

# CONCHA BULLOSA : FREQUENCY AND APPEARANCES ON SINONASAL C.T

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**ABSTRACT :** Aeration of the middle turbinate, termed "Concha bullosa", is one of the most common, obstructive, anatomic variants seen in patients with sinusitis. The present study was carried out on 150 patients of chronic sinusitis, who underwent CT scan paranasal sinuses, coronal section prior to Functional Endoscopic Sinus Surgery (FESS). The CT Scans were evaluated to detect the incidence of Concha bullosa and its types, the significance of Concha bullosa in genesis of osteomeatal complex disease and relation between type of Concha bullosa and osteomeatal complex disease. Later the patients were subjected to FESS.

In this study we found that the overall incidence of inflammatory disease in the osteomeatal complex in these symptomatic patients was no different between with and without Concha bullosa and osteomeatal complex disease is found to be more frequent if pneumatization is localized to inferior part of middle turbinate. Concha bullosa requires specific endoscopic surgical techniques.

**Key Words :** Concha bullosa; osteomeatal complex; Paranasal sinuses.

## INTRODUCTION

The development of Functional Endoscopic Sinus Surgery, has heralded the extensive use of Computed Tomography (C.T.) of paranasal sinuses. The advent of computerized tomography in the delineation of Sinonasal pathology and subtle anatomic variations has proven invaluable to the otolaryngologist in preoperative planning for functional Endoscopic Sinus Surgery. Som (1985) and Zinreich et al (1988), performing detailed studies have suggested a CT protocol regarding paranasal sinuses.

Kennedy et al (1985) described the concept of Osteomeatal obstruction as fundamental to F.E.S.S. and indicated that the obstruction may be due to osteomeatal inflammation or anatomical variations.

Concha bullosa, a pneumatized middle turbinate, is one of the most common anatomic variants of lateral wall of nose. The interior of the concha bullosa is lined with ciliated respiratory epithelium and its ostium may drain into the frontal recess, lateral sinus or hiatus semilunaris. (Zinreich et al, 1988).

The aerated middle turbinate may completely fill the space between the septum and the lateral nasal wall, with subsequent blockage of the middle meatus predisposing to sinus infection

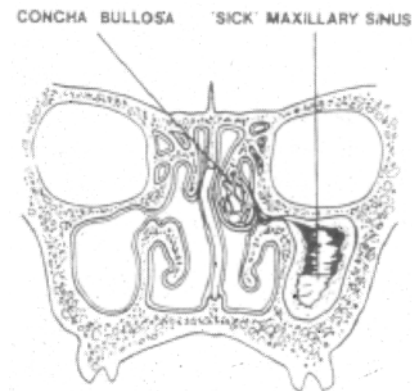


Fig. I : Large pneumatized middle turbinate producing obstruction of ethmoid infundibulum with secondary maxillary sinus injection

In this study, we aimed to assess the frequency of concha bullosa and its types along with their relation with osteomeatal complex disease.

## MATERIAL AND METHODS

One hundred and fifty patients from the Out Patients Department of Otorhinolaryngology, M.G.M. Medical College and M.Y. Group of Hospitals, Indore, between May 1994 & April 1998, with clinical evidence of chronic sinusitis were included in this study. These patients after detailed

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clinical evaluation and routine investigations were submitted for CT Scan paranasal sinus coronal section prior to Functional Endoscopic Sinus Surgery.

As per the protocol, patients in the 12 to 60 years age group were included irrespective of the sex. Patients who were clinically and/or radiologically diagnosed as having chronic sinusitis were included in this study. The chronic sinusitis was defined in this population as representing a state of persistent disease frequently accompanied by nasal congestion, nasal obstruction, nasal discharge, headache, post-nasal drip, proptosis, hyposmia and midfacial pains. These patients were refractory to medical therapy for more than 6 months duration.

All CT Scans were obtained with CT.MAX 640(VIPRO-G) Scanner using contiguous 5 mm sections, obtained every 5mm from the frontal sinus to the sphenoid sinus, in the head extended supine position. Examinations were evaluated using both bone and soft tissue windows.

Patient's preparation before CT Scan examination was aimed at maximum removal of "reversible" disease. Each patient was routinely imaged at the end of his or her broad spectrum antibiotic and antihistamine decongestant therapy.

CT Scans were carefully analyzed and any sign of pneumatisation within the middle turbinate was termed as concha bullosa. As per the criteria of Som (1985), any evidence of mucosal changes, ranging from minimal mucosal thickening to total sinus opacification detected on CT was considered as, "abnormal". All types of opacification medial or lateral to the uncinate process was considered as Osteomeatal complex disease and its distribution compared critically in patients with concha bullosa, to those without concha bullosa.

