



Incidence of Concha Bullosa in Chronic Sinusitis and Symptomatic Relief following Crushing Turbinoplasty

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Abstract

Background: *The study was conducted with the aim to study the incidence of concha bullosa in chronic sinusitis as detected on computed tomography and to assess the symptomatic relief following crushing turbinoplasty using Kressners turbinate forceps.*

Objective: *To assess the incidence of concha bullosa in chronic sinusitis. To perform endoscopic crushing turbinoplasty using Kressners turbinate forceps in patients with concha bullosa. To compare pre-operative SNOT-22 score and post-operative SNOT-22 score after crushing turbinoplasty.*

Methods: *Computed tomography of 100 patients with chronic sinusitis were studied for the presence of concha bullosa. They were categorized into three types: lamellar, bulbous and extensive types. Further graded on diagnostic nasal endoscopic findings. The endoscopic crushing turbinoplasty using Kressners turbinate forceps was done in 15 patients. Patients were regularly followed for a period of 2 months.*

Results: *The incidence of concha bullosa in chronic sinusitis was found to be 36%. Also, there was significant relief following crushing turbinoplasty with statistical significance ($p < 0.05$).*

Conclusion: *The incidence of concha bullosa in our study is 36%. There is statistical significance in the outcome following crushing turbinoplasty.*

Keywords: *Concha Bullosa, Crushing Turbinoplasty, Kressners turbinate forceps.*

Introduction

Sinusitis is inflammation of sinus mucosa (Van Alyea 1963). When symptoms of sinusitis persist for 2 months or more, this is labeled as chronic sinusitis (Lund and Kennedy, 1995).^[1] Sinusitis complicates approximately 5% to 10% of upper respiratory tract infections. Acute bacterial rhino sinusitis has been defined as sudden in onset and with duration of less than four weeks. Most important cause of chronic sinusitis is failure of acute infections to resolve. Chronic sinusitis is one of the most frequent otorhinolaryngological disease encountered.

Pneumatization of the middle turbinate, the concha bullosa, is one of the most common obstructive anatomic variations in patients with chronic sinusitis. The incidence of positive findings for concha bullosa varies from 14-53%. The incidence of concha bullosa in sinusitis patients was found to be 45%.^[2]

The aerated middle turbinate may completely fill the space between the septum and the lateral nasal wall thereby blocking the middle meatus and predisposing to sinus infection. Symptomatic concha bullosa needs surgical correction.

Surgeries commonly done for concha bullosa are complete or partial turbinectomy, partial laminectomy, crushing turbinoplasty, evacuation turbinoplasty. This study attempts to find the incidence of concha bullosa in patients with chronic sinusitis and their relief following crushing turbinoplasty using Kressners turbinate forceps.

Materials and Methods

Study Design: Phase I- Prospective study, Phase II-Interventional study.

Source of Data: Study was conducted among the patients who underwent Computed Tomography-paranasal sinus for chronic sinusitis in ENT department at Rajah Muthiah Medical College Hospital, Chidambaram during the study period during the period of 2 years from October 2017 to August 2019.

Study Population: The study will be conducted among 100 patients who underwent Computed Tomography of paranasal sinus for chronic sinusitis.

Inclusion Criteria: Patients of age more than 18 years but not more than 50 years with chronic rhino sinusitis

Exclusion Criteria: Patients with nasal polyposis, major surgery or accidents involving the maxillofacial region, uncontrolled Diabetes mellitus, systemic illness like autoimmune disease, neoplastic disease, previous functional endoscopic sinus surgery, immunosuppressants and congenital deformities of the nasal cavity, paranasal sinuses.

Method of Study

100 patients who were diagnosed to have chronic rhinosinusitis, which was confirmed with CT scan and were included. In phase-I of study, detailed history was taken. Examination of Ear, nose, throat and general examination was done in all the patients. The preoperative symptoms' severity was measured using SNOT-22 score by asking the patient to score according to their symptoms. Anterior Rhinoscopy and diagnostic nasal endoscopy were done in all patients. Endoscopic grading of middle turbinate was done from grade 1 to grade 4.

