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Case Report

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Cerebral Convexity Subdural Empyema Due to Odontogenic Chronic Sinusitis

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Abstract

Intracranial infections associated with dental procedures usually occur in the frontal or temporal area shortly after the procedure. However, we present a case of a 29-year-old young healthy man who suffered from a left cerebral convexity subdural empyema associated with odontogenic chronic sinusitis about 2 years after a tooth extraction on a left upper molar. The period between the dental procedure and the onset of illness was unusually long, and the empyema occupied an extensive area. The patient's neurologic deficits could be successfully restored after surgical drainage of pus from the subdural empyema and the affected paranasal sinuses, in addition to administering intravenous antibiotics.

Introduction

Intracranial infections, including a subdural empyema, are rare but potentially life-threatening complications of odontogenic infections. Bacteria can disseminate from the oral cavity following a dental infection or procedure [1]. Numerous microbes have been identified in the oral cavity, and transient bacteremia can be induced even by simple tooth brushing [2,3]. Particularly, tooth extraction is most often implicated in the induction of intracranial suppuration. Additionally, oral/dental procedures including dentoalveolar surgery and periodontal therapy can facilitate the penetration of microorganisms into the brain by hematogenous spread [1]. To date, there have been some cases of intracranial abscess of odontogenic origin presenting with acute infection. One review article reported that the average time between the performance of a dental procedure and the onset of neurologic symptoms was only 17.6 days [1]. Thus, it is hard to envisage that an intracranial abscess could occur because of chronic infection of the paranasal sinuses of odontogenic origin. However, we here report the case of a patient with chronic sinusitis who presented with a severe headache and had undergone a tooth extraction 2 year earlier.

Care Report

A 29-year-old man was admitted to the department of neurology for severe headache, which had started 2 days earlier. He had no history of disease or trauma, except for a dental procedure 2 year earlier. He had no other risk factors for a major infection such as long-term steroid intake or immunocompromise. He was a social drinker and non-smoker. He had undergone a tooth extraction and bridge procedure on his left upper molar 2 years earlier. Since that procedure, he had complained of intermittent left-sided toothache. In the previous six months, he had suffered from a small amount of yellowish discharge from the left upper gingiva every morning and a foul odor inside his nasal and oral cavities. One day prior to visiting our hospital, he had visited the emergency room of a secondary care hospital with a headache, but his consciousness, communication ability, and motor strength were normal at that time. A brain Computed Tomography (CT) scan and Magnetic Resonance (MR) imaging showed a small amount of left pneumocephalus in his left frontal area without definite fracture, a fluid collection with a fluid-fluid level along the left cerebral convexity and falx without prominent marginal enhancement, and leptomeningeal enhancement in both cerebral and cerebellar hemispheres (Figure 1).

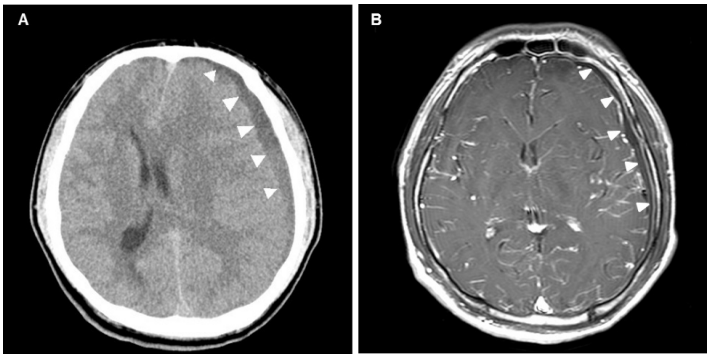

Figure 1: (A): Preoperative brain CT and MR images. Subdural fluid (white arrow) had collected along the left cerebral convexity without a definite fracture in the axial CT image. (B): However, a definite marginal enhancement of the fluid collection was not detected on a post-enhanced T1-weighted MR image.

