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Case Report

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Tuberculoma in the Fourth Ventricle: An Unusual Location

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ABSTRACT

To present a young immunocompetent patient with a fourth ventricle tuberculoma without pulmonary tuberculosis.

A previously healthy young male patient presented with a history of headache, nausea, and blurred vision. Neuroimaging revealed a mass present in the fourth ventricle. The lesion was successfully resected. Histological and microbiological findings suggested the presence of a tuberculoma.

Tuberculomas can be found in the posterior fossa in adults. This infectious pathology should not be forsaken when considering the differential diagnosis for infratentorial masses.

KEYWORDS: Central nervous system, fourth ventricle, meningitis, tuberculoma, tuberculosis

ABBREVIATIONS: TB: Tuberculosis, **CNS:** Central nervous system, **PCR:** Polymerase chain reaction, **MRI:** Magnetic resonance imaging, **AFB:** Acid-fast bacillus, **HIV:** Human immunodeficiency virus, **TBM:** Tuberculous meningitis

INTRODUCTION

Tuberculosis (TB) generally affects the lungs. Nevertheless, it can have extrapulmonary involvement, including the central nervous system (CNS). Meningitis, tuberculomas, abscesses, and spinal arachnoiditis are part of the CNS TB spectrum (13). CNS involvement represents approximately 5 to 10% of extrapulmonary TB cases and only 1% of all TB cases (7,13).

The most common manifestation of CNS TB is TB meningitis (4,13). Intracranial tuberculomas are only found in 1% of all patients with CNS TB (7). The clinical presentation depends on the location of the lesion, but frequently includes headache, seizures, focal neurological deficit, and papilledema (12). We present the case of a young immunocompetent patient with a fourth ventricle tuberculoma, without pulmonary TB. Institutional Review Board approval and patient consent were obtained before the commencement of this report.

CASE REPORT

A 27-year-old male, with a history of hypothyroidism and cognitive impairment, came to the emergency department. He complained of a 2-week global headache associated with nausea, vomiting, sleep disturbances, and blurred vision in the horizontal plane.

His vital signs were normal. The neurological examination revealed nystagmus with conjugated gaze to the right, and right IV, left VI, and left XII cranial nerves palsy. No gait disorders, dysmetria, or diadochokinesis were identified.

Brain magnetic resonance imaging (MRI) with contrast was performed. A contrast-enhancing fourth ventricle lesion with central necrosis was visualized, infiltrating the roof of the ventricle and the pontine tegmentum, and accompanied by nodules in the left cerebellar hemisphere and hypothalamus. Anaplastic ependymoma, metastasis, or medulloblastoma were considered in the differential diagnoses.

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The lesion was surgically resected. Macroscopically, it was an extra-axial mass, attached to the roof of the fourth ventricle. Histologically, the lesion had a chronic necrotizing granulomatous inflammatory process with the presence of multinucleated giant cells, suggesting a diagnosis of a tuberculoma. Polymerase chain reaction (PCR) of the cerebrospinal fluid sample was positive for *Mycobacterium tuberculosis*.

Thoracic imaging studies did not show areas of consolidation or cavitation. Bacilloscopy and HIV serology were negative. Extrapulmonary TB treatment was started. The drug regimen included rifampin, isoniazid, pyrazinamide, and ethambutol.

DISCUSSION

M. tuberculosis is an aerobic, nonmotile, non-spore-forming, acid-fast bacillus (AFB) (4,13). TB infection affects more than 2 billion people worldwide, approximately a third of the world population, with 10% of cases presenting with symptoms of active TB. Extrapulmonary TB occurs when AFBs migrate out of the lungs, and involves the lymph nodes, skin, and meninges (13).

CNS TB is one of the most devastating human mycobacterial infections. It generally affects children and immunocompromised patients, mainly those with human immunodeficiency virus (HIV) infection. Other risk factors are malnutrition, alcoholism, neoplasms, and the use of immunosuppressive medications (15). In our patient, pulmonary TB was not found, HIV serology was negative, and no risk factors for TB were identified.

CNS TB infection presents as subacute or chronic meningitis, abscess, intracranial tuberculoma, and TB arachnoiditis. The most common manifestation of CNS TB is TB meningitis (TBM), which results from the hematogenous spread of AFBs to the choroid plexus and the rupture of the tubercle bacillus in the subarachnoid space (13).

Approximately 10% of the patients with TBM also have tuberculomas (15). Tuberculomas are spherical, granulomatous masses that develop when AFBs in the brain parenchyma enlarge without rupturing into the subarachnoid space (13). They are the least frequent presentation of CNS TB, found in only 1% of these patients. Multiplicity is found in 15 to 33% of all cases (8).

Tuberculomas can occur in the brain, spinal cord, epidural, subdural, or subarachnoid space. They are typically supratentorial (frontal and parietal) in adults, as opposed to children where they are usually infratentorial (1,6,15). Posterior fossa tuberculomas in adults are rare; 12 cases have been reported in the literature (Table I), but none of them were found in the fourth ventricle. The clinical presentation depends on the location of the lesion, but frequently includes headache, seizures, focal neurological deficit, and papilledema (12). Our patient had a fourth ventricle tuberculoma (CNS TB). His symptoms were secondary to the mass effect and irritation exerted by the lesion on the surrounding neurological structures.

