



CASE REPORT

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Nocardial brain abscess in an immunocompetent patient and review of literature

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Abstract

Background: Nocardial brain abscesses are associated with significant morbidity and mortality rates. The optimal management remains unclear.

Case presentation: We report a case of 49-year-old woman presented with dizziness, progressive headache for 3 days, accompanied with left arm twitched for twice. The patient underwent a right parietal craniotomy for resection of the lesion. Gross total resection of the lesion was achieved. There were no new neurological deficits post-operatively, and no lesions was demonstrated on Gd-enhanced MRI images at six months follow-up.

Conclusions: After review of the literature and experience learned from our case, we suggest that craniotomy and surgical resection of the lesions, instead of aspiration, is a safe, efficacious treatment for the patient with nocardial brain abscesses. Long-term chemotherapy and follow-up is mandatory in all cases.

Keywords: Brain abscess, nocardiosis, Surgical treatment, Magnetic resonance imaging

Abbreviations: ADC, apparent diffusion coefficient; CT, computed tomography; DWI, Diffusion weighted imaging; FLAIR, fluid attenuated inversion recovery; MRI, magnetic resonance imaging

Background

Nocardial brain abscesses are associated with significant morbidity and mortality rates. The optimal management remains unclear. The authors describe the case of an immunocompetent patient suffering from afebrile nocardial brain abscess in right parietal lobe after CT scan of brain and lungs, which was mistaken for a metastatic tumor of bronchioloalveolar carcinoma when the patient was admitted. Careful differential diagnosis and proper treatment are vital for a favorable prognosis.

Case presentation

History and presentation

A 49-year-old woman presented with dizziness, progressive headache for 3 days, accompanied with left arm twitched for twice. She had headache and dizziness three months ago, and the symptoms relieved several days later. No fever

was noted in past 3 months before admission. Skin test for tuberculosis was negative. HIV antibody, hepatitis B surface antigen (HBsAg), and hepatitis C antibody (anti-HCV) were all negative. She was immunocompetent and without history of surgery and steroid abuse. On examination, she was alert and oriented but has left hemiparesis with a muscle power of grade 3. No significant neurological deficits were found on examination of the sensory and cranial nerves, as well as on cerebellar/coordination reviews. Chest X-ray and CT demonstrate disseminated lesions in both lungs (Fig. 1a-b). Preoperative CT scan shows a hypodense lesion in right parietal lobe and moderate perilesional edema (Fig. 2a). MRI demonstrate a lesion in right parietal lobe, which is heterogeneously hypointense on T1-weighted images, homogeneously hyperintense on T2-weighted images, heterogeneously isointense on FLAIR, importantly, homogeneously hypointense on ADC and demonstrate ring-enhancing lesion after gadolinium administration (Fig. 2b-f).

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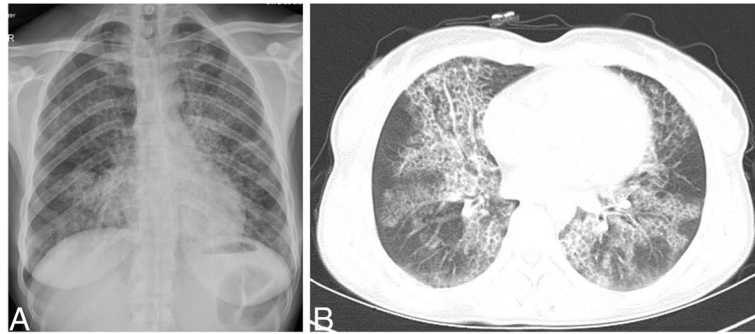


Fig. 1 Preoperative chest X-ray and CT images

Operation

The patient underwent a right parietal craniotomy for resection of the lesion. Gross total resection of the lesion was achieved. Yellow-green pus was found inside the lesion during operation and the sample was sent to lab for bacterial and fungal culture. The operation time was 3 h and 15 min.

Pathological findings

Histopathological examination showed neutrophils in abscess wall that has infiltrated into adjacent brain, with surrounding granulation tissue hyperplasia (Fig. 3).

Lab test

Hematoxylin-eosin staining confirmed brain abscess, and the pus bacterial and fungal culture confirmed *Nocardia asteroides* infection.

Postoperative course

There were no new neurological deficits post-operatively, and patient was discharged 15 days after surgery. Her left hemiparesis disappeared and her muscle power recovered to grade 5 at discharge. No neurological deficits were demonstrated at one year follow-up. Ceftriaxone sodium and trimethoprim-sulfamethoxazole (TMP-SMX) were used to treat the patient after surgery. No abnormal signal was demonstrated on Gd-enhanced MRI images at 6 months follow-up (Fig. 4a). Chest CT demonstrated lesions in both lungs were diminished at six months after treatment (Fig. 4b-c).

