

**RESEARCHING CLINICAL AND PARACLINICAL CHARACTERISTICS
AND EVALUATING TREATMENT OUTCOMES
IN CHRONIC SINUSITIS PATIENTS WITH CONCHA BULLOSA
WHO UNDERWENT FESS AT CAN THO ENT HOSPITAL AND
CAN THO CENTRAL GENERAL HOSPITAL**

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ABSTRACT

Background: Concha Bullosa, a frequently encountered anatomical variant within the nasal cavity, has been implicated in the obstruction of the osteomeatal complex, potentially contributing to the pathogenesis of chronic rhinosinusitis. Functional endoscopic sinus surgery (FESS) incorporating middle turbinate resection offers a potentially effective solution by improving both pneumatization and drainage of the paranasal sinuses. **Objectives:** To study clinical and paraclinical characteristics and to evaluate the treatment results of chronic sinusitis in patients with concha bullosa who underwent FESS at Can Tho ENT Hospital and Can Tho Central General Hospital. **Materials and methods:** A descriptive cross-sectional study designed to evaluate a cohort of 57 patients diagnosed with chronic sinusitis in the presence of Concha Bullosa who underwent FESS. **Results:** The female/male ratio was 1:1. The average age was 41.8 ± 12.9 years. The common symptom was headache (89.5%). Out of 57 patients studied, Concha bullosa was bilateral in 19 (33.3%) patients, and unilateral in 38 (66.7%) patients. The Extensive type of concha bullosa had the highest prevalence (38.2%). There were statistically significant differences between the presence of Concha Bullosa and the presence of anterior group sinusitis on the same side ($p < 0.01$). There were no statistically significant differences between the presence of types of Concha Bullosa and the presence of anterior sinusitis group ($p > 0.05$). For headache, measured using the VAS, demonstrated a statistically significant improvement ($p < 0.05$) following surgery. Preoperative VAS scores averaged 7.02 ± 2.8 , decreasing to 2.11 ± 1.6 at 1 month and 0.44 ± 0.19 at 3 months postoperatively. Similarly, the Lund-Kennedy score also showed significant improvement ($p < 0.05$). Preoperative scores averaged 3.47 ± 1.97 , declining to 1.09 ± 0.17 at 1 month and 0.44 ± 0.19 at 3 months postoperatively. Notably, at the three-month follow-up, 84.82% of patients achieved successful treatment outcomes. **Conclusion:** Functional endoscopic sinus surgery combined with middle turbinate resection, which improves pneumatization and drainage, has a good outcome.

Keywords: Concha Bullosa, chronic sinusitis, FESS.

I. INTRODUCTION

Concha bullosa is a prevalent anatomical variant within the nasal cavity characterized by pneumatization of the middle turbinate. This condition can manifest unilaterally or bilaterally. Three primary variations have been identified based on location and shape: lamellar (pneumatization confined to the vertical lamella), bulbous (pneumatization of the inferior segment), and extensive (encompassing significant pneumatization of both the lamellar and inferior portions) [1]. While often asymptomatic, concha bullosa has been

implicated in the development of sinusitis by potentially compromising the physiological function of the osteomeatal complex, thereby hindering proper aeration and drainage [2]. Middle turbinoplasty surgery may improve the pneumatization and drainage of sinuses. This is the goal of treatment in chronic sinusitis patients with concha bullosa. Hence, we conducted this research to study clinical and subclinical characteristics and evaluate treatment results of chronic sinusitis in patients with concha bullosa who underwent FESS at Can Tho ENT Hospital and Can Tho Central General Hospital.

II. MATERIALS AND METHODS

2.1. Materials

- **Study population:** The study was conducted on patients with chronic sinusitis and concha bullosa who underwent FESS at Can Tho ENT Hospital and Can Tho Central General Hospital between June 2022 and March 2024.

- **Inclusion criteria:** The inclusion criteria were as follows: (1) Patients diagnosed with chronic sinusitis with concha bullosa based on a comprehensive evaluation, including: clinical presentation, endoscopic examination, and computerized tomography scans. (2) Patients had undergone FESS.