Table 1 Endoscopic grading of concha bullosa

Grade	Description
Grade 1	The sphenoid recess and uncinat process are both clearly visible.
Grade 2	The sphenoethmoidal recess is invisible; the uncinat process is visible.
Grade 3	The sphenoethmoidal recess and uncinat process are both invisible.
Grade 4	Giant concha bullosa occupying the entire middle meatal area, extending to the inferior meatus.

The surgery for concha bullosa was limited to patients with grades 2 to 4 concha bullosa in endoscopy. In CT-PNS imaging the concha bullosa

was classified into lamellar concha bullosa, bulbous concha bullosa and extensive / true concha bullosa as per Bolger et al classification.

Figure 1 Types of concha bullosa in CT PNS

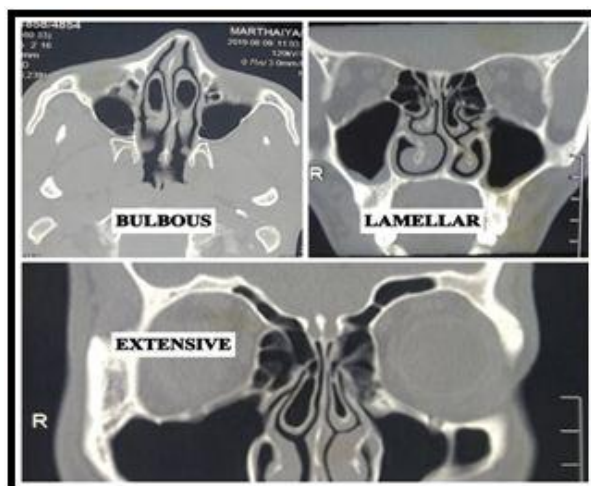


Table 2 Bolger et al classification of concha bullosa

Type	Description
Lamellar type	Pneumatisation of the vertical lamella of middle turbinate.
Bulbous type	Pneumatisation of the inferior part of middle turbinate.
Extensive type	Pneumatisation of both the vertical lamella and inferior part of middle turbinate.

In phase-II study, crushing turbinoplasty was done only for patients with chronic sinusitis and concha bullosa showing minimal mucosal thickening in sinus, no DNS or mild DNS, with absent / minimal

inferior turbinate hypertrophy. The endoscopic crushing turbinoplasty using Kressners turbinate crushing forceps was carried out in 15 patients who met the above-mentioned criteria.

Figure 2. Kressners turbinate forceps



Under general anaesthesia, patient put on supine position, nasal cavities were packed with cottonoids soaked in oxymetazoline and 2% lignocaine drops. The enlarged pneumatised portion of the middle turbinate was gently crushed between the blades of Kressner turbinate crushing forceps that has a relatively large crushing surface area under rigid 0° endoscopic view. This was continued inferiorly and posteriorly until adequate visualization of the middle meatus was achieved and middle turbinate was no longer in contact with

the lateral wall of nose. This was followed by anterior nasal packing with merocel and removed after 48 hours.

Post operatively parental antibiotics, analgesics, nasal decongestant drops, steroid nasal spray were given for a period of one week. Patients were discharged on 7th post-operative day with advice of nasal douching along with steroid spray for another 2 weeks. Patient were assessed on post-operative day 2, day 7, at the end of 1 month and at the end of 2 months after surgery.

