

A STUDY OF MORPHOLOGY OF AIR CELLS IN THE MIDDLE TURBINATE AND IT'S RELATIONSHIP WITH SINUSITIS AND DEVIATED NASAL SEPTUM

E. Kamala¹, N. Vinay Kumar², Kavın Raj³, T. S. Gugapriya⁴, Senthil Rajkumar⁵

HOW TO CITE THIS ARTICLE:

E. Kamala, N. Vinay Kumar, Kavın Raj, T. S. Gugapriya, Senthil Rajkumar. "A Study of Morphology of Air Cells in the Middle Turbinate and it's Relationship with Sinusitis and Deviated Nasal Septum". Journal of Evidence based Medicine and Healthcare; Volume 2, Issue 8, February 23, 2015; Page: 976-982.

ABSTRACT: INTRODUCTION: Concha bullosa, the pneumatization of the middle turbinate is commonly found as an anatomical variation and is said to be usually associated with deviated nasal septum. It is classified into bulbous, lamellar and extensive variety. **METHODS:** 100 coronal CT images of chronic sinusitis patients of both sexes were studied for the 3 varieties of concha bullosa and its association with deviated nasal septum and sinusitis. **RESULTS:** The concha bullosa found was classified into lamellar (23%), bulbous (3%) and extensive (16%) variety based on the definitions and compared. The results obtained shows that in southern Tamil Nadu population the lamellar variety of concha bullosa was more prevalent than the other two varieties. Also a significant relationship was found to exist between concha bullosa, deviated nasal septum and sinusitis (19%). Similarly, the association of concha bullosa and deviated nasal septum and with sinusitis was seen in 16% and 4% respectively. **CONCLUSION:** Hence the study suggests that the otolaryngologists should be aware of the prevalence of lamellar variety of concha bullosa and familiar with the co- existence of concha bullosa, deviated nasal septum and sinusitis for proper interpretation and diagnosis.

KEYWORDS: Concha Bullosa, Pneumatized Middle turbinate, Deviated Nasal septum, Sinusitis, CT.

INTRODUCTION: The nasal cavity is the reception point of inspired air. It has many structures each with a specific set of function. The nasal septum gives support to the nasal structures whereas the lateral nasal wall takes the important function in conditioning the inspired air. Amongst them the middle concha plays a very vital role as it warms and humidifies the air that is inspired. ^(1, 2) The ethmoidal fold of middle nasal wall gives rise to the middle nasal concha. The anterior and middle ethmoidal air cells start to develop as invaginations into the middle meatus of the nose from the nasal cavity around the third month of intra uterine life.⁽²⁾ There are suggestive studies showing that the middle turbinate may also be pneumatized by the posterior ethmoidal air cells around the same time.⁽¹⁾

The air cells of middle turbinate is otherwise called Concha bullnose (CB) or middle turbinate pneumatization⁽³⁾ or bullous middle turbinate,⁽⁴⁾ while Pneumatization can also appear in the superior and inferior concha less frequently. It is commonly found as an anatomical variation and is said to be usually associated with deviated nasal septum and with sinus disease.⁽⁵⁾

ORIGINAL ARTICLE

CB of the middle turbinate is classified broadly into three types :^(5, 6)

- **Lamellar:** pneumatization of the vertical lamella of the concha.
- **Bulbous:** pneumatization of the bulbous segment.
- **Extensive (total):** pneumatization of both lamellar and bulbous parts of the concha.

The positive CT findings for CB have varied from 14 - 53%.⁽⁶⁾ Existing literature reporting states that bulbar and extensive variety prevails more than the lamellar variety⁽⁷⁾ and a higher female prevalence.⁽⁸⁾

Nasal septal deviation was claimed to occur due to CB, while contradicting claims stated that a prominent CB was found only on the contra lateral side of deviation or no association between them.^(9,10,11) The existence of CB in sinusitis patients was noted in few studies but not statistically proven by them.^(12,13,14,15) A lot of studies discussed the relation between extensive type CB, DNS and sinusitis, expect few^(7,16,17) all described mainly extensive type of CB.

The obstruction of airflow by the presence of CB or deviated nasal septum has been proven, but the correlation of the pathology of the para nasal sinuses and CB are still controversial.

Hence the aim of this study was to identify the prevalence of the lamellar and bulbous variety of the CB to correlate its association with sinusitis and deviated nasal septum in the population of southern Tamil Nadu.