Discussion

Nocardial brain abscess are relatively uncommon, accounting for 2 % of all abscesses [1]. The published literature is limited, consisting largely of case reports involving three or fewer patients, and it is thus not possible to draw firm

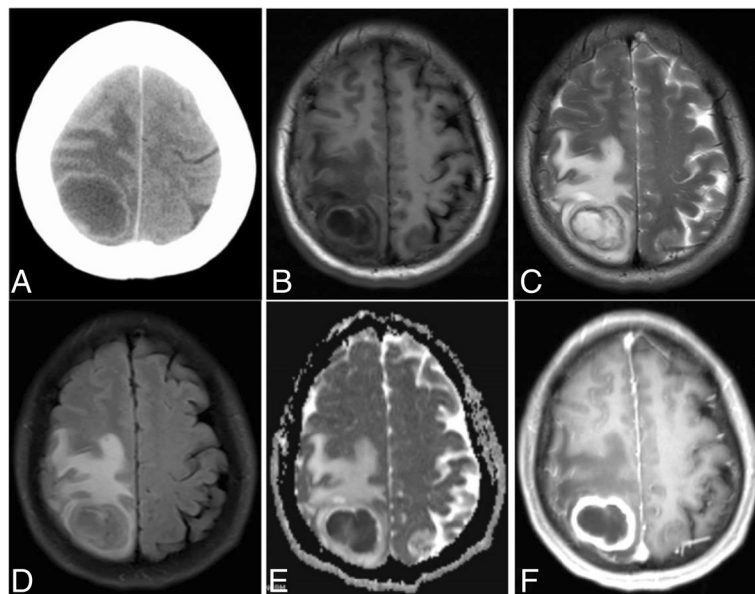


Fig. 2 Preoperative brain CT and MRI images

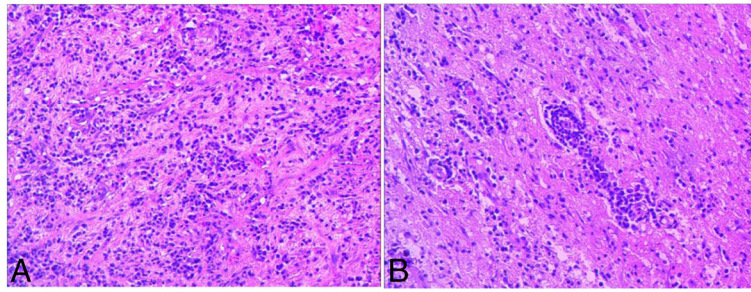


Fig. 3 Histopathologic images

conclusions regarding the optimal surgical management of this condition. To date, there has only been one large clinical study, which suggested that craniotomy and excision is necessary in most cases of nocardial brain abscesses [2]. Nocardial brain abscesses are associated with significant morbidity and mortality rates. We reviewed the surgical outcome of one patient treated with surgical resection combined with antibiotics postoperatively at a single institution. The diagnosis was made as a metastatic tumor when the patient was admitted according to her chest and brain CT scans. Our case shows the importance of early diagnosis and aggressive treatment of these lesions. Careful differential diagnosis and proper treatment are vital for a favorable prognosis. Despite their low incidence, we need to consider nocardial infection in the differential diagnosis of a cerebral lesion in order to obtain an early diagnosis and start treatment as soon as possible.

Like most brain lesions, the likelihood of successful management of nocardial brain abscess increases with early diagnosis. For this reason, and because a nocardial brain abscess can progress rapidly, a presumptive diagnosis is often necessary. Less than 10 % of nocardial infections originate in the CNS, it is more commonly encountered as a secondary lesion (as seen in our case). Subsequent hematogenous dissemination may lead to infection of almost any organ, with a particular predilection for the CNS [3]. It often appears as a focal abscess, predominately supratentorially. The management of nocardial brain

abscesses requires a high index of clinical suspicion, and early diagnosis is imperative.

The mortality rate of patients with these abscesses is more than three times higher than that of patients with other bacterial brain abscess. Although *Nocardia* is a rare cause of intracranial abscess, its mortality rate (31 %) is considerably greater than others (<10 %) [4]. Prompt diagnosis followed by aggressive surgical management appear most likely to cure patients with cerebral nocardiosis. Diagnosis and treatment of nocardial brain abscesses continue to be challenging.

These infections usually occur in immunocompromised patients who have predisposing factors such as malignancy, diabetes mellitus, malnutrition and uremia. However, they are not necessarily associated with predisposing factors such as immunosuppression, and there have been report of nocardial infections being observed in immunocompetent patients [3], and our case also show this lesion can occur in immunocompetent patient without fever. In our opinion, nocardial brain abscess is insidious infection, so the immune system may not work effectively enough to response the infection, as a result, no fever was seen in these patients.

