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ASSESSMENT OF PREVALENCE AND EXTENT OF PNEUMATIZATION OF TEMPORAL BONE BY COMPUTED TOMOGRAPHY IN INDIAN POPULATION: REVISITED

Dental Science

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ABSTRACT

Objective: To assess the prevalence of pneumatization in Computed tomographic sections of normal patients.

Study design: Retrospective CT scans of 220 patients with no pathology in temporal bone were collected and examined for the prevalence of pneumatization of temporal bone. Based on the extent of pneumatization from mastoid cavity to articular eminence [AE] it was divided into 4 groups.

Results: Among 220 patients 180 (81%) patients showed pneumatization. In 180 sections grade I pneumatization was seen in highest number of scans 74(41%) followed by grade zero with 31% grade II with 24% and least in grade III with 4% .Prevalence of pneumatization was found to be highest on right side compared to left side.

Conclusion: Prevalence and extent of temporal bone pneumatization can be assessed using CT sections significantly.

KEYWORDS

Pneumatization; Articular Tubercle; Mastoid Process; Computed Tomography

INTRODUCTION:

Pneumatization is the process during which epithelium infiltrates the developing bone and forms epithelium-lined air cell cavities[1].The squamous, petromastoid, and tympanic parts are the most seen pneumatized parts[2,3],but pneumatization sometimes may extend to the articular eminence of TMJ[4,5].

The pneumatization process begins prenatally, during the 22nd to 24th gestational weeks. At around 28 weeks of gestation, the petrous apex begins to be pneumatized [6]. The pattern of pneumatization of the temporal bone is normally completed by the age of 15 years in males and 10 years in females [7].

In routine head and neck radiology practice, a bulk of the temporal bone is routinely visualized on TMJ and orthodontic studies; thus, it is important for dentists in general and oral radiologists in particular to know normal anatomical variations and pneumatization patterns to identify any pathological changes and make appropriate referrals to specialists in this region like otorhinolaryngologists and neuroradi ologists [8].

MATERIALS AND METHOD:

The present study analyzed retrospective CT scans of patients with normal temporal bone in axial, coronal, sagittal sections. A total number of 220 CT scans of patients with both the gender were collected from Kamineni institute of Medical sciences. The age of the patients ranged between 8-75years. All the scans were assessed for prevalence of pneumatization of temporal bone and extension of it. Based upon extent of pneumatization from mastoid process to articular eminence CT sections were divided into 4 groups according to classification given by Al- Faleh W et al [9] (Table 1). Statistical analysis was done using SPSS 19 software.

TABLE 1: The grading system for air cell pneumatization

GRADE	LOCATION
GRADE 0	The air cell are limited to the mastoid process. .[figure1]
GRADE 1	The air cells extended between the mastoid process and the deepest point of the glenoid fossa. .[figure2]
GRADE 2	The air cells extended from the deepest point of the glenoid fossa to the crest of the articular eminence.[figure3]
GRADE 3	The air cells extended beyond the crest of the articular eminence.[figure 4]

RESULTS:

Among 220 scans pneumatization was found n 180 (81%) scans out of which 124 (69%) were males and 56 (31%) were females (Table 2).The mean age of the patients was 39.8 ± 4.98.

Among 180 scans grade 1 type of pneumatization was found in 74 scans (41%) among which 52 (28%) were males and 22 (12%) were females. Grade 0 pneumatization was found in 54 (30%) scans out of which 42(23%) were males and 12(6%) were females. Out of 46 (25%) grade 2 pneumatization 28(15%) were males and 18(10%) were females. Grade 3 pneumatization was found in 6 patients out of which 2(1%) were males and 4(2%) females (Table 3). Extent of pneumatization was compared among right and left sides. It was found to be highest on right side compared to left side. Though it was seen more on right side the difference was not statistically significant (P>0.001) (Table 4).

DISCUSSION:

Pneumatization has been ascribed to perform the below functions : reception of sound, resonance, insulation, air reservoir action, acoustic dissipation [10], protection from external violence [11] and lightening of the weight of the skull [12]. Pneumatization of the articular eminence of the temporal bone is a relatively uncommon incidental finding in dental practice. Often, patients presenting with facial pain has to be evaluated with a complete history and physical examination, which includes obtaining proper radiographic images [13]. 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 [14].

The pneumatized articular eminence is an important finding due to its potential for causing complications. In these cases, the roof of the glenoid fossa gets weakened due to pneumatization [15].

Many other classification systems [8] were proposed for estimation of extent of pneumatization but analyzing based on grading as done in present study is comparatively easier and can be demarcated in all the tomographic sections of CT. Many authors have used various radiographic techniques ranging from conventional tomograms to CBCT to assess the pneumatization for evaluation or as a pre surgical procedure.

Our study results match with the results of Al-Faleh et al [9], who examined 300 conventional TMJ tomograms showed that highest incidence of air cells in the right and left temporal component was that of grade I, followed by grade II, and the least incidence was that of grade III.

In a restrospective study of 1049 panaromic radiographs conducted by Orhan K et al [16] showed prevalence of 1.62% pneumatized articular eminence. Another study Shokri A et al [17]examined 1694 panaromic radiographs and found a prevalence of 6.2% pneumatized articular tubercle.

Temporal bone pneumatization was examined in 225 computed tomography scans by Bronoosh P et al [18] and found 9.55% prevalence of PAT. Nascimento et al [19] in a study evaluated CBCT images of 698 patients and concluded that 3.3 % of individuals presented with zygomatic bone pneumatizations. Mosavat F et al [20] evaluated retrospective CBCT scans of 239 patients, and suggested that Pneumatized articular tubercle prevalence was 51% in females and 49% in males as seen in the present study.

Previous studies findings in the literature suggested that the prevalence of hyperpneumatization is not uncommon and can cause easy fractures and extension into articular tubercle and zygomatic process can caused damage to facial nerve and lead to serious complications.Hence pre evaluation before critical surgeries is helpful and can prevent life threatening conditions.kaugers et al [21] using panaromic radiographs has concluded that PAT is prevelant in adults affecting TMJoint hence before surgical procedures like eminectomy evaluation is much important.

The grading system followed in the present study is easier and can clearly demarcate the landmarks. Sometimes overlap may be seen over ear canals or labrynthine vessels. Hence proper isolation has to be done which may lead to errors in estimating the extent and can be considered as a limitation of above study.

CONCLUSION:

Pneumatization is a routine finding in most of the cases which is mostly neglected and the extension must be noticed during radiographic evaluation. The Present study helps to clearly locate the pneumatization in CT images which provide high contrast.

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