MATERIALS AND METHODS: This was a cross sectional observational Computed tomography coronal axis study. The study was conducted according to Helsinki directions to conduct medical research by the World Medical Association after obtaining the institutional ethical committee clearance. For this study, 100 patients who had complaints of chronic sinusitis and headache were enrolled with their informed consent. The age of the study population varied between 5 to 90 years of age. Mean age being 47.5 years. Out of 100 patients 57% were males and 43% were females. Then the case history of the patients was recorded.

Those who had previous sinus surgery, with sino nasal polyps, and those with any iatrogenic or pathological alteration in nasal anatomy were excluded. The coronal CT pictures of the patients were taken using Wipro GE Model 5114671/2 machine. The soft and hard copies of the pictures were then collected. The coronal CT pictures were then interpreted by the trained and expert professionals. Following interpretation of the CT pictures, the observations and inferences were documented using the data proforma and statistical analysis was carried out.

CASE CLASSIFICATION:

- Patients with paranasal sinus inflammatory disease were identified and graded as mild, moderate or severe.
- Sphenoid, ethmoid, maxillary, and frontal sinuses were each graded separately on both sides.
- If pneumatization of the middle turbinate was seen then it was graded in size as small, moderate, or large. If bilateral conchae were present, sizes were compared and the larger was identified as dominant.

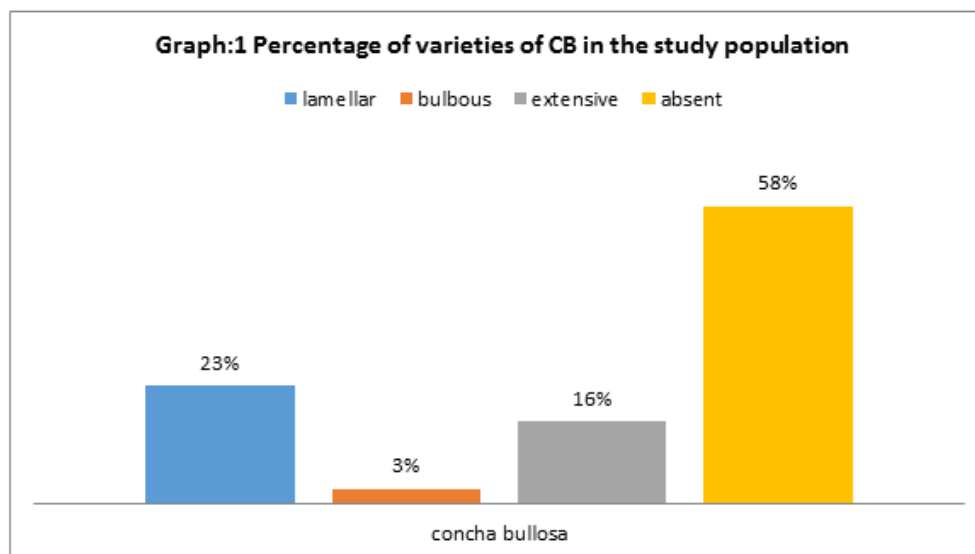
ORIGINAL ARTICLE

- The identified CB was also classified according to the area of pneumatization as bulbous, lamellar and extensive type.
- The side of presentation of CB was also taken into account as right, left or bilateral.

STATISTICAL ANALYSIS: All values were expressed as mean+SD. The prevalence of CB of lamellar type and bulbous type were calculated and expressed as percentages. All data were tabulated in MS-Excel Sheets and analyzed using SPSS software.

OBSERVATIONS & RESULTS:

