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Concha bullosa: types and relationship with chronic sinusitis

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ABSTRACT

Background: The study was conducted with the objective to study the incidence of various types of concha bullosa as detected on computed tomography and to assess the relation between types of concha bullosa and sinusitis.
Methods: Computed tomography of 70 patients who were having symptoms and signs of sinusitis and had concha bullosa were studied retrospectively. These scans were categorized into three types of concha: lamellar, bulbous and extensive type.
Results: There was no significant relation between ostium blockage and presence of concha bullosa ($p>0.05$). Also there was no significant relation between sinus disease and presence of concha bullosa on same side ($p>0.05$).
Conclusions: There is no statistical significance of the type of concha bullosa with respect to sinusitis or ostio meatal complex blockage.

Keywords: Concha bullosa, Sinusitis, Computed tomography

INTRODUCTION

Chronic rhinosinusitis (CRS) is the most common ailment for which patient consults an otorhinologist.[1] The treatment protocol of chronic sinusitis has undergone massive changes after Messerklinger published his work on nasal endoscopic surgery. The main indication of endoscopic sinus surgery is to remove the obstruction of the main drainage pathway- in the osteomeatal complex. This is fundamentally based on the notion that such obstruction perpetuates the sinus disease. Histopathologically sinusitis is defined as inflammation of the nasal and paranasal sinus mucosa. Obstruction of the osteomeatal complex leads to chronic sinusitis. This may occur as a result of concha bullosa (CB), deviated nasal septum (DNS), paradoxical middle turbinate or Haller cells.[2] The most frequent anatomical variations subsequent to agger nasi cells are concha bullosa and deviated nasal septum. Pneumatization of the concha, in spite of of the amount and the location, is defined as concha bullosa. It is most commonly encountered in the middle concha, though can also be seen in superior and inferior concha. Pneumatization of the concha was classified by Bolger et al into 3 types: lamellar concha bullosa (LCB), bulbous concha bullosa (BCB) and extensive concha bullosa (ECB). The CB is a classic example of an anatomic variation that predispose to sinus disease.[3]

Mere presence of concha bullosa does not imply disease itself, but it increases chances of the patient to develop chronic sinusitis more easily. The CB also causes increased mucosal contact areas which further lead to nasal polyp formation.[2]

METHODS

The present study was conducted at BPS GMC, Sonepat, Haryana from November 2016 to March 2017. The study period was 5 months and a total of 70 patients were included in the study. The patients included in the study were those who had symptoms and signs of sinusitis and

headache symptoms and had paranasal CT studies that showed pneumatization of the middle concha.

Exclusion criteria were patients with history of previous sinus surgery, trauma to face and any congenital deformities or diseases of the nasal cavity, paranasal sinuses, example are cleft palate and malignancy.

A concha bullosa was defined as being present when the turbinate was pneumatized. Sinus disease was diagnosed if there were findings of either thickening of the sinus margin or opacification of the sinus or both. Healthy sinus was defined as a clear radiolucent cavity surrounded by a narrow margin of bony wall. The collected data were evaluated, analysed and the statistical tests used were mean and chi-square test at 5% level of significance. The p value was calculated which denotes the probability that the difference between two samples occurred by chance. The p value less than 0.05 is considered to be statistically significant.

RESULTS

All the 70 patients included in the study had symptoms of sinusitis and on computed tomography showed concha bullosa either unilateral or bilateral. The age of patients included in study ranged from 13 to 58 years. Of the 70 patients, 43 were females (61.5%) and 27 were males (38.5%). Out of 70 patients studied, 38 patients (54.28%) had concha bullosa on left side and 21 patients (30%) had concha bullosa on right side. 11 patients (15.71%) had bilateral concha bullosa.

Table 1: Age distribution of male and female population.

Age range (years)	Gender	
	Male	Female
11-20	4	11
21-30	5	8
31-40	10	7
41-50	6	13
51-60	2	4

Table 2: Frequency of osteomeatal disease in relation to concha bullosa type.

Type	OMD (-)	OMD (+)	Total	P value
Lamellar	29	50	44	>0.05
Extensive	6	9	15	>0.05
Bulbous	14	8	22	>0.05

In our study group, 44 concha bullosae were of lamellar type, 22 were of bulbous type and 15 were extensive type. There were no statistically significant differences between the presence of lamellar, bulbous and extensive types of concha bullosa on the right side and ostiomeatal disease on the same side (p>0.05). Again, no statistically significant differences were noted between the presence of lamellar, bullous and extensive type of concha bullosa and ostiomeatal disease on the left side (p>0.05) There were also no differences between types of concha bullosa and the presence of sinus disease on the same side (p>0.05).

