Intraventricular Rupture of Nocardia Brain Abscess

—Case Report—

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Abstract

A 71-year-old male presented with left hemiparesis and confused conversation. Computed tomography showed a mass lesion with rim enhancement in the right parietal lobe. He developed meningeal irritation the day after admission. Emergent fluid-attenuated inversion recovery (FLAIR) magnetic resonance (MR) imaging revealed a clear hyperintense component in the right lateral ventricle and neum formation inside the intracerebral lesion, indicating intraventricular rupture of the brain abscess. The patient underwent aspiration of the abscess and ventricular drainage with antibiotic administration. Nocardia asteroides was isolated from the aspirated pus, so systemic and direct administration of effective antibiotics was subsequently commenced. These procedures resulted in gradual improvement of his clinical course, and he left our hospital. Several days after discharge, he developed acute pan-peritonitis due to malignant lymphoma. He appeared to be progressively deteriorating after an exploratory laparotomy, and died on the 17th day after the laparotomy. Intraventricular rupture of nocardia brain abscess can be successfully treated after early definitive diagnosis with FLAIR MR imaging.

Key words: brain abscess, flair sequence, intraventricular rupture, Nocardia asteroides

Introduction

Recent advances in antibiotic therapy and radiological diagnosis of brain abscess have reduced the mortality to less than 10% and yielded good overall outcomes. However, the intraventricular rupture of brain abscess is a devastating and often fatal complication of purulent brain abscess. The mortality in patients with intraventricular rupture of brain abscess remains high at about 80%. Here, we report the successful treatment of a case of nocardia brain abscess associated with intraventricular rupture after early detection of the ventricular extension by fluid-attenuated inversion recovery (FLAIR) magnetic resonance (MR) imaging.

Case Report

A 71-year-old male was admitted after an episode of mild left hemiparesis and confused conversation. Initial computed tomography (CT) demonstrated a mass lesion with rim enhancement in the right parietal lobe, but could not easily differentiate between brain abscess, glioblastoma multiforme, malignant lymphoma, and metastasis (Fig. 1). On admission, his body temperature was 36.5°C. Laboratory examination showed a white blood cell count of 7900/mm³, and C-reactive protein was 1.2 mg/dl. Chest radiography showed no abnormalities. He was treated initially with osmotic diuretic and anticonvulsant agents. However, he became somnolent the day after admission, and developed meningeal irritation with severe headache, nausea, and high-grade fever with chills.

Emergent MR imaging was performed because of the strong suspicion of meningeal extension from the brain abscess. T₂-weighted MR imaging showed no direct evidence of ventricular extension from the abscess (Fig. 2B), but T₁-weighted MR imaging with contrast medium confirmed some volume reduction of the expansive mass lesion compared with the previous CT scans. T₁-weighted MR imaging with contrast medium also showed slightly increased intensity of the cerebrospinal fluid (CSF) within the...
right lateral ventricle (Fig. 2A). FLAIR MR imaging revealed a clear hyperintense component inside the CSF of the right lateral ventricle and niveau formation inside the mass lesion, indicating rupture of the brain abscess into the ventricular system (Fig. 2C).

The patient immediately underwent surgical treatment consisting of aspiration and drainage from the abscess cavity under ultrasound guidance and continuous ventricular drainage via the anterior horn of lateral ventricle with direct infusion of antibiotics. Gram staining of the drained fluid found no bacteria, but culture revealed Gram-positive bacilli.

Finally, *Nocardia asteroides* was isolated from the aspirated pus. CSF examination demonstrated mild meningitis at the initial stage of the meningo-ventriculitis (cell count 312/3, protein 150 mg/dl, sugar 110 mg/dl). The initial regimen was broad-spectrum antibiotics, but was changed to panipenem after the results of the sensitivity test. He subsequently received an 8-week course of intravenous administration of panipenem (40 mg/kg/day) and twice-daily intraventricular infusion of gentamicin (10 mg) for 2 weeks through the ventricular catheter. These procedures resulted in gradual improvement of his condition as well as the neurological status. Follow-up MR imaging showed obvious reduction of the abscess cavity with the surrounding edema (Fig. 3). There was no confirmation of ventricular enlargement caused by progressive hydrocephalus during his hospitalization and he returned home on the 80th hospital day.

