PAIN UPDATE

Maxillary tooth pain as a symptom of internal carotid artery dissection

Case series

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CLINICAL PROBLEM

Evaluation of a toothache in the dental office is a common, if not daily, occurrence. Clinicians identify dental disease through modern diagnostic and imaging techniques. Occasionally, a toothache occurs without dental disease, or pain persists after a pathologic dental condition is treated optimally. If one of these situations occurs, the clinician ought to consider a secondary origin of the toothache.

In the following cases, a vascular condition in the neck called *internal carotid artery dissection* (ICAD) caused the dental pain.[1-3] This condition occurs when blood enters the wall of the artery and splits its layers, causing a stenosis or aneurysmal dilatation in the artery. This change affects arterial blood flow and the structures surrounding the artery. ICAD classically is identified by the concurrent appearance of 2 of the following 3 symptoms: ipsilateral pain in the head, face, or neck; Horner syndrome (occulosympathetic palsy); and an ischemic condition, including transient monocular blindness or transient ischemic attack.[4,5]

Case 1. A 65-year-old right-handed man sought care at a tertiary orofacial pain center. He had a 6-month history of right-sided maxillary toothache that radiated to the right preauricular area and right vertex. He described the pain as a continuous throbbing with an intensity of 7 out of 10 on a visual analog scale ranging from 0 to 10. Chewing, exercising, and drinking hot or cold liquids aggravated the pain. He also developed headaches that were unilateral and severe, aggravated by movement, accompanied with photophobia and nausea, and occurring 3 or 4 times per week.

His medical history included cerebrovascular infarcts 9 and 11 years previously, which resulted in expressive aphasia and decreased cognition. Subsequently, he had been receiving a daily regimen of warfarin, an anticoagulant. Although there were previous cerebrovascular accidents, he did not have a history of headache, pain, or neurologic deficits in the pain area after those events.

Six months before his initial orofacial pain consultation, the patient had undergone endodontic therapy and extraction for this pain, initially on the maxillary right first molar without relief. An emergency department physician and the primary care physician then examined the patient, and both attributed the pain to odontogenic causes. They prescribed opioids for pain relief and a sedative for sleep, which did not relieve the pain.

During examination, the orofacial pain dentist (J.J.A.) noted anisocoria with right-sided miosis. All right-sided trigeminal nerve divisions had a 40% decrease in subjective sensation to pinprick and light touch. Palpation of head and neck muscles and joints revealed clinically significant right-sided tenderness, but minimal tenderness was present on the left side. No signs of odontogenic or oral soft-tissue disease were present. Examination of the temporomandibular joint showed normal range of motion without joint sounds or crepitation. Dynamic and static mechanical allodynia test results were positive in the right maxilla. The orofacial pain dentist applied topical anesthetic initially, followed by injectable local anesthetic in the right maxilla, both with minimal pain relief.

Because the pain was of an unknown cause, the orofacial pain dentist ordered magnetic resonance (MR) imaging with and without the use of contrast and MR angiography. MR imaging revealed the 2 previous infarcts of the left cerebral hemisphere, and MR angiography revealed a probable distal right ICAD at the level of the skull base (Figure 1). Next, vessel wall imaging by means of a computed tomographic angiogram of the head and neck disclosed the previous cerebral infarcts and the right ICAD showing persistent change in the arterial wall confirming ICAD.

Once the ICAD was discovered, the orofacial pain dentist referred the patient to a neurosurgeon (W.I.S.). Because of the patient's previous anticoagulation therapy regimen of warfarin, the neurosurgeon reassessed his laboratory values. The dissection management was

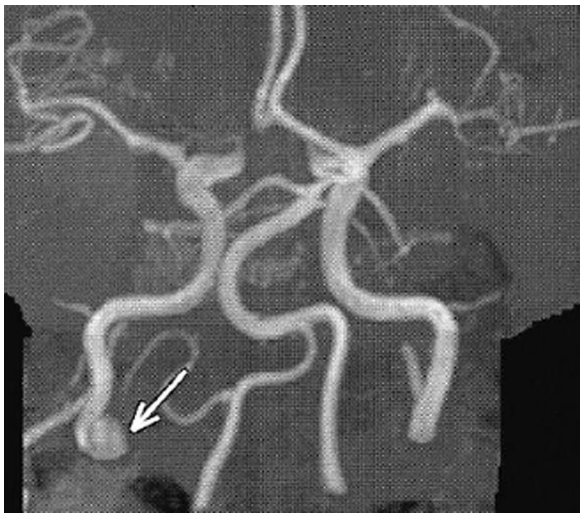

Figure 1. Magnetic resonance angiography image in the coronal view shows right distal internal carotid artery dissection (arrow) at the level of the skull base.

