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CONCHA BULLOSA AND DEVIATED NASAL SEPTUM IN PATIENTS WITH CHRONIC RHINOSINUSITIS

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ABSTRACT Chronic rhinosinusitis is one of the most prevalent diseases and affects almost 11% of the world population . Concha bullosa and deviated nasal septum(DNS) are among the most common anatomical variations that can cause chronic rhinosinusitis . Aim of this study is to estimate the proportion of concha bullosa and DNS in patients with chronic rhinosinusitis and their clinical profile. **Materials and methods** A hospital-based descriptive study was conducted among patients who attended the Department of Otorhinolaryngology, Government T.D. Medical College, Alappuzha, over a period of 18 months from November 2022 to April 2024, with the symptoms of chronic rhinosinusitis. Demographic profile, symptomatology, diagnostic nasal endoscopy and imaging were used to evaluate the patients. Data were processed with SPSS v16. **Results** Out of 126 subjects, majority belonged to the age group of 41-60 years, with a slight male preponderance. Most common symptom was nasal obstruction(69.8%), followed by headache. DNE showed septal deviation in 117 patients (92.9%), concha bullosa in 61.9% of patients and osteomeatal block in 77.8%. On CT scan, DNS was seen in 92.9% of patients. Concha bullosa was observed in 75.4% of the subjects, predominantly lamellar type (31.8%). Among the sinuses involved, maxillary sinus opacification was the commonest. Partial opacification was seen more commonly. Air column between the concha bullosa and DNS was maintained in 65.1%. Most patients belonged to the Lund Mackay score between 5–9(37.3%). A significant association was found between nasal obstruction, ipsilateral DNS, concha bullosa, and paranasal sinus opacification. **Conclusion** DNS and concha bullosa play a significant role in the OMC block, thereby causing altered sinus clearance and later, sinusitis. DNE and CT scan aid in identifying the anatomical variations, OMC block, and also in assessing severity. Early detection and management help in the reduction of disease burden.

KEYWORDS : Chronic rhinosinusitis, Concha bullosa, Deviated Nasal Septum, Diagnostic Nasal Endoscopy, CT scan of nose and paranasal sinus

INTRODUCTION

Rhinosinusitis refers to the inflammation of the mucosa of nose and paranasal sinuses. Based on the duration of the symptoms, rhinosinusitis can be roughly divided into acute and chronic rhinosinusitis. A patient is diagnosed with chronic rhinosinusitis (CRS) if the symptoms persist for over 12 weeks. The etiology of rhinosinusitis is multifactorial as both the host and the environment tend to influence the progression of the illness.

Chronic rhinosinusitis (CRS) has a significant burden worldwide and it affects almost 11% of the population and poses a substantial economic burden[1]. The most popular clinically accepted classification of rhinosinusitis is the Lanza and Kennedy criteria reported by the American Academy of Otolaryngology-Head and Neck Surgery multidisciplinary rhinosinusitis task force[3]. This criterion uses major and minor symptoms to categorize the patients. Even though many guidelines exist based on the symptomatic profile of the patients, the European position paper on rhinosinusitis and nasal polyps (EPOS) 2020 has defined rhinosinusitis based on the presence of characteristic symptoms and objective evidence of mucosal inflammation[4]. Recent international studies have also stressed the need for objective evidence-based guidelines like that of EPOS. EPOS criteria use symptoms, nasal endoscopy, and CT scan of nose and paranasal sinus to diagnose patients with chronic rhinosinusitis.

Clinical definition of rhinosinusitis in adults is defined as[4]: inflammation of the nose and the paranasal sinuses characterised by two or more symptoms, one of which should be either nasal blockage/obstruction/congestion or nasal discharge (anterior/ posterior nasal drip):

± facial pain/pressure
± reduction or loss of smell
and either endoscopic signs of:
- nasal polyps, and/or
- mucopurulent discharge primarily from the middle meatus and/ or
- oedema / mucosal obstruction primarily in the middle meatus and/or

CT changes:
- mucosal changes within the ostiomeatal complex and/or sinuses

CRS can be divided into chronic rhinosinusitis with polyps (CRSwNP) and without polyps (CRSsNP). Lund and Kennedy's endoscopic scoring system can be used to assess the severity of the disease[5]. CT scan of nose and paranasal sinus has become the standard radiological investigation for patients with chronic rhinosinusitis as it provides accurate fine bony anatomical details, and the extent of the disease and also allows confirmation and staging of the disease. Lund-Mackay scale can be used for the staging the severity of rhinosinusitis[6].

