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# ***Journal of Radiology Research and Practice***

*Vol. 2014 (2014), Article ID 260913, 26 minipages.*

*DOI:10.5171/2014.260913*

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*Research Article*

## **Is there Any Relationship between Allergic Rhinitis and Concha Bullosa?**

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Received Date: 30 March 2014; Accepted Date: 4 June 2014; Published Date: 24 June 2014

Academic Editor: Erkan Tarhan

**Cite this Article as:** Turhan San, Deniz Hanci, Nuray Bayar Muluk and Cemal Cingi (2014), "Is there Any Relationship between Allergic Rhinitis and Concha Bullosa?," Journal of Radiology Research and Practice, Vol. 2014 (2014), Article ID 260913, DOI: 10.5171/2014.260913

## **Abstract**

Concha bullosa (CB) is the pneumatization of intranasal turbinates. It is most commonly seen in the middle turbinate. The formation mechanism of CB is not fully elucidated so far. It is well known that allergic rhinitis (AR) affects the mucosa of intranasal structures and eventually these structures become edematous. The aim of this study was to investigate the presence of CB retrospectively in patients with AR.

The method used is to determine the presence of CB, paranasal sinus computed tomography (PNSCT) scans of 45 patients (25 females, 20 males) with AR were examined. The PNSCT sections showing maxillofacial fractures, sinonasal neoplasms and the results of previous surgeries were not included into the study.

CB was observed in 25 of 45 patients with AR (55.5%). 7 of these 25 patients had unilateral (28%), while 18 had bilateral (72%) CB. All the patients had the middle turbinate pneumatization. There was no significant correlation between side of the CB (unilateral or bilateral) and gender and age.

CB is a common anatomic variation in patients with AR and this contributes to the severity of symptoms. CB makes nasal obstruction much worse in AR patient, and may cause rhinosinusitis besides contact headaches. In the present study, coexistence of CB was detected as 55.5% with AR. In case of non-symptomatic CB, there is no need for additional treatments. However, in symptomatic cases, removal of the lateral lamella of the middle turbinate should be performed.

**Keywords:** Allergic rhinitis, concha bullosa, paranasal sinus computed tomography (PNSCT).

## **Introduction**

The pneumatization of middle turbinate has been called as concha bullosa (CB). It is usually asymptomatic, but it sometimes can cause different sinonasal symptoms. The severity of symptoms is related to degree of pneumatization.

Allergic rhinitis (AR) is a symptomatic disorder of the nose induced after allergen exposure by an immunoglobulin E (IgE)-mediated inflammation (Bousquet et al, 2001). AR affects 10–30% of the population, with the greatest frequency found in children and adolescents (Sih and Mion, 2010).

In Sedaghat et al's (2012) study, infraorbital (Haller) cells, CB, frontal intersinus cells, and anterior ethmoid frontal recess cells



were evaluated in coronal paranasal sinus computed tomographies. They reported that infraorbital and frontal intersinus cells are associated with development of chronic rhinosinusitis (CRS) in patients with AR.

Until now, CB has related to nasal septum deviation and sinusitis (Uygur et al, 2003; Ural et al, 2010). There was no study about the relationship between CB and AR. Here, our aim was to investigate the presence of CB in patients with AR.

## **Material and Methods**

This retrospective study was carried out in ENT Department of Istanbul Medeniyet University, Göztepe Training and Research

Hospital according to the principles outlined in Helsinki Declaration (2008).

## **Subjects**

Present study was designed retrospectively and consisted of 45 patients (25 females, 20 males) with AR who were previously diagnosed according to the skin prick test results.

A skin prick test that involved the most common regional environmental antigens was applied to each participant previously. Histamine and saline solutions were used as positive and negative controls, respectively. The resulting “wheal and flare” reactions were evaluated 10 min after the application. Each reaction wider than 3 mm in diameter was regarded as a positive

result. Each participant who developed at least one positive reaction against an antigen was evaluated as an allergic individual.

Paranasal sinus computed tomography (PNSCT) sections showing maxillofacial fractures, sinonasal neoplasms, sinonasal polyps and patients with previous surgery were not included into the study. None of the AR patients was concurrent with diagnosed asthma.

### **Paranasal Sinus Computerized Tomography (PNSCT)**

**Evaluation:** To detect the presence of CB, the coronal plane paranasal sinus CT scans of the patients with AR were examined. PNSCTs were taken for a various reasons, such as headache and nasal obstruction. The Paranasal Sinus Computerized

Tomography (PNSCT) archive of the first author (TS) was used as retrospective data source of this study for the measurement. The PNSCTs were obtained from General Electric Optima 660 (USA) machine  $64 \times 2 = 128$  slices and with Toshiba Activation (Japan) machine as 16 slices.

### **Statistical Analysis**

All study data were evaluated using the SPSS version 16.0 software. The Chi-square test and Spearman's correlation rho efficient test were used.

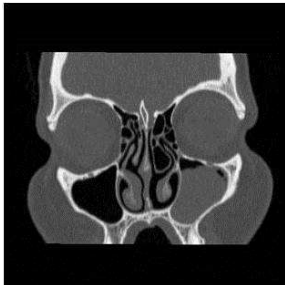
A  $p < 0.05$  was accepted as indicative of a significant difference.

