Showa Univ J Med Sci **23**(3), 197～203, September 2011

Case Report

A Case of Rhinogenic Intracranial Complication : Epidural Abscess

Erika TOKITA, So WATANABE, Jyun UCHIDA
and Harumi SUZAKI

Abstract : We report a case of acute rhinosinusitis complicated by epidural abscess. A 33-year-old woman consulted her local otorhinolaryngology clinic complaining of left eye pain and left periorbital swelling. After visiting additional clinics and receiving treatment she did not obtain relief from her symptoms. Thereafter, she was referred to our hospital. Contrast-enhanced computed tomography (CT) and magnetic resonance imaging (MRI) were conducted and it was found that acute rhinosinusitis had caused an epidural abscess in the left frontal tip. The patient was admitted to the hospital and endoscopic sinus surgery (ESS) as well as septoplasty were performed under general anesthesia. A neurosurgeon was consulted regarding the brain lesion and treatment with antibiotics was selected. Intravenous PAPM/BP (panipenem/betamipron) and hydrocortisone sodium succinate were administered postoperatively. On the fifth postoperative day, the patient's condition had improved and the nasal inflammation had almost disappeared. She was discharged from hospital on the tenth postoperative day.

Key words : acute rhinosisnusitis, epidural abscess, intracranial complications, endoscopic sinus surgery

Introduction

The incidence of intracranial complications from acute rhinosinusitis has decreased with advances in antibiotics[1)]. Once an intracranial complication develops, it is generally fatal, therefore, immediate medical attention is required to identify such complications.

Here, we present a patient who developed an epidural abscess as a complication of acute rhinosinusitis.

Case report

On March 27, 2006, a 33-year-old woman consulted her local otorhinolaryngology clinic complaining of left eye pain and left periorbital swelling. She was prescribed an antibiotic (CFPN-P I: cefeopene pivoxil hydrochloride), but there was no improvement. On March

Department of Otorhinolaryngology, Showa University School of Medicine, 1-5-8 Hatanodai, Shinagawa-ku, Tokyo 142-8555, Japan.

Fig. 1. Enhanced CT obtained on March 31 showed a high-density area involving the bilateral ethmoid sinuses, maxillary sinuses, and ring enhancement in the left frontal tip (white arrow).

30, she was administered an intravenous antibiotic (name unknown) but this treatment did not relieve the pain either. Thereafter, she visited another clinic, and the doctor referred her to our hospital on the next day.

Upon physical examination, her consciousness was clear and her temperature was 38.0°C. There was no contributory past medical history and she had not had any prior neurological problems. Her left periorbital region was erythematous and swollen. There was no visual disturbance, except for slight pain and diplopia on upward gaze. There was no other findings related to the cranial nerves. There was no meningeal irritation, such as neck stiffness, headache, nausea on vomiting. On nasal examination, there was a deviated nasal septum, but there was no swelling of the middle turbinate or any nasal discharge.

Hematological and biochemical findings were within normal limits except for a white blood cell (WBC) count of 13,400/mL and C reactive protein (CRP) of 17.5 mg/dL.

Contrast-enhanced computed tomography (CT) obtained on March 31 showed a low-density area in the bilateral ethmoid sinus and maxillary sinus, and ring enhancement in the left frontal tip. In addition, low-density areas in the right sphenoid sinus and frontal sinus were also found (Fig. 1). Based on CT findings, an epidural abscess was suspected. Therefore, we obtained magnetic resonance imaging (MRI) on April 1. T2-weighted imaging showed a high intensity area (Fig. 2), and diffusion-weighted MR imaging showed a high intensity area in the same region (Fig. 3). An epidural abscess was detected in the left frontal tip, which may have been caused by acute rhinosinusitis. The patient was admitted to the hospital and both endoscopic sinus surgery (ESS) and septoplasty were performed under general anesthesia on the same day. A neurosurgeon was consulted regarding the brain

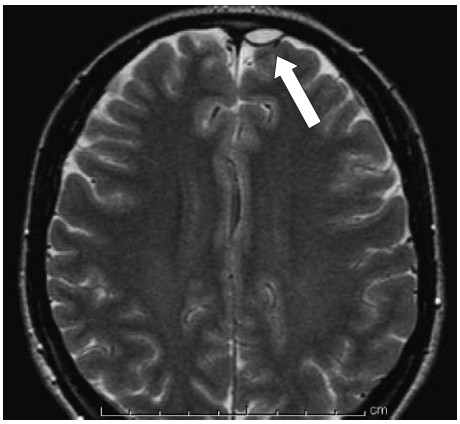

Fig. 2. T2-weighted MRI obtained on April 1 showed a high intensity area in the left frontal tip (white arrow).

