



Case Report

Surgical strategy for tuberculous brain abscess with dural infiltration: A case report

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ABSTRACT

Background: Tuberculosis is one of the top 10 leading causes of death worldwide. Although tuberculous central complications account for 1% of all tuberculosis patients, there are many cases of medical resistance; and early surgical treatment is required for brain abscess. Reports on tuberculous brain abscesses with dural infiltration are rare, and there are no reports on surgical treatment methods.

Case Description: An 81-year-old man was presented with the right arm paresis. His recent medical history included a 6-month course of immunosuppressants, and steroids prescribed for ulcerative colitis, and four antituberculosis drugs had been started 2 months before for relapse of pulmonary tuberculosis at an early age. Head T1-weighted magnetic resonance imaging with administration of gadolinium showed two ring-enhanced lesions in the left precentral gyrus and continuous with the dura mater. Surgery was performed and he was pathologically diagnosed with a tuberculous brain abscess. Since the pathological diagnosis revealed dura mater invasion, we removed the dura mater and reconstructed by periosteum. After the surgery, the symptoms gradually improved, and the abscess and edema improved when viewed on the image. Despite the administration of steroids for ulcerative colitis without antituberculosis drugs, no recurrence was observed for 1 year. Recurrence of tuberculous brain abscess is a major problem in immunosuppressed patients, but it is considered that the relapse could be prevented by removing the dural infiltration.

Conclusion: In cases of tuberculous brain abscess with dural infiltration, it is considered that the recurrence can be prevented even in an immunosuppressed state by removing the dura.

Keywords: Dural infiltration, Immunosuppressed patients, Surgical technique, Tuberculous brain abscesses, Tuberculous central complications

INTRODUCTION

About 10 million new cases of tuberculosis occur worldwide every year, thereby making it one of the top 10 leading causes of death.^[5,11] Tuberculous central complications include meningitis, encephalitis, tuberculoma, and brain abscess; however, tuberculous brain abscess is extremely rare. We report a case of tuberculous brain abscess with dural infiltration in which the course was uneventful by surgically removing the abscess and dura.

CASE REPORT

Case presentation

An 81-year-old man was presented with the right arm paresis. He had a medical history of pulmonary tuberculosis when he was in junior high school. His recent medical history included a 6-month course of immunosuppressants, and steroids prescribed for ulcerative colitis, and he was taking steroids until 2 weeks before coming hospital. In addition, for the past 3 months, he has been taking four antituberculosis drugs (isoniazid 300 mg, ethambutol hydrochloride 750 mg, pyrazinamide 1.2 g, and rifampicin 450 mg) for relapse of latent pulmonary tuberculosis. During the same time, cervical lymph node biopsy revealed papillary thyroid cancer (Stage IIB, cervical lymph node metastasis), and surgical treatment was considered.

Symptoms were difficulty in writing and weakness in his right-hand grip, and when it became difficult to raise his right upper limb, he presented to the hospital.

On admission, his height was 171 cm, weight was 62.8 kg, blood pressure was 161/89 mmHg, body temperature was 36.5°C, and oxygen saturation was 98% (room air). His

consciousness was clear, and neurologic findings revealed right mouth ptosis, dysarthria, and right upper limb paresis (manual muscle test [MMT] Grade 4/5). Blood test results were leukocytes 3010/ μ L, hemoglobin 9.8 g/dL, platelets 183,000/ μ L, aspartate aminotransferase 29 U/L, alanine aminotransferase 20 U/L, blood urea nitrogen 17 mg/dL, serum creatinine 1.15 mg/dL, C-reactive protein 1.37 mg/dL, D-dimer 2.3 μ g/m, carbohydrate antigen 19-9 51.3 U/mL (normal, <37.0 U/mL), cancer antigen 125 63.2 U/mL (normal, <35.0 U/mL), HIV antibody 0.05 S/CO (<1.00 S/CO), and HIV antigen/antibody 0.17 S/CO (<1.00 S/CO). The tuberculosis DNA-loop-mediated isothermal amplification (LAMP) test and sputum mycobacteria smear were positive. Cerebrospinal fluid test results were glucose 68 mg/dL, total protein 43.7 mg/dL, and cells 4/ μ L; cerebrospinal fluid culture was negative.