As the etiology of CRS is multifactorial, anatomy of nose and paranasal sinuses also play a major role in the aetiology of the disease. DNS and osteomeatal anatomical variations also play a role in the course of the disease. Mladina classified nasal septal deviation into 7 types[7]. Obstruction of the osteomeatal complex can lead to mucosal congestion and defective drainage and ventilation of the paranasal sinuses. Hence, adequate knowledge of the osteomeatal unit and the commonly encountered findings like concha bullosa and deviated nasal septum needs to be studied for effective medical and surgical treatment.

AIMS AND OBJECTIVES

- To estimate the proportion of concha bullosa and deviated nasal septum in patients with chronic rhinosinusitis
- To describe the clinical profile of patients with chronic rhinosinusitis

MATERIALS AND METHODS

The study was a hospital-based descriptive study conducted among the patients with chronic rhinosinusitis attending the Department of Otorhinolaryngology at Government T.D. Medical College, Alappuzha, Kerala. It was conducted over a course of 18 months, from November 2022 to April 2024, after obtaining clearance from the institutional ethics committee.

Inclusion criteria

1. Patients above the age of 12 years
2. Patients who fulfil the criteria for chronic rhinosinusitis using the

EPOS criteria (European position paper on Rhinosinusitis and Nasal Polyps)
3. Those who have given consent for the study

Exclusion criteria
1. Previous history of sinonasal surgery
2. History of trauma to face
3. History of malignant sinonasal diseases

Study Procedure
After obtaining informed consent from the patients presenting with chronic rhinosinusitis, they were assessed based on the EPOS criteria. Detailed history and examination were done and they were further evaluated with nasal endoscopy and CT. Diagnostic nasal endoscopy was performed to assess the findings in the nasal cavity, and CT scan of nose and paranasal sinus were also assessed. Permission to conduct the study was obtained from the Institutional Research Committee, and the study was started after receiving clearance from the Human Institutional Ethics Committee. Informed consent was obtained from patients participating in the study.

Statistical methods
Data collected was tabulated using Microsoft Excel and presented with the help of descriptive statistics using SPSS software version 16. For quantitative variables, findings were expressed in mean and standard variation. For qualitative variables, data was analyzed for frequency and percentage. Chi-square test was applied for assessing the association.

RESULTS
Out of the total 126 patients, majority of the cases belonged to the age group of 41-60 years (n=52, 41.3%), which was followed by 21-40 years (n=48, 38.1%). The study also showed a male preponderance with 65 males (51.6%) and 61 females (48.4%).

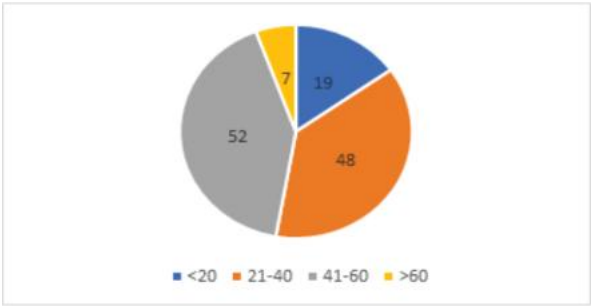

Fig 1: Age distribution of patients

Nasal obstruction (n=88, 69.8%) was the most common symptom among the study subjects followed by headache (n=75, 59.5%) and postnasal drip (n=66, 52.4%).

Table 1: Symptomatology of patients

Symptoms	Frequency	Percentage
Nasal obstruction Unilateral Bilateral	88 80 8	69.8% 63.4% 6.4%
Headache	75	59.5%
Facial pain	31	24.6%
Anterior nasal discharge	49	38.9%
Postnasal discharge	66	52.4%
Smell disturbance	23	18.3%

Diagnostic nasal endoscopy was performed to evaluate the nasal cavity for anatomical variations and pathological conditions. Deviated nasal septum was observed in 117 patients (92.9%). Concha bullosa, visualised endoscopically as an enlarged middle turbinate was seen in 78 patients (61.9%). Osteomeatal complex (OMC) block was observed in 98 of the 126 subjects (77.8%). Nasal polyps were identified in 52 patients (41.3%).