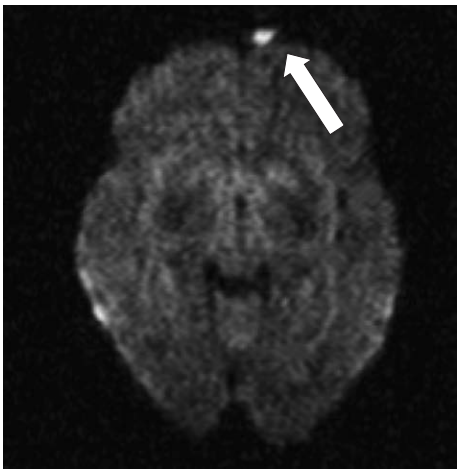

Fig. 3. Diffusion-weighted MR imaging obtained on April 1 showed a high intensity area in the left frontal tip (white arrow).

lesion and treatment with antibiotics was selected owing to the lack of increasing intracranial pressure.

Surgery was performed using nasal endoscopy. The nasal mucosa was edematous, but there was no purulent nasal discharge. On opening the nasofrontal duct, there was no mucus from the frontal sinus.

Postoperatively, we administered PAPM/BP (panipenem/betamipron) 2 g/day for 9 days and hydrocortisone sodium succinate (tapered from 300 mg over 3 days) intravenously. Her eye and nasal symptoms gradually improved. On the seventh post-operative day, there was

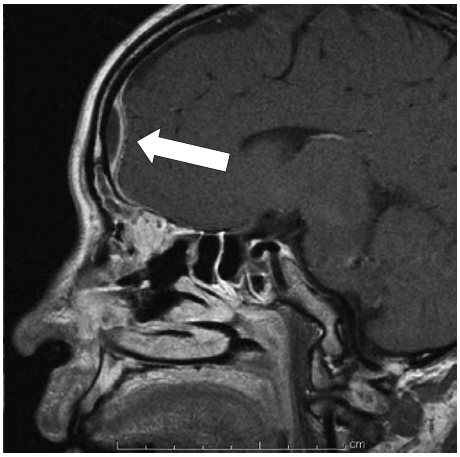

Fig. 4. T1-weighted MR imaging with gadolinium enhancement obtained on April 8 showed a ringed low intensity area in the left frontal tip (white arrow).

Fig. 5. T1-weighted MRI obtained on May 9 showed that there was no longer any abscess in the left frontal tip (white arrow).

still a ringed low intensity area in the left frontal tip on T1-weighted MR imaging with gadolinium administration (Fig. 4). On the fifth postoperative day, blood test data showed WBC 8700/mL, and CRP 2.5 mg/dL. Her condition had improved and the nasal inflammation had almost disappeared. She was discharged from hospital on the tenth postoperative day. One month after her discharge from hospital, there was no sign of brain abscess on MRI obtained on May 9 (Fig. 5).

Discussion

The intracranial complications of acute rhinosinusitis include meningitis, intracranial abscess, epidural abscess, subdural abscess, superior and cavernous sinus thrombosis. Previously, reports of meningitis were common but these have been decreasing with the use of more effective antibiotics, whereas there have been relatively increasing reports of intracranial abscess[2-7]. One of the reasons for this is that meningitis can be diagnosed and treated as soon as signs of meningeal irritation are detected.

There have been several routes proposed for the spread of intracranial infections. In some cases, bone defects in the posterior wall of the frontal sinus after surgery or trauma lead to the direct spread of infection, and in others, infection spreads through the venous or lymphatic system. In this case, the patient had no history of nasal surgery or trauma, and there were no bone defects found in the frontal sinus during surgery. Therefore, infection is proposed to have spread via one of two possible venous routes. One starts from the naso-frontal vein, continuing to the cavernous sinus through the superior ophthalmic vein. The other starts from the superior sagittal vein, continues to the right and left vertical vein and transverse sinus through the diploic vein[7, 8]. The spread of infection through such routes is not only due to the fact that these veins have no valves and regurgitate easily[5], but also because the diploic vein and cranial sinus connect to the veins in the frontal sinus mucosa. The diploic vein is well developed before 20 years-of-age, and these complications can occur easily[4, 5, 9].

There are two age groups with an increased incidence of intracranial complications ; young people and the elderly. About 60% of patients with rhinogenic intracranial complication are in 10-20 years old age group[2]. There are two reasons for this : first, the flat bone contains red bone marrow and frontal sinus osteomyelitis develops easily[2, 4, 10]; secondly, the sinus bone becomes thinner with age[7, 11], causing faster spread of infection.

In about 70-80% of cases, acute rhinosinusitis arises from the frontal sinus[10]. The reason is that, the passage of the nasofrontal duct is longer and narrower than that of other nasal ostium, so it may be more easily obstructed by infection[7].

The most common symptoms are fever and headache but symptoms may sometimes be even less specific. In fact, there are very few nasal symptoms in most cases[4, 12].

The initial symptoms of intracranial abscess are mild until the size of the abscess increases, which can make it a severely life-threatening condition. Thus, when patients with acute rhinosinusitis accompanied by headache or fever are examined, the risk of intracranial complications must be considered. In this case, the first symptoms were fever and pain in the left eyelid, but there were no symptoms of intracranial complication. The diplopia observed in this case could have been the result of orbital cellutis complicated by rhinosinusitis but we suspected intracranial complication and detected the epidural abscess by CT on the initial examination.