He was readmitted with abdominal pain and distention several days after discharge. An exploratory laparotomy was performed because of acute panperitonitis. At surgery, much ascites was encountered in the peritoneal cavity. The regional lymph nodes around the pancreas were markedly enlarged, and so were dissected. Histological examination of the dissected lymph nodes disclosed malignant lymphoma. His condition appeared to be progressively deteriorating, and he died on the 17th day after the laparotomy.

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**Fig. 1** Computed tomography scans with contrast medium on admission showing a mass lesion with rim enhancement and surrounding edema in the paraventricular area.

**Fig. 2** A: Axial T1-weighted magnetic resonance (MR) image with contrast medium demonstrating some volume reduction of the expansive mass lesion compared with the previous computed tomography scans. The intensity of the cerebrospinal fluid inside the right lateral ventricle was slightly increased. B: Axial T2-weighted MR image demonstrating a hyperintense abscess cavity with hypointense capsule. C: Fluid-attenuated inversion recovery MR image revealing a clear hyperintense component in the right lateral ventricle and niveau formation inside the abscess cavity.

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Fig. 3 Follow-up axial T₂-weighted magnetic resonance images with contrast medium, 1 month (A) and 2 months postoperatively (B), showing gradual reduction of the abscess cavity with surrounding edema.

**Discussion**

Early diagnosis or detection of intraventricular rupture is extremely important. The presence of brain abscess close to the ventricular system indicates immediate treatment to prevent rupture. In our patient, the manifest development of meningeal irritation after admission was a strong indicator of intraventricular rupture of the brain abscess. FLAIR MR imaging directly revealed the appearance of ventricular extension from the abscess, accompanied by nique formation of the abscess cavity.

Recently, diffusion-weighted MR imaging or proton MR spectroscopy has been used for the preoperative diagnosis of brain abscess. Diffusion-weighted MR imaging can establish the differential diagnosis of the brain abscess based on the hyperintense appearance. Proton MR spectroscopy shows the presence of acetate, lactate, and amino acids, the products of bacterial metabolism in patients with brain abscess, and the absence of normal brain components. T₂-weighted MR imaging characterizes intracerebral abscess by the abscess capsule as a marked hypointensity. FLAIR imaging shows ventricular extension from the abscess as a hyperintense area against the dark CSF background, which is more useful than the other sequences for this purpose. This hyperintensity may relate to the high protein content of the purulent material. These findings can easily provide a definitive diagnosis for the rupture of brain abscess into the lateral ventricle.

The main reason for the extremely poor outcome in patients with intraventricular rupture of brain abscess may be the resultant meningo-ventriculitis. Consequently appropriate treatments with systemic antibiotics and/or surgical intervention should be performed. In our patient, emergent surgical intervention with decompression of the abscess cavity and continuous ventricular drainage for direct infusion of antibiotics were highly effective treatments of the initial stage of the meningo-ventriculitis in addition to the intravenous administration of antibiotics.

Nocardia brain abscess occurs in 25–40% of all cases of systemic nocardiosis. Cerebral nocardiosis is the primary event in only 7% of all cases of nocardiosis. Nocardia brain abscess accounts for only 1% to 2% of all brain abscesses. Although nocardia brain abscess occurs predominantly in immunocompromised patients including those with human immunodeficiency virus, underlying malignancy, and diabetes mellitus, about one half of the patients with nocardia brain abscess had no known risk factors for infection. Our patient had suffered from diabetes mellitus for 12 years, but no signs of immunocompromised condition were recognized during the initial hospitalization. Despite the successful treatment of the intraventricular rupture of the nocardia brain abscess, he finally died of malignant lymphoma approximately 3 months after the initial hospitalization. Latent diminution of the immune function by the underlying malignancy and diabetes mellitus may have been the cause of nocardial infection. Therefore, patients with nocardia brain abscess should always be carefully evaluated, regardless of the presence or absence of factors that influence the immune function.

FLAIR MR imaging allowed the early detection of ventricular extension in a patient with nocardia brain abscess associated with intraventricular rupture. The key principles for the management of intraventricular rupture of brain abscess are early diagnosis of ventricular extension from the intracerebral abscess and appropriate treatment with antimicrobial agents and/or surgical interventions with careful evaluation of any immunocompromised state.

**References**


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