
Eric T. Stoopler  
*University of Pennsylvania, ets@dental.upenn.edu*

Andres A. Pinto  
*University of Pennsylvania, apinto@upenn.edu*

David C. Stanton  
*University of Pennsylvania, david.stanton@uphs.upenn.edu*

Muralidhar Mupparapu  
*University of Pennsylvania, mmd@dental.upenn.edu*

Thomas P. Sollecito  
*University of Pennsylvania, tps@pobox.upenn.edu*

Follow this and additional works at: [http://repository.upenn.edu/dental_papers](http://repository.upenn.edu/dental_papers)

Part of the Dentistry Commons, Medical Pathology Commons, Musculoskeletal Diseases Commons, Pathological Conditions, Signs and Symptoms Commons, and the Radiology Commons

**Recommended Citation**


This paper is posted at ScholarlyCommons. [http://repository.upenn.edu/dental_papers/41](http://repository.upenn.edu/dental_papers/41)

For more information, please contact repository@pobox.upenn.edu.

Abstract
A 53-year-old Caucasian female presented to the Oral Medicine Department at the hospital of the University of Pennsylvania for consultation regarding facial pain. A panoramic radiograph revealed multilocular radiolucencies in the right articular eminence. A CT scan was then performed, and the radiolucencies were determined to be pneumatization of the articular eminence.

Keywords
articular eminence, CT scan, panoramic radiograph, pneumatization, temporal bone

Disciplines
Dentistry | Medical Pathology | Musculoskeletal Diseases | Pathological Conditions, Signs and Symptoms | Radiology

This journal article is available at ScholarlyCommons: http://repository.upenn.edu/dental_papers/41
Extensive pneumatization of the temporal bone and articular eminence: An incidental finding in a patient with facial pain. Case report and review of literature

Eric T. Stoopler, DMD¹/Andres Pinto, DMD²/David C. Stanton, MD, DMD³/Muralidhar Mupparapu, DMD⁴/Thomas P. Sollecito, DMD⁵

A 53-year-old Caucasian female presented to the Oral Medicine Department at the University of Pennsylvania for consultation regarding facial pain. A panoramic radiograph revealed multi-locular radiolucencies in the right articular eminence. A CT scan was then performed, and the radiolucencies were determined to be pneumatization of the articular eminence. (Quintessence Int 2003;34: 211–214)

Key words: articular eminence, CT scan, panoramic radiograph, pneumatization, temporal bone

CASE REPORT

A 53-year-old Caucasian female presented to the Hospital of the University of Pennsylvania, Department of Oral Medicine, complaining of facial pain. By the patient’s report, the original pain was diagnosed as muscular soreness secondary to occlusal discrepancy and treated with orthodontic and prosthodontic therapy. The symptoms started to recur multiple years ago, but were intermittent and infrequent with minimal severity. Three months prior to her presentation, the pain returned as a dull, sometimes throbbing ache extending from the right temporal region into the right neck and right face. She admitted suffering trauma to the right side of her face, one month prior to the onset of her recent symptoms. Three months prior to her presentation, the pain returned as a dull, sometimes throbbing ache extending from the right temporal region into the right neck and right face. She admitted suffering trauma to the right side of her face, one month prior to the onset of her recent symptoms. The pain was worsened with mastication, while non-steroidal anti-inflammatory drugs provided some relief. Her symptoms did not change with positional change, stooping, or with the valsalva maneuver.

The patient's medical history included rheumatoid arthritis and asthma, as well as a history of recurrent urethral blockage. Her medications were estrogen replacement therapy, celecoxib (100 mg twice daily) and mometasone spray as needed. She was allergic to erythromycin and penicillin. A detailed review of systems
revealed occasional bilateral tinnitus associated with significant sinus congestion. Other noted symptoms included mild blurry vision (followed by her ophthalmologist), shortness of breath with exertion, and intermittent urinary retention. Her family history was significant only for lung cancer (father) and her social history was noncontributory.