- **Exclusion criteria:** The exclusion criteria were as follows: (1) Patients with suspicious odontogenic, fungal, or post-trauma sinusitis, or paranasal sinus tumors. (2) Patients with a history of rhinosinusitis surgery.

2.2. Methods

- **Study design:** A prospective interventional study.

- **Sample size:** We employed this statistical formula designed for proportion estimation.

$$n = \frac{Z_{1-\alpha/2}^2 \cdot p \cdot (1 - p)}{d^2}$$

In which: n: is the smallest sample size; Z = 95%; $Z_{1-\alpha/2} = 1.96$.

d: is the allowable error, with $d = 0.07$

According to a study by Ha Thanh Quen *et al.*, the rate of good outcome in chronic sinusitis patients with concha bullosa who underwent FESS was 93.7% [3]. Based on this data and using appropriate sample size calculations, a minimum sample size of 47 was determined. However, our investigation ultimately included a total of 57 subjects.

- **Study contents:**

+ General characteristics of research subjects: Age, gender.

+ Clinical and paraclinical characteristics of chronic sinusitis with concha bullosa: clinical symptoms recorded were: nasal discharge, nasal congestion, facial pain, olfactory dysfunction; Endoscopic examination recorded: the Lund-Kennedy score; Computed tomography of the nose and paranasal sinuses in the axial and coronal planes recorded: site of concha bullosa (unilateral, bilateral), types of concha bullosa (Bulbous, Lamellar, Extensive), the Lund-Mackay score.

+ Evaluate treatment results of chronic sinusitis in patients with concha bullosa who underwent FESS: Visual analogue scale (VAS) was employed to assess clinical symptoms at three time points (preoperative, 1 month postoperative, and 3 months postoperative); Lund-Kennedy endoscopic score was recorded at three time points (preoperative, 1 month postoperative, and 3 months postoperative); treatment outcomes (good, average, poor).

- **Statistical analysis:** The data were analyzed using SPSS 20.0 software.

III. RESULTS

3.1. General characteristics of research subjects

Gender: 28 male patients (49.1%) and 29 female patients (50.9%). The male/female ratio was 1/1.

Age: the mean age in the study was 41.8 ± 12.9 years old, the youngest was 17 years old and the oldest was 74 years old.

3.2. Clinical and subclinical characteristics of research subjects

Table 1. Clinical symptoms

Symptom	Number of patients	Percentage (%)
Nasal discharge	48	84.2
Nasal congestion	47	82.5
Headache	51	89.5
Olfactory dysfunction	8	14

The common symptom was headache (89.5%) and olfactory dysfunction was the lowest rate (14%). Nasal discharge and nasal congestion accounting for 84.2% and 82.5%, respectively.

Out of 57 patients studied, Concha bullosa middle turbinate was present bilaterally in 19 patients (33.3%), unilaterally in 38 patients (66.7%).

Table 2. Types of Concha Bullosa

Type	Number	Ratio (%)
Bulbous	26	34.2
Lamellar	19	25
Extensive	31	40.8

Type Extensive was the highest rate (40.8%). Type Bulbous and Extensive accounted for 34.2% and 25%, respectively.

Table 3. The relationship between Concha Bullosa type and Anterior sinusitis group on the same side

Side	Type	Anterior sinusitis group		P
		Present	Absent	
Left nostril	Bulbous	12	1	> 0.05
	Lamellar	6	2	
	Extensive	14	0	
Right nostril	Bulbous	12	0	> 0.05
	Lamellar	10	1	
	Extensive	16	0	

There were no statistically significant differences between the presence of types of Concha Bullosa and the presence of anterior sinusitis group on the same side ($p > 0.05$).

Table 4. The relationship between Concha Bullosa grade and Osteomeatal Complex Obstruction on the same side

	Grade	Osteomeatal Complex obstruction		p
		Present	Absent	
Concha Bullosa on left side	1	4	6	< 0.001
	2	15	0	
	3	23	2	

	Grade	Osteomeatal Complex obstruction		p
		Present	Absent	
Concha Bullosa on right side	1	2	8	< 0.001
	2	10	2	
	3	18	1	

There were statistically significant differences between the grade of Concha Bullosa and the presence of Osteomeatal Complex Obstruction on the same side ($p < 0.01$).