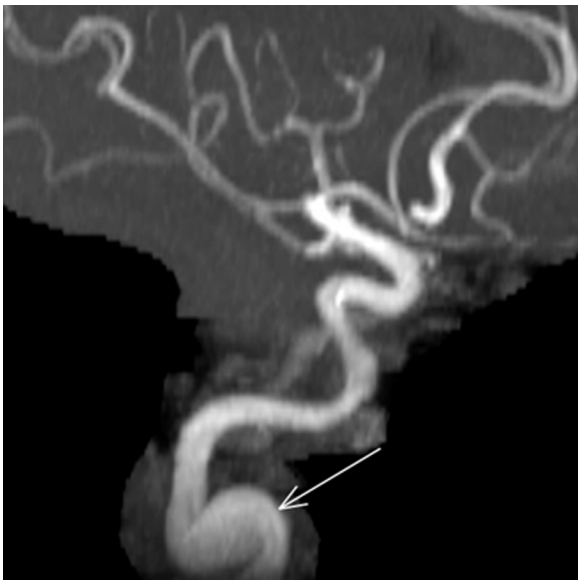

Figure 2. Magnetic resonance angiography image in the sagittal view shows right ancient internal carotid artery dissection (arrow).

through continued anticoagulant therapy and observation with vessel wall imaging, which demonstrated a stable dissection. Once his condition was stable, the neurosurgeon referred the patient back to the orofacial pain dentist for pain management.

For the management of the patient's pain, the orofacial pain dentist prescribed gabapentin, an anticonvulsant. Over 2 months, the dose was increased to 3,000 milligrams per day in divided doses, which alleviated his pain. Subsequently, this medication level was sustained over 2 years, continuing to provide pain relief.

Case 2. A 61-year-old woman sought care for maxillary right canine pain, which she had experienced for 2 years. She described the pain as intermittent throbbing and aching with an intensity of 7 out of 10 on the visual analog scale. The pain was exacerbated when lying down and intraoral palpation of the maxillary right canine area. The pain was worse at night and prevented her from falling asleep. No migrainous or autonomic features were present with the canine pain. She had a history of infrequent migraine without aura for which she used propranolol prophylactically. Over the 2 years before consulting with an orofacial pain dentist (A.N.), she had undergone endodontic therapy and extraction of the maxillary right canine for this pain without alleviation of her pain symptoms.

At physical examination, the cranial nerve screening examination results were normal, with the exception of mechanical allodynia in the right trigeminal maxillary distribution. Diagnostically, topical and injectable anesthetic administered by the orofacial pain dentist to the pain site provided minimal pain relief.

Results from MR imaging and MR angiography of the brain revealed a right ICAD. Because of this discovery, the orofacial pain dentist immediately referred her to a neurosurgeon (W.I.S.) for consultation. Subsequent vessel wall imaging results were consistent with a long-standing or ancient dissecting aneurysm (Figure 2); the signal intensity of the dissection observed during imaging was the determining factor.[6] Because of the dissection's age, no anticoagulation therapy was instituted because the risk of experiencing complications was minimal. After the dissection was determined to be stable, the neurosurgeon referred her back to the orofacial pain dentist for pain management.

For management of her pain, the orofacial pain dentist prescribed gabapentin and increased the dose to 900 mg over 30 days, which completely removed her pain. The medication was continued at this level with pain resolution for 6 months, until the dentist referred her back to her primary care physician for continued prescription maintenance.

PATHOPHYSIOLOGICAL ASPECTS OF INTERNAL CAROTID ARTERY DISSECTION

Dissections occur when blood under arterial pressure penetrates the blood vessel wall through a discontinuity of the intimal layers. The dissection type is determined by the vessel wall layer the blood has entered. A subintimal dissection occurs between the intima and adventitia layers and typically results in an arterial stenosis, whereas subadventitial dissections occur between the adventitia and dura layers, frequently causing an aneurysmlike dilatation of the artery.[4]

In extracranial dissections, the resulting enlargement usually occurs around the second or third vertebra,