Hemianopsia From Occipital Lobe Abscess
After Dental Care

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We treated four patients who developed a homonymous hemianopsia from a bacterial abscess in the occipital lobe of the brain. All four patients were treated successfully by surgical drainage of the abscess and administration of parenteral antibiotics for at least six weeks. Despite cure of the brain abscess, each patient was left with a permanent residual homonymous visual field defect. Cultures from the abscess fluid in three of the four patients grew oral flora. Moreover, each patient had a history of dental care two to four weeks before the onset of visual symptoms. A history of recent dental treatment in a patient with a new hemianoptic field defect should alert the ophthalmologist to the possibility of a bacterial abscess in the occipital lobe.

Pyogenic abscess of the occipital lobe is an uncommon cause of hemianoptic visual loss. The infection is usually caused by hematogenous dissemination of bacteria from a remote primary site. The chance of survival is improved by rapid diagnosis. Since the introduction of computed tomography, the mortality rate from parenchymatous brain abscess has decreased from 40% to less than 5%.

We treated four patients with bacterial abscess of the occipital lobe. Each patient developed visual symptoms several weeks after dental treatment. We suggest that transient bacteremia during dental manipulation provided the inoculum for the brain abscess.

Case Reports

Case 1
A 13-year-old girl had a five-day history of headache and nausea, and complained of spots moving before her eyes. She had a fever of 37.7 °C but results of her physical examination were otherwise normal. She was treated with analgesics and discharged. The girl had a history of chronic headache that began four years earlier. At that time, results of electroencephalography and computed tomography were normal and she was considered a migraineur.

Twelve hours later, the patient was admitted to a hospital because of persistent vomiting and a fever of 38.9 °C. A computed tomographic scan obtained without contrast was normal. A lumbar puncture performed the next day yielded clear colorless fluid with an opening pressure of 300 mm H₂O. The glucose concentration was 55 mg/dl and the protein concentration was 120 mg/dl. There were 701 white blood cells/mm³, of which 90% were polymorphonuclear leukocytes. No organisms were found on Gram staining. The patient was treated empirically with intravenously administered ceftriaxone for meningitis. Computed tomography with intravenous contrast was performed the next day. It disclosed a faint pattern of ring enhancement in the right occipital lobe. Subsequently, the patient's visual fields were tested and a left homonymous hemianopsia was discovered.

When the patient was transferred the next day to our institution, her visual acuity was 20/20 in both eyes without correction. She had a dense left homonymous hemianopsia as determined by confrontation testing. Magnetic resonance imaging showed a bilocular mass in...
Fig. 1 (Wohl and associates). Coronal T1-weighted magnetic resonance image showing a bilocular lesion in the right occipital lobe in Patient 1. A prominent ring pattern of enhancement is visible after gadolinium administration.

the right occipital lobe. Ring enhancement was observed after administration of gadolinium (Fig. 1). Intravenously administered penicillin, metronidazole, and nafcillin were substituted for ceftriaxone. The next day, the mass was tapped through a right occipital burr hole and 10 ml of foul purulent material drained spontaneously. All smears and cultures were negative. Echocardiography showed mitral valve prolapse but no evidence of endocarditis.

For the next two weeks, the patient continued to have intermittent headaches and fluctuating fevers. A follow-up scan showed no diminution in the occipital lobe abscess. The patient was taken back to the operating room and 30 ml of pus was aspirated. After this procedure, the patient improved rapidly and was discharged from the hospital a week later. An eight-week course of parenteral penicillin and nafcillin, plus orally administered metronidazole, was completed at home. A year later, the patient had an incongruous left lower quadrantic field defect.

After the diagnosis of occipital lobe abscess was established, further questioning disclosed that the patient’s teeth had been cleaned by a dental hygienist four weeks before the onset of visual symptoms. Alginate impressions of the teeth had also been prepared to assist in the planning of orthodontia care. At the time of this procedure, a dentist examined the child’s teeth and observed only mild gingival disease. She had seven class-1 fillings and no caries.

Case 2

A 48-year-old man consulted his ophthalmologist a few days after developing a severe headache and multiple, evanescent white stars in his right visual hemifield. On examination, the visual acuity was correctable to 20/20 in both eyes. A dense right homonymous paracentral scotoma was mapped with a Goldmann perimeter. Contrast-enhanced computed tomography disclosed a poorly defined left occipital mass with surrounding edema; no ring enhancement was observed. A malignant tumor was suspected. The patient was treated with phenytoin and dexamethasone and his symptoms improved. An operation was scheduled for the next week.

