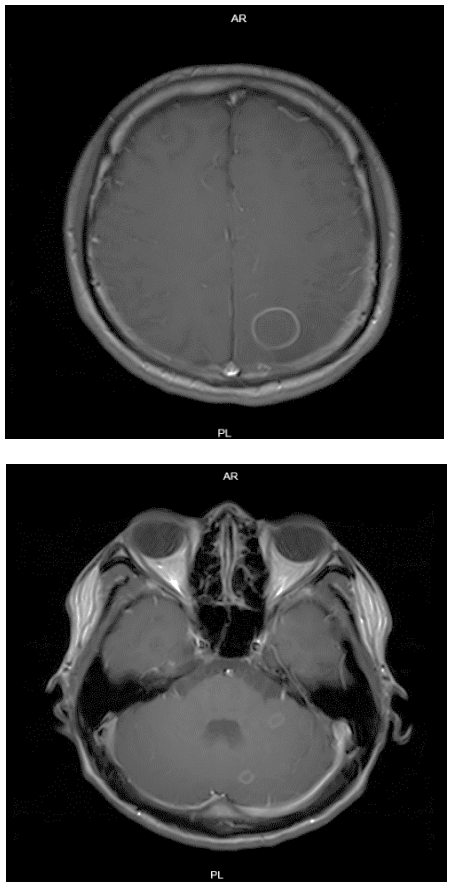

Figure 1. A contrast-enhanced MRI of the head shows multiple well-defined round intra-axial lesions

On contrast-enhanced whole spine MRI, multiple ill-defined round lesions were seen in the intramedullary spinal cord at C1 and T12 levels. These lesions appeared isointense on T1, slightly hyperintense on T2, and T2 FatSat, with inhomogeneous enhancement post-contrast. They are consistent with multiple intracranial and intramedullary tuberculomas (Figure 2).

The patient received treatment with Dexamethasone injection 10 mg bolus followed by 5 mg every 6 hours iv, Ranitidine injection 50 mg every 12 hours iv, Vitamin B12 injection one ampoule every 12 hours iv, Phenytoin 200 mg every 24 hours orally, Folic acid 1 mg every 24 hours orally, and Fleet enema suppository as needed. For TB treatment, the patient is using Streptomycin injection 750 mg every 24 hours IM, Rifampicin 450 mg every 24 hours, Isoniazid 300 mg every 24 hours, Ethambutol 1000 mg every 24 hours, Pyrazinamide 1250 mg every 24 hours, Levofloxacin 750 mg every 24 hours, Vitamin B6 50 mg every 24 hours, and Paracetamol 500 mg every 8 hours if feverish. In an outpatient visit, the patient continued the OAT, and the chest X-ray examination showed an improvement in the miliary TB findings.

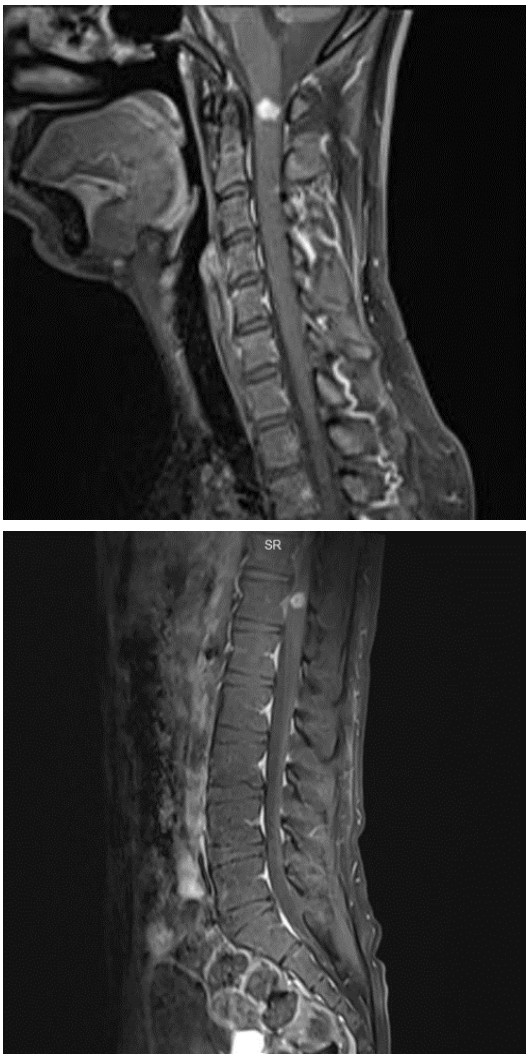

Figure 2. The contrast-enhanced whole spine MRI reveals multiple round lesions with poorly defined or unclear boundaries located within the intramedullary region of the spinal cord, specifically at the C1 vertebral level (a) in the cervical spine and the T12 vertebral level (b) in the thoracic spine

