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Case Report

Surgical resection of pericallosal tuberculoma through contralateral approach: A case report

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ABSTRACT

Background: Pericallosal tuberculoma, a rare form of intracranial tuberculoma, affects the corpus callosum and results from tuberculosis (TB), a bacterial infection that can cause a myriad of symptoms. Diagnosing this condition can be challenging but can be confirmed through imaging studies and biopsy. Treatment involves a combination of antitubercular medications and surgical removal of the lesion if it is in a critical location or causing significant symptoms. This article describes the surgical management and imaging characteristics approach to a patient with intracranial tuberculoma.

Case Description: A 17-year-old female with a history of TB meningitis nine years ago presented with one week of recurrent seizures and mild third nerve palsy, later diagnosed as a tuberculoma of the corpus callosum through radiological imaging and biopsies. A total surgical resection of the lesion was performed using a contralateral interhemispheric frontal parasagittal approach. The patient went under observation and suitable follow-up plans.

Conclusion: Surgical management can effectively treat cerebral granulomas and improve neurological deficits in patients with recurring TB. Despite the possibility of complications, the benefits of such measures are highlighted in this case, suggesting that surgical intervention can be a viable option for achieving optimal outcomes in these patients.

Keywords: Gross total resection, *Mycobacterium tuberculosis*, Seizure, Tuberculoma, Tuberculous meningitis

INTRODUCTION

Tuberculosis (TB) involving the central nervous system (CNS), a rare manifestation of the chronic infectious disease caused by *Mycobacterium tuberculosis* bacteria, poses significant mortality and morbidity risks. Accounting for only 1% of all TB cases, CNS TB typically manifests as meningitis, leading to severe neurological complications that necessitate immediate diagnosis and treatment to prevent permanent disability and death.[7]

Pericallosal tuberculoma, a scarcely encountered brain tuberculoma, results from TB meningitis (TBM) and refers specifically to mass growth within the corpus callosum. Extra-

axial tuberculomas are commonly found in the frontal and parietal areas, though they may also emerge in the suprasellar, pontine, and pericallosal regions.[5] Intracranial tuberculomas, tuberculous brain abscesses, and tuberculous arachnoiditis represent infrequent manifestations of CNS TB, more commonly affecting immunocompromised patients, particularly those with human immunodeficiency virus (HIV) infection.[7] Pericallosal tuberculoma symptoms vary according to the involved site and lesion extent, potentially including headaches, seizures, disorientation, and limb weakness or numbness.[1] The incidence of pericallosal tuberculoma differs across countries based on TB prevalence, with the increasing incidence of HIV and acquired immunodeficiency syndrome contributing to its occurrence. Although this brain tuberculoma is rare, several case reports and case series have documented it, underscoring the necessity for prompt diagnosis and proper management in affected individuals.[10]

This study delineates the surgical techniques and imaging characteristics employed in addressing intracranial tuberculoma patients. Furthermore, the study seeks to offer insights into diagnostic and therapeutic approaches for this unusual condition, which can enhance patient outcomes and inform future research in this domain.

CASE SCENARIO

Presentation and examination

A 17-year-old female from Iraq was diagnosed with tuberculous meningitis nine years ago. The patient was noncompliant with anti-TB medications. She experienced a recurrence of pulmonary TB 4 years ago. Three months before admission, the patient suffered recurrent seizures for one week. Neurological examination revealed mild right-sided Ferner palsy. The patient was conscious, and there were no other notable findings.

Magnetic resonance imaging (MRI) sequences displayed multiple intra-axial supratentorial lesions on the left frontal precentral area and a cluster of at least ten small lesions. These lesions exhibited a low signal on T1-weighted imaging and a complex signal on T2-weighted imaging with areas of low/iso signal surrounding vasogenic edema. They appeared as signal voids in gradient echo sequences. Postcontrast sequences revealed a peripheral cluster of ring enhancement of the small lesions (granulomas). A mass effect was noted on midline structures with right-sided subfalcine herniation [Figure 1]. Computed tomography (CT) imaging demonstrated hyperdense lesions in the left anterior part of the frontal horn of the lateral ventricle with subfalcine herniation to the right, with surrounding vasogenic edema [Figure 2].

Operation

The patient underwent craniotomy through a contralateral interhemispheric right frontal parasagittal approach, which allowed for a gross total resection of the mass. Selecting this modification is mainly due to the lateral extension of pathology. The lesion had both pericallosal arteries entered and terminated inside it, which were atrophied and subsequently removed. The ventricle was dissected due to the involvement of the corpus callosum [Figure 3]. Histopathological examination confirmed the diagnosis of (cerebral granuloma).