Figure 3 Pre-operative and intra-operative image of concha bullosa

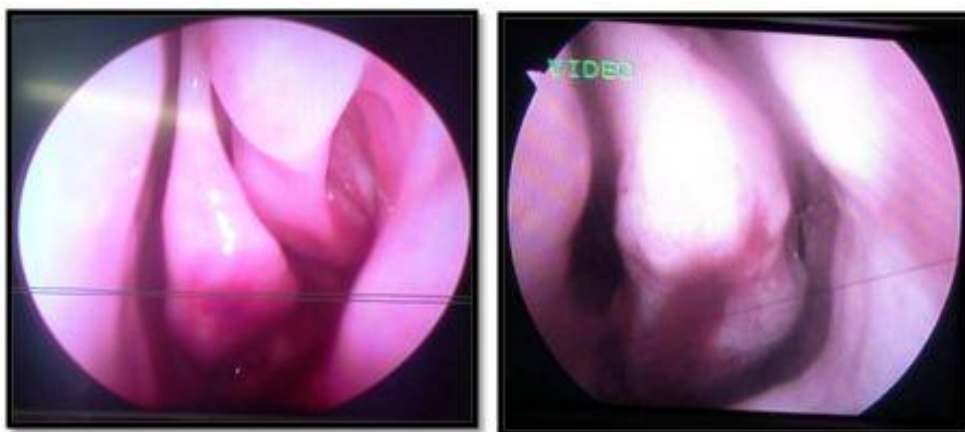


Figure 4. Concha bullosa being crushed between the blades of Kressners turbinate forceps

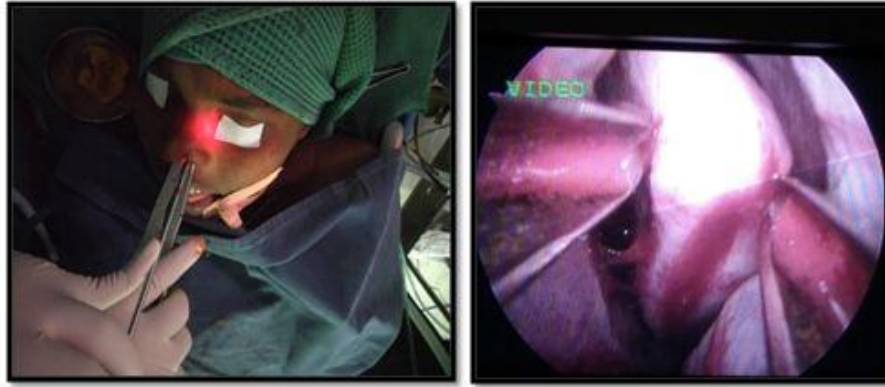


Figure 5. Post-operative endoscopy image

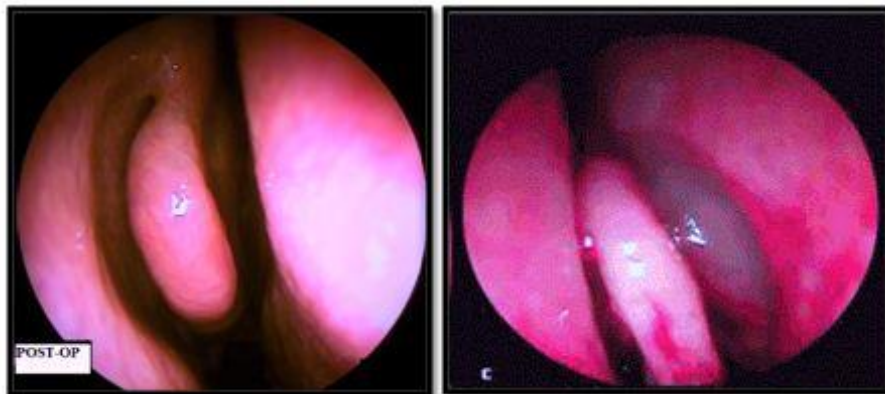


Figure 6 SNOT 22 score

ID: _____ DATE: _____

SINO-NASAL OUTCOME TEST (SNOT-22)

Below you will find a list of symptoms and social/emotional consequences of your rhinosinusitis. We would like to know more about these problems and would appreciate your answering the following questions to the best of your ability. There are no right or wrong answers, and only you can provide us with this information. Please rate your problems as they have been over the past two weeks. Thank you for your participation. Do not hesitate to ask for assistance if necessary.

