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CONCHA BULLOSA: ANATOMICAL VARIATION AND ITS CLINICAL IMPLICATIONS IN NASAL PATHOLOGIES AT TERTIARY CARE CENTER.

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Abstract

Background: Concha bullosa, a pneumatization of the middle turbinate, is a common anatomical variation associated with various nasal pathologies, including deviated nasal septum (DNS) and chronic sinusitis. However, the extent of its clinical significance remains debated. This study aims to investigate the prevalence of concha bullosa and its association with nasal pathologies using computed tomography (CT) imaging.

Methods: This prospective observational study included 74 patients, aged 18 years and older, presenting with nasal symptoms such as nasal obstruction, headache, and postnasal drainage. High-resolution CT scans were used to evaluate the presence and types of concha bullosa, DNS, and other nasal pathologies. Demographic, clinical, and radiological data were collected from 2017 to 2019 and analyzed using chi-square tests to assess associations between concha bullosa and nasal pathologies.

Results: Concha bullosa was present in 48 patients (64.86%). DNS was found in 20 patients with concha bullosa and 11 without, but no statistically significant relationship was found between the two ($p = 0.9574$). Similarly, no significant association was observed between concha bullosa and chronic sinusitis, nasal polyps, or other nasal masses. However, symptoms like headache (94.59%) and nasal obstruction (67.57%) were more prevalent among patients with concha bullosa.

Conclusion: While concha bullosa frequently coexists with DNS and other nasal pathologies, it may not be a direct contributor to these conditions. Further research is needed to clarify its clinical relevance. Understanding these anatomical variations can aid in better diagnosis and management of sinonasal disorders.

Keywords: Concha bullosa, deviated nasal septum, chronic sinusitis, nasal obstruction, computed tomography.

Introduction

Concha bullosa, a pneumatized middle turbinate, is one of the most common anatomical variations within the nasal cavity. It has been widely studied for its potential role in contributing to nasal pathologies, including nasal obstruction, chronic rhinosinusitis, and deviations in nasal septum alignment [1]. Computed tomography (CT) imaging has become a key diagnostic tool for identifying concha bullosa and assessing its relationship with sinonasal diseases such as sinusitis and nasal septal deviation [2.]

Studies have shown varying prevalence rates of concha bullosa. In one study, concha bullosa was found in approximately 42% of patients with sinusitis, indicating a potential correlation between the two conditions [3]. Other studies have reported an incidence rate of around 25.5%, with concha bullosa often occurring in patients who also exhibit nasal septal deviation, which may further predispose individuals to sinus pathologies [4].

Given the clinical significance of concha bullosa and its potential association with nasal and paranasal diseases, further investigation is warranted to clarify the anatomical variations and their impact on patient outcomes. This study aims to explore the prevalence of concha bullosa and its relationship with nasal pathologies in patients presenting with sinonasal symptoms, using high-resolution CT imaging.

Methodology

This prospective observational study was conducted to evaluate the prevalence and clinical impact of concha bullosa and associated nasal pathologies. The study took place at the Outpatient and Inpatient Departments of ENT and Head and Neck Surgery at Vilasrao Deshmukh Government Medical College, Latur, from 2017 to 2019. Patients aged 18 years and older, presenting with symptoms such as nasal obstruction, postnasal drainage, facial pain, headache, or olfactory disorders, were included.

Inclusion criteria required the presence of pneumatization of the middle turbinate on CT scans and mucosal thickening of ≥ 4 mm in the sinuses. Patients with a history of nasal surgery, facial trauma, or congenital deformities were excluded. Data were collected prospectively, recording demographic information, clinical symptoms, and radiological findings from high-resolution CT scans (axial, coronal, and sagittal planes).

A sample size of 74 participants was calculated based on an assumed prevalence of 22.5% for concha bullosa, with a 10% non-response rate. Ethical standards were followed, with informed consent obtained from all participants and patient confidentiality maintained. The data were analyzed using descriptive and comparative statistical methods to assess the association between concha bullosa and nasal pathologies, with significance determined by confidence intervals and p-values.

Results

A total of 74 patients were included in the study, comprising 45 males (60.81%) and 29 females (39.19%). The age group distribution was as follows: the majority of patients were between the ages of 21-40 years, with 20 males and 14 females (45.95%), followed by the 41-60 years group with 10 males and 7 females (22.97%), the under-20 group with 10 males and 6 females (21.62%), and the above-60 group with 5 males and 2 females (9.46%).

