IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 23, Issue 3 Ser. 4 (March. 2024), PP 42-45
www.iosrjournals.org

A Retrospective Study To Assess The Prevalence Of Anatomical Variations Of Maxillary Sinus And Osteo-Meatal Complex Using Cbct

Dr. Sarumathi.T[1], Dr. Kavitha.M[2], Dr. Devi.S[3], Dr. Samu Fathima[4], Dr. Guruswathy.R[5], Dr. Santhiya. K[6]

[1]*professor And Head Of Department Of Oral Medicine And Radiology, Madha Dental College And Hospital, Chennai-69*
[2]*professor, Department Of Oral Medicine And Radiology, Madha Dental College And Hospital, Chennai-69*
[3]*corresponding Author, Postgraduate Student, Department Of Oral Medicine And Radiology, Madha Dental College And Hospital, Chennai-69*
[4]*senior Lecturer, Department Of Oral Medicine And Radiology, Madha Dental College And Hospital, Chennai-69*
[5]*postgraduate Student, Department Of Oral Medicine And Radiology, Madha Dental College And Hospital, Chennai-69*
[6] *Postgraduate Student, Department Of Oral Medicine And Radiology, Madha Dental College And Hospital, Chennai-69*

Abstract
Background and objectives: *the maxillary sinuses and osteo-meatal complex are of particular importance to dentist because of their close proximity to the teeth and their associated structures, so increased risk of maxillary sinusitis has been reported with periapical abscess, periodontal diseases, dental trauma, tooth extraction and implant placement. Cone beam computed tomography (cbct) is a radiographic imaging method that allows accurate, three-dimensional(3d) imaging of hard tissue structures. Is the most significant among medical diagnostic imaging modalities that have emerged recently. The purpose of this study is to assess the interobserver variability and prevalence of anatomical variation in maxillary sinus and osteo-meatal complex using cbct of asymptomatic patients.*
Material and methods: *cbct images (maxilla) were collected from various diagnostic scan centres in chennai city. Evaluation of images was done by two well experienced radiologists in imaging sciences for identification of the prevalence of the anatomical variations in maxillary sinus and osteo-meatal complex.*
Results*: the result obtained in the present study is substantial interobserver variability and higher frequency and percentage distribution of agger nasi cells-89% followed by ethmoidal bullae-88%, haller cells-81%, paradoxical middle turbinate-72%, spheno-ethmoidal air cells-42%, bullous type of concha bullosa-41%, uncinate process-41% and thickening of nasal septum-34%.*
Conclusion: *the occurrence of abnormalities in asymptomatic maxillary sinus emphasis how important it is for dento-maxillofacial radiologist to undertake a comprehensive interpretation of whole volume acquired in cbct images in identification of the prevalence of the anatomical variations in maxillary sinus and osteo-meatal complex.*
Keywords: *anatomical variations, osteo-meatal complex, maxillary sinus pathology*

Date of Submission: 13-03-2024 Date of Acceptance: 23-03-2024

I. Introduction

Maxillary sinuses are facial pyramidal cavities with thin walls corresponding to the orbital, alveolar, facial and infratemporal aspects of the maxilla. The size, shape and wall thickness of this anatomic structure vary from one individual to another. The maxillary sinuses are of particular importance to dentist because of their close proximity to the teeth and their associated structures, so increased risk of maxillary sinusitis has been reported with periapical abscess, periodontal diseases, dental trauma, tooth extraction and implant placement. Cone beam computed tomography (cbct) is a radiographic imaging method that allows accurate, three-dimensional(3d) imaging of hard tissue structures. Is the most significant among medical diagnostic imaging modalities that have emerged recently. Although cone beam computed tomography (cbct) images of the maxillofacial region allow the inspection of entire volume of maxillary sinus, identifying anatomic variations and abnormalities in the image

volume, is frequently neglected by oral radiologists. The osteo-meatal complex/ osteo-meatal unit is a functional three-dimensional entity that links the frontal sinus, anterior ethmoidal air cells and the maxillary sinus to the middle meatus, act as a final common pathway for ventilation and mucociliary drainage. It is bounded superiorly and posteriorly by basal lamella, medially by middle turbinate and laterally by lamina papyracea, enclose the following anatomical variations such as middle concha bullosa, haller cells, agger nasi cells, spheno-ethmoidal air cells, uncinate process of ethmoid bone, enlarged ethmoid bullae, paradoxical middle turbinate, nasal septum and maxillary sinus pneumatisation. Hence the anatomical variations of these regions are important for proper drainage and ventilation, obstruction may proceed to recurrent chronic rhinosinusitis, mid facial pain and nasal blockade. Moreover, it also has the ability to ensure the outcome of surgical procedures. The cbct images were taken in the carestream cs-9600 with tube voltage of 70kvp, tube current of 5ma with exposure of 5 secs. The images were evaluated using planmeca software by two maxillofacial radiologists well experienced in radiologic imaging sciences.

