

## Assessment of Pneumatization of Articular Eminence and its Characteristics on CBCT: A Retrospective Study

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### Abstract

**Background:** Diseases of the TMJ are a frequent finding in the population. Imaging of temporomandibular joint for diagnosis of pathology often involves the articular eminence which shows various radiolucencies in cross section. These are normal variations of pneumatization of the bone, which can be considered as pathology if not well versed with the anatomy.

**Aim:** To study pneumatization of the articular eminence on CBCT imaging

**Methodology:** retrospective study conducted on 60 CBCT scans, where TMJs were evaluated bilaterally to study the various types of pneumatization in males and females. Presence of pneumatization was evaluated as unilateral, bilateral, unilocular, multilocular, present & absent.

**Result:** The study was done on 32 males and 2 males (6.2%) showed multilocular pneumatization and 3 females (10.7%) out of 28 females also showed multilocular pneumatization, also on 12 subjects (20%) of 60 patients showed unilateral pneumatization of which unilateral pneumatization was seen in 5 males (15.6%) and 7 females (25.0%), data was evaluated with chi square test no significant findings were noted.

**Conclusion:** Although the present study has reported a prevalence of pneumatization of articular tubercle to be 8% it may be misdiagnosed as pathology.

**Key words-** Pneumatization, Articular tubercle, Cone Beam Computed Tomography.

### Introduction

The formation of air-filled cavities in bone is referred to as pneumatization.<sup>1</sup> Pneumatization of articular tubercle (PAT) is significant as low resistance makes it easier for several disease processes, such as tumors, inflammation or fractures, to occur into the joint.

It is crucial to identify this anatomic variation, often referred to as aeration of the petrous section of the temporal, in order to distinguish it from local diseases. Since panoramic radiographs are typically thought to be helpful in displaying the PAT<sup>1</sup>, practically all case reports and prevalence research pertaining to PAT rely on this technique.

The medial component of the articular tubercle could be identified by computed tomography (CT), as shown by Milogu et al<sup>2</sup> and Ladeira et al<sup>2</sup>. In this study, we have attempted to evaluate pneumatization of articular eminence and its characteristics on CBCT.

### Methodology:

This is a retrospective study conducted in the Department of Oral Medicine and Radiology, from September 2018 – November 2018 and approved by the ethical committee of the Institute. A total of 100 CBCT scans were assessed of patients aged 18 to 60 years, 60 fulfilled the criteria to be included in the study. Digital images taken using Kodak Carestream 9000 CBCT scanner were analyzed for pneumatization of articular eminence.

### Inclusion Criteria

Data of patients aged 18 years and above was considered for the study.

Images showing articular eminence, glenoid fossa and condylar head of both right and left side of Temporomandibular joint in the same patient.

### Exclusion Criteria

Images with fracture of the joint, TMJ pathology, developmental disorder were excluded from the study.

### Procedure:

Evaluation of scans was carried out to see pneumatization in articular eminence. The presence and absence of pneumatization were performed in the sagittal section. Hence, the following entities were assessed like unilateral or bilateral, unilocular or multilocular and presence or absence of the same.

### Results

The present study evaluate pneumatization of articular eminence with the help of CBCT imaging in the population. The following findings were noted in our study of 60 patients and 120 joints, scans of 32 males (53.3%) and 28 females (46.7%). The age range was between 18 to 60 years with mean age of  $36.53 \pm 11.754$ . Of the total 60 scans we found 12 patients (20%) which included both male and female who

showed pneumatized articular eminence. Between these 60 patients, a total of 120 Temporomandibular Joints were evaluated out of which 12 joints (20%) were found to be pneumatized. Among 32 male patients pneumatization of articular eminence was seen in 5 males (15.6%). Among 28 female patients pneumatization of articular eminence was seen in 7 females (25%)(table 1).

Of the 32 males 2 males (6.2%) showed multilocular pneumatization and 3 females (10.7%) out of 28 females showed multilocular pneumatization (table 2). Of the 32 males 3 males (9.4%) showed unilocular pneumatization and 4 (14.3%) of 28 females showed unilocularpneumatization. On evaluating the joints bilaterally we found that none of the cases showed bilateral pneumatization. All 12 subjects (20%) of 60 patients showed unilateral pneumatization of which unilateral pneumatization was seen in 5 males (15.6%) and 7 females (25.0%). When data was evaluated with chi square test no significant findings were noted. As the P value was recorded at 0.05 all the values were found to be greater than the level of significance.

