

Brain Abscess Transformation in a Non-Operated Spontaneous Intracerebral Hemorrhage

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Brain abscess is a rare but potentially fatal neurological condition that occurs after a complication in immunocompromised patients or brain surgery. Although this complication occurs after surgery for intracerebral hemorrhage (ICH), it rarely occurs in untreated ICH. Here, we report on a 46-year-old female patient with a history of brain abscess at 6 weeks after spontaneous ICH without previous episodes of infection or surgery. If headaches and neurological deficits are present after episodes of fever, abscess formation should be considered. Neurosurgical imaging, microbiological identification, and early identification of infectious biomarkers and causative pathogens are important indicators for surgical drainage or resection and treatment with appropriate antibiotics. In fact, rapid diagnosis and treatment do ensure good outcomes and long-term survival; however, in cases of misdiagnosis, morbidity rates are very high.

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INTRODUCTION

Brain abscess is a serious infection of the brain parenchyma and hence early surgical drainage and administration of a high dose of antibiotics are needed.¹⁾ Although the mortality rate of brain abscesses is approximately 0-15%, it can increase to 80% due to diagnostic errors.²⁾⁴⁾¹¹⁾

Signs of increased intracranial pressure, such as headache, nausea, vomiting and deteriorated mental state are most commonly associated with brain parenchymal abscesses, and are usually accompanied by

seizures, dysarthria and motor and sensory deficits (approximately 30-50%). Neurological deficits and seizures are observed in approximately 30% of patients treated for abscess.⁹⁾ Furthermore, unlike in other infectious diseases, fever is not an ordinary symptom associated with brain abscesses. Previous studies have shown that brain abscesses occasionally occur after brain surgery; however, the presence of abscesses in untreated intracerebral hemorrhage (ICH) has not been observed yet. Hence, this report presents a case in which brain abscess occurred even though surgery was not performed for ICH.

CASE REPORT

A 46-year-old female patient was admitted to our hospital due to left side weakness of both upper and lower limbs of motor grade I. Initial computed tomography (CT) showed spontaneous ICH on the right frontal lobe (Fig. 1A). After 4 weeks of medical treatment, the patient's upper and lower limb strength improved to grade II and IV, respectively, and she was transferred to the rehabilitation department (Fig. 1B). At 6 weeks of hospitalization, she underwent both CT and magnetic resonance imaging (MRI) examinations for sudden aggravation of left side upper and lower

limb motor weakness that each decreased to a motor grade score of I/IV-. CT and MRI scans of the brain showed swelling around the site of previous hemorrhage resolution and high signal intensity on diffusion weighted imaging (Fig. 1C, D, E). The patient did not have definite risk factors of brain abscess such as diabetes, wound infection, pneumonia, sepsis and previous brain surgery; however owing to the deterioration in her clinical condition brain abscess was suspected. Hence, cerebrospinal fluid examination with a lumbar puncture was performed for the differential diagnosis of a CNS infection. The examination revealed a high WBC count and protein levels sugges-

