A population-based retrospective study of zygomatic air cell defect in Bengaluru

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Abstract

Aim: The aim of the study is to determine the occurrence, radiographic appearance, disparities, features and establishing predominant site, and form of zygomatic air cell defect (ZACD) among the population in Bengaluru.

Materials and Methods: The orthopantomographs of 600 dental hospital outpatients were examined to estimate the occurrence and characteristic features of the ZACD.

Results: ZACD was evaluated to be present in 16 patients with male predominance. Unilateral (69%) and unilocular appearances (56%) of ZACD were the dominant patterns.

Conclusion: It is essential to identify the ZACD before surgical procedures to avoid inadvertent post-surgical complications. Among Indian population, the incidence of ZACD is in accordance with the other supplementary studies performed in other populations worldwide.

Keywords:
Pneumatization, surgical complications, zygomatic air cell defect

Introduction

Panoramic radiographs are the good diagnostic aid in clinical practice as they can appreciate precisely the pathology from the normal anatomy. Pneumatization is commonly seen in paranasal sinuses. Zygomatic air cell defect (ZACD) also acknowledged as pneumatized articular eminence (PAE) and pneumatized articular tubercle, a variable form of normal anatomy which is apparent on panoramic radiographs.1,2 The most commonly involved pneumatic bone is temporal, and air cells are a series of collaborating craters existing within the bone which is surrounded by mucous membranes.3 Hence, ZACD is implied as pneumatized air cells in the zygomatic process of temporal bone. This entity usually goes unnoticed during dental practice and is consider to be authoritative to evaluate its variations among different populations studied.

Materials and Methods

Patients time of life selected between ranges of 10-60 years, who reported to the OPD of our Department were nominated by stratified random sampling. It consists of 600 patient population which was divided into various groups as follows: Groups I-IV with the age range of 10-year interval as 10-19 years, 20-29 years, 30-39 years, 40-49 years, and 50-59 years, respectively [Graph 1].

Patients with developmental craniofacial malformations, any systemic conditions affecting growth, any past history of trauma and with clinical or radiographic pathologies in jaws or face region, and those who had undergone any surgical intervention were excluded from this study. Panoramic radiographs of the patients were taken using a panoramic component Orthophos DS; Sidexis XG for children 14.1 s, 62 kVp, 8 mA and adults 14.1 s, 64 kVp, 8 mA and were interpreted. Patient was asked to remove glasses, dentures, and other artificial things and complete instructions were given how to bite on bite block, close his lips and place the tongue against the roof of the mouth, and make his head stable. The ZACDs were recognized and assembled on the basis of locularity as unilocular or multilocular and laterality as unilateral or bilateral predominantly. The data obtained were tabularized, and statistical analysis was done for the same [Figures 1 and 2].

Results

The average age of the studied patients was 25 years; 29 years in males and 42 years in females. For our study, 600 sample size
was taken, and we found ZACD in 16 patients, giving an overall incidence of 2.7%. Out of 16 ZACDs, three were in Group I, four in Group II, six in Group III, two in Group IV, and one in Group V [Graph 1].

Out of 16 ZACDs, 10 were in males and 6 were in females. Among 16 ZACDs, 11 were unilateral and 5 were bilateral. Among the 11 unilateral ZACDs, 4 were seen in males left and 3 in the right and 3 in females left and 1 in right side [Table 1]. Of the 5 bilateral ZACDs, 3 were in males and 2 were in females. Among the 16 ZACD, 9 were of the unilocular type and 7 were multilocular [Graph 2].

A 2×2 contingency table was made for Chi-square test to find the association between two categorical variables, i.e., gender (males and females) and the presence of unilocular and multilocular in patients [Table 2].