3.3. Evaluate treatment outcomes in the research subjects

Table 5. Comparison of VAS score for clinical symptoms at three times (preoperative, 1 months postoperative and 3 months postoperative)

Clinical symptoms \ Time	Preoperative	1 month postoperative	3 months postoperative	P
Headache	7.02±2.8	2.11±1.6	0.79±0.9	< 0.001
Nasal congestion	5.28±2.3	1.18±1.3	0.33±0.8	< 0.001
Nasal discharge	3.75±2.4	0.58±0.9	0.26±0.8	< 0.001
Olfactory dysfunction	1.04±2.4	0.16±0.5	0.02±0.1	< 0.001

Headache, was the most improved clinical symptom, preoperative VAS was 7.02±2.8, decreasing to 2.11±1.6 at 1 month and further declining to 0.44±0.19 at 3 months postoperatively ($p < 0.05$). Other clinical symptoms, including nasal congestion, nasal discharge and olfactory dysfunction also exhibited statistically significant improvements in VAS scores after surgery ($p < 0.001$).

Table 6. Comparison of Lund-Kennedy endoscopic scores at three times (preoperative, 1 months postoperative and 3 months postoperative)

	Preoperative	1 month postoperative	3 months postoperative
Lund-Kennedy score	3.47±1.97	1.09±0.17	0.44±0.19
P	< 0.01		

Nasal endoscopy was performed at 1 month and 3 months postoperatively. The Lund-Kennedy score significantly decreased from a preoperative mean of 3.47±1.97 to 1.09±0.17 at 1 month and 0.44±0.19 at 3 months ($p < 0.01$).

At three months postoperatively, good treatment outcome reached to 84.82%. Average and poor outcome accounted for 12.3% and 3.5%, respectively.

IV. DISCUSSION

4.1. General characteristics of research subjects

Our analysis revealed no significant gender bias within the study population. The male-to-female ratio was demonstrably close to parity (1:1), which aligns with the observations reported by Ha Thanh Quen *et al.* [3]. In their study, the authors documented a similar near 1:1 sex distribution.

The mean age of participants in our investigation was 41.8 years (± 12.9 years), with a range of 17 to 74 years. This age distribution diverged from the findings of Salah U.A. *et al.* [4], where the mean age was demonstrably lower at 32.45 years (range: 19-72 years).

Several potential explanations exist for this observed discrepancy: study location, time of sampling and our study focused exclusively on patients undergoing FESS.

4.2. Clinical and paraclinical characteristics of chronic sinusitis with Concha Bullosa middle turbinate

Concha bullosa of the middle turbinate is often asymptomatic and incidentally identified during paranasal sinus computed tomography scans. However, significant pneumatization can potentially contribute to chronic rhinosinusitis, presenting with symptoms such as nasal congestion, discharge, headache, and even olfactory dysfunction. In our study, headache emerged as the most prevalent symptom (89.5%), while olfactory dysfunction exhibited the lowest prevalence (14%). These findings align with the results reported by Ha Thanh Quen *et al.* [3]. The proposed mechanism for headache associated with Concha Bullosa involves pressure exerted on the nasal mucosa due to excessive pneumatization of the middle turbinate [5]. Similarly, olfactory dysfunction may occur when a concha bullosa significantly obstructs the pathway of inspired air reaching the olfactory epithelium [5]. Notably, the severity of clinical presentations and symptoms appears to correlate with the degree of pneumatization and the presence of inflammatory changes within the concha bullosa itself [5].

Among the 57 patients included in this study, concha bullosa was identified bilaterally in 19 patients (33.3%) and unilaterally in 38 patients (66.7%). Raja K. *et al.* reported a prevalence of bilateral concha bullosa in 35 patients (54.7%) and unilateral involvement in 29 patients (45.3%) within their study cohort [6]. The observed discrepancies in the distribution of bilateral versus unilateral concha bullosa may stem from variations in diagnostic methods employed or potential ethnic differences between the study populations.

