



2003

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

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: https://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

Stoopler, E. T., Pinto, A. A., Stanton, D. C., Mupparapu, M., & Sollecito, T. P. (2003). Extensive Pneumatization of the Temporal Bone and Articular Eminence: An Incidental Finding in a Patient With Facial Pain. Case Report and Review of Literature. *Quintessence International*, 34 (3), 211-214. Retrieved from https://repository.upenn.edu/dental_papers/41

This paper is posted at ScholarlyCommons. https://repository.upenn.edu/dental_papers/41
For more information, please contact repository@pobox.upenn.edu.

Extensive Pneumatization of the Temporal Bone and Articular Eminence: An Incidental Finding in a Patient With Facial Pain. Case Report and Review of Literature

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

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

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 multi-ocular 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

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.

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 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

¹Fellow, Department of Oral Medicine, University of Pennsylvania School of Dental Medicine, Philadelphia, Pennsylvania.

²Assistant Professor, Department of Oral Medicine, University of Pennsylvania School of Dental Medicine, Philadelphia, Pennsylvania.

³Assistant Professor of Oral and Maxillofacial Surgery, Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania.

⁴Assistant Professor of Radiology, Department of Oral Medicine, University of Pennsylvania School of Dental Medicine, Philadelphia, Pennsylvania

Reprint requests: Dr Thomas P. Sollecito, Department of Oral Medicine, University of Pennsylvania School of Dental Medicine, 4001 Spruce Street, Philadelphia, Pennsylvania 19104. E-mail: tps@pobox.upenn.edu



Fig 1 Cropped, magnified, panoramic radiograph of the patient showing the right condyle, glenoid fossa, and pneumatization of the temporal bone extending into the articular eminence (arrows).



Fig 2 Axial CT scan from a high speed CT scanning protocol with bone windowing shows the extensive pneumatization within the temporal bone and involvement of the right zygomatic arch (arrows). Note the absence of pneumatization of the left articular eminence.

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 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.¹

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.¹ 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.²

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 Tremble⁴ 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 Matteson³ studied panoramic radiographs of 1,061 patients and reported that 28 patients or 2.6% of the study population had pneumatized articular eminences. Kaugers et al⁶ 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 Fleischmann⁷ 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.^{7,8} In addition, 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.^{3,6} Tyndall and Matteson³ 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.^{3,9,10}

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.⁸ 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

1. Liebgott B. The skull. In: Liebgott B (ed). The Anatomical Basis of Dentistry. Toronto: B.C. Decker, 1986: 202-204, 1289.
2. Liebgott B. The head by regions. In: Liebgott B (ed). The Anatomical Basis of Dentistry. Toronto: B.C. Decker, 1986: 296-298.
3. Tyndall D, Matteson S. Radiographic appearance and population distribution of the pneumatized articular eminence of the temporal bone. J Oral Max Surg 1985;43:493-497.
4. Tremble GE. Pneumatization of the temporal bone. Arch Otolaryngol 1934;19:172-182.
5. Mawson SR. Prenatal and postnatal development of the ear. In: Mawson SR (ed). Diseases of the Ear, ed 3. Baltimore: William and Wilkins, 1974:7,12-13.
6. Kaugers G, Mercuri L, Laskin D. Pneumatization of the articular eminence of the temporal bone: Prevalence, development, and the surgical treatment. J Am Dent Assoc 1986; 113:55-57.
7. Groell R, Fleischmann B. The pneumatic spaces of the temporal bone: Relationship to the temporomandibular joint. Dentomaxillofac Radiol 1999;28:69-72.
8. Hasnaini M, Ng SY. Extensive temporal bone pneumatization: Incidental finding in a patient with TMJ dysfunction. Dent Update 2000;27:187-189.
9. Swartz JD, Harnsberger HR. The middle ear and mastoid. In: Swartz JD, Harnsberger HR (eds). Imaging of the Temporal Bone, ed 2. New York: Thieme, 1992:55-60.
10. Virapongse C, Sarwar M, Bhimani S, Sasaki C, Shapiro R. Computed tomography of temporal bone pneumatization: 2. Petrosquamal suture and septum. AJNR 1985;6:561-568.
11. Betz BW, Wiener MD. Air in the temporomandibular joint fossa: CT sign of temporal bone fracture. Radiology 1991; 180:463-466.
12. Weismann JL, Hirsch BE, Chan K, Tabor EK, Curtin HD. Dehiscent temporomandibular joint. Radiology 1991;180: 211-213.

HARVARD CEMENT

Fixation of Crowns, Inlays and Orthodontic work.
Pulp cement for the protection of dental pulp.



Herstellung- und Vertriebsgesellschaft · Richter & Hoffmann HARVARD Dental GmbH
Babelsberger Straße 42, 10715 Berlin, Tel. ++49 (0) 30 82 00 99-0, Fax: ++49 (0) 30 822 81 45