Table 2 : DNE findings

DNE FINDINGS	UNILATERAL N	%	BILATERAL N	%	ABSENT N	%
DNS	117	92.9	9	7.1	-	-
Concha bullosa	60	47.6	48	38.1	18	14.3
Inferior turbinate hypertrophy	10	7.9	108	85.7	8	6.4
Paradoxical middle turbinate	12	9.5	114	90.5	0	0
Mucoid discharge	38	30.2	87	69	1	0.8
Mucopurulent discharge	16	12.7	104	82.5	6	4.8
Edematous mucosa	21	16.6	101	80.2	4	3.2
OMC block	89	70.7	28	22.2	9	7.1
Nasal polyps	40	31.8	74	58.7	12	9.5

CT scan of nose and paranasal sinus with coronal and axial cuts was taken to correlate with the findings of nasal endoscopy. Deviated nasal septum was seen in 92.9% of patients (n=117). OMC block was seen in 83.3% of patients (n=105). Concha bullosa was seen in 95 patients(75.4%). Maxillary sinus was the most commonly involved (n=120, 95.2%), followed by anterior ethmoids (n=106, 84.1). Lund Mackay score was used to assess the severity of the disease. Mladina classification was used to assess the types of DNS. Type 1 variant of septal deviation was most commonly observed.

Table 3: CT scan of nose and paranasal sinus findings

CT SCAN OF NOSE AND PARANASAL SINUS FINDINGS	UNILATERAL N	%	BILATERAL N	%	ABSENT N	%
Maxillary sinus opacification	55	43.7	6	4.8	65	51.6
Anterior ethmoid sinus opacification	43	34.1	20	15.9	63	50
Posterior ethmoid opacification	33	26.2	43	34.1	50	39.7
Frontal sinus opacification	39	31	70	55.5	17	13.5
Sphenoid sinus opacification	26	20.6	82	65.1	18	14.3
OMC block	94	74.6	21	16.7	11	8.7
Deviated nasal septum	117	92.9	9	7.1	-	-
Concha bullosa	73	57.9	31	24.6	22	17.4

Table 4: Lund Mackay score

LUND MACKAY SCORE	Frequency	Percentage
0-4	37	29.4
5-9	47	37.3
10-14	28	22.2
15-24	14	11.1
Total	126	100

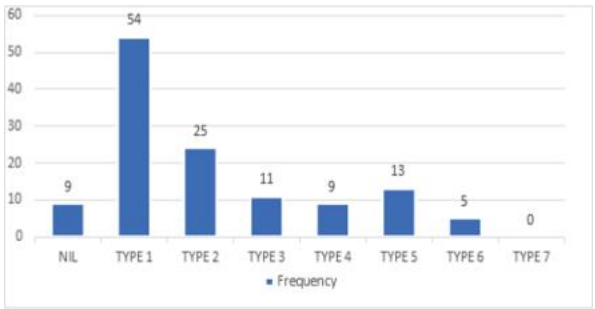

Fig 2: Types of DNS according to Mladina classification

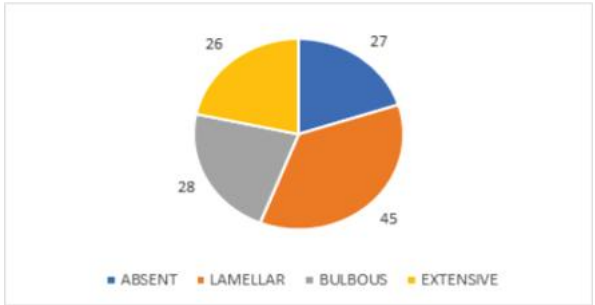

Fig 3: Types of concha bullosa

The lamellar type of concha bullosa was found to be more prevalent than the other variants. Although concha bullosa is often presumed to contribute to a deviated nasal septum (DNS), the presence of an intervening air column suggests otherwise. To evaluate the relationship between concha bullosa and DNS, the presence of an air column between the concha and the nasal septum was specifically assessed using computed tomography (CT). An intervening air column was identified in 82 patients (65.1%).