Chest radiography showed patchy shadows and the previous tuberculosis with calcification in the lower right lung lobe; however, no obvious exacerbation was observed after the start of antituberculosis drug [Figure 1a]. Head computed tomography showed a low-density lesion in the left precentral gyrus [Figure 1b]. The lesions showed

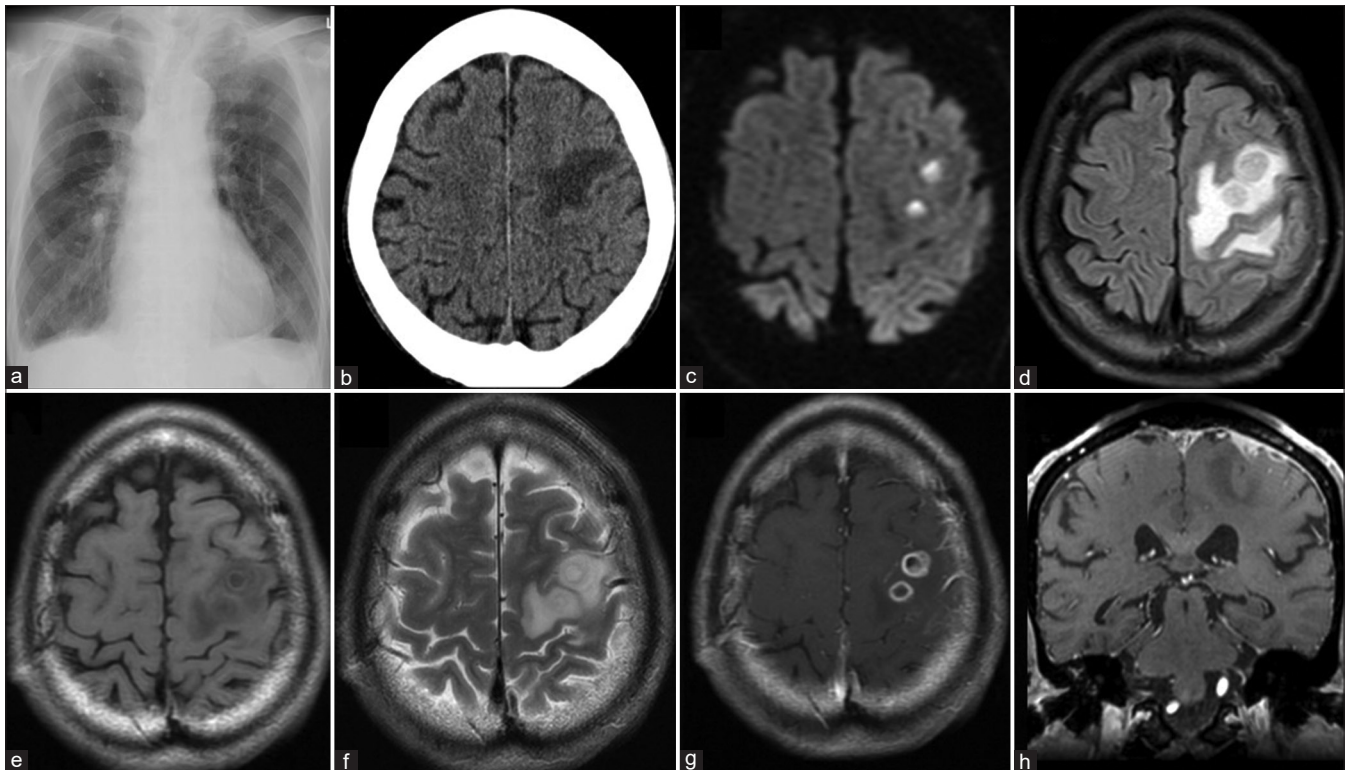


Figure 1: Chest X-ray shows mottled shadow and old tuberculosis with calcification in the right lower lung lobe (a). Computed tomography shows a low-density lesion in the left precentral gyrus (b). Magnetic resonance imaging shows the lesions high intensity on a diffusion-weighted image (c). Fluid-attenuated inversion recovery image shows high-intensity area around the lesions (d), low intensity on T1-weighted image (T1WI) (e), and high intensity on a T2WI (f). T1WI with administration of gadolinium shows two ring-enhanced lesions in the left precentral gyrus on axial image, and dural-enhanced lesion on coronal image (g and h).

high intensity on a diffusion-weighted magnetic resonance imaging (MRI), low intensity on T1-weighted image (T1WI), and high intensity on T2-weighted image (T2WI); also, fluid-attenuated inversion recovery (FLAIR) image showed an area of high intensity around the lesions [Figures 1c-f], and T1W-MRI with administration of gadolinium showed two ring-enhanced lesions that was major axis of 15 mm and continuous with the dura mater [Figure 1g and h]. No cranial bone lesions were found on either CT or MRI.

Because the patient had a cancer and was taking immunosuppressive drugs and steroids, metastatic dural tumor and bacterial brain abscess were suspected, and surgery was considered for diagnosis and treatment. However, because the tuberculosis DNA-LAMP test and sputum acid-fast bacillus smear were positive, the risk of spreading tuberculosis infection during the perioperative period was considered, so conservative treatment was selected using antibiotic administration to address the first diagnosis considered, bacterial brain abscess.