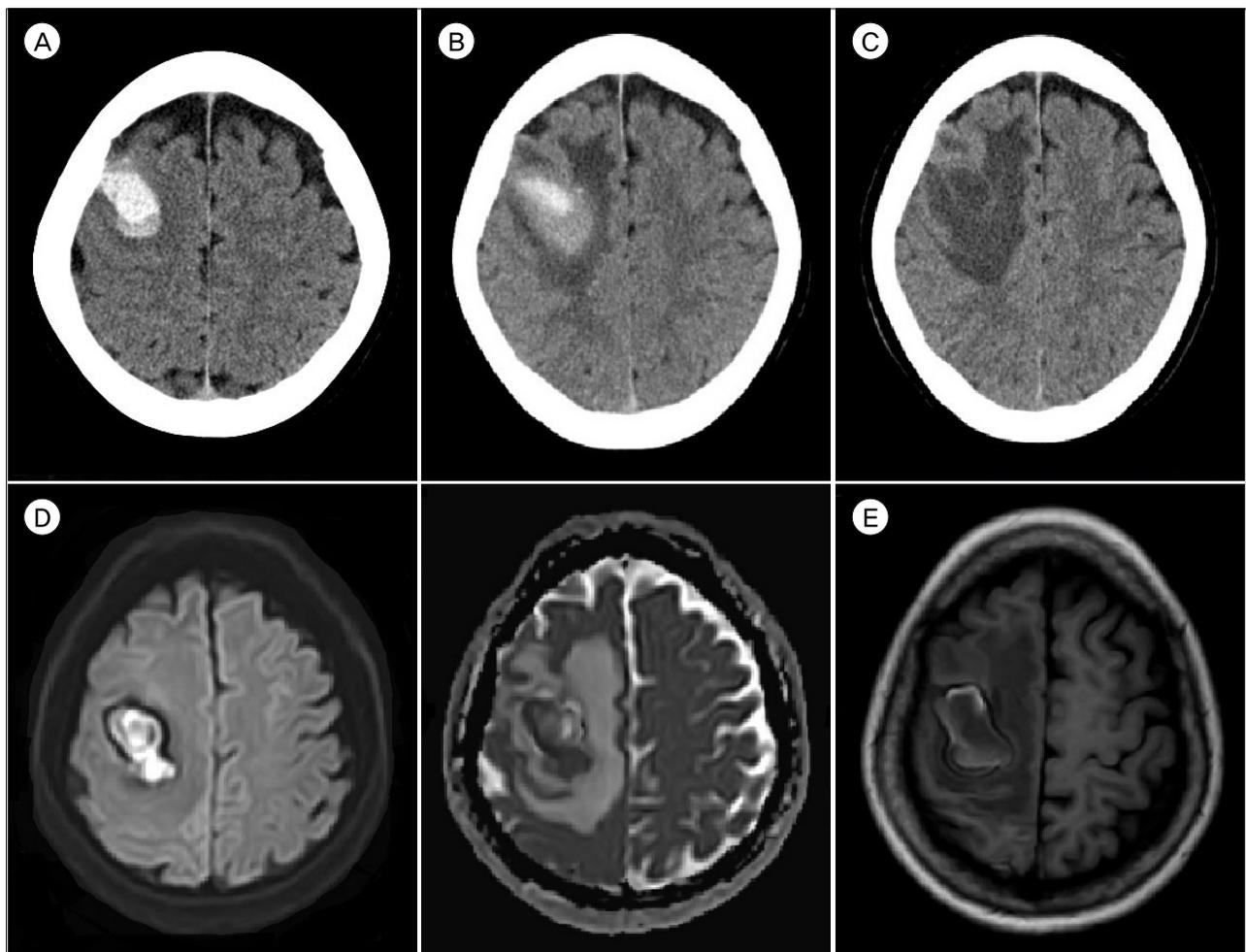


Fig. 1. (A) Initial CT images. Pre-contrast CT shows high density ICH on the right frontal lobe. (B) Follow-up CT images at 3 weeks. Pre-contrast CT shows an initial volume reduction of hemorrhage and resolution. (C) Follow-up CT images at 6 weeks. Pre-contrast CT shows a mass-like lesion on the right frontal lobe with severe swelling. (D) Diffusion-weighted MRI. (E) MRI shows a ring-enhanced mass-like lesion. CT = computed tomography; ICH = intracerebral hemorrhage; MRI = magnetic resonance images.