1. Considering how severe the problem is when you experience it and how often it happens, please rate each item below on how "bad" it is by circling the number that corresponds with how you feel using this scale: →

	No problem	Very Mild problem	Mild or slight problem	Moderate Problem	Severe problem	Problem as bad as it can be	5 Most Important Items
1. Need to blow nose	0	1	2	3	4	5	<input type="radio"/>
2. Nasal Blockage	0	1	2	3	4	5	<input type="radio"/>
3. Sneezing	0	1	2	3	4	5	<input type="radio"/>
4. Runny nose	0	1	2	3	4	5	<input type="radio"/>
5. Cough	0	1	2	3	4	5	<input type="radio"/>
6. Post-nasal discharge	0	1	2	3	4	5	<input type="radio"/>
7. Thick nasal discharge	0	1	2	3	4	5	<input type="radio"/>
8. Ear fullness	0	1	2	3	4	5	<input type="radio"/>
9. Dizziness	0	1	2	3	4	5	<input type="radio"/>
10. Ear pain	0	1	2	3	4	5	<input type="radio"/>
11. Facial pain/pressure	0	1	2	3	4	5	<input type="radio"/>
12. Decreased Sense of Smell/Taste	0	1	2	3	4	5	<input type="radio"/>
13. Difficulty falling asleep	0	1	2	3	4	5	<input type="radio"/>
14. Wake up at night	0	1	2	3	4	5	<input type="radio"/>
15. Lack of a good night's sleep	0	1	2	3	4	5	<input type="radio"/>
16. Wake up tired	0	1	2	3	4	5	<input type="radio"/>
17. Fatigue	0	1	2	3	4	5	<input type="radio"/>
18. Reduced productivity	0	1	2	3	4	5	<input type="radio"/>
19. Reduced concentration	0	1	2	3	4	5	<input type="radio"/>
20. Frustrated/restless/irritable	0	1	2	3	4	5	<input type="radio"/>
21. Sad	0	1	2	3	4	5	<input type="radio"/>
22. Embarrassed	0	1	2	3	4	5	<input type="radio"/>

2. Please mark the most important items affecting your health (maximum of 5 items) ↑

The post-operative SNOT-22 scoring was done after the end of 2 months of surgery. The assessed

pre-operative and post-operative SNOT-22 scores were compared and statistically analysed using

SPSS 16.0 Software. The significance was set at 5% level of significance ($P < 0.05$).

Observation and Results

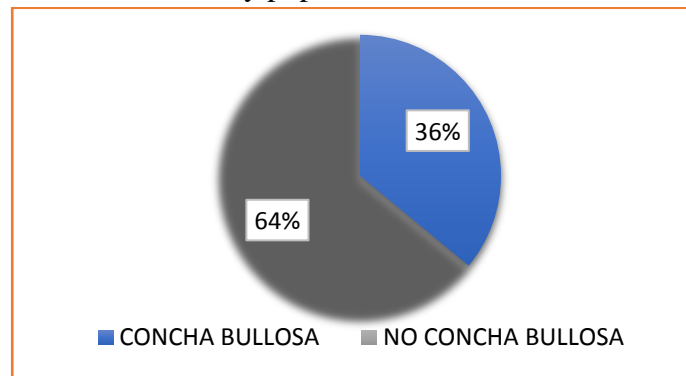
This study shows that more patients belong to the age group 21-30 years. The mean age of study

population is 30.2 years. In the above-mentioned Table.4 and graph.2, the sex distribution of our study population is depicted. There is male predominance (55%) in this study.

Table 3: Incidence of concha bullosa in study population (n=100)

Concha bullosa	Study population	
	Number of patients	Percentage
Present	36	36%
Absent	64	64%
Total	100	100%

Graph-1. Incidence of concha bullosa in study population



The Table-3 and graph-1 mentioned above shows that the incidence of concha bullosa in study population is 36%.

