Brain abscess potentially secondary to odontogenic infection: case report

Joseph Yang, DMD, MBE,[a] Stanley Y. Liu, DDS, MD,[b] Mehran Hossaini-Zadeh, DMD,[c] and M. Anthony Pogrel, DDS, MD, FRCS, FACS[d]
University of California, San Francisco, CA, USA

Odontogenic infections are rarely implicated in the causes of brain abscess formation. As such, there are very few reports of brain abscesses secondary to odontogenic infections in the literature. This is due partly to the relative rarity of brain abscesses but also to the difficulty in matching the causative organisms of a brain abscess to an odontogenic source. The authors report a case of a 50-year-old woman whose brain abscess may potentially have been secondary to an odontogenic infection. The patient's early diagnosis, supported by imaging and microbiologic assessment, along with early minicraniotomy and extraction of infected dentition followed by a course of cephalosporins and metronidazole, contributed to a successful outcome. (Oral Surg Oral Med Oral Pathol Oral Radiol 2014;117:e108-e111)

Brain abscesses are rare, but they represent a serious infection of the brain parenchyma in which a localized area of suppuration develops. The incidence of brain abscesses is approximately 1 in 100,000 in the United States, and brain abscesses account for 1 per 10,000 hospital admissions.[1] They may be the result of direct head injury, a complication of neurosurgical procedures, or the result of secondary infections from distant sites.[2] A review of 400 cases from China found that the most common etiology was ear infections, accounting for 65.75% of brain abscesses, followed by blood-borne infections at only 13%.[3] Rarely, odontogenic infections are implicated in the etiology of brain abscesses.[4] A review of the literature found fewer than 20 reports of brain abscess of odontogenic origin, with only 6 cases reported in this century so far.[5] Owing to the relatively low incidence of brain abscesses, the clinician's challenge is to recognize the possibility of such a diagnosis and to prevent a delay in treatment. When brain abscesses are diagnosed early and managed with surgical debridement and appropriate antibiotics, reported mortality rates range from 0% to 24%.[6] This is a significant improvement from the mortality rates up until the 1960s, when despite diagnosis of a brain abscess, antimicrobial resistance and lack of computed tomography (CT) contributed to a mortality rate of 36% to 66%.[3] Despite advancements in imaging modalities and diagnostic techniques, failure to recognize an odontogenic origin as the source of a brain abscess may still remain a diagnostic challenge, particularly among clinicians who are not dentally oriented. This case report presents the signs and symptoms, management, and hospital course for a patient whose brain abscess was possibly of odontogenic origin.

REPORT OF CASE

A 50-year-old woman with a history of migraine headaches, hypertension, fibromyalgia, bipolar disorder, and end-stage renal disease on hemodialysis presented to her local emergency department (ED) complaining of right leg weakness. The patient reported feeling right leg weakness 5 days previously, which she had originally thought to be secondary to her fibromyalgia, which had presented similarly in the past. On the morning of her presentation to the ED, she woke up and was unable to move her right leg at all. Before the onset of her right leg weakness, the patient reported a 2-week history of headaches and blurry vision, which were similar in nature to previous migraines. She denied having any measurable fevers but did report chills and dizziness. She also denied any recent history of nausea, vomiting, diarrhea, seizures, sensory deficits, or language difficulties. The patient also reported receiving multiple root canals in the past 2 years, with accompanying episodes of pain and drainage in her upper right quadrant. At the time of her presentation to the ED, the patient denied taking any medications. The patient reported a 20-pack-year history of tobacco use but denied any alcohol or illicit drug use.

A CT scan ordered by the ED physician found a 2-cm lesion in the left frontoparietal region near the paracentral primary motor cortex. A magnetic resonance imaging (MRI) scan confirmed the same lesion. Neither study was performed with contrast, given the patient's end-stage renal disease. With these findings, the patient was transferred to our medical center and admitted under the care of the neurosurgery service. Of note, the nephrology service was consulted to determine the appropriate management of the patient's dialysis needs during her hospitalization, given her history of

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[a]Resident, Department of Oral and Maxillofacial Surgery, University of California, San Francisco.
[b]Chief Resident, Department of Oral and Maxillofacial Surgery, University of California, San Francisco.
[c]Health Sciences Associate Clinical Professor, Department of Oral and Maxillofacial Surgery, University of California, San Francisco.
[d]Chairman and Professor, Department of Oral and Maxillofacial Surgery, University of California, San Francisco.
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end-stage renal disease thought to be secondary to either immunoglobulin A nephropathy or hypertension.