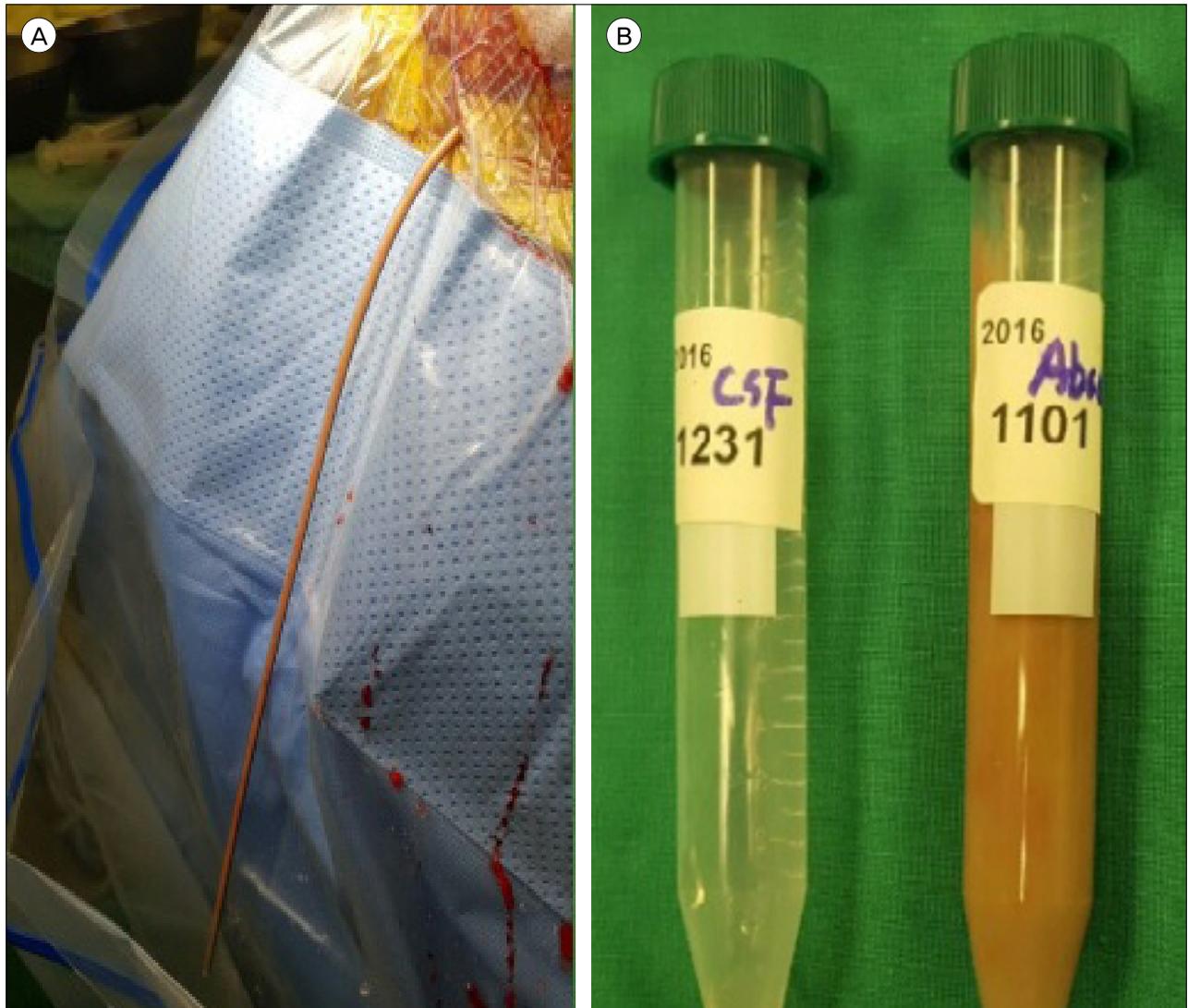


Fig. 2. (A) Intra operative findings of abscess drainage, (B) specimens.

tive of a CNS infection. Hence, we planned and performed an emergency operation. Stereotactic catheter insertion revealed a puslike discharge of unpleasant odor and hence, abscess aspiration and drainage was performed (Fig. 2). First, IV fortum (ceftazidime) 6g#3 and vancomycin 2g#2 were administrated with empirical antibiotics until postoperative day 9. Thereafter, cefolatam (cefoperazone + sulbactam) 4g#2 was administered for up to 6 weeks after surgery because follow-up CSF examination and bacterial culture results were negative. The patient was discharged after 6 weeks of antibiotic treatment. Only minimal edema-

tous changes are observed in the final CT scan and motor grade score of the upper and lower limbs of the left side improved to II/IV each at discharge (Fig. 3).