Table 4. Incidence of concha bullosa in various age group

Age group (in years)	Concha bullosa	
	Number of patients	Percentage (%)
18-20	3	8.33%
21-30	21	58.33%
31-40	7	19.44%
41-50	5	13.88%
Total	36	100

Graph-2. Incidence of concha bullosa in various age group

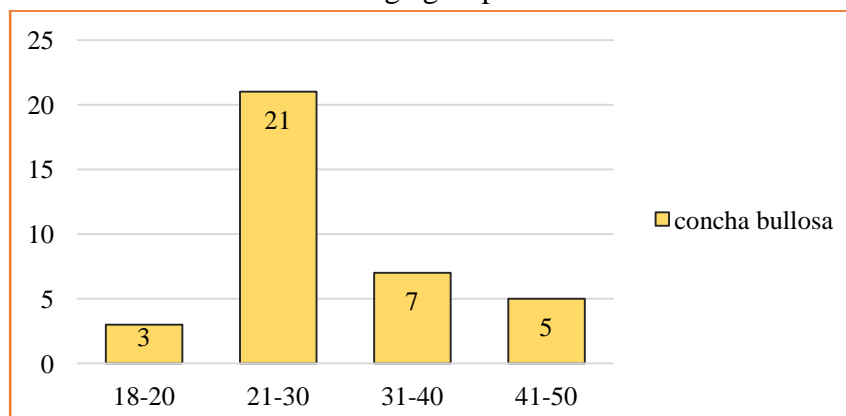


Table .4 and graph 2 shows that in our study, the incidence of concha bullosa is more in the age

group 21-30 years (58.33%), followed by 31-40 years (19.44%).

Table 5. Sex distribution among concha bullosa patients

Sex	Study population	Incidence of Concha bullosa	
		Number	Percentage (%)
Female	45	13	28.88%
Male	55	23	41.81%

Graph-3. Sex distribution of concha bullosa

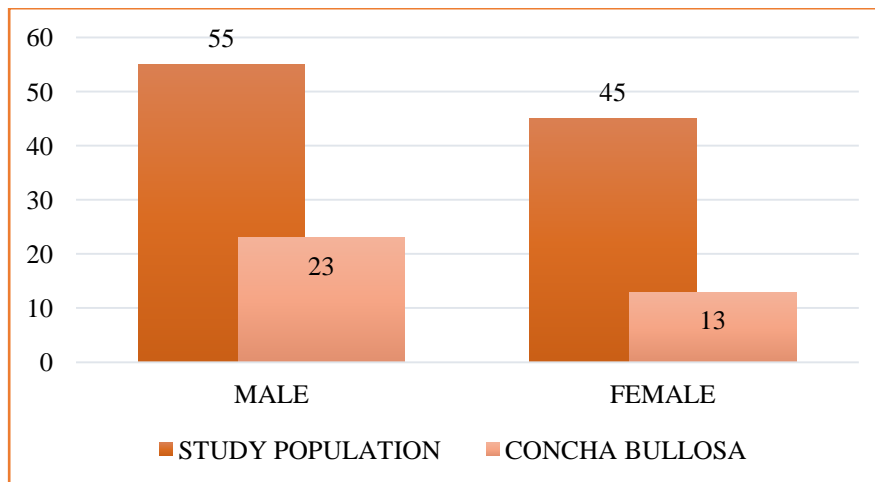


Table .5 and graph 3 shows that in our study there is male predominance (41.81%) in the incidence of concha bullosa.

Table 6 Incidence of concha bullosa laterality

Concha bullosa		No. of patients	Percentage
Bilateral		14	38.89%
Unilateral	Left	12	33.33%
	Right	10	27.78%
Total		36	100