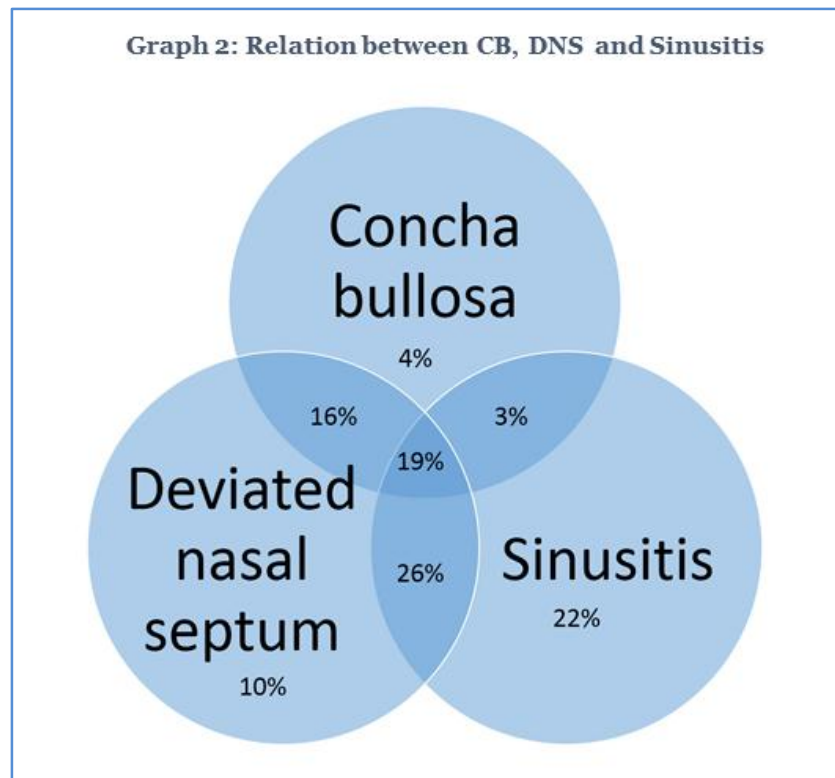
CONCHA BULLOSA: The three varieties of CB, bulbous (Figure-1), lamellar (Figure-2) and extensive (Figure-3) types were identified and their percentage in the study population was tabulated. (Graph 1)



Amongst the patients with CB, 29% had unilateral and 13% had bilateral variety. Amongst the 29% unilateral, left and right side CB were seen in 16% and 13% respectively. In the bilateral variety, right side was dominant in 4% of patients studied. Based on severity of the CB, 42% was divided into mild 17%, moderate 23% and severe 2%.

RELATIONSHIP BETWEEN CB, DEVIATED NASAL SEPTUM AND SINUS DISEASE (GRAPH 2): In the total population, the percentage of people with co-existing CB, deviated nasal septum and sinus disease was 19%. Sinus disease was absent radiologically in 16% of patients with CB and deviated nasal septum. While 3% had CB and sinus disease but with no deviated nasal septum.

Nasal septum deviation and sinus disease was seen in 26% with absence of CB in them. Sinus disease, deviated nasal septum was seen in 22% and 10% respectively without any other associated features. In 4% had only CB and nasal septum deviation with absence of sinus disease.



STATISTICAL ANALYSIS: The statistical analysis of the above observations was done using SPSS software. In that Fisher's Chi square test 2x2 was used for comparing the population with CB and deviated nasal septum and the p value was found to be 0.0001 ($p < 0.05$). The above data shows that the relationship between CB and Deviated nasal septum is significant.

The Fisher's exact probability test 2x3 was applied to population having CB, deviated nasal septum and sinusitis and the p value was 0.000155 ($p < 0.05$) which shows that the relationship is strongly significant.

When the data for the people with deviated nasal septum and sinusitis was evaluated using Fisher's Chi square test 2x2, the p value was 0.0087 ($p < 0.05$) and again proved to be significant.

But when the same test was applied to the data with CB and sinusitis the p value was 0.2022 ($p < 0.05$) and showed that in the collected data there was no significant relation between CB and sinusitis. 26% showed statistically significant ($p = 0.0087$) association between deviated nasal septum with sinusitis.

DISCUSSION: Although research into the mechanism of CB formation was beyond the scope of this study, it is generally considered that the airflow pattern of the nasal cavity plays an important role. Pneumatization of the middle turbinate is augmented in the contralateral side as the airflow is markedly reduced in the nasal cavity due to the convexity of the deviation. ⁽²³⁾ On contrary to the previous reports of extensive and bulbar type predominance,^(8,16) this study found the lamellar variety in increased incidence in the population of southern Tamil Nadu.

ORIGINAL ARTICLE

Further the present study data on the incidence of bulbous and extensive variety also stands varied from the previous studies.^(7,8,11,16,18) This difference in prevalence rates of each type of CB may indicate data specific to Tamilnadu population.