Nocardia organisms are mostly isolated from plants and soil, and infection occurs most often as a result of inhalation or direct skin inoculation. Many case reports cite the earliest symptoms as a respiratory infection (i.e., with coughing and fever) [2, 5]. However, no fever and

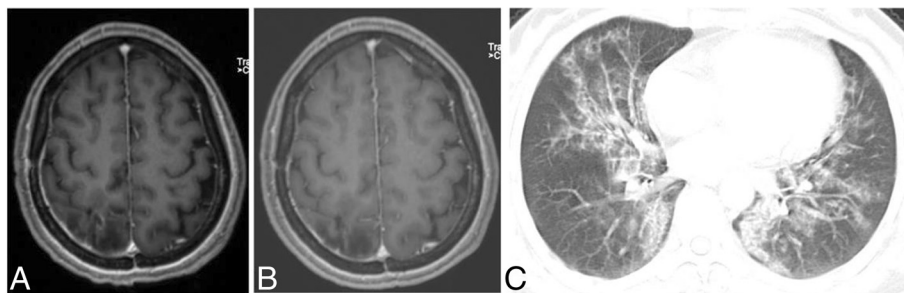


Fig. 4 Postoperative images

coughing was noted in our case when and before patient admitted. The brain, meninges, or spinal cord is often the site of secondary nocardial infection. The lungs are the most common primary sites of infection (73 % of patients). This distribution of infection is not unexpected, given that *Nocardia* are believed to first enter the body via the lungs or gastrointestinal tract before disseminating through the blood stream to the various organs. Frequently, the onset of a nocardial brain abscess is insidious, particularly in those individuals who are immunocompetent. As is the case with other brain abscesses, headaches seem to be the most common presenting symptom. Focal neurologic deficits occur depending on the location of the abscess.

Nocardial brain abscesses present as characteristic hyperenhanced multiloculated ring lesions. Perilesional edematous changes also might be present. It is sometimes difficult to differentiate a brain abscess from intracranial metastatic malignancy on regular MRI [4]. However, diffusion weighted imaging (DWI) and apparent diffusion coefficient (ADC) map could be very helpful in the differentiate diagnosis, with brain abscess showing the characteristic homogeneously hyperintense lesions on DWI and hypointense lesion on ADC. The restricted Brownian motion of water molecules in the organized purulent milieu of microorganisms, macromolecules and inflammatory cells contributes to the signal of restricted diffusion on DWI [6]. Our patient displayed these imaging characteristics and clinical manifestation without fever, and she is an immunocompetent patient. As a result, we made a diagnosis as metastatic tumor when combined the clinical presentation and preoperative CT of lungs and MRI scans without DWI and ADC when patient admitted. And then, the diagnosis of brain abscess were made when DWI and ADC map were completed.

Our case shows the importance of early diagnosis and aggressive treatment of these lesions. Nocardial brain abscess may progress rapidly, lead to brain herniation, and become life threatening. Also, as learned from Lee's experience [2], in which they made aspiration and biopsy first, and then the neurological symptoms deteriorated with progressive drowsy, so the craniotomy and excision of the lesion was performed to save the patient's life. To prevent a delay in diagnosis and treatment, an aggressive therapeutic approach is required [7, 8]. Unlike other bacterial abscesses, craniotomy and excision of the entire abscess and wall are usually more effective than aspiration and drainage, particularly when the lesions have not responded to antibiotic therapy [1, 9]. Importantly, keep the abscess wall intact during surgical procedure is critical.

To treat a nocardial brain abscess, craniotomy with evacuation of the abscess, as well as collection of a specimen for culture to further assess drug sensitivity, are essential for successful treatment. Antibiotics is necessary

and as adjunct therapy after surgery. Sulfonamides are the drug of choice, based on empirical data. Given the high rate of relapse and the characteristic resistance pattern, treatment should be aggressive and continued for months, with antibiotic treatment being adjusted according to the drug sensitivity test [6]. A 12-month course of therapy is recommended for the treatment of nocardial brain abscesses. Trimethoprim-sulfamethoxazole (TMP-SMX), ceftriaxone, amikacin and minocycline are used for nocardiosis. TMP-SMX is currently accepted as the first-line treatment for nocardiosis [2]. In our case, we gave ceftriaxone sodium for one month according to drug sensitive test of pus, and then gave TMP-SMX to the patient for one year after surgery, and the lesions in lungs were significantly diminished at six months follow-up after surgical procedure.

Conclusion

Diagnosis and treatment of nocardial brain abscess continue to challenge clinicians. It is important for the clinicians to be familiar with the characteristics of nocardial infections so that an early presumptive diagnosis can be made while awaiting confirmatory results of culture. We report a nocardial cerebral abscess mimicking a metastatic brain tumor. From the literature review and our experience, it is suggestive that craniotomy and surgical resection of the lesions, instead of aspiration, may be a safe and efficacious treatment for the patient with nocardial brain abscesses. Long-term chemotherapy and follow-up is mandatory in these cases. Prompt diagnosis followed by aggressive surgical management appear most likely to cure patients with these lesions.

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Availability of data and material

There is no new software, databases and raw data to be shared in this manuscript.

Authors' contributions

YP, YZ, QL carried out the neurosurgery and obtained the specimen. YZ, WZ, YJ and BH collected the data of the patient and drafted the manuscript. WZ and NW carried out the pathology experiments. YZ, QL, BH, NW and YP made follow-up of patient. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

Consent for publication

The patient involved in this study consent to publication her individual person's data (including individual details and images) in Chinese Neurosurgical Journal.

Ethics approval and consent to participate

This study was approved by the Ethics Committee of Lanzhou University Second Hospital (number: 20150270).

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