Table 3: Frequency of sinus disease in relation to concha bullosa types.

Side	Type	SD*(-)	SD(+)	Total	P value
Right	Lamellar	11	6	17	>0.05
	Extensive	4	2	6	>0.05
	Bulbous	5	4	9	>0.05
Left	Lamellar	19	14	33	>0.05
	Extensive	2	5	7	>0.05
	Bulbous	5	4	9	>0.05

*Sinus disease

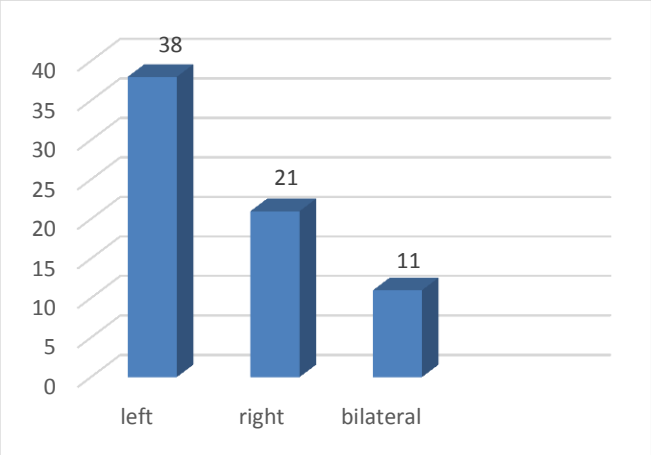

Figure 1: Laterality of concha bullosa.

DISCUSSION

The middle concha is embryologically a derivative of medial part of the ethmoid bone. The middle concha pneumatizes almost always from the anterior ethmoidal cells. Pneumatization through the posterior air cells or both occurs but is very rare. Concha bullosa is the pneumatization of the concha and one of the most frequent variant noted.[4] It is generally seen in the middle concha. It is infrequently found in the superior and inferior conchae. Categorization of the pneumatization of the middle concha was first done by Bolger et al into three groups: lamellar type is the pneumatization of the vertical lamella of the concha; bulbous type is the pneumatization of the inferior segment; pneumatization of both the lamellar and bulbous parts is called extensive concha bullosa.[3] The concha bullosa incidence as found out in various studies done ranges from 14-53%. Some authors have not incorporated small sized or lamellar type conchae bullosa in their studies.[4] In a study done by Scribano et al, incidence of CB was 67% and in a separate study done by Perez-Pinas et al CB incidence

was as high as 73%.[5,6] In studies done by Yousem and Calhoun separately, incidence of bilateral concha bullosae was found out to vary from 45%-61.5%.[7,8] Concha bullosa was bilateral in 15.71% of the cases in our study. There is no agreement on the rate of occurrence of concha bullosa or frequency of various types of concha bullosa. The variation may be due to difference in the methods used to analyse, variation of the ethnicity of study groups, differences in pneumatization parameters.

Table 4: Frequency of concha bullosa types in the literature.

	Extensive type CB* (%)	Lamellar type CB* (%)	Bulbous type CB* (%)
Bolger et al[3]	15.7	46.2	31.2
Uygur et al[10]	10.8	55.3	33.9
Unlu et al[11]	34.2	45.23	20.63
Hatipoglu et al[12]	46.95	20.86	32.17
Tonai and Baba[13]	52	2	19

*Concha bullosa

In the present study, all CB were seen in middle turbinate. No pneumatization was seen in the inferior and superior turbinate. A study by Kiroglu et al in their study showed that concha bullosa of the inferior turbinate is an exceptionally atypical with 11 reports of this condition in the literature.[9] In the work published by Stammberger, pneumatization of superior turbinate was never noticed.[2]

