A case of fatal vascular invasive rhinocerebral mucormycosis after dental extraction in a patient with type 2 diabetes mellitus

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Abstract

Mucormycosis is a rarelife-threatening fungal infection that occurs in immunocompromised subjects, including patients with poorly controlled diabetes mellitus (DM). There have been even rarer case reports that describe the development of rhinocerebral mucormycosis in diabetic patients after dental extraction. Here, we describe a 57-year-old female patient with type 2 DM who developed a fatal vascular invasive rhinocerebral mucormycosis after dental extraction. (J Med Life Sci 2009;6:126-129)

Key Words : Mucormycosis, Dental Extraction, Diabetes Mellitus

Introduction

Rhinocerebral mucormycosis is anacute, progressive infectious disease that mainly affects craniofacial area including orbit and central nerve system. This fatal infection is caused by a fungus of the order Mucorales which is ubiquitous in the environment[1, 2]. However, it can be pathogenic in immunocompromised patients, especially when acidosis, high iron concentrations, hematologic malignancies, or uncontrolled diabetes is present[1] The exact pathway of rhinocerebral mucormycosis is not clearly known[3]. It is generally known for that mucor initially inoculates the nasal mucosa, spreading to the paranasal sinuses, orbit,and finally the intracranial fossa, although skin laceration can be a gate for mycotic entry[3]. In addition, there have been few reports of mucormycosis after dental procedures[4, 5]. In this report, we describe a patient with type 2 DM who developed a fatal vascular invasive rhinocerebral mucormycosis after dental extraction.

Case Report

A 57-year-old woman was admitted to the hospital her chief complaint being left facial pain and swelling. A week before the hospitalization, the patient had her third maxillary molar tooth extracted at a private dental clinic. Before the dental extraction, the patient was known to have no specific sign of infection or neurologic deficit in that area. After the extraction, the patient began having pain, fever, and swelling on the left side of her face. In the meanwhile, however, she had not controlled her diabetes and did not seek a professional medical care until the admission. The patient had a medical history of multiple endocrine neoplasia type 2A, and had received bilateral adrenalectomy followed by total thyroidectomy and parathyroidectomy with autotransplantation to the nondominant forearm in 1995. She also had detected type 2 DM at that time. Then, she has been taking 150 ug of thyroxine and 7.5 mg of prednisone daily. Recently, her blood glucose level has been controlled by glimepiride and NPH insulin. Before the dental extraction, we had checked her on a regular appointment. She was allowed to get the dental procedure on the basis of her sugar control status at that time, and recommended to double or triple the dose of prednisone according to her state. Her family history was not contributory.

Physical examinations on her arrival revealed significant swelling on left periorbital and maxillary area, and the skin in this area showed the redness, bulla, and a focal necrosis. The swelling also involved the left side of nose. The patient showed alert mental status and intact orientation. She was blind in her left eye with some necrotic changes in the left cornea and eyeball. The blood pressure was 170/80 mmHg, a pulse rate 120/min, body temperature 38.3℃, and a

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respiratory rate of 36/min. Chest radiography was unremarkable. The results of initial laboratory tests are shown in Table 1.

Table 1. The results of initial laboratory tests

Variables	On Arrival	Normal Range
Glucose (mg/dl)	564	70~110
Hb A1c (%)	13.3%	4.3~6.3
Arterial blood gas analysis		
pCO2 (mmHg)	11.4	32~48
pO2 (mmHg)	70.5	74~108
pH	7.35	7.35~7.46
HCO3 (mmol/L)	6.3	21~29
BUN (mg/dL)	32.9	8.0~20.0
Creatinine (mg/dL)	2.4	0.5~0.9
ALT (IU/L)	28	4~44
AST (IU/L)	24	8~38
ALP (IU/L)	202	66~220
WBC (103 / ul)	19.8	4.0~10.0
CRP (mg/dL)	39.4	0~0.30
ESR (mm/hr)	68	0~20

A cranial computed tomography (CT) scan showed ethmoidal and maxillary sinusitis accompanied by severe soft tissue swelling of left frontal and periorbital area. The soft tissue in the left orbit was also swollen and contained gas collection. Apparent bony involvement was not confirmed. On admission, incision and drainage was done on the left facial area. Gross pus-like and exudative material was also drained from the site of dental extraction. Initial antibiotic therapy included vancomycin, metronidazole, and imipenem. KOH stain of the drained material was not contributory. Radical resection, including necrotic tissues and orbital exenteration, was recommended to the patient, but the patient and her family refused. Then, 50 mg IV amphotericin B was ordered to patient's antifungal regimen. No microorganism grew in the first 2 samples of blood culture. Tissue culture confirmed a zygomycetes species. On pathologic examination of the infected tissue, huge amount of fungal hyphae was confirmed (Fig. 2). On the 11th hospitalization day, when the mental status of the patient becomestuporous, brain CT scan showed severe destructive change of left periorbital tissue, cavernous sinus thrombophlebitis, and obstruction of internal carotid artery. Additionally, the infarctions of basal ganglia, anterior limb of internal capsule, and periventricular white matter were detected (Fig. 3). Thereafter, her family consented to the extensive surgical debridement. Despite of the radical resection of the necrotic tissues and the intensive management at the ICU, the patient's condition continued to worsen, and she died 27 days after admission.