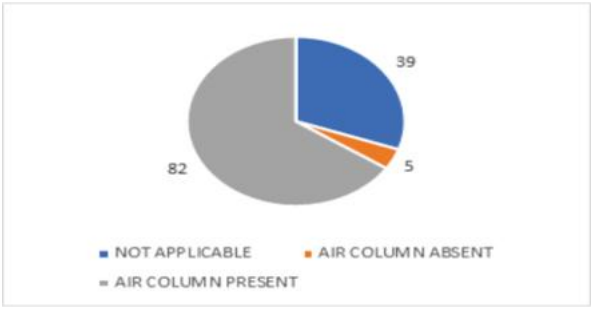

Fig 4: Presence of air column between septum and concha bullosa

Nasal obstruction and its laterality were found to have a significant association with the deviated nasal septum, concha bullosa, and OMC block, whereas other symptoms were not statistically significant. Statistical significance was found with ipsilateral DNS/ concha bullosa and sinus opacification. Among the types of concha bullosa, the extensive type was found to be statistically significant with the OMC block.

Table 5 : Association of parameters

	Parameters	P value
Nasal obstruction	DNS	0.000
	Concha bullosa	0.000
	DNS and concha bullosa	0.012
	OMC block	0.011
OMC block	Nasal obstruction	0.001
	DNS	0.005
	Concha bullosa	0.015

DISCUSSION

Patients diagnosed with chronic rhinosinusitis were evaluated using detailed symptomatology, diagnostic nasal endoscopy and CT of nose and PNS. The majority of the subjects belonged to the age group of 41-60 years (n=52, 41.3%), closely followed by the 21- 40 year age group (n=48, 38.1%). These findings are comparable to those reported by Shi et al., who observed the highest prevalence in individuals aged 15–34 and 35–59 years [8]. There was a slight male preponderance (n=65, 51.6%) to the female counterparts (n=61, 48.4%). Similar results were reported by Asif A Wani et al, who documented a male preponderance of 65.3% [9].These observations highlight that CRS predominantly affects individuals in their economically productive age group, underlining early intervention and prompt treatment for improving the quality of life.

Among the symptoms studied, nasal obstruction was most common (n=88, 69.8%) followed by headache in 75 patients (59.5%). Nasal discharge was also frequently observed; postnasal discharge was observed in 66 patients (52.4%), while anterior nasal discharge was noted in 49 patients (38.9%). Facial pain was reported by 31 patients(24.6%). Hyposmia was noticed in 19 patients (15.1%) and anosmia in 4 patients(3.2%). These findings are consistent with the study by Mogarnad et al., in which all patients presented with nasal obstruction, followed by headache, nasal discharge, facial pain, and hyposmia[10].

DNE facilitates assessment of the nasal cavity and identification of anatomical variations, nasal polyps, septal deviation, OMC block, and other abnormalities. Septal deviation was the most common endoscopic finding, observed in 117 patients (92.9%). Tiwari and Goyal similarly reported septal deviation in 88.3% of their study population, closely aligning with the present findings [2]. Concha bullosa was seen in 61.9% of patients, of which unilateral involvement was seen in 47.6%, and bilateral in 18 patients (14.3%). Nasal polyps were observed in 41.3%, of which unilateral polyposis was seen in 31.7% of patients, and bilateral nasal polyposis was seen in 9.5%. Osteomeatal block was observed in 77.8% of patients, predominantly unilateral (70.7%), while bilateral block was seen in 7.1%. Evaluation by CT scan focused mainly on DNS and its laterality, concha bullosa and its types, OMC block, and paranasal sinus opacification. Septal deviation was studied according to the Mladina classification. Septal deviation was seen in 92.9% of patients. According to the study, type 1 deviation of Mladina classification was most common (42.9%), followed by type 2 (19.8%) and type 5 (10.3%). Type 7 was not observed. These findings are comparable to those of Daghistani et al., who reported type 1 deviation in 34.8% and type 2 in 30.7% of patients[11].

Concha bullosa was observed in 75.4% of subjects, with unilateral involvement in 57.9% and bilateral involvement in 17.5%. Based on the Bolger classification, the lamellar type was the most common (31.8%), followed by the bulbous (22.2%) and extensive types (21.4%) in this study. Maru and Gupta et al reported concha bullosa in 41.3% of their subjects, predominantly unilateral (83.5%), lamellar type being the most frequent, followed by bulbous and extensive types[12]. OMC block was observed in 83.3% of patients (n=105), with unilateral block in 74.6% and bilateral block in 8.7%. CT imaging proved superior to DNE in identifying OMC obstruction.