At craniotomy, an occipital lobe abscess was discovered. Gram staining showed many gram-positive cocci. Laboratory cultures grew abundant colonies of *Streptococcus milleri*, a member of the viridans group. Results of ultrasonography of the heart were normal. The patient was treated with intravenously administered metronidazole and penicillin but failed to improve. Twelve days later, he developed confusion, alexia, and a complete right homonymous hemianopsia. Another craniotomy was performed to evacuate the occipital lobe abscess completely. After six more weeks of treatment with intravenously administered metronidazole and penicillin, the patient was discharged from the hospital. Two years later the patient had a residual right homonymous hemimacular scotoma.

While the patient was recovering from his first craniotomy, it was learned that a routine dental prophylaxis had been administered two weeks before the onset of visual symptoms. After this history was obtained, the plaque on the patient’s teeth was scraped and cultured. *Streptococcus milleri* was successfully isolated among the organisms constituting the oral flora.

Case 3

A 44-year-old man with a 25-year history of migraine sought an emergency consultation for
severe headache. The headache was preceded by intense lights that flashed in the right upper quadrant of his visual field. On examination, the visual acuity was 20/20 in both eyes with correction. A right homonymous superior visual field defect was found with confrontation testing. Computed tomography showed a subtle area of hypodensity in the left occipital lobe consistent with infarct or edema (Fig. 2). This impression was confirmed by a magnetic resonance scan that disclosed an increased bright signal in this region on T2-weighted images (Fig. 3). Migraine complicated by vascular infarction was diagnosed and the patient was treated with propranolol hydrochloride, aspirin, and analgesics.

At home, the patient continued to experience frequent headaches. Eleven days later he was mildly confused and febrile (39.4 °C). He was taken to the hospital emergency room, where a lumbar puncture was performed. The fluid contained 1,230 white blood cells/mm³ and the protein concentration was 149 mg/dl. The patient was treated with intravenously administered ampicillin, cefotaxime, and metronidazole. A magnetic resonance scan showed a left occipital lobe lesion with ring enhancement after gadolinium administration (Fig. 4). Several days later, the lesion was aspirated and 18 ml of pus was removed. The cultures grew microaerophilic streptococci. Results of ultrasonography of the heart were normal. The patient responded well to a six-week course of parenteral antibiotics. A year later he had a small permanent defect in the periphery of the upper right visual field.

The patient later recounted that two to three weeks before the abrupt onset of his visual symptoms and headache he had undergone an endodontic (root-canal) operation.

**Case 4**

A 60-year-old woman observed the onset of blurred vision two days after developing headache and fever. She was examined by her internist who prescribed erythromycin and acetaminophen by mouth. The next day she was brought to the hospital emergency room in a confused and agitated condition. Her temperature was 39 °C and her neck was slightly stiff. On cardiac auscultation, a midsystolic click was heard. The visual acuity was 20/20 in both eyes with correction. A left homonymous hemianop-
Hemianopsia was detected by confrontation testing at the bedside in the emergency room.

Computed tomography showed an area of low density in the right occipital lobe. With contrast administration, a ring of enhancement was evident. The next day the patient underwent a right occipital craniotomy and 15 ml of pus was drained from an abscess cavity. Cultures were positive for viridans group streptococci. Echocardiography demonstrated mitral valve prolapse but no vegetations on the cardiac valves. The patient completed a course of six weeks of intravenously administered penicillin in the hospital. Four years later, she had a persistent left inferior homonymous quadrantanopsia.

A review of her history later disclosed that 12 days before the onset of blurred vision, the patient had received an annual dental examination and prophylaxis.

Discussion

We treated four patients who developed hemianopsia caused by an occipital lobe abscess after receiving routine dental care. The phenomenon of transient bacteremia after tooth extraction was first described by Okell and Elliott more than a half century ago. Using standard blood culture techniques, they found bacteremia in 34% of patients with no detectable gum disease. In a recent study, bacteremia was found by the lysis-filtration method in 100% of patients after tooth extraction. Less invasive oral procedures such as root-canal operations, scaling, and filling of teeth are also associated with transient bacteremia. Even relatively minor procedures such as dental prophylaxis can produce bacteremia. Silver, Martin, and McBride documented bacteremia in 44% of their patients after toothbrushing.