Physical examination revealed normal range of jaw motion with no pain. The patient was noted to have a right “S” shape deviation on opening. Auscultation of the temporomandibular joint area revealed crepitation over the left condylar area as well as an opening non-reciprocal click of the right temporomandibular joint, both of which were not associated with any pain. Palpation of the pretragus and intra-auricular areas did not reproduce the painful symptoms. The patient’s closing muscles of mastication were, however, mild to moderately tender, bilaterally, but notably more severe on the right side. The salivary glands were free flowing and had no palpable masses. Palpation over the area of distribution of the temporal artery was negative. The patient’s cranial nerves II through XII were grossly intact. Mild thyromegaly was detected, but no lymph node enlargement was noted. Her occlusion was physiologic.

Since the right zygomatic arch area was painful, a computer tomographic scan (CT) of the maxillofacial region was obtained to rule out bony pathology such as a giant cell lesion, central hemangioma, traumatic bone cyst, aneurysmal bone cyst, myxoma, and metastasis. Axial CT scan images revealed extensive pneumatization of the right temporal bone with the pneumatization extending into the right zygomatic arch including the articular eminence (Fig 2). On the left side, no such extensive pneumatization was noticed. The area was observed on reformatted sagittal and coronal images which confirmed the findings from the panoramic radiograph regarding the extension into the articular eminence. The bone and the surrounding structures appeared normal in both the bone windows and soft tissue windows. It was concluded that the radiographic changes were simply an incidental finding of extensive pneumatization of the temporal bone.

A panoramic film revealed pneumatization of the right zygomatic arch (Fig 1). The patient was given a provisional diagnosis of myofascial pain of the muscles of mastication, as well as the aforementioned pneumatization of the right zygomatic arch. Other incidental changes observed in the radiographic exam were consistent with arthritic changes of the left condyle.

A treatment plan was formulated, including passive stretching exercises together with local heat/cold therapy. Because of the anatomic localization of the pain, an erythrocyte sedimentation rate (ESR) was also obtained to rule out temporal arteritis. The ESR was not elevated. She was advised to continue using the anti-inflammatory agent (celecoxib) as initial therapy.

At two subsequent visits, her symptoms were greatly reduced with the prescribed conservative treatment for muscular pain. A follow-up at 8 weeks revealed 98% relief in a verbal scale with only mild myalgia in the masseter muscle, bilaterally.

LITERATURE REVIEW

Prior to reviewing the current published literature regarding pneumatized articular eminence, a brief review of the anatomy of the temporal bone and pertinent aspects of the temporomandibular joint (TMJ) area would be appropriate. The temporal bones of the skull contain the cranial vault, the mastoid process, the great wing of the sphenoid, the zygoma, the petrous ridge, and the condyle of the mandible. These structures constitute the superficial part of the temporal bone.

The temporal bone contains the middle and inner ear. The temporal bone provides structural support for the base of the skull and contains the facial nerves (VII-XII). The greater wing of the sphenoid bone forms the floor of the sella turcica.

The first cranial nerve (CN I) supplies sensory fibers to the face and the tongue. The second cranial nerve (CN II) supplies sensory fibers to the optic nerve. The third cranial nerve (CN III) supplies motor fibers to the muscles of ocular movement. The fourth cranial nerve (CN IV) supplies sensory fibers to the motor fibers of the third cranial nerve. The fifth cranial nerve (CN V) supplies sensory fibers to the face, the meninges, and the meninges of the brain. The sixth cranial nerve (CN VI) supplies motor fibers to the muscles of ocular movement. The seventh cranial nerve (CN VII) supplies motor fibers to the facial muscles and sensory fibers to the skin of the face.

The eighth cranial nerve (CN VIII) supplies sensory fibers to the inner ear. The ninth cranial nerve (CN IX) supplies motor fibers to the muscles of the tongue and sensory fibers to the taste buds of the tongue. The tenth cranial nerve (CN X) supplies motor fibers to the muscles of the pharynx and sensory fibers to the skin of the neck. The eleventh cranial nerve (CN XI) supplies motor fibers to the muscles of the neck. The twelfth cranial nerve (CN XII) supplies motor fibers to the muscles of the tongue.
The pneumatized articular eminence of the temporal bone is an air cell cavity that is similar to air cells in the mastoid process and ethmoid bone. 3 Pneumatization of the mastoid process and ethmoid bone is an air cell cavity that is similar to air cells in the mastoid process and ethmoid bone. 3