## Results

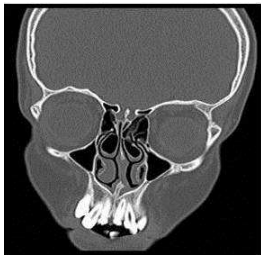
A total of 45 patients with AR were included in this study. The mean age of the patients with was 39.5 years (range 15-74 years).

Of these 45 patients with AR, CB was present in 25 patients (55.5%). The mean age of patients with CB (14 females and 11 males) was  $36.3 \pm 16.3$  years (range 15-74). Seven of these 25 (7/25) had unilateral (28%) (Figure 1); however 18 of them (18/25) had bilateral (72%) CB (Figure 2). All of the patients had the middle turbinate pneumatization, whereas superior and inferior turbinate pneumatization was not seen. CB was not detected in 20 patients (45.5%). The mean age of the patient with

AR without CB (11 females and 9 males) was  $43.6 \pm 14.7$  years (Ranged from 17.0 to 71.0).



**Figure 1: Coronal Paranasal Sinus Computed Tomography View for Left Unilateral Concha Bullosa**



**Figure 2: Coronal Paranasal Sinus Computed Tomography View for Bilateral Concha Bullosa**

Gender of the AR patients with CB were shown on Table 1. There is no significant difference between gender of the patients and unilateral or bilateral CB by Chi-Square test ( $p=0.419$ ,  $X^2=0.654$ ).

**Table 1: Gender of the Allergic Rhinitis Patients with Concha Bullosa**

		Unilateral Concha Bullosa		Bilateral Concha Bullosa		Total		p
		n	%	n	%	n	%	
<b>Gender</b>	Male	4	36.4	7	63.6	11	100.0	P=0.419 X <sup>2</sup> =0.654
	Female	3	21.4	11	78.6	14	100.0	
	Total	7	28.0	18	72.0	25	100.0	

\*p value shows the results of Chi-Square test

The relationship between gender, age and side of the CB (Code 1: Unilateral, Code 2: Bilateral) was analyzed by the results of Spearman's correlation rho efficient test (Table 2). There was no significant correlation between side of the CB, gender and age.



**Table 2: The Results of Spearman's Correlation Rho Efficient Test**

		<b>Gender</b>	<b>Age</b>	<b>Concha Bullosa (Code 1: Unilateral, Code 2: Bilateral)</b>
<b>Gender</b>	<b>r</b>		-0.257	0.165
	<b>p</b>		0.214	0.430
<b>Age</b>	<b>r</b>	-0.257		-0.087
	<b>p</b>	0.214		0.681
<b>Concha Bullosa (Code 1: Unilateral, Code 2: Bilateral)</b>	<b>r</b>	0.165	-0.087	
	<b>p</b>	0.430	0.681	

## **Discussion**

CB is a very common variation in normal population. CB is usually seen in the middle turbinate (Unlu et al, 1994; Bolger et

al, 1991). There are few theories for its occurrence: (1) Expansion of sinus pneumatization into the turbinated during intrauterine period (Yang et al, 2008), (2) Fusion abnormality during intrauterine development, (3) Conchal bone microfractures during late puberty causing nasal mucosal invagination expanding to bullosa cavity and eventual CB development (Peric et al, 2010; Dogru et al, 1999).

In the present study, we investigated the presence of CB in patients with AR. CB was present in 55.5% of patients with AR. It was either unilateral (28%) or bilateral (72%). In CB cases, there was only middle turbinate pneumatization. There was no correlation between side of the CB (unilateral or bilateral) and gender and age.

Our results showed that there is a high rate coexistence of 55.5% between AR and CB. In Unlu et al's (1994) and Bolger et al's studies (1991), the incidence of CB was 13% and 53%. Anterior and posterior ethmoidal cells are responsible for pneumatization of CB (Unlu et al, 1994; Bolger et al, 1991). After the formation of septum deviation, the air flow pattern of nasal cavity on the opposite side of the deviation provokes the development of CB (Stammberger et al., 1991). Whereas according to Uygur et al., CB incidence doesn't increase with septal deviation (Uygur et al, 2003).

AR comorbidities are asthma, middle ear effusion, rhinosinusitis, lymphoid hypertrophy with obstructive sleep apnea, etc. (Lack, 2001). In Smith et al's study (2010), there was pneumatization of at least one concha (67.5%), septal deviation (19.4%) and

mucosal thickening and maxillary rhinosinusitis (50.0%) with AR. In 49.3% of the patients, there were CB and maxillary sinusitis.

CB may cause nasal congestion and sinusitis (Caughey et al, 2005). CB makes nasal obstruction much worse in AR patient, and may cause rhinosinusitis besides contact headaches. In the present study, coexistence of CB was detected as 55.5% with AR. However, Bolger et al. (2001) reported that lamellar, bulbous and extensive concha bullosa were detected in 46.2%, 31.2% and 15.7% of CT images respectively.

In patients with CB, removal of the lateral lamella of the middle turbinate should be performed. In AR patients with nasal obstruction, presence of coincidental CB should be considered.

## **Conclusion**

In patients with AR, coincidence of CB should be kept in mind. Especially in AR patients with nasal obstruction; or contact headache, CB should be investigated by PNSCT.

## **Acknowledgement**

"With the exception of data collection, the preparation of this paper, including design and planning, was supported by the Continuous Education and Scientific Research Association."

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