DISCUSSION

In 10% of cases, brain abscesses are caused by infections that occur due to extrinsic factors, such as compound skull fracture, brain surgery, or gunshot wounds; however, in most cases, it develops secondary to an infectious condition in the patient.⁹⁾¹³⁾ Common causes are adjacent infection, such as

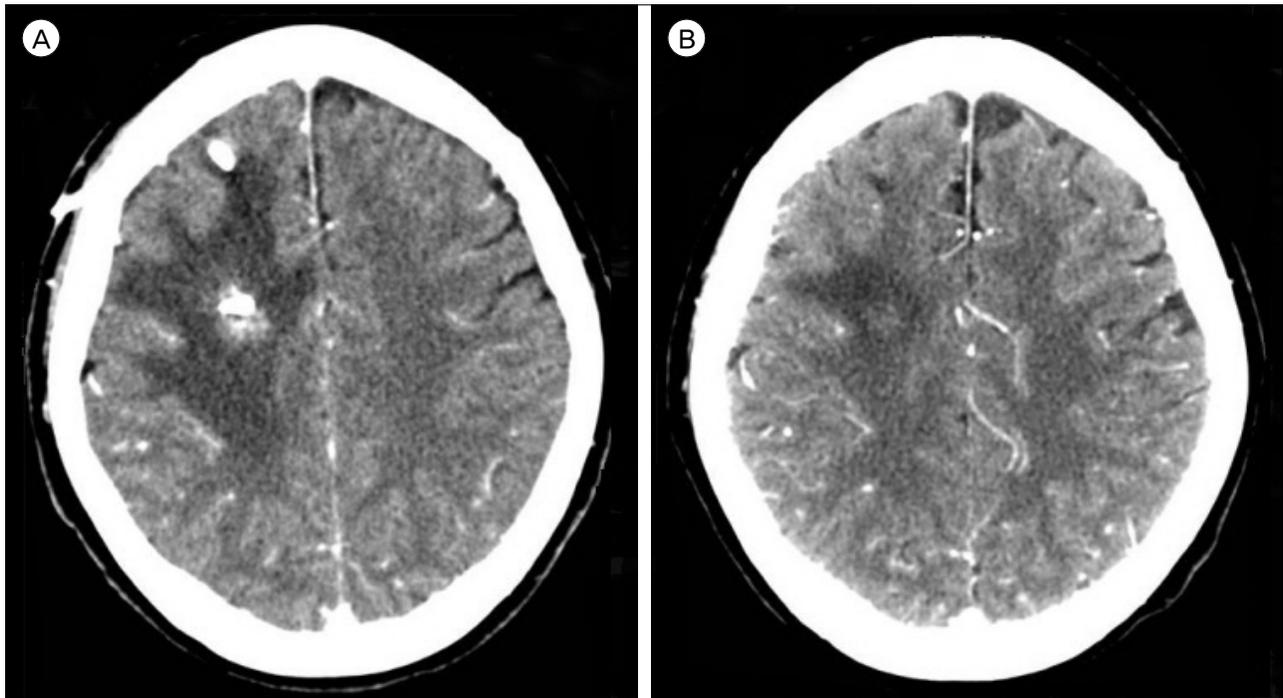


Fig. 3. (A) Post-operative contrast enhanced CT images. Two catheters are placed in the ventricle and abscess. Decrease in the size of an abscess pocket in the frontal lobe. (B) Final follow-up contrast enhanced CT images. CT shows only minimal edematous changes on a previous abscess loculated lesion. CT = computed tomography.

para-nasal sinusitis, otitis, dental infection, craniotomy and infection via the bloodstream (such as due to infective endocarditis, cardiac incision, pneumonia, sepsis, urinary tract infection).⁶⁾¹¹⁾ Owing to an incomplete diagnosis, origin of the brain abscess remains unknown in 40% of the patients.⁸⁾ Age, diabetes, immunodeficiency, acquired immune deficiency syndrome (AIDS), and vitamin K deficiency can increase the occurrence of abscess.²⁾⁴⁾¹¹⁾