Postoperation course

The patient was conscious and experienced a single seizure managed with antiepileptic medication. She also suffered mild left foot drop resulting from scarifying right bridging veins during surgery; however, it resolved over time through physiotherapy. It lasted for two months. The patient developed severe conjunctivitis, which was resolved with medication. She was discharged on a 12-month course of anti-TB medication, to which she adhered, and her neurological deficits improved. A follow-up MRI 12 months post-surgery [Figure 4] and axial and sagittal brain MRI demonstrated lesion resection and alleviation of the mass effect.

DISCUSSION

Cerebral tuberculoma is a condition in which the brain parenchyma reacts to an *M. tuberculosis* infection, exhibiting stages such as granulomas, abscesses, and calcifications. Brain infection by *M. tuberculosis* can occur through bloodborne dissemination or during tuberculous meningitis. Furthermore, a cerebral tuberculoma can rupture and infect the subarachnoid space.[4] The incidence of solid extra-axial tuberculous masses is extremely low despite the common intraparenchymal tuberculomas. Cerebral tuberculomas are usually located at the corticomedullary junction because of the high blood supply in these areas, as they are often the result of hematogenous spread as part of miliary TB.[6] The most common sites within the cerebrum are the frontal and parietal lobes, and less often in the temporal lobes, the centrum ovale, and the basal ganglion, and rarely manifest in the suprasellar, pontine, and pericallosal regions.[2]

CT and MRI are as sensitive when detecting intracranial tuberculomas in all patients. It was observed that MRI was slightly more effective in diagnosing brain stem tuberculomas as a result of its ability to assess the extent of the lesion accurately. Tuberculomas vary in appearance on a T2-weighted image according to the stage of evolution. Small tuberculomas appear to be scattered areas of varying intensity,

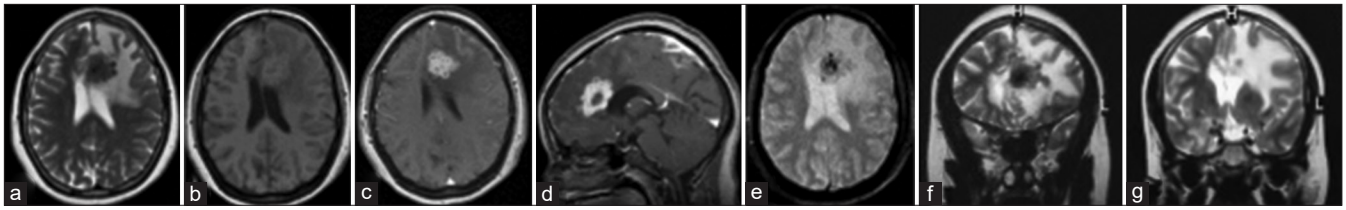

Figure 1: (a-g) The preoperation magnetic resonance imaging sequences demonstrate multiple intra-axial supratentorial lesions on the left of the frontal precentral location, and at least ten small lesions cluster together. These lesions are of low signal on T1-weighted imaging, the complex signal on T2-weighted imaging with areas of low/iso signal, surrounding vasogenic edema, and appear as a signal void in GRE. On postcontrast sequences, there is a peripheral cluster of ring enhancement of the small lesions (granulomas). (f and g) A mass effect is noted on the midline structures with subfalcine herniation.

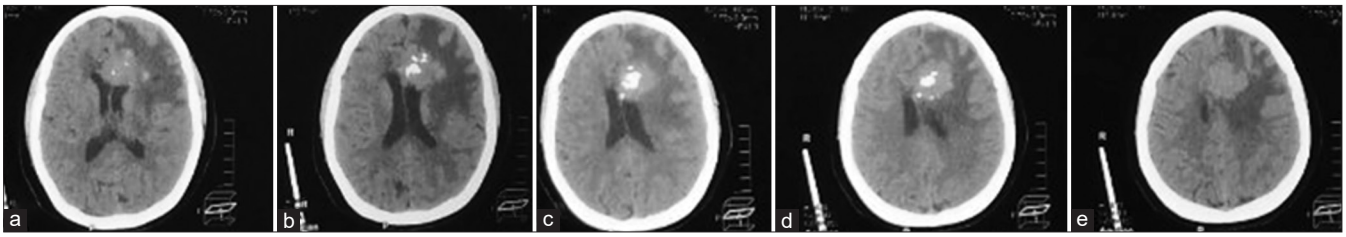

Figure 2: (a-e) Axial brain computed tomography (CT) scans without contrast images, which demonstrate a left pericallosal isodense lesion with areas of hyperdensities. The lesion is ill-defined, round-shaped, and measures approximately 3 × 3 cm. It is causing a mass effect on the left frontal horn and minimal midline shift. Diffuse left frontotemporal vasogenic edema is noted.