Seventeen days after the start of the antibiotic, the right arm paralysis worsened to MMT 1/5, and the imaging findings showed no improvement for the contrast-enhanced lesions or peritumoral edema. At this point, the sputum acid-fast bacillus culture taken at admission was confirmed as negative, so the risk of perioperative infection spread was judged to be low, and craniotomy was performed on the hospital day 18.

Operation and pathological diagnosis

When the dura mater just above the contrast lesion was incised, the lesion was easy to peel off from dura, but there was a finding that part of the dura was infiltrated. The boundary with the normal brain was unclear and the adhesion was strong, making it difficult to peel the tumor off the brain. When the contents of the cyst were punctured and aspirated, a liquid suspected to be white turbid pus was collected [Figure 2a]. The area that pathologically diagnosed dural infiltration was resected and periosteum was used to repair the dura mater. Pathologic findings showed granulomatous tissue with inflammatory cell infiltration, mainly composed of neutrophils and lymphocytes, and necrotic foci were observed in some areas [Figure 2b]. Granuloma formation and inflammatory cell infiltration were also observed in the dura mater [Figure 2c]. Bacteria were not detected in the culture test, and a positive image was observed by Ziehl-Neelsen staining [Figure 2d]. Therefore, the diagnosis was determined to be tuberculous brain abscess.

Postoperative course

The paralysis of the right upper arm gradually improved postoperatively and recovered to MMT 5/5 at postoperative week 2. Head T1WI MRI with gadolinium showed no

residual enhanced lesion, and FLAIR showed reduction of the peritumoral high-intensity lesion [Figure 3]. The four antituberculosis drugs were started preoperatively and

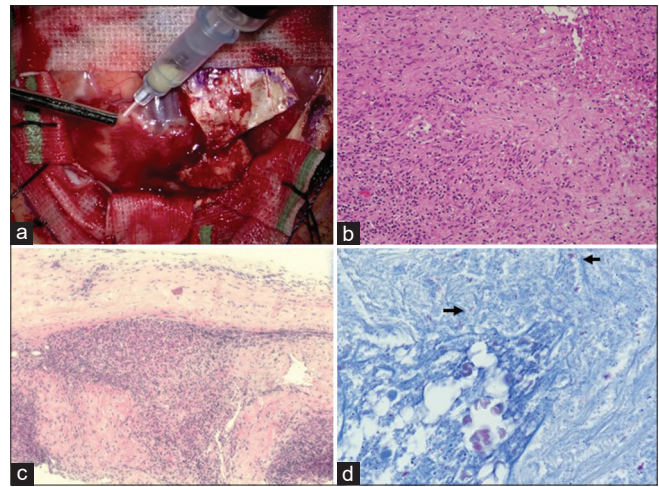


Figure 2: (a) This intraoperative photograph shows an abscess of a mass lesion. (b) Photomicrography of the dura mater shows granuloma with infiltration of inflammatory cells mainly composed of neutrophils and lymphocytes. (c) Granuloma formation and inflammatory cell infiltration were observed in the dura mater. (d) Arrows show the acid-fast bacilli in Ziehl-Neelsen stain.

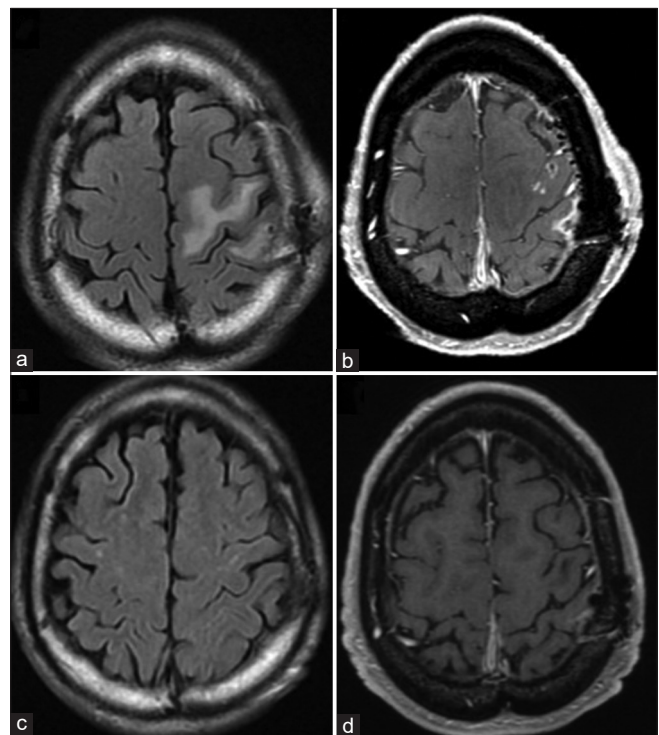


Figure 3: Fluid-attenuated inversion recovery postoperative 14 days (a) and 4 months (c) show reduce the peritumoral high-intensity area. T1WI with Gd postoperative 14 days (b) and 4 months (d) shows removal of mass lesion.

were continued. Pyrazinamide, ethambutol hydrochloride, isoniazid, and rifampicin were administered for 2, 6, 12, and 12 months, respectively. The patient was discharged on the hospital day 35. Since then, no recurrence has been observed with steroid after 1 year without antituberculosis drugs.