Further analysis of middle turbinate pneumatisation, location and size was carried out, resulting in a classification of concha bullosa types under three different groups, as per Bolger et al (1991).

1. Lamellar-type concha bullosa-Pneumatisation is localized to the vertical lamella of the middle turbinate.

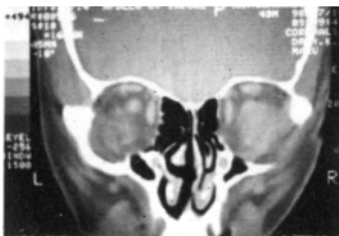


Fig II : Lamellar type of concha bullosa.

2. Bulbous type concha bullosa: Pneumatisation of the inferior bulbous part of middle turbinate

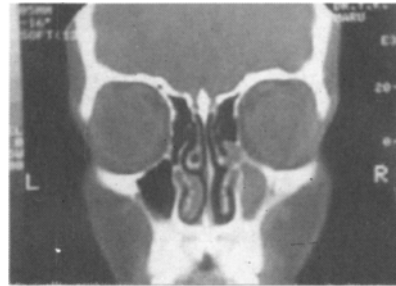


Fig. III : Bulbous type of concha bullosa .

3. True or Extensive type concha bullosa : Pneumatisation of both the vertical lamella and the inferior part of middle turbinate .

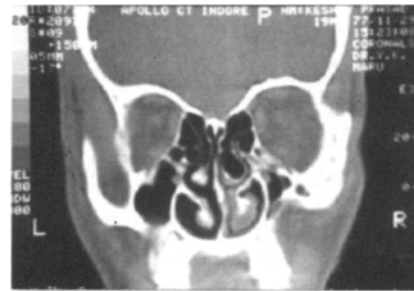


Fig. IV : True or extensive type of concha bullosa.

Furthermore, the presence of Ostiomeatal complex disease was also recorded separately for each type of concha bullosa and data analyzed.

### OBSERVATIONS

All the patients had coronal CT Scan of paranasal sinuses, 5mm coronal sections were done. CT Scans were carefully analyzed for middle turbinate pneumatisation and osteomeatal complex disease.

Of these patients 62(41.3%) were found to have concha bullosa. Of the 62 patients 10(16.1%), had bilateral concha bullosa and 52 (83.5%) had unilateral concha bullosa. (Table-I). The vertical lamella is the middle turbinate were pneumatized in 45% (28) of these cases thereby forming a "lamellar cell". In 29% (18 cases) pneumatisation was noted in inferior bulbous portion of the middle turbinate. Extensive pneumatisation of the middle turbinate, or a true con-

**Table -I****RELATION BETWEEN CONCHA BULLOSA & OSTIOMEATAL DISEASE**

	<b>Ostiomeatal disease</b>	
	<b>Present</b>	<b>Absent</b>
·Concha Bullosa(62)		
(a) Unilateral (52)	40	12
(b) Bilateral (10)	08	02
· Total	48(77%)	14(23%)
· No Concha Bullosa	56(81%)	14(19%)

**Table -II****FREQUENCY OF VARIOUS TYPES OF CONCHA BULLOSA ON C.T**

<b>Types of Concha Bullosa</b>	<b>No. of Patients</b>	<b>Percentage</b>
· Pneumatization of vertical lamella (lamellar cell)	28	45%
· Pneumatization of inferior bulbous part of middle turbinate.	18	29%
· True concha bullosa	16	25.8%
<b>TOTAL</b>	<b>62</b>	

cha bullosa was noted in 19 patients (25.8% ) (Table – II)

The incidence of osteomeatal disease in patients with concha bullosa was 77% and without concha bullosa was 81% (Table -I). Thus the effect of presence of concha bullosa on osteomeatal complex disease was statistically insignificant. Many of the concha bullosa were small and probably contributed little to the pathophysiology of the sinus disease in these patients. However in some cases the concha bullosa was remarkable and did contribute to the pathogenesis of the sinus disease. With respect to type of concha bullosa the bulbous and true type contributed mostly to pathogenesis of sinus disease resulting in increased osteomeatal complex disease in such cases (Table-III).

**DISCUSSION**

The middle turbinate is an integral part of ethmoidal labyrinth and is usually a thin plate of bone attached to roof of nose just lateral to cribriform plate. However, it may become aerated by extension of ethmoid air cells. This aerated middle turbinate is known as “concha bullosa”.

The middle turbinate has several known functions, it provides a baffle which deflects inspired air superiorly towards olfactory epithelium, provides moisture to inspired air, laminates nasal air flow and directs expired air into middle me-

atus to aid in aeration of sinuses.