Therefore, his assumed diagnosis was a variable stage of subdural hemorrhage and secondary change of the leptomeninges or combined meningitis. However, a few hours later, he was able to use only short words and felt weakness on the entire right side of his body. Neck stiffness, global aphasia, and right-side weakness were found on physical examination. His CSF analysis revealed increased WBCs (1,920 cells/μl) and decreased glucose (51 mg/dl). Intravenous antibiotic therapy was therefore started immediately to treat meningitis, and the patient was transferred to our tertiary referral center. Ceftriaxone 2 g q12h was immediately administered in our center by intravenous infusion. Evacuation of the suspected subdural hematoma was also performed as an emergency procedure to reduce the intracranial pressure as a brain midline shift was observed in a fresh brain CT scan. Pus, but not hematoma, was aspirated via burr hole trephination; consequently, the diagnosis of subdural empyema and not subdural hemorrhage was confirmed. The patient's mental status, language ability, and motor power were not remarkably restored after neurosurgery.

To identify and remove the source of the subdural empyema, additional Osteomeatal Unit (OMU) CT scanning and paranasal sinus MR imaging was performed, since a left frontal, ethmoid, and maxillary sinusitis was suspected from the outside brain MR imaging. The images revealed mucosal thickening and fluid collection of the left maxillary, ethmoid, and frontal sinuses, focal bone defect on the inferior wall of the left maxillary sinus at the tooth extraction site, a focal hyperdense lesion in the left maxillary sinus, and fine dehiscence and focal enhancement at the posterior table of the left frontal sinus (Figure 2).

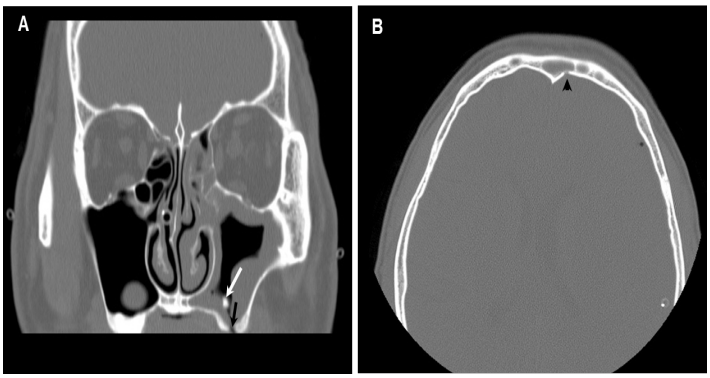

Figure 2: Preoperative paranasal sinus CT. (A): The coronal sections revealed obstruction of the left ostiomeatal unit, left maxillary sinus mucosal thickening, focal defect in the inferior bony wall at the tooth extraction site (black arrow), and a hyperdense lesion in the left maxillary sinus (white arrow). (B): Dehiscence of the posterior wall of the left frontal sinus was found (black arrowhead) on an axial scan.

These findings suggested a sinusitis of odontogenic origin progressing to osteomyelitis of the left frontal sinus and fronto-parietal subdural empyema and meningitis. Therefore, the patient underwent Endoscopic Sinus Surgery (ESS) to drain pus from the left paranasal sinuses 5 days after neurosurgery. A large amount of pus was drained from the left frontal sinus (Figure 3), and a calcified mass was removed from the inferomedial wall of the left maxillary sinus. However, there was no definite bone defect in the posterior wall of the left frontal sinus.

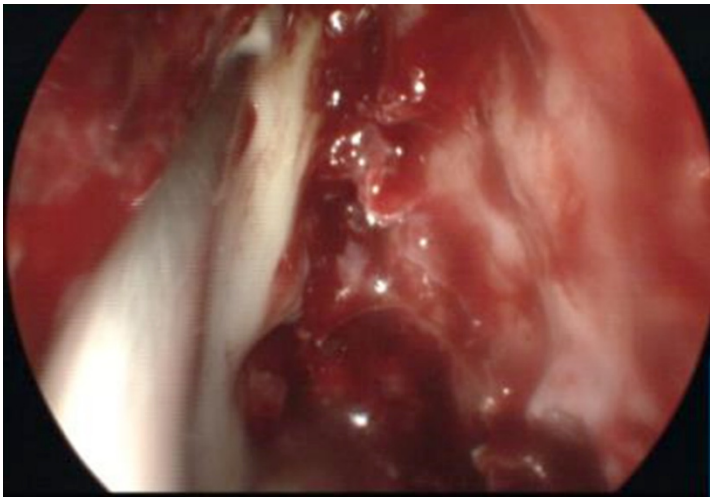

Figure 3: Intraoperative endoscopic view of the left frontal sinusotomy. Pus was evacuated from the left frontal sinus.

