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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
Extensive pneumatization of the temporal bone and articular eminence: An incidental finding in a patient with facial pain. Case report and review of literature

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Pneumatization of the articular eminence of the temporal bone is a relatively uncommon incidental finding in dental practice. Often, patients presenting with facial pain are evaluated via a complete history and physical examination, which includes obtaining proper radiographic images. The most common imaging modality used is the panoramic radiograph, which should be thoroughly evaluated for pathology by the dentist. The following article details a case report of a patient with facial pain, who was found to have a pneumatized articular eminence but ultimately ruled out for intrabony pathology. A review of the current literature regarding this phenomenon also is presented.

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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. The pain was worsened with mastication, while nonsteroidal 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 giant cell lesion, central hemangiomia, 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 (celexob) 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 and participate in the formation of the mastoid antrum, the mastoid sinus, and the mastoid process. The mastoid is an important landmark for the surgical approach to the middle ear.

The temporal bone is a complex structure that consists of the zygomatic process, the temporal process, and the squamous process. The zygomatic process forms the lateral wall of the maxillary sinus and the temporal process forms the lateral wall of the middle ear. The squamous process forms the lateral wall of the mastoid antrum and the mastoid sinus.

The mastoid process is a bony prominence posterior to the external auditory meatus. It is divided into the antrum, the sinus, and the process. The antrum is a small air-filled space that lies anterior to the mastoid process. The sinus is a large air-filled space that lies posterior to the mastoid process. The process is a bony prominence that extends posterior to the sinus and is continuous with the squamous process of the temporal bone.

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Quintessence
axial CT scans of the base of the skull and found only of the articular eminence. In a more recent study, Groell and Fleischmann reviewed radiographs of 1,061 patients and reported that 28 patients or 2.6% of the study population had pneumatized articular eminences. Kaugers et al. reviewed 784 years old, although it is unknown at what age air cells prevalence 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 cause of pneumatization of the articular eminence is unknown but may allow herniation of the soft tissue contents into the middle ear. This herniation could result in acute middle ear and mastoid effusion. In addition, temporal skull contribute to the lower lateral aspects of the cranial vault and the cranial base. The temporal bone articulates with the occipital bone, the parietal bone, the greater wing and body of the sphenoid bone, and the zygomatic bone. There are three portions of the temporal bone: the squamous portion which includes the zygomatic process and the articular eminence; the petrous mastoid portion which separates the middle and posterior cranial fossa within the skull and houses the components of the middle ear chamber; and the tympanic portion which contributes to the structure of the external auditory meatus.

The TMJ is a complex articulation of the mandibular condyle and the mandibular fossa of the temporal bone. The fossa is bordered laterally by the root of the zygomatic process, medially by the spine of the sphenoid bone, anteriorly by the articular eminence, posteriorly by the squamotympanic and petrotympanic fissures, and superiorly by a thin plate of bone that separates the mandibular fossa from the middle cranial fossa. The masseter muscle, both superficial and deep portions, originates from the zygomatic arch, and the fibers of the temporalis muscle pass downward deep to the zygomatic arch, to insert into the coronoid process and ramus of the mandible.

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. The most popular theory to explain pneumatization of the mastoid process is that of the spread of infections within 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.

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.

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. 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. 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. Dehiscence of the middle wall of the glenoid fossa may allow herniation of the soft tissue contents into the middle ear. This herniation could result in acute middle ear and mastoid effusion. In addition, temporal

Overall, the studies demonstrated no gender predilection for pneumatization of the articular eminence and the mean ages of patients with this phenomena ranged from 32.4 years to 45.9 years.
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