Concha bullosa can be categorized into three distinct subtypes based on the location of pneumatization within the middle turbinate: lamellar, bulbous, and extensive. In our study, the distribution of these subtypes was as follows: Extensive (40.8%), Bulbous (34.2%), and Lamellar (25%). These findings align with the results reported by Raja K. *et al.* [6], who observed a similar distribution with Extensive (49.5%), Bulbous (28.3%), and Lamellar (22%) subtypes.

Our analysis did not reveal any statistically significant associations ($p > 0.05$) between the specific type of Concha Bullosa and the presence of ipsilateral anterior sinusitis. These findings are consistent with the observations reported by Saarthak W. *et al.* [7]. However, some contrasting evidence exists within the literature. Prior studies have suggested that bulbous and extensive Concha Bullosa subtypes may hold a stronger association with ostiomeatal complex pathology, potentially leading to inflammatory sinus disease [7]. This discrepancy highlights the need for further research to definitively elucidate the relationship between Concha Bullosa morphology and the development of sinusitis.

Our study revealed a statistically significant association ($p < 0.01$) between Concha Bullosa grade and Osteomeatal Complex obstruction on the same side. This finding aligns with prior research by Susana I., who reported that grade 1 concha bullosa does not influence the drainage and aeration of the paranasal sinuses, while grade 3 has a larger surface area in contact with the septum and causes airflow resistance [9]. Lakshmi Y.V. *et al.* found out that larger the size of Concha Bullosa, greater was the chance of osteomeatal block and sinusitis [10]. Therefore, it is considered that research using a normal random sample or a

comparative study between a normal group and a paranasal sinus disease group will be necessary in the near future.

4.3. Evaluate treatment outcomes in chronic sinusitis with Concha Bullosa

We found that middle turbinoplasty surgery is the first step and plays an important role when performing functional endoscopic sinus surgery in patients with concha bullosa, due to two reasons: Firstly, middle turbinoplasty surgery has greater improvement in headache due to contact points and removes the pathology caused by the enlarged middle turbinate. Secondly, it becomes necessary to facilitate visualization of the osteomeatal complex during endoscopic sinus surgery.

The fact that almost all patients who underwent FESS combined with middle turbinoplasty surgery had the greatest improvement in headache, which reached a peak at VAS 7.02 ± 2.8 before surgery. One month postoperatively, it decreased to VAS 2.11 ± 1.6 , and at three months postoperatively, it fell to VAS 0.44 ± 0.19 ($p < 0.05$). The over-pneumatization of the middle turbinate may cause contact between two mucosal surfaces, which creates a sensory stimulus resulting in the release of substance P that is responsible for migraine-like headache symptoms [8]. Hence, the surgical treatment of concha bullosa may shrink the size of the middle turbinate, which may eliminate contact points to relieve headache in these cases. Other clinical symptoms such as nasal congestion, nasal discharge, and olfactory dysfunction also showed better VAS scores after surgery compared with preoperative scores ($p < 0.001$).

There was a statistically significant improvement in the Lund-Kennedy endoscopy scores between the preoperative and postoperative periods. The score was highest before surgery (3.47 ± 1.97), decreased to 1.09 ± 0.17 at 1 month postoperatively, and reached the lowest level at 0.44 ± 0.19 after 3 months. Thus, we can conclude that functional endoscopic sinus surgery combined with middle turbinoplasty surgery may relieve the obstruction of drainage and pneumatization of the paranasal sinuses, which is a safe and effective treatment method for chronic sinusitis patients with concha bullosa.

After 3 months post-surgery, we evaluated treatment outcomes based on improvements in endoscopy evaluation, clinical relevance, and patient feedback. The greatest prevalence was found in good treatment outcomes, reaching 84.82%. Average and poor outcomes accounted for 12.3% and 3.5%, respectively. Our result was nearly equal to the rate in Ha Thanh Quen's study [3].

V. CONCLUSION

Functional endoscopic sinus surgery incorporating middle turbinate resection has the potential to alleviate obstruction of the osteomeatal complex, thereby improving drainage and pneumatization of the paranasal sinuses. This surgical approach represents a safe and effective treatment option for chronic rhinosinusitis patients with Concha Bullosa.

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