Imaging characteristics of tuberculomas are not specific. They are generally visualized as isointense lesions surrounded by a hyperintense enhancing ring with central calcification (4). However, neuroimaging features vary according to whether the lesion is solid, noncaseating, caseating with a solid center, or caseating with a liquefied center. Noncaseating lesions are usually hypointense on T1 and hyperintense on T2-weighted MRI. Caseating lesions with a solid center are iso- to hypointense on T1- and T2-weighted MRI. Caseating lesions with a liquefied center are hypointense on T1- and hyperintense on T2- weighted MRI (4,15). Gadolinium-enhanced MRI provides a more detailed visualization of the anatomical location of the lesion. Tuberculoma size varies between 1 mm to 8 cm. Differential diagnoses include neoplastic lesions, sarcoidosis, pyogenic abscesses, toxoplasmosis, and cysticercosis (4,8).

There are two methods for confirming the diagnosis of a tuberculoma. The first method, which is microbiological, consists of demonstrating the presence of *M. tuberculosis* in culture or by PCR. The second method, which is histological, involves the identification of central caseous necrosis surrounded by epithelioid histiocytes and Langhans giant cells. *M. tuberculosis* can exhibit a histochemical reaction using the Erlich Ziehl-Nielsen stain (4). This technique is based on the structure of the mycobacterial cell wall that contains

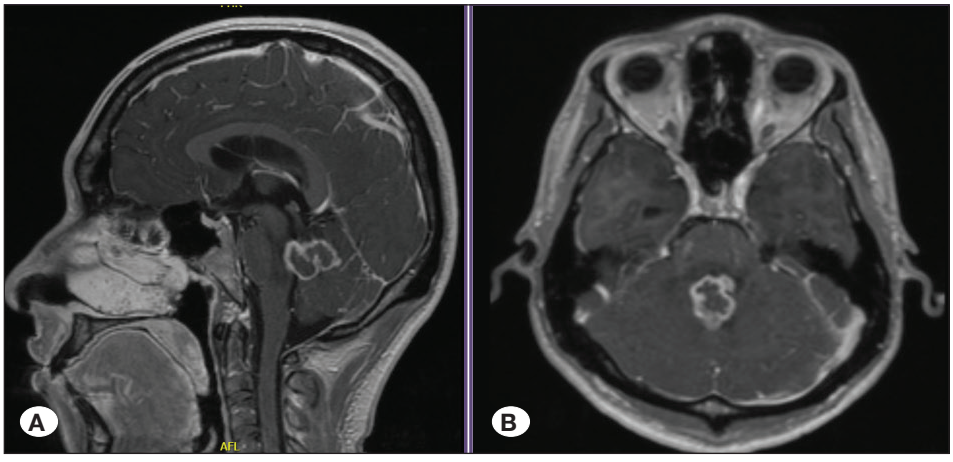

Figure 1: Brain MRI with contrast (Panel A, Sagital; Panel B, Axial) revealed a lobulated lesion with peripheral contrast enhancement involving the roof of the fourth ventricle and the pontine tegmentum.

Table I: Infratentorial Tuberculomas in Adult Population

Author	Patient(s)	Location
Bayindir et al., (1)	2 adult patients	Cerebellum
Kelly et al., (6)	1 adult patients	Middle pons Left Cerebellar hemisphere
	2 adult patients	Supratentorial and Infratentorial lesions
Binesh et al., (2)	42-year-old female	Right brachium pontis
Nabiuni and Sarvarian (10)	23-year-old female	Left cerebellar hemisphere
Fabrizio et al., (5)	35-year-old female	Left superior cerebellar hemisphere Right inferior cerebellar hemisphere
	34-year-old female	Right cerebellar hemisphere
Bouali et al., (3)	49-year-old male	Vermian mass extending to the left cerebellar hemisphere
Poonnoose et al., (11)	26-year-old female	Left cerebellar hemisphere
Muzumdar et al., (9)	46-year-old female	Right cerebellar hemisphere Right middle cerebellar peduncle

lipids and other high molecular weight fatty acids, which gives the property of not releasing dyes contained between the wall and the membrane. This method has a range in sensitivity of 0% to 44% for detecting this infection and requires the presence of 104 mycobacteria per field or ml to establish a diagnosis (14). In our case, the diagnosis of tuberculoma was made through histological and microbiological studies.

Anti-tubercular treatment for tuberculomas includes isoniazid, rifampin, pyrazinamide, and ethambutol as the first line of therapy. Corticosteroids have also been shown to improve prognosis by modulating the inflammatory response (4,13,15).

CONCLUSION

Tuberculomas can be found in adults with posterior fossa lesions. This infectious pathology should not be forsaken when considering differential diagnosis for infratentorial masse.

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