Case report

Neuroimaging features of cerebral aspergillus abscess: Case report

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Received 20 November 2014; revised 10 January 2015; accepted 12 January 2015
Available online 21 February 2015

Abstract

Background: With the global growth of immunocompromised patients, the incidence rate of aspergillus infections in central nervous system increased accordingly. Aspergillus abscess is a typical phenotype of aspergillus infections in central nervous system, and is tended to be confused with tumors. Neuroimaging features with careful observation and detailed history-taking can help to make final diagnosis.

Case description: We report a case of central nervous system aspergillus abscess which was misdiagnosed as tumor before surgical operation. The patient had diabetes and chronic bronchitis history for many years and received treatment for lobar pneumonia half a year ago. According to examinations of CT and MRI, isodensity or isointensity mass were shown on nonenhanced scanning, and honeycomb-like enhanced with mild crenate-like rim were shown on enhanced scanning. On follow-up MRI study after surgical operation, the similar neuroimaging features were shown in the recurrent lesion.

Conclusion: Cerebral aspergillus abscesses possess some degree neuroimaging features on traditional CT/MR imaging. Combined with patient's clinical history, CT/MRI examination could facilitate early diagnosis of aspergillus abscesses in central nervous system.

Keywords: Aspergillus; Brain abscess; CT; MRI

1. Introduction

Aspergillus fumigatus is a fungal organism with a widespread distribution in the nature. Although the CNS (central nervous system) aspergillus infections are uncommon, the prevalence is upgrading with the increasing amount of immunocompromised/weakened immune system patients in the whole global. Here, we report neuroimaging features from a 58-year-old man who received surgical operation for a solitary tumor but finally diagnosed as aspergillus abscess.

2. Case report

A 58-year-old male was admitted in hospital due to headache for 2 weeks with nausea, vomit, and left limb weakness progression for 5 days. The patient suffered constitutional weakness with 3-year history of diabetes and 40-year history of chronic bronchitis. About half a year ago, he suffered lobar pneumonia and was hospitalized to receive treatment for more than 2 months. Medical examination indicated 36.4°C of body temperature, dullness, hemiparalysis of left limb, decreased muscular tension to level III, and negative meningeal irritation sign. Laboratory examination revealed $6.3 \times 10^9/L$ white blood cells (WBC), decreased lympholeukocyte ratio to 12.4%, and 7.49 mmol/L serum glucose (reference value is 3.6–6.1 mmol/L).

The patient received CT (computed tomography) scan and MR (magnetic resonance) imaging with very short interval time. Cranial nonehanced CT (NECT) showed an isodensity mass relative to gray matter located in the right basal ganglia,
with prominent low-attenuation cerebral edema. The right lateral ventricle was compressed and deformed, and the median line structure shifted to the opposite side due to the mass effect. After following contrast administration, a honeycomb-like heterogeneous round lesion with clustered obvious enhanced rings was depicted (Fig. 1). Brain MR imaging showed an isointensity mass on both T1WI and T2WI, compared with cortex. Moreover, ill-defined margin, extensive surrounding edema, and space occupying effect were strongly presented. T1WI-enhancement scanning showed the mass was intensively enhanced, with clusters of small enhanced rings that made the lesion look like a “honeycomb”. The lesion size was 3.1 cm × 3.0 cm × 2.9 cm (anteroposterior × transverse × suprainferior diameters). There was no infectious evidence of paranasal sinuses and temporal apophyses (Fig. 2). Preoperative diagnosis was malignant glioma or metastatic tumor.

Gross findings during surgical operation included a toughening mass with grayish-red and grayish-yellow cream inside, and a glial reaction zone between the lesion and adjacent brain.

Twice frozen section during surgery had the same result of fungus infection with gross necrosis, inflammatory reaction, and glial cell proliferation within periphery brain tissue (Fig. 3). Based on postoperative bacterial culture, cerebral aspergillus abscess was concluded as final diagnosis.

Ten month after the surgical operation, the patient was readmitted in hospital due to complaint of headache and weakness. Thereafter, the recurrent lesions were detected on follow-up MR images (Fig. 4).