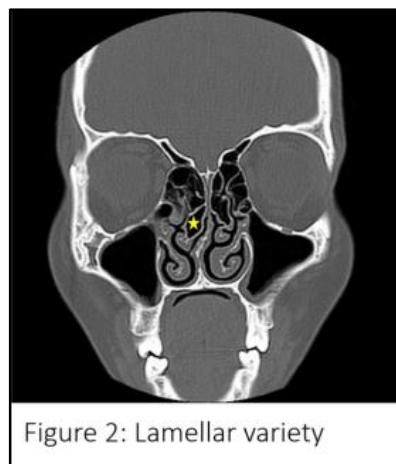
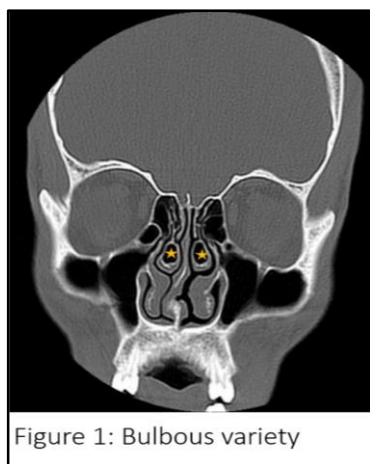
The incidence of presence of CB in deviated nasal septum was equal or lower when compared to previous studies.^(8, 10, 11, 18) This may be due to the difference in ethnicity and age group of the study population included for this study. Few studies similar to present study design on association between CB and DNS never proved their relation statistically.^(12, 18)

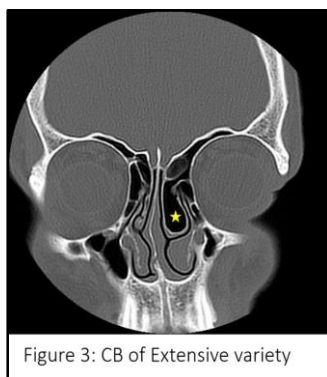
Even though the occurrence of CB with deviated nasal septum and sinusitis was noted and reported by numerous studies,^(7, 13, 20, 21, and 22) their association was statistically proved significant by the present. In contrary to this, a study showed insignificant association between these features in a large sample size.⁽²³⁾ The present study also found insignificant association between CB and sinusitis which is in conformity with few of the earlier reporting.^(13,14,15,16)

As the presentation of CB in DNS and sinusitis had been proved strongly, it is recommended that more longitudinal studies should be done in both symptomatic DNS and sinusitis patients to identify the exact mechanism of development of CB and thereby help the surgeons to curb CB at its earliest.

CONCLUSION: This study on the morphology of air cells in the middle turbinate and its relationship with occurrence of sinusitis and deviated nasal septum concludes that

1. The type of CB predominant in the population of southern Tamil Nadu is the lamellar variety against the popular belief of bulbous variety being more common.
2. There is a statistically significant relationship between CB, deviated nasal septum and sinusitis. However, the etiological correlation and the sequence of events need to be evaluated.
3. Against popular theory, the association present between deviated nasal septum and CB is also made significantly evident by the present study.
4. Similarly, in contrast to the well accepted hypothesis of the relation between sinusitis and CB this study witnessed insignificant association suggesting that the prevalence of CB in sinusitis in the southern Tamil Nadu population may not be a causative association.





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ORIGINAL ARTICLE

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AUTHORS:

1. E. Kamala
2. N. Vinay Kumar
3. Kavin Raj
4. T. S. Gugapriya
5. Senthil Rajkumar

PARTICULARS OF CONTRIBUTORS:

1. Assistant Professor, Department of Anatomy, Chennai Medical College Hospital and Research Centre, Trichy.
2. Assistant Professor, Department of Anatomy, Chennai Medical College Hospital and Research Centre, Trichy.
3. Student, Department of Anatomy, Chennai Medical College Hospital and Research Centre, Trichy.

4. Associate Professor, Department of Anatomy, Chennai Medical College Hospital and Research Centre, Trichy.
5. Consultant Radiologist, Department of Radiology, Meenakshi Hospitals, Thanjavur.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. E. Kamala,
Department of Anatomy,
Chennai Medical College Hospital and
Research Centre, Trichy-621105.
E-mail: vijaykamala2001@yahoo.com

Date of Submission: 10/02/2015.
Date of Peer Review: 11/02/2015.
Date of Acceptance: 14/02/2015.
Date of Publishing: 17/02/2015.