Discussion

TB of the central nervous system occurs due to the hematogenous spread of M. tuberculosis from an extracranial source. Intracranial TB manifestations are extensive and can affect different anatomical locations, such as meningeal or parenchymal, and vary by type, such as diffuse meningitis, tuberculoma, tuberculous abscess, focal cerebritis, vasculitis, and stroke (23%).[8,9] However, tuberculoma (granuloma) and tuberculous meningoencephalitis are CNS tuberculosis's two most common manifestations.[10] Therefore, early diagnosis and treatment are crucial for effective management. In the early stages, there may be no clinical presentation or symptoms. Later, characteristics such as headaches and epilepsy may appear.[11,12] If the patient presents in a delayed condition, there will be increased intracranial pressure (ICP) and limb weakness. The location of the lesion influences other clinical manifestations.[13] The symptoms of intramedullary tuberculoma resemble the clinical picture of subacute spinal cord compression, depending on the lesion level, such as motor and sensory symptoms. There are incidents of lower limb weakness, back pain, bowel or bladder dysfunction, and paresthesia.[14] Like intracranial tuberculoma, this disease can appear incidentally or manifest symptoms. In intramedullary tuberculoma, the thoracic segment is the most common location, and hematogenous spread is usually the primary etiology.[15] Most cases of intramedullary tuberculoma are subacute and present with progressive symptoms indicating compressive myelopathy. Intramedullary tuberculoma presents with symptoms of sensory loss, muscle weakness, and loss of autonomic function, depending on the level of the spine involved.[16] Intramedullary tuberculoma has been described in young individuals with immunocompromise and immunocompetence due to HIV infection or immunosuppressive therapy. However, this patient tested negative for HIV.[15,17]

Microscopic examination of sputum, sputum culture, and chest X-ray are the initial examinations performed on patients suspected of having tuberculosis. Chest X-rays are often used as an initial examination to evaluate an unexplained cough. Lumbar puncture is generally avoided due to the risk of increased intracranial pressure and potential brainstem herniation, with findings often being nonspecific. Although brain lesion biopsy is the most accurate diagnostic method, it is often not performed due to the limitations related to the lesion's location and the associated risks. Thoracic MSCT can detect radiographically hidden disease, differentiate parenchymal lesions, evaluate mediastinal lymph nodes, assess disease activity, and evaluate complications. These MSCT findings can be used to initiate empirical OAT therapy. In head CT

scans, brain tuberculoma is characterized as a hypo- or hyperdense mass with round or lobular margins. Lesions may show ring enhancement with contrast, as seen in the patient's radiological images.[18] However, it should be noted that this appearance can also be present in other diseases. MRI is the optimal tool for evaluating and diagnosing tuberculoma at an early stage and is helpful in follow-up. However, MRI is sometimes nonspecific and can be challenging to differentiate from malignant lesions, especially if there is no TB in other body parts, such as the lungs or lymph nodes. The imaging characteristics of intramedullary tuberculoma are hypo- or isointense to the spinal cord on T1 with only indirect signs of spinal cord expansion and heterogeneous intensity on T2 with central hypointensity and peripheral hyperintensity, described as a target sign.[19,20] In this case, the multiple tuberculoma central nervous system diagnosis was mainly based on clinical findings and brain imaging (Figures 1 and 2).

The differential diagnosis of intramedullary tuberculomas includes granulomas like tuberculomas and cysticerci granulomas and neoplastic lesions such as astrocytoma, metastasis, or lymphoma. In this instance, the clinical presentation, the lesion's size, the characteristic ring enhancement, and the surrounding edema indicated a tuberculous granuloma.