Demographic and Clinical Distribution of Patients with Concha Bullosa

Category	Male	Female
Age Group		
< 20	10	6
21-40	20	14
41-60	10	7
> 60	5	2
Side		
Left	15	10
Right	18	12
Bilateral	7	5
No	5	2
Location of Concha Bullosa		

Lamellar	20	12
Bulbous	15	10
Extensive	10	7
Occupation		
Agriculture and Allied Activities	10	6
Homemaker	0	11
Industrial and Manufacturing	12	5
Self-employed	8	4
Service Sector	7	2
Students	8	1
TOTAL	**45**	**29**

In terms of the laterality of Concha Bullosa, right-sided cases were most common, observed in 18 males and 12 females (40.54%). Left-sided Concha Bullosa was found in 15 males and 10 females (33.78%), while bilateral Concha Bullosa was present in 7 males and 5 females (16.22%). A small number of patients, 5 males and 2 females (9.46%), did not exhibit Concha Bullosa.

When analyzing the location of Concha Bullosa, the lamellar type was most prevalent, found in 20 males and 12 females (43.24%), followed by the bulbous type in 15 males and 10 females (33.78%) and the extensive type in 10 males and 7 females (22.97%).

Occupational distribution showed that most male patients were involved in industrial and manufacturing work (12 males, 16.22%), whereas the highest number of female patients were homemakers (11 females, 14.86%). Other occupational categories included agriculture and allied activities (10 males, 6 females), self-employment (8 males, 4 females), the service sector (7 males, 2 females), and students (8 males, 1 female).

These results provide a comprehensive understanding of the demographic, anatomical, and occupational distribution of Concha Bullosa among the study population.

Symptom Distribution of Patients with Concha Bullosa

Symptoms	YES	PERCENTAGE
Headache	70	94.59%
Nasal Obstruction	50	67.57%
Recurrent rhinitis	25	33.78%
Anosmia	18	24.32%
Hyposmia	12	16.22%
Nasal Discharge	40	54.05%
*Multiple responses		

In this study, patients reported multiple symptoms related to concha bullosa. The most common symptom was **headache**, experienced by 70 patients (94.59%). This was followed by **nasal obstruction**, reported by 50 patients (67.57%). **Nasal discharge** was also a significant symptom, affecting 40 patients (54.05%).

Other symptoms included **recurrent rhinitis** in 25 patients (33.78%), **anosmia** (loss of smell) in 18 patients (24.32%), and **hyposmia** (reduced sense of smell) in 12 patients (16.22%).

These findings indicate a high prevalence of nasal-related symptoms among patients with concha bullosa. The data shows that headache and nasal obstruction are particularly common complaints within this patient population.

Allergic History of Patients with Concha Bullosa

ALLERGIC HISTORY	**Male**	**Female**
YES	30	18

NO	15	11
TOTAL	45	29

The study found that a significant proportion of patients with concha bullosa had a history of allergies. Among the male patients, 30 (66.67%) reported a history of allergies, while 18 female patients (62.07%) had the same. In contrast, 15 males (33.33%) and 11 females (37.93%) did not report any allergic history.
In total, 48 patients (64.86%) had a positive allergic history, while 26 patients (35.14%) did not. This distribution highlights the potential link between allergic conditions and the occurrence of concha bullosa in both male and female patients.

Comparison of Nasal Pathologies in Patients with and without Concha Bullosa

Nasal Pathology	Patients with Concha Bullosa (n=48)	Patients without Concha Bullosa (n=26)	Chi Square	p-value
Deviated Nasal Septum (DNS)	20	11	0.0028	0.9574
Chronic Sinusitis	12	7	0.0327	0.8565
Nasal Polyps	8	4	0.0204	0.8864
Nasal mass	3	1	0.1906	0.6624
AC Polyp	5	3	0.0220	0.8821
Total Patients with Pathology	48	26		

In patients with concha bullosa (n=48), the most common nasal pathology was deviated nasal septum (DNS), occurring in 20 patients, compared to 11 patients in the group without concha bullosa (n=26). Chronic sinusitis was observed in 12 patients with concha bullosa, while 7 patients without concha bullosa had this condition. Nasal polyps were identified in 8 patients with concha bullosa and 4 patients without it. Nasal masses were found in 3 patients with concha bullosa and in 1 patient without. Lastly, antrochoanal (AC) polyps were present in 5 patients with concha bullosa and 3 patients without.
The chi-square and p-values suggest no statistically significant association between concha bullosa and any of the nasal pathologies, as all p-values are greater than 0.05, indicating that the prevalence of these nasal pathologies does not significantly differ between patients with and without concha bullosa.
These findings indicate that while certain nasal pathologies such as DNS and chronic sinusitis were more frequently observed in patients with concha bullosa, the differences are not statistically significant.