**Table 1: Comparison of Pneumatization among males and females using chi square test**

			<i>Pneumatization Right</i>		<i>Total</i>
			<i>Present</i>	<i>Absent</i>	
<i>Gender</i>	<i>Male</i>	<i>Count</i>	3	29	32
		<i>%withinGender</i>	9.4%	90.6%	100.0%
	<i>Female</i>	<i>Count</i>	5	23	28
		<i>%withinGender</i>	17.9%	82.1%	100.0%
<i>Total</i>		<i>Count</i>	8	52	60
		<i>%withinGender</i>	13.3%	86.7%	100.0%
Chi square value:0.930      P value:0.335					

**Table 2: Showing statistical correlation of multilocular PAT among the males and females**

			<i>Multilocular</i>		<i>Total</i>
			<i>Present</i>	<i>Absent</i>	
<i>Gender</i>	<i>Male</i>	<i>Count</i>	2	30	32
		<i>%withinGender</i>	6.2%	93.8%	100.0%
	<i>Female</i>	<i>Count</i>	3	25	28
		<i>%withinGender</i>	10.7%	89.3%	100.0%
<i>Total</i>		<i>Count</i>	5	55	60
		<i>%withinGender</i>	8.3%	91.7%	100.0%
Chi square value:0.390      P value:0.533					

## Discussion

The cause of PAT is unknown but may be similar to that of pneumatization of the mastoid process. The most popular theory to explain pneumatization is resorption of diploic bone by an active invasion of tympanic epithelium.<sup>3</sup> Therefore, any process that interferes with epithelial growth, such as inflammation, would limit pneumatization.

Previous studies state, pneumatization of the mastoid process completes by 5 years of age and air cells continue to develop through adulthood.<sup>4-7</sup> Zygomatic process of the maxilla pneumatizes by 9 years.<sup>8</sup> Studies have reported patients as young as 15 and 19 years. Lack of documented cases of PAT in patients younger than 15 years might be attributed to the fact that young patients may not be exposed frequently to radiographic examinations that would show PATs or that the process of pneumatization does not become extensive enough to become radiographically evident until early adulthood.<sup>3</sup>

In the present study the male to female ratio of pneumatisation PAT was 1.1:1 whereas OMiloglu reported it to be 1.6:1. Prevalence of PAT was unilateral in all the twelve subjects i.e.20%. The present study did not find any case with bilateral pneumatisation as against the study by OMiloglu that has reported 75% unilateral pneumatisation and 25% bilateral cases.<sup>1</sup>

While panoramic radiographs may show the air cells next to the TMJ, only CT will show the medial section of the articular eminence. Thus, in order to guarantee excellent accuracy in this prevalence investigation of PAT, CBCT images were used. It is necessary to distinguish PAT from other radiolucencies found in the zygomatic arch, such as metastatic tumor deposits, aneurysmal bone cysts, haemangiomas, giant cell tumors, eosinophilic granulomas and fibrous dysplasia.<sup>9,10</sup>

According to reports, every other entity in the differential diagnosis exhibits painful cheek enlargement and appears as destructive, expansile lesions on radiography. When there is a differential diagnosis for suspected instances, CT imaging may be taken into consideration.<sup>1</sup> Pneumatization in the articular eminence that coincidentally appears without any symptoms should be monitored. When treating recurrent chronic mandibular dislocation, eminoplasty or eminectomy may not be appropriate if PAT is present.

## Conclusion

It is important for the Maxillofacial Radiologist to be aware about the normal variations that exist in the TMJ. Pneumatization of articular tubercle is an important

consideration as it may be misdiagnosed as pathology. Although the present study has reported a prevalence of Pneumatization of articular tubercle to be 8%, Larger population should be evaluated to know its frequency and variation in presentation.

## References

1. Betz B W, Wiener M D. Air in the temporomandibular joint fossa: CT sign of temporal bone fracture. *Radiology* 1991;180: 463–466.
2. O Miloglu, AB Yilmaz, E Yildirim and HM Akgul. Pneumatization of the articular eminence on cone beam computed tomography: prevalence, characteristics and a review of the literature. *Dentomaxillofacial Radiology* 2011;40;110–114
3. Mawson, S.R., and Ludman, H. *Diseases of the ear*, ed 4. Chicago, Year Book Medical Publishers, Inc, 1979;(7);12-13.
4. Allam AF. Pneumatization of the temporal bone. *Ann OtolRhinolLaryngol* 1969;78:48–64.
5. Hollinshead WH. *Anatomy for Surgeons: The Head and Neck*, 2nd edn. New York: Harper and Row 1968:190–4.
6. Tyndall D, Matteson S. The appearance of the zygomatic air cell defect (ZACD) on panoramic radiographs. *Oral Surg Oral Med Oral Pathol* 1987;64:373–6.
7. Kaugars GE, Mercuri LG, Laskin DM. Pneumatization of the articular eminence of the temporal bone: prevalence, development, and surgical treatment. *J Am Dent Assoc* 1986; 113: 55–57
8. Bichir C, Rusu MC, Vrapciu AD, Măru N. The temporomandibular joint: pneumatic temporal cells open into the articular and extradural spaces. *Folia Morphol (Warsz)*. 2019;78(3):630-636.
9. Groell R, Fleischmann B. The pneumatic spaces of the temporal bone: relationship to the temporomandibular joint. *Dentomaxillofac Radiol* 1999; 28: 69–72.
10. Zamaninaser A, Rashidipoor R, Mosavat F, Ahmadi A. Prevalence of zygomatic air cell defect: Panoramic radiographic study of a selected Esfehonian population. *Dent Res J (Isfahan)* 2012;9 Suppl 1:S63-8.