Treatment for brain tuberculoma is pharmacological using first-line Anti-Tuberculosis Drugs (OAT), namely rifampicin, isoniazid, pyrazinamide, and ethambutol for a 2-month intensive phase.[21] This is followed by a continuation phase with isoniazid, rifampicin, and ethambutol for 10-12 months. Pharmacologically, rifampicin and isoniazid are bactericidal drugs that penetrate the cerebrospinal fluid. Streptomycin injections penetrate the cerebrospinal fluid and kill Mycobacterium tuberculosis within the first 14 days of therapy. Steroids are clinically recommended to reduce the risk of inflammation, alleviate cerebral edema, and lower intracranial pressure. The dose of intravenous dexamethasone is 0.4 mg/kg/24 hours in 3-4 divided doses. Supportive therapy includes seizure management and mechanical ventilation. Surgical resection of the mass with decompression may be considered when patients have signs and symptoms of increased intracranial pressure.[22] After surgical resection, patients need to be given continued anti-tuberculosis treatment for 18 months with rifampicin, isoniazid, pyrazinamide, and ethambutol.[23] Surgical intervention is performed for central nervous system tuberculosis when there are complications such as hydrocephalus to reduce intracranial pressure. Clinical recovery is expected to begin within a few weeks after starting treatment. Still, it may take six to twelve months for radiological resolution related to the size of brain lesions.[24] In patients with tuberculoma, new intracranial lesions or the expansion of existing lesions can occur during OAT treatment. This patient receives OAT therapy consisting of rifampicin 450 mg/24 hours, isoniazid 300 mg/24 hours, ethambutol 1000 mg/24 hours, pyrazinamide 1250 mg/24 hours, and streptomycin injections. The patient is also receiving steroid therapy with intravenous dexamethasone starting at a dose of 5 mg every 8 hours. In patients with tuberculoma, new intracranial and intramedullary lesions are also possible, as well as the expansion of existing lesions during OAT treatment.[25,26]

Conclusion

TB patients presenting with neurological deficits or signs of raised intracranial pressure without symptoms of systemic illness or meningeal signs, CNS tuberculoma, should be considered. Considering its high morbidity and mortality, early diagnosis and treatment are crucial in CNS TB. CNS tuberculoma should be included in the differential diagnosis of ring-enhancing lesions on brain imaging in patients with the mentioned risk factors. Treatment involves a conventional anti-TB regimen along with steroids, with surgical resection rarely being necessary.

References

1. WHO. (2023). Global Tuberculosis Report 2023. Retrieved from WHO website.
2. Thwaites, G. E., & van Toorn, R. (2022). Tuberculous meningitis and encephalitis. In: Handbook of Clinical Neurology. Vol 184, pp. 165-188.
3. Lakshmi, V., & Krishna, S. (2021). Spinal intramedullary tuberculomas: Diagnostic challenges and treatment outcomes. *Journal of Neurosciences in Rural Practice*, 12(2), 222-226. doi:10.4103/jnrp.jnrp_291_20.
4. Jha, P., & Das, B. (2023). Brain Tuberculoma: A Comprehensive Review. Journal of Neurosciences in Rural Practice, 14(1), 15-22.
5. Hoonjan, B., & Desai, S. (2022). CNS Tuberculosis: Current Practices in Diagnosis and Management. Current Neurology and Neuroscience Reports, 22(2), 10-18.
6. Meegada S, Gyamfi R, Muppidi V, Dandu V, Challa T. Multiple Intracranial Tuberculomas with an Intra-medullary Spinal Cord Tuberculoma in a Pediatric Patient. Cureus. 2020 Mar 12;12(3):e7248. doi: 10.7759/cureus.7248. PMID: 32292663; PMCID: PMC7152571.
7. Srinivasan, K., & Narayanan, R. (2021). Spinal tuberculomas and neurological deficits: A retrospective

analysis of clinical outcomes. *Journal of Spinal Cord Medicine*, 44(5), 715-721. doi:10.1080/10790268.2020.1860381.