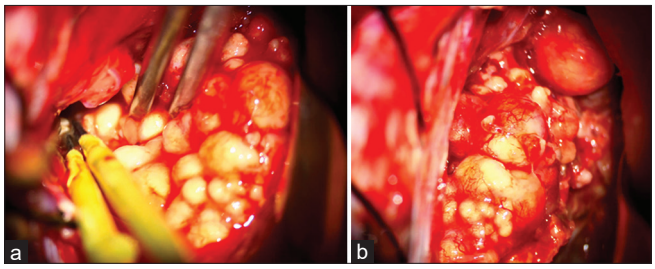

Figure 3: (a and b) Intraoperative view of the Tuberculoma through contralateral frontal parasagittal approach.

whereas mature tuberculomas appear to be space-occupying lesions with a central area of low signal and surrounding edema. The lack of signal has probably been caused by thick fibrosis, calcification, and free radicals. It usually shows an enhancement of contrast, which is ring or annular. Ring enhancement is common. Caseation usually results in the "target sign" appearance.[9] Although MRI is potentially useful for diagnosing intracranial tuberculomas, similar findings can occur in other infectious or metastases. Therefore, intracranial tuberculomas need to be diagnosed with a comprehensive evaluation, which includes clinical manifestations, cerebrospinal fluid analysis, and neuroimaging.[12]

Medical management is appropriate for patients with communicating hydrocephalus and should be the first-line therapy in patients in Vellore Grades 1 and 2. Steroids are usually given to all patients with TBM and may reduce hydrocephalus. More than 70 % of patients may benefit from medical treatment to prevent shunting surgery. However, medical management should be discontinued if the patient does not respond to treatment or is starting to worsen despite medicines.[11]

The ipsilateral interhemispheric approach is the traditional approach for pericallosal lesions.[3] Nonetheless, modification or a different approach may be indicated in certain situations. Contralateral modification of the interhemispheric route is usually preserved for pathologies with a lateral extension and deeply seated ones. It will provide a decreased need for retraction of the brain parenchyma and retractor deviation, better steeper working angles, and a greater variety of surgical angles, which were substantially more advantageous than the traditional ipsilateral method.[8] In our cases, the tuberculomas had lateral spread and deeply situated lesions, which favored the contralateral modification of the approach. Another obstacle facing the traditional ipsilateral approach is the condensation of parasagittal veins, which can be assessed preoperatively. Furthermore, a different approach can be contemplated for the pericallosal location, the ipsilateral transcortical route. However, transcortical approaches usually need extensive preoperative evaluations like tractography for optimal surgery planning, and these approaches usually transgress the normal brain parenchyma. Such tools often are not available in low- and middle-income countries.

The patient suffered from seizures in this case, and imaging showed at least ten small lesion clusters together. CT shows a hyperdense lesion in the left anterior part of the lateral

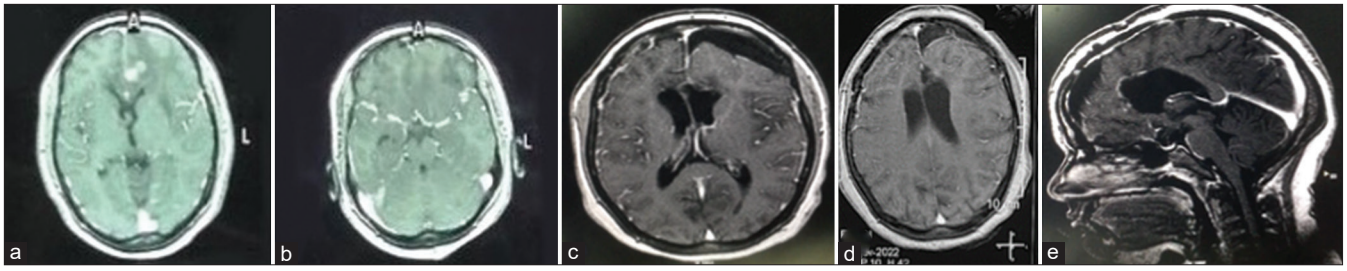

Figure 4: (a and b) follow up magnetic resonance imaging after six months and (c-e) 12 months, the images show the lesion's total resection.

ventricle with subfalcine herniation to the right, so we decided that the patient needs total gross resection. The common approach in surgery of pericallosal tuberculoma is the ipsilateral approach. However, the contralateral approach may be considered depending on the lesion's depth, the patient's age, and the surgeon's preference.

CONCLUSION

Surgical management can effectively treat intracranial tuberculomas and ameliorate neurological deficits in patients experiencing recurrent TB. Despite the possibility of complications, the benefits of such measures are highlighted in this case, suggesting that surgical intervention can be a viable option for achieving optimal outcomes in these patients.

Declaration of patient consent

Patient's consent not required as patient's identity is not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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