Brain abscess accounts for 1 in 10,000 hospitalizations.⁹⁾ Despite of low incidence of brain abscess and developments in imaging technology and antibiotic treatment, mortality rates due to brain abscess are still relatively high.¹²⁾ Brain abscess is very rare in ICH patients who have not undergone surgical treatment. A common hypothesis of brain abscess occurring at the same site after ICH is disruption of the blood brain barrier, which selectively prevents the transfer of substances from the bloodstream to brain tissue. Owing to disruption of the blood brain barrier, pathogens can easily enter the brain parenchyma through the

bloodstream and cause an abscess.⁹⁾

Brain abscesses were previously reported only in 19 cases of untreated ICH patients,¹⁰⁾ of which pathogens were a significant contributing factor. The most common cause of abscess was infections of the skin, wounds, and respiratory tract. The most frequently identified bacteria in brain abscess patients were *Staphylococcus* species which are the most common facultative anaerobic gram-positive cocci found in the skin and upper respiratory tract. Other pathogens present in respiratory or digestive systems, such as *Streptococcus*, *Enterococcus faecalis*, *Klebsiella* were also observed. Based on etiology, seven cases of sepsis, three cases of pneumonia, one case of urinary tract infection and one case of phlebitis were the causes of abscess among the previously reported 19 cases. Furthermore, one case of cerebral amyloid angiopathy, one case of vasculitis, one case of wound infection after carotid endarterectomy, and four cases of unknown cause were reported.¹⁰⁾ However our patient did not have any of the predisposing factors, such as

diabetes, AIDS, immunocompromised condition due to chemotherapy or radiation therapy, or long-term steroid therapy.¹¹⁾ Additionally, no infectious foci on the skin, respiratory tract, urinary tract, local wound and vasculature were observed. Although the patient used a central venous catheter for a short duration, analysis of blood culture, urine culture, sputum culture and specimens obtained during surgery revealed negative results. Hence, the cause of abscess remains unknown in our patients.

Typically, clinical features, such as fever, headache, and local neurological disorders, have been observed to occur between 25 and 90 days after ICH.⁹⁾ These features appear in less than half of the abscess patients.¹¹⁾ Therefore, a sudden appearance of fever and focal neurologic deficits in patients who are in the resolving or resolution phase of ICH, could indicate a brain abscess. Further, contrast enhanced CT should be considered when fever or neurologic deterioration occurs in patients recovering after cerebral stroke.⁹⁾ Since 1975, several studies have supported the non-surgical treatment of brain abscess. However, these treatments have disadvantages owing to the side effects caused by long-term administration of empirical antibiotics. Except for staging of encephalitis, surgical drain or resection can shorten the duration of antibiotic administration, reduce the mass effect of abscess, and facilitate pathogen confirmation and antibiotic selection.⁵⁾ Mamelak et al.⁷⁾ stated that aggressive surgical drainage and 6-8 weeks of intravenous antibiotics after operation is important. It is also necessary to perform a CT scan every 2 weeks to monitor the progression or failure of resolution of the abscess.⁷⁾ CT studies are currently becoming increasingly available, and stereotactic surgical techniques are being further developed. Additionally, empirical antibiotics have also been developed greatly. Hence, de-bulking by aspirating abscesses in combination with antibiotic administration can be a preferred treatment plan. Aspiration through stereotactic surgery may be a good choice if the brain abscesses are

multiple or are difficult to access using open surgery, such as in the brain stem or eloquent area.³⁾

CONCLUSION

Brain abscess after untreated ICH is an extremely rare complication, which can be determined based on other infectious conditions of the patient. Transition to brain abscess should be considered when neurologically and clinically exacerbated symptoms are observed with or without fever following ICH. Contrast-enhanced CT, MRI scan and laboratory biomarkers are useful for the early diagnosis of brain abscess and can also eliminate potential risk factors of fatal conditions. Surgery combined with antibiotic administration is the best treatment for this pathological condition. Furthermore, this disease condition should be diagnosed early to ensure proper management and lower mortality and morbidity.

Disclosure

The authors report no conflict of interest concerning the materials or methods used in this study or the findings specified in this paper.

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