8. Perez-Malagon CD, Barrera-Rodriguez R, Lopez-Gonzalez MA, Alva-Lopez LF. Diagnostic and Neurological Overview of Brain Tuberculomas: A Review of Literature. Cureus. 2021 Dec 3;13(12):e20133. doi: 10.7759/cureus.20133. PMID: 34900500; PMCID: PMC8648135.
9. Verma, N., & Kapoor, K. (2023). Cerebral tuberculoma: A comprehensive review of clinical features, diagnosis, and treatment. *Journal of Neuroinfectious Diseases*, 14(1), 45-53. doi:10.4172/2314-7326.1000309.
10. Yilmaz, T., & Tuncel, E. (2019). Clinical and radiological features of intracranial tuberculoma: A series of 22 patients. *Journal of Neurosurgical Sciences*, 63(1), 1-9. doi:10.23736/S0390-5616.18.04628-4.
11. Singh, A. K., & Pandey, A. (2021). Central nervous system tuberculosis: A clinical and radiological review. Neuroradiology Journal, 34(3), 208-218.
12. Rajasekhar, V., Prabhakaran, V., & Dhanraj, B. (2020). Management of tuberculoma in the brainstem: A neurosurgical approach. *Asian Journal of Neurosurgery*, 15(4), 729-735. doi:10.4103/ajns.AJNS_74_20.
13. Cherian, A., Ajitha, K.C., Iype, T., & Divya, K.P. (2021). Neurotuberculosis: An Update. *Acta Neurologica Belgica*, 121(1), 11-21.
14. Sardana V, sharing P. Intramedullary tuberculoma of the Spinal Cord, Clinical features & imaging: Possibility of early diagnosis with imaging? Indian J Tuberc [Internet]. 2020;67(3):346–8. Available from: https://doi.org/10.1016/j.ijtb.2019.03.007.
15. Singhal, S., Dixit, R., & Kumar, A. (2021). Management of Tuberculosis of the Spine: Clinical and Surgical Aspects. *Asian Spine Journal*, 15(1), 45-56.
16. Kalita, J., Misra, U.K., & Pradhan, P.K. (2019). Spinal Tuberculosis and MRI Findings: Correlation with Clinical Features and Treatment Outcome. *Journal of Neurology*, 266(6), 1491-1500
17. Biakto KT, Arifin J, Wonggokusuma G, Micelli C. Tuberculoma of spine mimicking intramedullary tumor: A case report. Int J Surg Case Rep. 2020;76:231–6.
18. Garg, B., Mehta, N., Mukherjee, R.N., & Swamy, R. (2022). Brain Tuberculoma: Diagnostic Challenges and Therapeutic Considerations. *Cureus*.19.
19. Kamble, R.B., Sharma, A., & Jagtap, S.V. (2020). Spinal Cord Tuberculoma: MRI Features and Diagnostic Challenges. *European Journal of Radiology Open*, 7, 100276. https://doi.org/10.1016/j.ejro.2020.100276
20. Capone, S., Emechebe, D., St. Clair, E.G., Sadr, A., Feinberg M. 2021. Presentation, diagnosis, and treatment of a cerebellar tuberculoma: illustrative case. J. Neurosurg. Case Lessons. 2021;2(18):10–3.
21. Mota, P.C., Teixeira, R., Carvalho, A., & Fernandes, A. (2021). Management of Extrapulmonary Tuberculosis: Evidence, Challenges, and Future Options. *Journal of Clinical Medicine*, 10(6), 1302. https://doi.org/10.3390/jcm10061302
22. Chandra Vemula et al., R. Chandra Vemula, B.C.M. Prasad, V. Koyalmantham, G. Hanu Role of surgery in intracranial tuberculomas and proposal of novel diagnostic criteria for diagnosis (Sri Venkateswara Institute of Medical Sciences Criteria) World Neuros.
23. Kang, W., Liu, S., Du, J., et al. (2022). Epidemiology of Concurrent Extrapulmonary Tuberculosis in Inpatients with Extrapulmonary Tuberculosis Lesions in China: A Large-Scale Observational Multi-Centre Investigation. *International Journal of Infectious Diseases*, 115, 79-85. https://doi.org/10.1016/j.ijid.2021.11.019
24. Nahid, P., Dorman, S.E., Alipanah, N., et al. (2019). Official American Thoracic Society/Centers for Disease Control and Prevention/Infectious Diseases Society of America Clinical Practice Guidelines: Treatment of Drug-Susceptible Tuberculosis. *Clinical Infectious Diseases*, 63(7), e147–e195.25.
25. Dronca SB, Cohan SA. *Tuberculosis and Nontuberculous Mycobacterial Infections of the Central Nervous System*. Springer; 2021. ISBN 978-3030657942.
26. Gupta RK, Sharma K. *Clinical Management of Tuberculosis: Recent Advances and Challenges*. CRC Press; 2022. ISBN 978-0367330747.