After ESS, the patient quickly recovered from the left hemiplegia, disorientation, and aphasia. Gram staining and a bacterial culture from the subdural empyema indicated penicillin-susceptible *Streptococcus constellatus*, whereas there was no bacterial growth in the pus from the frontal sinus, or from the blood and CSF. The oroantral fistula at the left upper molar area was repaired using a rotational mucosal flap. On the 5th postoperative day, no pus was detected in the frontal sinus and the C-reactive protein was normalized. Intravenous ceftriaxone was administered for 4 weeks and subsequently oral moxifloxacin 400 mg per day was prescribed for 2 weeks. An antiepileptic drug was prescribed for 6 weeks. Finally, the patient recovered to an almost normal state without any neurological sequelae after rehabilitation training, and was discharged 6 weeks after the initial surgery.

Discussion

Subdural empyema is a rare but serious infection requiring emergent surgical decompression and antibiotic therapy. This condition can result from the spread of an adjacent infection such as meningitis, sinusitis, or otitis media [4]. It has been reported that intracranial complications of a dental procedure mostly occur within 4 weeks [1,3,5]. Here, we report an unusual case in which a cerebral convexity subdural empyema was associated with chronic odontogenic sinusitis and oroantral fistula that persisted for 2 years after dental treatment. Additionally, the subdural empyema occupied an extensive area along the cerebral convexity, whereas intracranial abscesses of odontogenic origin usually occur in the frontal or temporal area and rarely in the parietal area [2,5]. CT images of a subdural empyema typically resemble a subdural hematoma in their crescentic shape and in the relationship to the sutures and Dural reflections [6]. The CT findings of a subdural hematoma vary with the clot status and organization. MRI images are similar to CT images in spite of their greater ability to detect contrast enhancement. In particular, because there was no definite prominent marginal enhancement on CT and MR images for our current patient, the initial radiological diagnosis was a variable stage subdural hemorrhage. Therefore, an accurate diagnosis and removal of the infection source was delayed. However, as he did not have a trauma history and his initial images showed ipsilateral paranasal sinusitis, subdural empyema due to sinusitis rather than hemorrhage could have been suspected in the initial assessment.

A yellowish discharge from the gingiva received dental treatment and a foul odor inside the nasal and oral cavities had persisted for the past 6 months without any definite symptoms of sinusitis such as nasal obstruction, purulent rhinorrhea or postnasal drip, facial fullness, and/or hyposmia. Nevertheless, at that time, if the possibility of oroantral fistula and chronic odontogenic sinusitis caused by tooth extraction had been considered early, the intracranial complication could have been prevented. It is generally known that the *Streptococcus viridans* group (*S. mitis, S. mutans, S. salivarius, S. sanguinis,* and *S. constellatus*) is most frequently isolated during an intracranial suppuration due to odontogenic sinusitis [3,5]. Consistently, penicillin-susceptible *S. constellatus* was identified in the pus from the subdural space in our current patient. Administration of intravenous ceftriaxone before ESS in our patient might have been why the specific organism in the pus from the frontal sinus had not been identified. An intracranial abscess should be drained to decompress the brain, evacuate pus, and identify the organism. Drainage of the affected sinuses and the dental intervention have to be performed to remove the infection source [3,5]. In our current patient, his consciousness and neurologic deficits were fully recovered by a drainage not of the subdural empyema but of the pus from the frontal sinus via an endoscopic approach. Moreover, an oroantral fistula should be closed. Intravenous broad-spectrum antibiotics are necessary to eradicate the abscess, but the period of administration is controversial. In our present case, intravenous antibiotics were maintained for 4 weeks until resolution of the inflammatory changes on MRI, as suggested by a previous report [3].

Conclusion

Intracranial abscess originating from an onset of sinusitis associated with dental procedures can occur at a relatively long period after the dental procedure. Furthermore, image findings of a subdural empyema cannot be easily distinguished from those of subdural hematoma. Therefore, if a patient with no history of head trauma complains of severe headaches, clinicians should suspect the possibility of intracranial infections of odontogenic origin, ask about symptoms of sinusitis and/or dental problems, investigate the history of dental procedures in the past several years, and consider performing a radiologic diagnostic workup for odontogenic sinusitis. Not only intracranial empyema but also its originating paranasal sinuses and oral lesions should be aggressively treated with emergency surgery combined with intravenous antibiotics.

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Conflicts of Interest: None.

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