In our patients, several lines of evidence implicated previous dental treatment as the cause of brain abscess. The interval of two to four weeks that elapsed between dental care and the onset of visual symptoms corresponds to the amount of time required for the development of a brain abscess. No other recent procedure or source was found to explain the brain abscess in our patients. Moreover, dental flora grew from the abscesses' fluid in all three patients with positive cultures. In two patients, the bacterial species were from the viridans group streptococci. The oral cavity is heavily colonized with these organisms. Heimdahl and associates reported that in patients with positive blood cultures after tooth extraction, 85% of isolates were members of the viridans group streptococci. In our third patient, the organisms cultured from the brain abscess were identified as microaerophilic streptococci organisms. These obligate anaerobes are common inhabitants of the periodontal space. Finally, in our second patient S. milleri grew from the brain abscess material and was also isolated from the patient's own dental flora.

The association between dental treatment and cerebral abscess has been reported previously. In 1945, Haymaker described eight cases of brain abscess after tooth extraction. Since that initial publication, a number of studies and individual case reports have confirmed an etiologic connection between dental procedures and brain abscesses. A dental source accounts for at least 4% to 7% of all pyogenic brain abscesses. The true percentage may actually be higher, inasmuch as no source is identified in most cases of brain abscess. A previous case
report described hemianopsia from a cerebral abscess after dental treatment.17

Two of our patients had mitral valve prolapse, a common and usually benign condition occurring in at least 5% of the population.18 Mitral valve prolapse has a 5.3 to 8.2 increase in the relative risk of infective endocarditis after dental procedures.19 The American Heart Association advises prophylactic antibiotic coverage for all dental procedures in patients with mitral valve prolapse accompanied by valvular regurgitation.20 The current recommended treatment regimen is amoxicillin, 3.0 g orally one hour before the procedure and 1.5 g six hours after the initial dose. Patients allergic to penicillin or amoxicillin may be treated with erythromycin or clindamycin.

It is unclear whether mitral valve prolapse was an incidental finding in our patients, or whether it contributed to cerebral abscess formation. We found no evidence for bacterial endocarditis in any of our patients; blood cultures and results of echocardiography were negative. However, echocardiography often fails to detect colonization of the cardiac valves in endocarditis.

After bacterial seeding of the brain, a period of two to four weeks is required for maturation of an encapsulated pyogenic abscess.9 Abscess formation is preceded by a period of early cerebritis. During this stage many patients are asymptomatic. About 50% of patients have intermittent headache or fever. Eventually brain necrosis or mass effect is sufficient to induce focal neurologic signs. At this point, patients usually seek medical consultation and computed tomographic magnetic resonance study is performed. Magnetic resonance imaging is more sensitive than computed tomography in detecting the cerebritis that precedes the formation of a frank abscess. The administration of contrast material is helpful because the capsule of a mature abscess shows a distinctive pattern of rim enhancement. Whether magnetic resonance or computed tomography is used to image the brain, it is important to be aware that an abscess can be confused with either tumor or infarct, especially in the early stages of capsule formation.21,22 Correct diagnosis was delayed in several of our patients because the cerebral lesion lacked typical features of brain abscess on initial neuroradiologic study. Our findings suggest that it may be worthwhile to query patients who have a new hemianoptic disturbance of vision about any dental treatment received during the preceding two to four weeks. In our experience, such information was not volunteered spontaneously. A trip to the dentist several weeks before is easily overlooked and likely to be regarded as irrelevant by a patient suffering from new visual symptoms. If a history of recent dental care is obtained, suspicion should be heightened for occipital lobe abscess. Early recognition of occipital lobe abscess can reduce morbidity and improve outcome. In selected cases, it may be possible to avoid neurosurgical intervention if treatment with antibiotics is initiated promptly.23,24 Identification of a probable dental source also helps to guide the choice of antibiotic treatment. Antimicrobial treatment should include medications effective against streptococci organisms and other oral flora.

References


OPHTHALMIC MINIATURE

His pupils enlarge as he leans closer to the mirror, making a shadow, seeking to see if there truly is a soul. That's what he used to think ophthalmologists were looking at when they pressed that little hot microscope of a flashlight tight against your eye. What they saw, they never told him. He sees nothing but black, out of focus, because his eyes are aging.

John Updike, *Rabbit, Run*