Mucociliary transport within concha bullosa is usually towards the conchal ostium located on anterosuperior aspect of middle turbinate. Nasal physiology has deleterious effect in presence of enlarged pneumatized middle turbinate causing obstruction to osteomeatal complex. It is postulated that due to Bernoulli's effect upon airflow in areas of close approximation of mucosal surfaces, dryness is produced with impaired mucociliary clearance and negative influence on paranasal sinus ventilation, ensuing local inflammatory process eventually resting in inflammatory disease.

Two varieties of middle turbinate syndrome, which produce pain and obstruction, have been described by Morgenstein and Kinger (1980).

Pain “ the four finger headache’ which includes :-

- Septoturbinal compression;
- Bulla-turbinal compression;
- Sinus ostium closure, and the Obstruction “ the crowded nose” :
- With septal deviation;
- Without septal deviation;
- Following rhinoplasty (narrowing of nose).

Table – III

## RELATION BETWEEN TYPE OF CONCHA BULLOSA &amp; OSTIOMEATAL DISEASE

Type of Concha	osteomeatal disease		Total
	Present	Absent	
<b>Bullosa</b>			
Lamellar	19(67.8%)	09(32.1%)	28
Bulbous	15(83.3%)	03(16.6%)	18
True	14(87.5%)	02(12.5%)	16
<b>TOTAL</b>	<b>48</b>	<b>14</b>	<b>62</b>

Concha bullosa is a common anatomical variant of normal nasal anatomy and was found in 41.3% of patients having CT for the evaluation of symptomatic sinus disease. Other common variations include a paradoxical curvature of the middle turbinate, septal deviation or spur, Haller's cells, Agger nasi cells, uncinate process deviations and bulla ethmoidalis. Several CT Scans showed concha bullosa contributing to nasal pathology. However an overall increase in ostiometal disease could not be demonstrated when patients having concha bullosa were compared with those patients without concha bullosa .

The incidence of concha bullosa in patients with sinusitis is reported as 24 to 53.6% by various authors as quoted by Unulu Halis H et al (1994). We also reported a similar incidence in our study ( 41.3%). The incidence of concha bullosa in patients with chronic sinusitis as described by Calhoun et al (1991) is 29%. Lioyd et al (1990) 24%, Zinreich (1988) 34% and Bolger et al (1991) 53.6%. Discrepancy in the reported prevalence of middle turbinate pneumatisation may be due to factors such as inherent differences in study population, differences in criteria of pneumatisation and sensitivity of method of analysis. In many anatomic dissections by different workers the incidence of concha bullosa were reported to be between 9-10%.

Bolger et al (1991) describes three patterns of concha bullosa with respect to localization of pneumatisation within the middle turbinate structure. We employed the same three patterns in our study. First pattern-air cells were localized in the vertical lamella of the turbinate (45%) . Second pattern-air cells were localized in bulbous segment of the turbinate (29%) and the third pattern-true concha bullosa were present in 25.8% cases. Calhoun et al (1991) state that concha bullosa is found more frequently in a symptomatic group of patients with sinusitis compared with asymptomatic group. Zinreich et al (1988) state that concha bullosa is

often associated with ostiometal complex disease. We found similar results in our study.

Functional endoscopic sinus surgery is the technique of choice for management of inflammatory disease of the middle meatus and anterior ethmoid including concha bullosa. If the problem is simply airway obstruction or if the ostiometal complex disease is mild, endoscopic removal of the lateral half of the middle turbinate may suffice .



Fig. V : Surgical therapy of concha bullosa.

The medial wall of turbinate and its superior attachment to prevent intracranial penetration and cerebrospinal fluid leak. More extensive disease in the ethmoid may require an endoscopic infundibulotomy and ethmoidectomy for complete eradication of the recurrent infection (Zinreich et al, 1988).

## CONCLUSIONS

From this study we concluded –

- Concha bullosa is a common anatomical variant of the middle turbinate and is frequently associated with pathology of the adjacent ostiometal complex.
- Concha bullosa is best diagnosed radiographically with the coronal CT Scan, of paranasal sinuses. The coronal CT Scan paranasal sinuses acts as a preoperative road map to accurately define the relevant microanatomy of osteomeatal complex and provides the otolaryngologist with the most

accurate information for therapeutic decisions and is currently the modality of choice in evaluation of paranasal sinuses and adjacent structures.

· Relationship between overall incidence of inflammatory disease in osteomeatal complex in these symptomatic patients and presence of concha bullosa is statistically insignificant.

· With respect to type of concha bullosa, osteomeatal complex disease is frequently associated with bulbous and true type of concha bullosa.

· Functional endoscopic sinus surgery is the technique of choice for management of inflammatory disease of middle meatus and concha bullosa so as to restore the normal function of the middle turbinate.

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