Upon admission to our medical center, the patient began to have progressive right arm weakness, measuring 2 out of 5 on right-hand grip. Imaging with contrast studies was ordered, after assessing the benefits versus risks with the nephrology service. Both the CT and MRI (Figure 1) showed a 2.0 × 1.2-cm lesion centered in the left paracentral lobe with features suggestive of an intracerebral abscess. Given these findings, the infectious disease service was consulted to determine the most appropriate antibiotic regimen to begin. With that service's recommendation, the patient was started on vancomycin 500 mg intravenously (IV) after hemodialysis sessions, ceftriaxone 2 g IV every 12 hours (q12h), and metronidazole 500 mg IV q8h. The patient was then taken to the operating room for a left frontal minicraniotomy for abscess drainage. Brain abscess specimens were submitted to microbiology for aerobic, anaerobic, fungal, and acid-fast bacilli cultures. The bacterial cultures returned positive exclusively for numerous viridans streptococcal growths, presumptively *Streptococcus anginosus*. All other brain abscess cultures were negative. Additionally, blood and urine samples were cultured, which were negative. Upon receiving these results, and given the patient's history of chronic odontogenic pain with recurrent episodes of intraoral drainage, the infectious disease service requested a consultation from the oral and maxillofacial surgery service to evaluate a possible odontogenic source for the streptococcus-proven intracranial abscess. Besides a possible odontogenic source, the infectious disease service did not believe there was any evidence of streptococcal contribution from the patient's gastrointestinal tract, genitourinary tract, or nasopharynx. The infectious disease service also recommended the continuation of ceftriaxone to cover the viridans streptococci, metronidazole to cover any pending anaerobic species, and discontinuation of the vancomycin, given the speciation of the streptococcal growths.

During consultation, the patient again reported a 2-year history of recurrent pain and drainage in her right maxillary arch, where she had received multiple root canal therapies and fixed prostheses. In her current state, the patient reported significant pain in her right maxillary arch. On extraoral examination, there was no cervical or submandibular lymphadenopathy. There was no evidence of trismus or facial swelling. On intraoral examination, the right maxillary first molar and first premolar were found to be sensitive to percussion and palpation, with suboptimally fitting restorations and mild mobility. There was no gross swelling intraorally. A panoramic radiograph (Figure 2) showed root canal therapy of the right maxillary first molar and canine, as well as periapical radiolucencies of the alveolar bone associated with the right maxillary first molar and canine. Given the patient's 2-year history of chronic odontogenic pain and drainage, the intraoral examination findings, and the absence of evidence indicating pathology of the patient's gastrointestinal and genitourinary tracts, the patient was taken to the operating room for extraction of her right posterior maxillary dentition, local debridement, and microbiologic assessment. Intraoperatively, we found fistula tracts apical to the right maxillary first molar and canine (Figure 3). Both alveolar bone and granulation tissue specimens associated with the 3 symptomatic teeth were sent to microbiology for aerobic and anaerobic cultures, as well as to surgical pathology. Additionally, a right maxillary sinus swab was sent for bacterial culture. After extraction of the right maxillary posterior dentition, there remained a maxillary sinus wall defect, which was immediately repaired by a buccal fat graft.

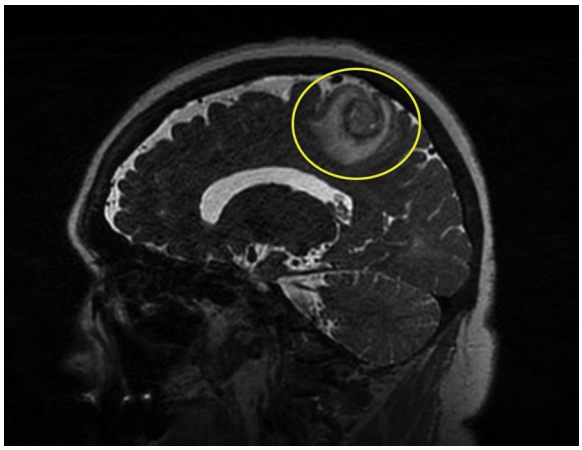

Fig. 1. Diffusion tensor imaging with magnetic resonance imaging (sagittal view): The *circle* encloses the lesion of the left frontoparietal region.

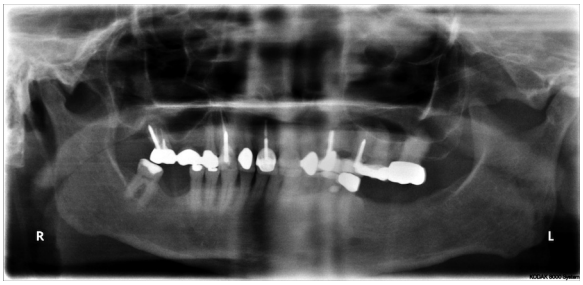

Fig. 2. Panoramic radiograph: extensive root canal therapy of the right maxillary first molar and canine, as well as periapical radiolucencies of the right maxillary first molar and canine.

Bacterial cultures from the oral specimens yielded enterococci, *Candida albicans*, anaerobic gram-negative rods, lactobacilli, and viridans streptococci. The right maxillary sinus swab cultured numerous polymicrobial growths, including nafcillin-resistant *Staphylococcus aureus*, enterococci, *Candida albicans*, anaerobic gram-negative rods, lactobacilli, and viridans streptococci. The histopathologic diagnosis for the tissue specimens was sclerosing osteitis. Upon receiving these results, the infectious disease service recommended coverage of streptococcal growths with cefepime 2 g IV after hemodialysis sessions for 4 weeks, and metronidazole 500 mg orally (PO) q8h for 4 weeks for anaerobic coverage. Although the patient's prior ceftriaxone regimen was being used to cover the streptococcal growths during her hospitalization, it was for the sake of convenience for the patient's hemodialysis sessions that ceftriaxone was switched to cefepime.