Graph-4 Incidence of concha bullosa laterality

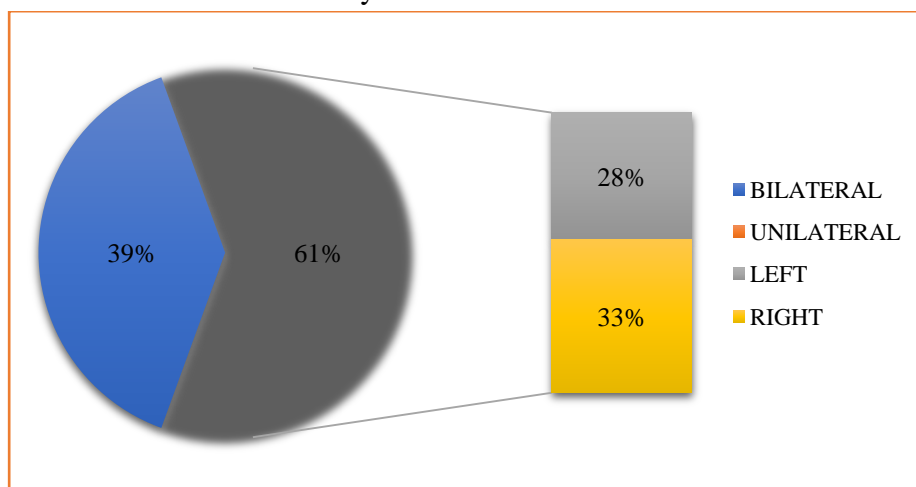
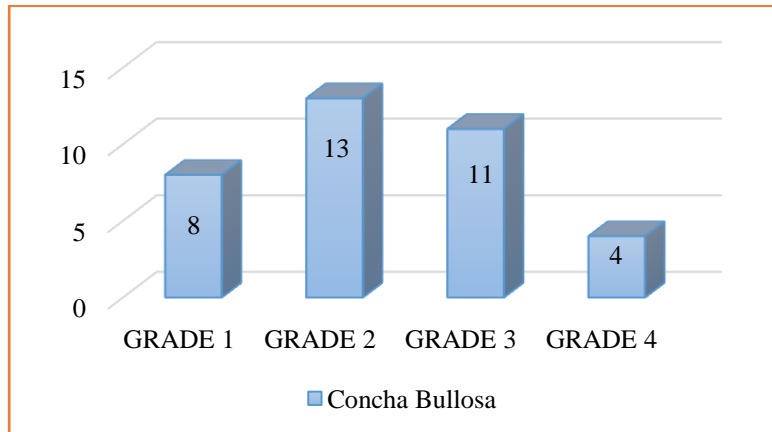


Table.6 and graph 4 shows that in our study, the unilateral concha bullosa (61.11%) is encountered more commonly than bilateral concha bullosa.

Table 7. Endoscopic grading of concha bullosa

Endoscopic grading	No. of. Patients	Percentage
Grade 1	8	22.22%
Grade 2	13	36.11%
Grade 3	11	30.56%
Grade 4	4	11.11%
Total	36	100.0%

Graph-5. Endoscopic grading of concha bullosa

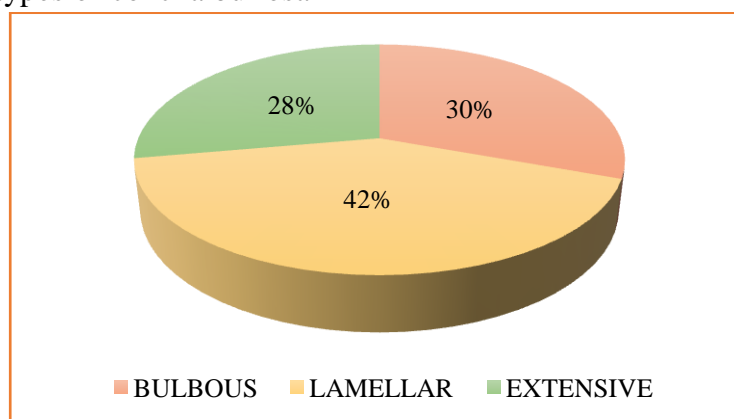


There is higher incidence of grade-2 type of concha bullosa (36.11%) in our study, as observed from table.7 and graph-5.

Table 8. Incidence of types of concha bullosa

Type of Concha bullosa	No. of. patients	Percentage
Bulbous	11	30.56%
Extensive	10	27.78%
Lamellar	15	41.67%
Total	36	100.0%

Graph-6. Incidence of types of concha bullosa



The lamellar type of concha bullosa (41.67%) is more common in our study population followed by bulbous type of concha bullosa (30.56%) and

extensive type of concha bullosa (27.78%) as shown by table-8 and graph-6.