II. Materials And Methods

In our retrospective study, cbct scans of 100 subjects were collected from various diagnostic scan centres in chennai city, which were referred for cbct examination of the maxillofacial region.

Inclusion criteria

Patients who were taken cbct for implant placement, impaction in the age group of 20-40 years of both genders. Patients with asymptomatic maxillary sinus and osteo-meatal complex pathologies were included in the study.

Exclusion criteria

Cbct images of patients with maxillary sinus and osteo-meatal complex disorders, other pathologic conditions like trauma, benign and malignant lesions infiltrating maxillary sinus and osteo-meatal complex.

Statistical analysis

Data were entered in microsoft excel spreadsheet and analysed using spss software (ibm spss statistics, version 20.0, armonk, ny: ibm corp.). Descriptive statistics were used for data summarization and presentation. A p value of 0.05 were considered to be statistically significant. Kappa statistics was done for interobserver variability.

III. Results

Table 1: interobserver variability for anatomical parameters

Observer 1		Observer 2			Total	Kappa value	P value
Nasal septum	Anterior dislocation	3	0	1	4	0.688	0.002
	Thickening of nasal septum	0	4	0	4		
	Thickening with anterior dislocation	0	1	1	2		
Concha bullosa	Lamellar type	2	0	0	2	0.643	0.006
	Bullous type	0	5	1	6		
	Extensive type	0	1	1	2		
Ethmoidal bulla	Absent	2	1	-	3	0.524	0.098
	Present	1	6	-	7		
Paradoxical middle turbinate	Absent	4	0	-	4	1.000	0.001
	Present	0	6	-	6		
Agger nasi cells	Absent	2	0	-	2	0.545	0.053
	Present	2	6	-	8		
Haller cells	Absent	4	0	-	4	0.615	0.035
	Present	2	4	-	6		
Sphenoethmoidal cells	Absent	6	0		6	0.623	0.016
	Present	1	3		4		
	Absent	6	0	-	6	1.000	0.002

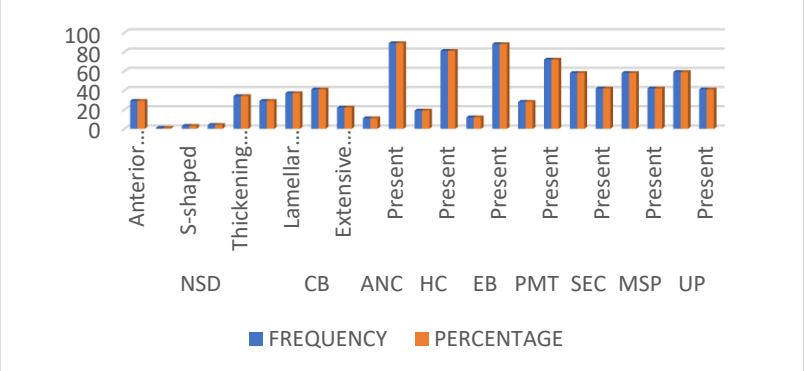
Maxillary sinus pneumatisation	Present	0	4	-	4		
Uncinate process	Absent	6	2	-	8	0.545	0.053
	Present	0	2	-	2		

Interobserver variability was statistically significant among the following parameters includes nasal septal deviation, concha bullosa, paradoxical middle turbinate, agger nasi cells, haller cells, sphenoethmoidal cells, maxillary sinus pneumatisation and uncinate process of ethmoid bone.

Table 2: frequency and percentage distribution of anatomical parameters

Anatomical parameters	Options	Frequency	Percentage
Nasal septal deviation	Anterior dislocation	29	29.0
	C-shaped	1	1.0
	S-shaped	3	3.0
	Nasal spur impinging on middle turbinate	4	4.0
	Thickening of nasal septum	34	34.0
	Thickening with anterior dislocation	29	29.0
Concha bullosa	Lamellar type	37	37.0
	Bullous type	41	41.0
	Extensive type	22	22.0
Agger nasi cells	Absent	11	11.0
	Present	89	89.0
Haller cells	Absent	19	19.0
	Present	81	81.0
Ethmoidal bulla	Absent	12	12.0
	Present	88	88.0
Paradoxical middle turbinate	Absent	28	28.0
	Present	72	72.0
Sphenoethmoidal cells	Absent	58	58.0
	Present	42	42.0
Maxillary sinus pneumatisation	Absent	58	58.0
	Present	42	42.0
Uncinate process	Absent	59	59.0
	Present	41	41.0

In our present study, the frequency and percentage distribution of anatomical parameters is highest for agger nasi cells 89% followed by ethmoidal bullae 88%, haller cells 81%, paradoxical middle turbinate 72%, sphenoethmoidal air cells 42%, bullous type of concha bullosa 41%, uncinate process 41% and thickening of nasal septum 34%. (table2) which represented in the form of graph1.