The pneumatized articular eminence of the temporal bone is an air cell cavity that is similar to air cells in the mastoid process and ethmoid bone. 3 One of the first reports of air cells in the temporal bone was by Tremble 6 in 1934, who was curious about the anatomic basis for the spread of infections within the temporal bone. The cause of pneumatization of the articular eminence is unknown but may be similar to other pneumatized areas of bone within the body, such as the mastoid process. The most popular theory to explain pneumatization of the mastoid process is resorption of diploic bone by an active invasion of tympanic epithelium. 5 Pneumatization of the mastoid process is almost complete when a patient reaches age 5, but air cells may continue to develop through adulthood. 6 Pneumatization of the zygomatic process of the maxilla does not begin until the patient is at least 9 years old, although it is unknown at what age air cells within the articular eminence begin to develop. 6

Several articles have been published regarding the prevalence of pneumatization of the articular eminence. Tyndall and Matteson 3 reviewed panoramic radiographs of 1,061 patients and reported that 28 patients or 2.6% of the study population had pneumatized articular eminences. Kaugers et al 6 reviewed 784 panoramic films and reported only eight patients or 1.0% of the study population to have pneumatization of the articular eminence. In a more recent study, Groell and Fleischmann 7 reviewed 100 high-resolution axial CT scans of the base of the skull and found only 12 patients with pneumatized articular eminences. Pneumatization is usually symmetrical, as reported in the literature, but asymmetry can occasionally be observed. 8 In addition, the studies demonstrated no gender predilection for pneumatization of the articular eminence and the mean ages of patients with this phenomenon ranged from 32.4 years to 45.9 years. 7, 8

Tyndall and Matteson 3 attempted to classify the radiographic types of pneumatized articular eminences into three types: unilocular, multilocular, and trabecular variant of multilocular type. Subsequent studies reported difficulty in classifying pneumatized articular eminences because of the overlap in radiographic appearance between the different types. Overall, the incidence of pneumatization of the articular eminence is relatively low in the general population; however, clinicians must be aware of this phenomenon to accurately assess radiographs and their patients.

A panoramic radiograph is a useful technique to display the pneumatized articular eminence of the temporal bone. In a symptomatic patient, high-resolution CT of the base of the skull represents the method of choice in the evaluation of bony structures allowing exact delineation of bony structures. 9, 10

The astute clinician, when observing variations in normal anatomy, will use a differential diagnosis to arrive at a specific diagnosis for the patient. The well-corticated multilocular radiolucencies in the articular eminence of the temporal bone may elicit a differential diagnosis consisting of giant cell lesion, central hemangioma, traumatic bone cyst, aneurysmal bone cyst, myxoma, metastasis, and of course, variation of normal anatomy. The pneumatized articular eminence is distinguished from these tumors by a lack of clinical signs or symptoms, as these pathologic lesions have been reported to be characterized by painful enlargement of the cheek, and seen radiographically as expansile, destructive lesions, which is best characterized by CT. 3

The pneumatized articular eminence is an important finding due to its potential for causing complications. In one study, CT scans revealed that due to pneumatization, there was approximately less than 1 mm of bone between the glenoid fossa and the middle cranial fossa. 6 This could be an important implication in the event of maxillofacial trauma. Fractures of the base of the skull frequently extend throughout the pneumatic spaces of the temporal bone and may release air into the glenoid fossa. 7 One study conducted demonstrated that air occurred in the TMJ fossa in 37% of temporal bone fractures, and in 12%, these air collections represented the only sign of fracture. 11

Dehiscence of the middle wall of the glenoid fossa may allow herniation of the soft tissue contents into the middle ear. 12 This herniation could result in acute middle ear and mastoid effusion. In addition, temporal...
air spaces are potential paths for the spread of infection and other disease processes.

There are wide variations in temporal bone aeration, and air cells in the articular eminence may present as an incidental finding to the clinician. Knowledge of this phenomenon may be helpful in the interpretation of radiographs and other imaging studies. In our case, as in most others, the articular eminence pneumatization was an incidental finding unrelated to the patient’s signs or symptoms.

REFERENCES