Table 9. Comparison of Pre-Operative and Post-Operative SNOT-22 Score

SNOT-22 score	Mean	Standard Deviation	't' value	P value
Pre-Op	48.67	3.109	38.483	0.000
Post-Op	17.07	1.100		

Graph-7. Comparison of Pre-Operative and Post-Operation SNOT-22 Score mean and standard deviation

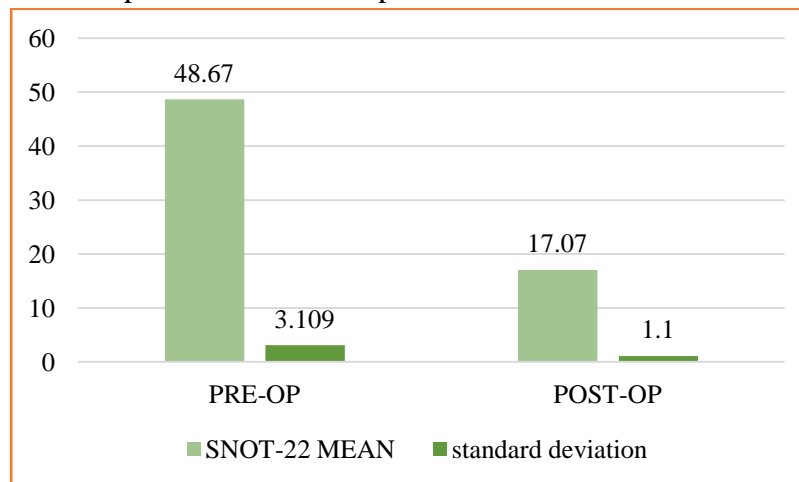


Table-9 and graph-7 shows the comparison between pre-operative and post-operative SNOT-22 score mean. There is appreciable decrease in the post-operative SNOT-22 mean which is statistically significant ($p=0.000$)

Discussion

The middle concha is embryologically a derivative of medial part of the ethmoid bone. Concha bullosa is the pneumatization of the concha and one of the most frequent variants noted. It is generally seen in the middle concha. It is infrequently found in the superior and inferior conchae.^[2] The middle concha pneumatizes almost always from the anterior ethmoidal cells. Pneumatization through the posterior air cells or both occurs but is very rare. 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] Pneumatized middle turbinates sometimes encroach upon the middle meatus, narrow the osteomeatal complex, hinder intraoperative

endoscopic access to the middle meatus, and hamper postoperative control of the postoperative bed. Excision of the lateral lamella of the concha bullosa, which is a commonly performed procedure, is associated with reported postoperative adhesions in 15% of patients especially if the procedure was combined with surgery of the paranasal sinuses.^[4]Crushing turbinoplasty has been carried out using various instruments like Pituitary rongeur forceps, Jason Middleton forceps, Freer septal elevator, Dogru forceps, Blakesley forceps and Kressners forceps. The blades of Kressners turbinate forceps has a large surface area and avoids mucosal damage to the middle turbinate. In our study, concha bullosa was treated with crushing turbinoplasty technique using Kressners turbinate crushing forceps. The SNOT-22 tool ^[5] was used to assess disease specific Quality of Life (QOL) pre-operatively and post-operatively. SNOT-22 scores decreased significantly at the end of follow up period.

In this study, the majority of the study population are between 21-30 years of the age (43%) and the mean age of the study group is 30.2 years of age. Concha bullosa was commonly identified in the age group between 21-30 years (58%) and the

mean age is 29.34 years. *Shyamakant Prasad et al* observed that the mean age for Concha Bullosa as 28.61 years.^[6] Mean age was 38.88 years in *S Subramanian et al.*^[7] *Satheesh Kumar Bhandary et al* noted that concha bullosa was found commonly in the age group of 21–40 years (56.3%).^[8]

In our study, out of 55 male patients 23 had concha bullosa and of 45 female patients 13 had concha bullosa. The male: female ratio was 1.8:1. In *Saarthak Wadhwa et al* that the male: female ratio

was 1:1.6.^[1] *Shyamakant Prasad et al* in their work observed 30 were (43.47%) male and 24 (47.06%) were female. The male: female ratio of the study population was 1.4:1.^[6] *Kyle D. Smith et al* in their work observed that, of all concha bullosa patients 67.8% were female patients and 68.3% were male patients.^[10] *Sumit Prinja et al* observed that out of 50 patients, 54.6% of male had concha bullosa and 53.5% of female patients had concha bullosa.^[11]