Graph 1 representing frequency and percentage distribution of anatomical parameters

IV. Discussion

In the present research, cbct images taken from 100 patients were evaluated to determine the prevalence of anatomical variations of the maxillary sinus and its components and interobserver variability in south-indian subjects. A significant relationship interobserver variability was observed between nasal septal deviation, concha bullosa, paradoxical middle turbinate, agger nasi cells, haller cells, spheno ethmoid cells, uncinate process of ethmoid bone and maxillary sinus pneumatisation.

Anatomical variations of maxillary sinus and its components has its direct associations for ventilation and drainage of the paranasal sinuses and its importance to dentistry because of its close proximity to posterior tooth region. Differences in the ethnicity, race and age of patients, the type of imaging modality, study population used, can lead to this discrepancy of the results.

Agger nasi cells (agn) situated in the frontal recess of maxilla, it is formed by pneumatisation of anterior ethmoidal cells. The frequency and percentage distribution of agn detected to be 89%, which is similar to the study conducted by liu et al and contradictory to the study conducted by wormald et al. According to bora et al suggested that the agger nasi cells are normal variant and hence they present in higher frequency.

Haller cells (hc) also called as infraorbital cells located superior to the maxilla and inferior to the floor of the orbit. In our present study, the frequency and percentage distribution of haller cells detected with 81%. Which is similar to the study conducted by khojastepour et al and contradictory to the study conducted by mathew et al. The difference in the wide range may be due to variation in the study population, sample size, imaging techniques utilised, difference in ethnicity, race, age and gender of the populations.

Paradoxical middle turbinate (pmt) is a rare anatomical variant is formed by pneumatisation of middle concha bullosa, in our present study the frequency and percentage distribution of pmt with 72%, which is similar to the study conducted by mohammad waheed ei-anwar et al and contrsary to the study conducted by temur et al.

Spheno-ethmoidal cells (sec) also called as onodi cells located in the upper anterior margin of sphenoidal air sinus. In our present study, the frequency and percentage distribution of sec with 42%, which is similar to the study conducted by ibrahim k ali et al, contradictory to the study conducted by gleamy et al.

Concha bullosa (cb) is defined as the presence of pneumatization of any size within the superior, middle or inferior conchae. In our present study, the frequency and percentage distribution of three types of cb were evaluated among them the bullous type of cb 41% followed by lamellar type 37% and extensive type 22%, which is similar to the study conducted by smith et al and contradictory to the study conducted by bora et al. According to the certain literature, concha bullosa has a significant role with maxillary sinus volume and nasal septal deviation.

Sinus pneumatisation is a normal physiological process, the volume of sinus increases with age, according to certain literature, the maxillary sinus volume increased due to posterior tooth loss and palatal displaced canine than buccally displaced canine. In our present study, the frequency and distribution of maxillary sinus pneumatisation with 42%, which is similar to the study conducted by michael j et al.

V. Conclusion

The normal anatomy and variations in maxillary sinus and osteo-meatal complex in the morphology on a cone beam computed tomography should be acquainted by clinicians in order to correlate with pathological conditions. Subsequently, that the distribution of rates of anatomical variations of maxillary sinus and osteo-meatal complex may be caused by the differences in the variation classification, ethnic origin, difference in the weight rates of the genders, difference in the imaging methods used for evaluation and difference in the population size.

Future perspectives

The future study can be conducted with larger sample size and the prevalence of the anatomical variations may be correlated with age, gender and pathological conditions.

Bibliography

[1] Whyte A, Boeddinghaus R. The Maxillary Sinus: Physiology, Development And Imaging Anatomy. Dentomaxillofac Radiol. 2019 Dec;48(8):20190205.
[2] Anon Jb, Rontal M, James Zinreich S. Anatomy Of The Paranasal Sinuses. Thieme Medical Publishers; 1996. 224 P.
[3] Mamatha H, Shamasundar N, Bharathi M, Prasanna L. Variations Of Ostiomeatal Complex And Its Applied Anatomy: A Ct Scan Study. Indian J Sci Technol. 2010;3(8):904-7.
[4] Keast A, Yelavich S, Dawes P, Lyons B. Anatomical Variations Of The Paranasal Sinuses In Polynesian And New Zealand European Computerized Tomography Scans. Otolaryngol Head Neck Surg 2008;139(02):216–221
[5] Ritter L, Lutz J, Neugebauer J, Scheer M, Dreiseidler T, Zinser Mj, Et Al. Prevalence Of Pathologic Findings In The Maxillary Sinus In Cone-Beam Computerized Tomography. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2011; 111:634-40.
[6] Baweja S, Dixit A, Baweja S.Study Of Age Related Changes Of Maxillary Air Sinus From Its Anteroposterior, Transverse And Vertical Dimensions Using Computerized Tomographic (Ct) Scan.Ijbr 2013;4:21-5.