DISCUSSION

In Japan, the number of newly diagnosed tuberculosis patients was 14,460 in 2019, and the number of newly diagnosed patients was 11.5 per 100,000 population. Although the incidence of tuberculosis has decreased in the past 20 years, it is still high compared with Western countries.^[5] The percentage of all tuberculosis patients with the central nervous system complications is low, at about 1%; among these rare diseases, tuberculous brain abscess is a very rare disease occurring in <10% of the central nervous system cases. The most common intracranial parenchymal tuberculosis is intracranial tuberculoma, which accounts for about 20% of all intracranial space-occupying lesion in the developing countries.^[10] However, tuberculous brain abscess is typically manifests with neurologic deficits and acute exacerbations,^[4] and early diagnosis and therapeutic intervention are required.

Imaging features of tuberculous brain abscess include: (1) size ≥ 3 cm, (2) the presence of restricted diffusion, and (3) a thin and smooth mass wall. Multiple lesions are considered to suggest tuberculous brain abscess rather than intracranial tuberculoma, and more prominent peritumoral edema has been reported for tuberculous brain abscess than for intracranial tuberculoma.^[3] In contrast, the MRI features for intracranial tuberculoma are low intensity on T2WI, suggesting mature caseous necrosis,^[2] which may an important finding for the differential diagnosis.

The Whitener diagnostic criteria for tuberculous brain abscess include: (1) presence of pus by microscopic findings, (2) denial of granulomatous changes such as giant cells and epithelioid cells by pathologic findings, and (3) proof of tubercle bacilli by culture test or stain with acid bacterium.^[10] As a pathologic finding of intracranial tuberculoma for differentiation from tuberculous brain abscess mainly composed of purulent inflammation, the presence of caseous necrosis in the center is important. However, because caseous necrosis tissue melts and liquefies in the course of intracranial tuberculoma to form an abscess, cases of transition to tuberculous brain abscess have been reported, and the distinction between the two remains ambiguous.^[9] In this case, head MRI showed an abscess size <2 cm, which is atypical for tuberculous brain abscess; however, a tuberculous brain abscess was diagnosed based on the following factors: the clinical course was relatively rapid; the peritumoral edema was prominent; multiple lesions were observed; intraoperative findings showed pus; and pathologic findings showed purulent inflammation, no giant nuclei cells or epithelial cells, and positive anti-acid bacterium staining.

One of the radiological differentiating features between tuberculous brain abscess and bacterial brain abscess is that the cyst wall is thicker in the tuberculous brain abscess than bacterial brain abscess, but in reality, there are few other characteristic differentiating features. It is often difficult to differentiate them radiologically.^[3,6] In addition, one of the features on the image of this case, the enhanced lesion continuous with the dura mater, required differentiation from extra-axial tumors such as metastatic dura tumor. There are few cases of tuberculous brain abscess with these characteristics, and further discussion is needed.

For the treatment of tuberculous brain abscess, it is effective to perform surgery and administer antituberculosis drugs simultaneously. Surgical treatment includes abscess aspiration, drainage, and abscess removal.^[1,8,9] In addition to pathologic diagnosis, surgical treatment is performed for the purpose of decompressing the tumor and reducing the amount of bacteria in the tumor.^[6] A treatment strategy for tuberculous brain abscess has not been established, and it is necessary to consider a treatment strategy according to the patient's condition, treatment course, anatomical location, and number of abscesses.^[6,7] In this case, the condition progressed under the administration of antituberculosis drugs, and it was difficult to make a preoperative differential diagnosis due to the characteristic radiological findings in which the enhanced lesion was continuous with the dura mater. Therefore, we have determined that abscess removal is necessary for postoperative recurrence prevention and pathologic diagnosis. The dural infiltration in tuberculoma and tuberculous brain abscess is extremely rare, and few reports have focused on the surgical method or treatment results. In this case, it was presumed that dural removal is valid for tuberculous brain abscess with dural infiltration.

CONCLUSION

The report presents a case of tuberculous brain abscess that was difficult to distinguish from bacterial brain abscess and metastatic dural tumor. The treatment strategy for tuberculous brain abscess has not been established, and it is necessary to consider the treatments from antituberculosis drugs and surgical interventions such as abscess aspiration, drainage, and abscess removal, depending on the case. In tuberculous brain abscess with dural infiltration, dural resection is considered necessary to prevent recurrence.

I have the patient's consent to academic presentations and publications.

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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