In the present study, out of 81 CB, lamellar type was 54.32%, bulbous type was 27.16% and extensive were 18.52%. The study showed higher frequency of lamellar type CB followed by bulbous type CB and the least is extensive type CB. Number of studies has been done on the incidence of type of CB. Results of study done by Bolger et al were similar to this study and he found lamellar type CB in 46.2% and bulbous type in 31.2%, extensive type in 15.7%.[3] Uygur et al found this figure as 55.3%, 33.9% and 10.8% respectively.[10] Unlu et al found 45% lamellar type CB, 21% bulbous type CB and 34% extensive type CB.[11] In contrast to these studies, a different frequency of the type of CB was observed by Hatipoqlu et al who found 20.86% lamellar type, 32.17% bulbous type and 46.95% extensive type CB.[12] Tonai et al studied the incidence of CB types and found lamellar type in 2%, bulbous type in 19% and extensive type in 52%.[13]

There is conflicting data on whether CB is a cause of sinusitis or not. Some authors insist that CB plays a role in recurrent sinusitis by compressing the uncinate process and obstructing or narrowing the infundibulum and the middle meatus.[3,4] Lloyd et al have stated that when CB occupies the space between the septum and the lateral nasal wall, there may be total impediment of the middle meatus orifice.[14,15] In our study we found that there was no significant relation between presence of concha bullosa and occurrence of sinusitis even on segregating the data for comparing type of concha bullosa with occurrence of sinusitis no significant relation was found.

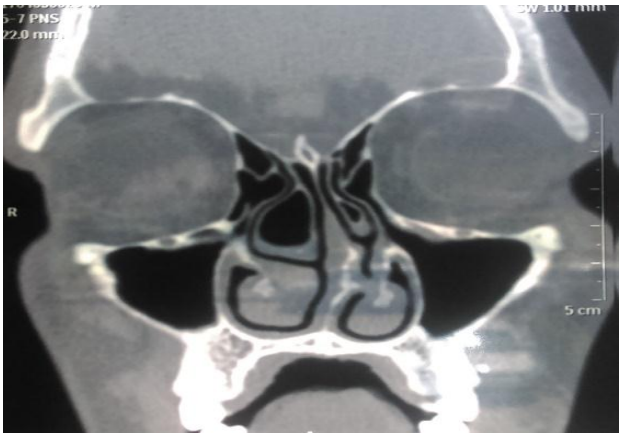

Figure 2: Bilateral concha bullosa: lamellar concha bullosa on left side.

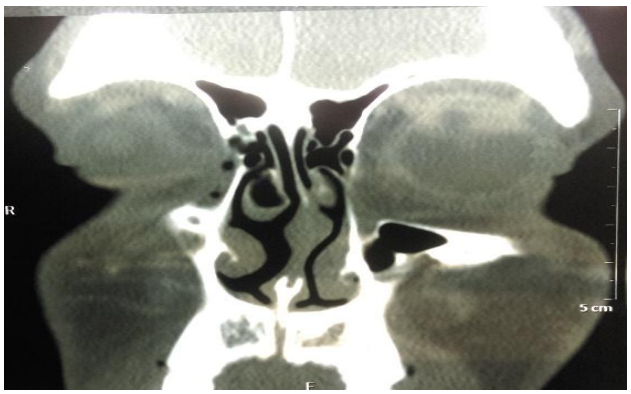

Figure 3: Bulbous concha bullosa on right side.

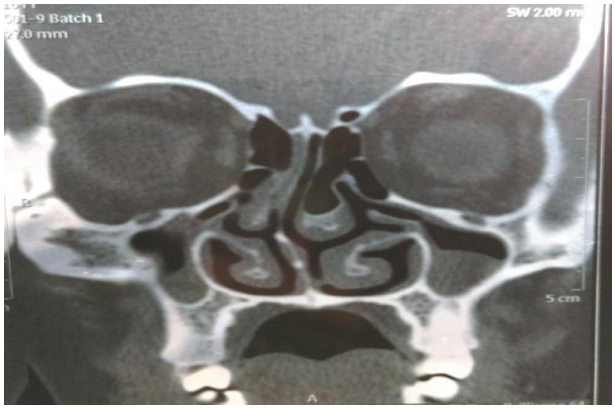

Figure 4: Extensive concha bullosa of left side.

One of the drawbacks of the present study was that the concha bullosa dimensions were not taken into account. Though Yousem et al have not demonstrated any direct relationship between CB and sinus disease, they have pointed out that size should be taken into account.[6] However, Stallman et al failed to show a relationship with sinusitis in a study by which CB was classified according to size.[5] The patients included in our study were symptomatic cases suspected of having sinonasal disease. Therefore the statistical interpretations of the conclusions of our study are valid only for the symptomatic population. The results should not be generalized to the entire population.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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