The main pathogens are *Streptococci* (30–50%), anaerobes (20–40%) and *Staphylococcus aureus* (15–25%)[2]. Recently, more diverse pathogens including Gram-negative rods have been observed in these cases[10]. Broad-spectrum antibiotics with spinal fluid permeability, such as aminobenzylpenicilin, chloramphenicol and third-generation cephalosporin are recommended in cases of intracranial complications.

In most cases, such antibiotics have previously been prescribed at local clinics, therefore many doctors at the first consultation in the hospital prescribe much broader spectrum antibiotics, such as carbapenem[2, 6, 10]. In this case, we administered carbapenem, because antibiotics had previously been prescribed at the local clinic and the pathogen causing the rhinosinusitis had not yet been identified. If antibiotic therapy had not improved the patient's condition, ESS, extranasal frontal sinusectomy or a neurosurgical procedure would have been necessary[2]. In this way, when the treatment strategy is selected, it is necessary to check the images and neurological symptoms carefully, then consult a neurosurgeon. As subdural abscesses develop rapidly, irrigation of the abscess with craniotomy is necessary in most cases. Epidural abscesses develop slowly[12, 13], and can be improved only by otorhinolaryngologic surgery[2]. In this case, craniotomy was not required, but we prescribed antibiotics and performed ESS, which improved the acute rhinosinusitis and the epidural abscess. As an alternative treatment, hyperbaric oxygen therapy has also been reported to be effective. This therapy removes edema of the nasal mucosa, and promotes antibiotic absorption into human tissue and is effective against anaerobes as well as aerobes[6].

The prognosis for intracranial complications has been improving. The previously high mortality rate for the condition has recently decreased by about 10%[5, 6, 14] but sequelae such as paralysis are still frequent.

Conclusion

We report a case of acute rhinosinusitis with epidural abscess. Since intracranial complications of acute rhinosinusitis can develop rapidly and may become fatal, it is essential to diagnose and treat such patients early, even if the symptoms are light.

References

1) Betz CS, Issing W, Matschke J, Kremer A, Uhl E and Leunig A: Complications of acute frontal sinusitis: a retrospective study. *Eur Arch Otorhinolaryngol* **265**: 63–72 (2008)
2) Nishiike S, Gouda S, Miyao Y, Shimada N, Nagai M, Nakagawa A, Konishi M, Sakata Y and Harada T: A case of rhinogenic intracranial complications. *Jpn J Rhinol* **44**: 145–150 (2005) (in Japanese)
3) Kitamura K, Otsuka K, Takada D, Araki S and Suzuki M: A case of rhinogenic intracranial complications. *Jpn J Rhinol* **45**: 172–176 (2006) (in Japanese)
4) Miyamaru S, Kumamoto Y and Kinoshita S: Two cases of rhinogenic intracranial complications. *Otolaryngol Head Neck Surg* **77**: 625–629 (2005) (in Japanese)
5) Kodama K, Ohta Y, Kanazawa T, Tsubaki K and Iino Y: Two patients with intracranial complications following acute sinusitis. *Oto-Rhino-Laryngology Tokyo* **50**: 170–177 (2007) (in Japanese)
6) Sekiyama K, Hanamure Y, Kasano F and Kashima N: Three cases of rhinogenic intracranial complications.

Practica Otol (Kyoto) **95** : 473-479 (2002) (in Japanese)
7) Nagata T, Suzuki M, Ikeda A, Kitanishi T and Kitajima J : A case of rhinogenic intracranial abscess. *Pract Otol* Kyoto **94** : 729-735 (2001) (in Japanese)
8) Osborn MK and Steinberg JP : Subdural empyema and other suppurative complications of paranasal sinusitis. *Lancet Infect Dis* **7** : 62-67 (2007)
9) Giannoni CM, Stewart MG and Alford EL : Intracranial complications of sinusitis. *Laryngoscope* **107** : 863-867 (1997)
10) Terao K, Saito K, Sugihara K, Mori K, Murata K and Sekiguchi S : Rhinogenic intracranial complications. *Jpn Soc Infect Dis Otolaryngol* **23** : 65-70 (2005) (in Japanese)
11) Jones NS, Walker JL, Bassi S, Jones T and Punt J : The intracranial complications of rhinosinusitis : can they be prevented? *Laryngoscope* **112** : 59-63 (2002)
12) Remmler D and Boles R : Intracranial complication of frontal sinusitis. *Laryngoscope* **90** : 1814-1824 (1980)
13) Yogev R : Suppurative intracranial complications of upper respiratory tract infections. *Pediatr Infect Dis J* **6** : 324-327 (1987)
14) Singh B, Van Dellen J, Ramjettan S and Maharaj TJ : Sinogenic intracranial complications. *J Laryngol Otol* **109** : 945-950 (1995)

[Received February 18, 2011 : Accepted March 24, 2011]