Paranasal sinus opacification was assessed as partial or complete. Maxillary sinus opacification was most common (95.2%), with unilateral involvement in 43.6% and bilateral involvement in 51.6%. This was followed by anterior ethmoid (84.1%), posterior ethmoid (65.9%), frontal (44.4%), and sphenoid sinuses (34.9%). The air column between the concha bullosa and deviated nasal septum was preserved in 65.1% of patients presenting with both concha bullosa and deviated nasal septum. This finding correlates with Tiwari and Goyal, who reported maintenance of the air channel in 97.8% of cases and they attributed this deviation of the septum away from the concha not as a consequence of the concha pushing the septum, but rather, some unknown developmental relationship between the concha and the nasal septum[2].

The Lund-Mackay score was calculated based on the sinus opacification and OMC involvement and categorized into 4 severity groups[13]. Most patients had scores between 5–9 (37.3%), followed by 0–4 (29.4%), 10–14 (22.2%), and 15–24 (11.1%). In contrast, Hopkins et al. reported the highest proportion of patients in the 10–14 category (28%), followed by 15–24, 5–9, and 0–4[6].

Analysis of symptom correlation with anatomical parameters revealed a significant association between the laterality of nasal obstruction and the presence of DNS, concha bullosa, and OMC block. Nasal obstruction was predominantly experienced on the side corresponding to these anatomical abnormalities.

A significant association was observed between right-sided DNS and opacification of the right maxillary and anterior ethmoid sinuses. Similarly, left-sided DNS was significantly associated with left anterior ethmoid sinus opacification. Although all paranasal sinuses were evaluated, statistical significance was limited to these sinuses. Alsaggaf et al. also reported an association between DNS and sinusitis, with maxillary sinusitis being most prevalent, followed by ethmoidal, sphenoidal, and frontal sinusitis[15]. These findings suggest that DNS predisposes to ipsilateral sinusitis.

Concha bullosa demonstrated significant associations with ipsilateral sinus opacification. Right-sided concha bullosa was significantly associated with right anterior and posterior ethmoid sinus opacification, while left-sided concha bullosa was associated with opacification of the left maxillary, anterior ethmoid, posterior ethmoid, and frontal sinuses. El Din et al. similarly reported a predominance of ethmoidal sinusitis followed by maxillary sinusitis, with extensive concha bullosa showing the strongest association with sinusitis[16]. A large concha bullosa can cause OMC obstruction, leading to impaired sinus drainage and subsequent CRS.

Patients with both concha bullosa and DNS also exhibited similar patterns. Right-sided DNS with right concha bullosa was significantly associated with right anterior and posterior ethmoid sinus opacification, while left-sided combinations were associated with left maxillary and posterior ethmoid sinus opacification.

OMC block showed a significant association with both DNS and concha bullosa. Among the concha bullosa subtypes, the extensive type was most commonly associated with OMC obstruction and

sinusitis, consistent with findings by El Din et al[16]. OMC obstruction is a well-recognized predisposing factor for sinusitis. Poje et al. suggested that concha bullosa is frequently associated with osteomeatal complex disease [17], while Chandra et al. demonstrated higher ipsilateral maxillary sinus disease and Lund–Mackay scores on the side of OMC obstruction[18].

CONCLUSION

Sinonasal anatomical variations play a significant role in the pathogenesis of chronic rhinosinusitis, with deviated nasal septum and concha bullosa being among the most important anatomical contributing factors. Diagnostic nasal endoscopy and CT scans of the nose and paranasal sinuses serve as valuable tools for accurate evaluation of the disease. The present study demonstrates that chronic rhinosinusitis predominantly affects individuals in the economically productive age group, emphasizing the need for early detection and intervention to improve quality of life.

Nasal obstruction, observed as the most common symptom, was also found to be statistically associated with OMC block. Both DNS and concha bullosa were significantly associated with an increased likelihood of OMC blockage, which may predispose patients to the development of CRS. Furthermore, the severity of OMC obstruction was influenced by the type of concha bullosa. Patients with DNS, concha bullosa, or a combination of both exhibited a higher prevalence of sinusitis, reinforcing the role of osteomeatal obstruction in the etiopathogenesis of CRS. Among the various types of concha bullosa, the extensive type showed a significantly stronger association with CRS compared to the lamellar and bulbous types.

While diagnostic nasal endoscopy is useful for identifying inflammatory changes such as mucosal edema and nasal discharge, CT imaging provides a more precise evaluation of paranasal sinus opacification and underlying sinonasal anatomical variations, thereby facilitating comprehensive assessment and management of chronic rhinosinusitis.

CONFLICT OF INTEREST- Nil
FINANCIAL SUPPORT - Nil

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