### Discussion

ZACD has unknown etiology but is comparable to that of pneumatization of the mastoid process. Small bony cavities are formed during the pneumatization of normal periosteum.\(^4\) It is a process of asymptomatic expansion of cavities containing air within the bone and temporal bone, ethmoid bone, and mastoid cells are the most important sites of maxillofacial region with infrequent sites including middle ear, squamomastoid, petrous apex, and perilabyrinthine.\(^5\) ZACD appears to be comparable with mastoid air cells and has been represented as accessory air cells which do not cross zygomaticotemporal suture anteriorly and are found to be present within the limitation of zygomatic process and articular eminence of the temporal bone.\(^6\)

Tremble, in 1934, reported the dispersal of air cells in the temporal bone. Tyndall and Matteson, in 1985, coined the word PAE and PAT and in 1987 coined the word ZACD.\(^1,7\) The growth of pneumatization is divided into three phases and are as following: An infantile, transitional, and adult phases with the age duration of birth to 2 years, 2-5 years,
and 5 years, respectively, and once the adult stage is reached, the process of pneumatization of temporal bones is accomplished by the age of ten years.[5] The process of pneumatization of temporal bones is accomplished by the age of ten years. ZACD did not show any physical signs, non-expandable, constructive radioopacity and was classified in 1985 by Tyndall and Matteson as unilocular, multilocular, and trabecular. Unilocular variant appears as a radiolucent defect, oval in shape with well-defined border, multilocular appears numerous small voids within the bone whose appearance resembles air cells present within mastoid bone, and trabecular is a variable form of multilocular with internal bony striations. 

The occurrence of ZACDs in the present study is 2.7% without any differentiation in male and female ratio, and the criteria came up with the mean age of the patients as 25 years. The incidence of ZACDs diminishes with age, and this finding was common among other studies as well. In the present study, the earliest patient to develop ZACD was 16 years of age, and approximately two-third of the ZACDs were unilateral and one-third were bilateral which appears to be quite similar to the study of Patil et al., Zamaninaser et al., and Friedrich et al.[10-12] In the study done by Carter et al., the result was 32 were unilateral and 8 were bilateral, 24 cases of ZACD (77.4%) were unilateral and 7 cases (22.6%) were bilateral by Parker et al. and Srikanth et al., and in their study conducted in South Indian population 15 were unilateral and 6 were bilateral.[12,13] This investigation concluded that high proportion of ZACDs were on the left side, on comparing to other studies which show the right side predominancy. In the present study, we evaluated that the most common occurrence of unilateral ZACDs was in males which was comparable to the study conducted by Patil et al. and Srikanth et al. In our study, nine were unilocular and multilocular was 9 and 7, respectively, which was opposite to study conducted by Patil et al., in which unilocular and multilocular appearances were 45 and 96, respectively.[10] Srikanth et al. stated that in his study, six were multilocular and 2 were unilocular which was totally contradictory with the study performed by Park et al. as 26 (68.4%) defects were of unilocular, whereas 12 defects (31.6%) were of multilocular. 

The defect in pneumatic spaces as in zygomatic process, temporal pneumatization spaces are directly proportional with various pathologies. Previous studies have highlighted that pneumatizations’ exposure can lead to cranial sepsis and infection during eminectomies.[3] During surgeries, there are chances of dural tear and leakage of cerebrospinal fluid due to accidental penetration through the defect. If ZACD has been detected preoperatively, then it serves as a contraindication for performing eminoplasty or eminectomy to treat recurrent mandibular dislocation, and alternative surgical therapy is indicated. 

There are more chances of these air spaces being ruptured during maxillofacial trauma.[6] For example, during fracture of glenoid fossa, there may be penetration of soft tissue contents into the middle ear resulting in the middle ear infections and mastoid effusion and may serve as the cause of mastoid tumors extending into temporomandibular joint (TMJ) which may further lead to ankylosis of TMJ as a complication.[2]

The various entities such as aneurysmal bone cyst, central hemangioma, central giant cell tumor, eosinophilic granuloma, fibrous dysplasia, and metastatic tumors are considered as differential diagnosis due to the involvement of zygomatic processes of the temporal bone.[1,2,7]

Conclusion

ZACD is considered to be an incidental finding with an unknown etiology. Computed tomography scan is considered to be the better option for precise visualization, and for the further confirmation of the diagnosis making professional as radiologists, diagnosticians, and surgeons are aware of this entity so that they can avoid complications in further practice. The present study demonstrates the appearances and various types of ZACDs among the Bengaluru population.

References

11. Friedrich RE, Schulz F, Scheuer HA. Pneumatic spaces of the


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