3. Discussion

Intracranial aspergillosis is one of manifestation patterns of deep aspergillus infection, present in approximate 20–30% of fungal cerebral abscesses [1]. Aspergillus abscesses usually occur in the presence of predisposing factor (eg, diabetes, malignant tumor, AIDS, long term usage of antibiotics/glucocorticoid) [2,3], and some cases can undergo multiple predisposing factors simultaneously. Aspergilli generally affect immunocompromised patients, although the infection can involve immunocompetent peoples occasionally. Hematogenous spread from lung aspergillosis to the CNS, as well as direct invasion from the paranasal sinuses and temporal apophyses, are common routes of intracranial aspergillosis. Some patients were infected after bone marrow transplantation or solid organ transplantation, even resulted from operation or trauma. Kourkoumpetis TK [4] reviewed 123 CNS aspergillosis cases and revealed that 27.6% cases had primary paranasal sinuses infection foci, 26.8% cases had primary lung lesions, whereas 22% cases had no obvious primary organ involvement. Yong-bo Yang [5] reported 15 cases of intracranial aspergillus abscesses, all of the cases had primary foci of infection in paranasal sinuses, temporal apophyses or lungs. And 7 cases had history of long term usage of antibiotics, 3 cases required steroid treatment for a long time. So, the medical history which can reflect the immunocompromise state and/or predisposing factors is very important for the right diagnosis. In the case we reported here, only solitary brain lesion without infection evidences of paranasal sinuses and temporal apophyses, as well as weak understanding of the disease and ignoring of clinical history, result in the misdiagnosis.

Beside lung, brain is the mostly involved organ [2,3], and lesions can occur in any lobe of cerebrum, basal ganglia or cerebellum. When aspergilli affected the brain, patients can present nonspecific symptoms such as headache, fever, altered mental status, and seizure. The intracranial aspergillus infection can occur as multiform and various stages of lesions in meninges, brain parenchyma and/or vessels, solitary or multiple foci. Single aspergillus abscess cases, although not rare, are more troublesome for making right preoperative diagnosis,
and are more urgent to distinguish with bacterial abscesses, tuberculous abscesses, and tumors. Cerebrospinal fluid examination has low detection rate [6] and biopsy still is the only reliable way for preoperative diagnosis. Therefore, identifying neuroimaging features of aspergillus abscesses is critical for the early diagnosis.

Generally, aspergillus abscesses appear as low-density lesions on NECT, hypointensity on T1WI and hyperintensity on T2WI, and restricted on DWI (diffusion weighted imaging). CECT (contrast-enhanced CT) and MR T1WI-enhanced scanning show ring-like enhancement [1,6,7]. Here we reported the case showed isodensity on NECT and isointensity on MR T1WI and T2WI, that are different with the literature. Notably, the case had extensive surrounding edema which could reflect the early stage related obvious brain edema. We speculate that the iso-density/intensity are related to the early stage of abscess formation and incomplete necrosis. Following contrast administration, the case showed conglomerate multiple rings enhancement which mimic the honeycombed change.

Fig. 2. MR images of the same patient on the next day. The lesion showed isointensity compared with cortex on T1WI (A) and T2WI (B). On enhancement scanning, cluster of small enhanced rings made the mass like as a “honeycomb” (C and D). The perilesion edema and space occupying effect were displayed. And the lesion margin was not smooth with mild crena-like change.

Fig. 3. Photomicrograph showed a great quantity of hyphae (HE staining, 400x).
and is similar to grape-like enhancement reported previously [6]. Our case showed the characteristic honeycomb-like enhancement on initial CT and MR scan as well as the follow-up MR imaging. We consider the honeycomb-like enhancement appearance is some degree of pathognomonic change of aspergillus abscesses, especially for the relatively earlier stage abscesses. Single ring or several contiguous ring-like enhancement also has been reported [8], that was perhaps due to more complete abscess cavity formed and tunicarescence of fungal abscesses. If the aspergillus abscess shows as single ring or several enhanced contiguous rings, it is difficult to distinguish between bacterial and tuberculous abscesses by simply depending on neuroimaging. Notably the abscess in our case showed mild crenate-like rim on enhancement scanning, which also is a character of fungal brain abscess [1].

Most majority bacterial and tuberculous brain abscesses are described as single ring or several contiguous ring-like enhancement lesions, and the rings were thin and uniform. Compared with aspergillus abscesses, bacterial abscesses have high positive rate of blood routine examination and cerebrospinal fluid examination, and the lesion can resolve or vanish after adequate medicine or surgery treatment. When bacterial brain abscesses form the capsule, lesion margins become clear and smooth. Aspergillus abscesses can sometimes be morphologically different with bacterial abscess according to its crenellated margin. Both aspergillus abscesses and bacterial abscesses are limited on DWI and can be detected with multiple peaks resonating between 3.6 and 3.8 ppm on MRS, that are insufficient for differential diagnosis. Some aspergillus abscesses can mimic as tumors, especially glioblastomas and metastatic tumors. Glioblastoma shows irregular ring enhancement surrounding a central nonenhancing core of necrosis, and the necrotic core does not restrict on DWI. Metastasis shows variable enhancement pattern, from nodule-like to irregular ring-like enhancement, and the primary tumor and obvious Lip on MRS can help us to make the diagnosis.

Cerebral aspergillus abscesses have some degree of characters on conventional CT/MR scanning, the honeycomb-like enhancement and crenate-like rim are more helpful for diagnosis. Imaging features, combined with the immunocompromise state and predisposing factors of patients, perhaps can make right diagnosis before surgical operation.

References