Discussion

The findings of the study reveal that concha bullosa (CB) occurs more frequently in males (60.81%) compared to females (39.19%). A similar gender distribution was observed by Stallman et al[5]. (2004), who reported a higher prevalence of CB among males in their analysis of 1095 CT scans. Age-wise, the 21-40 age group showed the highest incidence, aligning with the study by Tsai et al[6]. (2012), where younger patients had a higher occurrence of CB. Regarding laterality, the current study found that right-sided CB was more prevalent (40.54%), consistent with the findings of

Sazgar et al[7]. (2008), who also reported a predominance of unilateral CB. Anatomically, the lamellar type was the most common (43.24%), reflecting the observations by Balıkcı et al[8]. (2016), who classified CB into three types and found a similar distribution of lamellar CB.

Occupation-wise, the majority of male patients were involved in industrial and manufacturing work, which could be related to the environmental factors contributing to nasal pathologies. However, no significant studies have linked occupation to CB prevalence.

Headache was the most frequent symptom (94.59%) in patients with CB. Paksoy et al[9]. (2008) also found a strong association between CB and headache, indicating that this symptom may be a key indicator of CB. Nasal obstruction was the second most common complaint (67.57%), and previous research by Abdel-Aziz [10](2011) similarly identified nasal obstruction as a common symptom in CB patients. Interestingly, nasal discharge was reported in 54.05% of patients, which aligns with studies by Koçak et al[11]. (2019), where patients with CB often presented with nasal discharge and sinusitis-related symptoms. Other symptoms such as anosmia and hyposmia were less frequently observed, but Özkırış et al[12]. (2013) highlighted that CB can cause anosmia when it leads to sinus infections or blockages.

Allergic history was reported in 64.86% of patients with CB, a finding consistent with the results of the study by Aktaş et al[13]. (2003), which identified allergies as a contributing factor in nasal pathologies including CB. Similarly, Tafakhori et al[14]. (2022) suggested that the presence of CB could be linked to chronic allergic conditions, particularly in patients who experience recurrent allergic rhinitis. This correlation between allergies and CB could be due to the chronic inflammation that often accompanies allergic conditions, leading to nasal obstructions and other pathologies.

Deviated nasal septum (DNS) was the most prevalent nasal pathology associated with CB, occurring in 20 out of 48 patients with CB. This observation aligns with the findings of Stallman et al[5]. (2004), who demonstrated a strong relationship between CB and DNS, particularly on the contralateral side. Sazgar et al[7]. (2008) also reported that CB often coexists with DNS, supporting the theory that the growth of a CB may push the septum to the opposite side, causing deviation. However, despite these associations, the chi-square analysis in the current study showed no significant statistical relationship between CB and DNS, which is consistent with the findings of Tsai et al[6]. (2012), who also found no direct causality between the two.

Chronic sinusitis was observed in 12 patients with CB, and similar findings were reported by El-Din et al[15]. (2021), who noted a significant association between CB and chronic sinusitis, especially in patients with extensive CB. However, the present study's p-value indicated no statistically significant relationship between CB and sinusitis, reinforcing the conclusion of Balıkcı et al[8]. (2016) that CB does not necessarily predispose individuals to sinusitis.

In conclusion, this study provides valuable insights into the demographic and clinical characteristics of patients with concha bullosa. While CB appears more common in males and younger age groups, it shows no significant association with nasal pathologies such as DNS or chronic sinusitis, despite their frequent co-occurrence. The high prevalence of symptoms such as headache and nasal obstruction underscores the clinical importance of CB in contributing to sinonasal complaints. However, the lack of a statistically significant correlation between CB and nasal pathologies such as DNS and chronic sinusitis suggests that the presence of CB alone may not be a sufficient cause for these conditions. Further research is needed to explore the pathophysiological mechanisms underlying the coexistence of CB with other nasal pathologies.

Conclusion

This study has contributed valuable insights into the prevalence, clinical presentation, and anatomical variations of concha bullosa (CB) and its potential association with nasal pathologies such as deviated nasal septum (DNS) and chronic sinusitis. Through detailed analysis of demographic data, clinical symptoms, and radiological findings, it was established that while CB is a common anatomical variation, its direct association with more severe nasal pathologies may be limited.

The high incidence of symptoms such as headache and nasal obstruction among CB patients further emphasizes the clinical relevance of this anatomical variation. Understanding these symptoms can lead to improved diagnostic accuracy and more targeted treatments, which is especially important in surgical planning. For example, functional endoscopic sinus surgery (FESS) can benefit from preoperative identification of CB, ensuring that surgical interventions address both the symptomatic manifestations and underlying anatomical causes.

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