Table-10. Incidence of concha bullosa in various literatures

Concha bullosa	Incidence of concha bullosa in various literature				
	Our study	Saarthak Wadhwa et al	Shyamakant Prasad et al	S Subramanian et al	Safa Saheb Naji et al
Incidence	36 %	54.28%	45%	49.5%	46%

In this study of 100 patients with chronic sinusitis, the incidence of concha bullosa in concha is 36%. whereas 54.28% in *Saarthak Wadhwa et al*^[1] study, 45% in *Shyamakant Prasad et al*^[6] study, 49.5% in *Subramanian et al study.*^[7] 41.3% in *Y.K. Maru et al*^[12], 40.3% in *Satheesh Kumar Bhandary et al,*^[8] 44% in *Jamie S. Stallman,* 46% in *Safa Saheb Naji et al study.*^[13]

In this study out of 36 patients with concha bullosa, 14 (39%) had bilateral concha bullosa and 22 (61%) had unilateral concha bullosa. Among the 22 patients with unilateral concha, 12 (33%) had left sided and 10 (28%) had right sided concha bullosa. *Saarthak Wadhwa et al* observed that about 54.28% had concha bullosa on left side, 30% had concha bullosa on right side and 15.71% had bilateral concha bullosa.^[1] *Shyamakant Prasad et al* stated that unilateral Concha bullosa were seen in 38.89% with right side concha in 27.78%, left concha in 11.11% and bilateral CB in 61.11%.^[6] *Safa Saheb Naji et al* concluded that 75% were bilateral, 17% cases were on the right side and 8% cases were on the left side.^[13]

In this study, out of 36 patients with concha bullosa, 11(31%) patients had bulbous type, 10 (28%) patients had extensive type and 15(41%) patients had lamellar type of concha bullosa. *Saarthak Wadhwa et al* found that 54% were of

lamellar type, 27% were of bulbous type and 19% were extensive type.^[1] *Y.K. Maru et al* observed that 45% had lamellar type of concha bullosa, 29% had bulbous type of concha bullosa and 26% had extensive type / true concha bullosa.^[12] *Raja Kalaiarasi et al* study stated that extensive type was in 49.5%, bulbous type in 28.3% and lamellar type in 22.2% of patients.^[14] *Y. K. Maru et al* observed lamellar type in 42.3%, bulbous type in 27% and true Concha Bullosa in 30.7% patients.^[15]

In the study population, on Endoscopic examination grade 1 concha were seen among 22.22% (8 cases), grade 2 among 36.11% (13 cases), grade 3 among 30.55% (11 cases) and grade 4 among 11.11% (4 cases). *Tanyeri et al* in his study observed that grade 1 concha bullosa were seen in 13.63%, grade 2 among 31.81%, grade 3 among 45.45% and grade 4 among 9.09%.^[16]

In our study, the mean pre-op and post-op SNOT-22 score were 48.67 and 17.07 respectively. Statistical significance was found for crushing turbinoplasty with a p value of 0.00. *Zayed Mandour et al* also observed that there was a drastic decrease in mean SNOT-22 score and was statistically significant following crushing turbinoplasty.^[17]

Conclusion

- Concha bullosa is a common anatomical variant of lateral nasal wall in patients with chronic sinusitis with an incidence of 36%.
- Crushing turbinoplasty is a minimally invasive technique with a short learning curve and can be made as an effective alternative to other modes of conchoplasty.
- There is a drastic decrease in the post-operative SNOT-22 score following crushing turbinoplasty using Kressners turbinate forceps.
- This crushing turbinoplasty technique using Kressners turbinate forceps is simply to reduce the size of the concha bullosa without many complications. Thus, crushing turbinoplasty for concha bullosa can be preferred as a method for concha bullosa using Kressners forceps can be used as a preferred method for concha bullosa correction without much adverse effects.

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