Figure 1. Cranial CT scan shows the sinusitis in the ethmoid and maxillary sinus and the cellulitis in buccal and masseter space with superior extension to the left periorbital area.

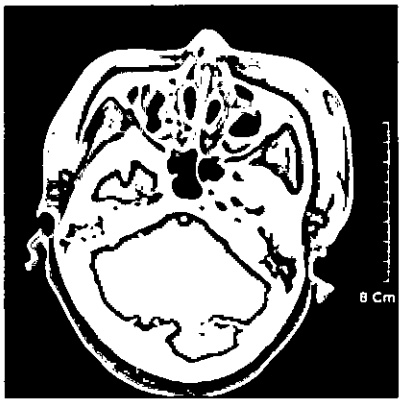
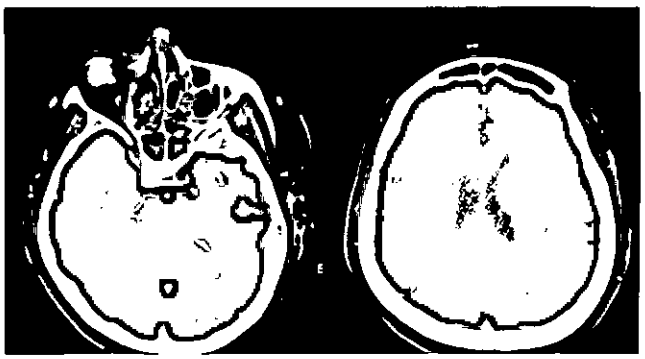


Figure 2. Excisional biopsy from left facial area. This slide shows extensive necrosis with numerous fungal hyphae that occupy nearly all the field of examination, consistent with zygomycosis (Periodic acid-Schiff stain, 200X).

Figure 3. Brain CT scan shows the cavernous sinus thrombophlebitis, occlusion of left side internal carotid artery at the bulb portion with middle cerebral arterial territory and deep portion infarctions including basal ganglia and caudate nucleus.



Discussion

Rhinocerebral mucormycosis is a rare necrotizing fungal infection that attacks mainly uncontrolled diabetic patients[4, 6]. The clinical progression and radiologic characteristics of our case revealed the typical case of rhinocerebral mucormycosis. However, rhinocerebral mucormycosis after dental extraction is very rare. Although there have been several cases reported worldwide, only one case was reported on a domestic medical literature in Korea[7].

The exact origin area of infection and its pathways of spread are still unclear. Generally, the initiation of mucormycosis is known to start from the inoculation of the fungus onto the nasal mucosa[6]. Ifthe infection progresses to the paranasal sinuses, the orbit usually become involved. In addition, mucormycosis can invade blood vessels[1,4]. Spores from the infection directly spread to superior alveolar vessels or ethmoidal artery through the blood vessels in the site of tooth extraction. Also, superior alveolar vessels allow communication among the sinuses and infraorbital vessels[4]. Theses spores invade maxillary and ethmoid sinus with superior extension to the left side periorbital area. Unfortunately, we couldn't strictly distinguish whether the infection was occurred spontaneously or due to the dental extraction in our case. However, we assume that the infection directly extended from the extraction site to sinuses and periorbital area, since the onset of the patient's symptoms occurred right after the dental extraction and there were no other predisposing factors on nasopharyngeal side or mucous membrane of palate.

Just like our patient's case, advanced infection often invades blood vessel, especially cavernous sinus and carotid artery. The fungal hyphae invade through the venous drainage and arterial blood supply and proliferate within the elastic laminae of arteries. The hyphae can induce injury of endothelium and thus lead to thrombosis. These processes can develop thrombophlebitis of the cavernous sinus[1, 3]. Cavernous sinus thrombophlebitis is the one of the most severe complication of rhinocerebral mucormycosis, especially in patient with poorly controlled diabetes or immunosuppression[8]. Hence, early identification of clinical signs and symptoms of this lethal condition is crucial for the efficiency of treatment and better prognosis[3, 9]. In addition to the early diagnosis, combined treatment of aggressive surgery and systemic antifungal agent are critical for patient's survival rates[1,10, 11]. Because our patient and her family refused the radical surgical resection, the treatment was limited to systemic amphotericin B administration and the partial debridement of the involved area. As in this case, if treating the patient only by controlling of the infection with amphotericin B is ineffective, radical surgical approach should be considered[11, 12]. Also, the control of predisposing disorder is also crucial for improving the treatment outcome[6]. Especially, hyperglycemia or diabetic ketoacidosis must be corrected[11, 13].

Although incidence of disease is very rare, this case showed that fungal infection should be considered in the differential diagnosis of the diabetic patient presenting with extensive facial and orbital involvement with early necrotic change of involved skin after dental extraction. Moreover, aggressive surgical and antifungal treatment and control of underlying factors should be applied in the management of the disease.

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