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Comparison between the Effect of Concha Bullosa Alone and Concha Bullosa with Deviated Nasal Septum on the Incidence of Sinusitis

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Abstract

Background: The relationship between conchae bullosa and sinusitis is unclear. Although previous studies have suggested that even large conchae bullosa may not cause sinusitis, there appeared to be a correlation between the degree of middle turbinate pneumatization with obstruction at the complex and the prevalence of ipsilateral sinus disease. This association is difficult of quantify, because patients' preoperative sinus complaints were not graded by scale of symptom severity.

Aim of Study: The aim of this study is to compare between the effect of concha bullosa alone or with deviated nasal septum on the incidence of chronic sinusitis and by then decide the medical or surgical intervention will help the patients more.

Material and Methods: Prospective clinical and radiological study was conducted on 50 patients with concha bullosa alone or associated with deviated nasal septum regarding the incidence of developing chronic sinusitis. This study had been carried out in the department of Otorhinolaryngology-Head and Neck surgery, Faculty of Medicine, MUST University in collaboration with ENT clinic of the memorial Souad Kafafi University Hospital, in Cairo, Egypt. This study was performed in the period of January 2023 till January 2024. 50 adult patients, aged 18 years or over had been included to obtain the final data in this study. This study had been approved by ethical committee, MUST University.

Results: Chronic rhinosinusitis occurred in 17 (34%) patients out of total 50 patients including 10 patients (59%) of group A with concha bullosa alone compared to 7 (41%) patients in group B with concha bullosa and DNS. All the 17 chronic sinusitis patients presented with maxillary sinusitis (100%), Sphenoid sinusitis in 3 patients (17.6%), frontal sinusitis in 2 patients only (11.8%) and ethmoidal sinusitis occurred into 6 patients (35.3%).

Conclusion: The incidence of chronic sinusitis occurred more in group A with concha bullosa alone more than group B with concha bullosa and deviated nasal septum. There was minimal differences between genders in all examined parameters. There was no correlation between the incidence of chronic sinusitis and the presence of concha bullosa alone or with deviated nasal septum.

Key Words: *Chronic sinusitis – Concha bullosa – Deviated nasal septum.*

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Introduction

THERE are four pairs of sinuses named after the bones of the skull they are pneumatizing into: Maxillary, ethmoid (divided into anterior and posterior cells), frontal and sphenoid sinuses, which are all lined by respiratory mucosa **[1].**

Normally, the frontal sinus drains into frontal recess. The maxillary sinus drains into the hiatus semilunaris, then into the middle meatus and finally in the nasal cavity through the primary maxillary ostium. The ostio-meatal complex is located into the region between the middle turbinate and the lateral nasal wall in the middle meatus draining the anterior ethmoid, maxillary and frontal sinuses. The spheno-ethmoidal recess lies above and posterior to the superior concha draining the sphenoid sinus, while the superior meatus drains the posterior ethmoid cells **[2].**

There are many studies investigating the relation between variants in the sinonasal anatomy and the occurrence of sinus pathology. Pneumatization of the nasal turbinates known as Concha Bullosa (CB) is the most common sino-nasal anatomical variation. The incidence rate ranges from 14% to 53.6% as reported in the literature, it occurs most often in the middle turbinate and less commonly in the inferior or superior turbinates **[3,4].**

The septum is the supportive structure of the nose and is also important in the nasal physiology.

It is formed of the quadrangular cartilage anteriorly, perpendicular lamina of ethmoid bone and vomer posteriorly. There is no standard definition of septal deviation, but it usually refers to the convexity of the septum to one or both sides with the accompanying deformities of midline structure. Septal deviation is the most commonly seen deformity of the nose, which might be either congenital or acquired **[5].**

Deviated Nasal Septum (DNS) is one of the most common variations. It may interfere with the physiology of the nose causing narrowing of the middle meatus which in turn causes nasal obstruction and secondary nasal and sinus infection. It has been reported in the literature that septal cartilage has an important role in facial growth, and that septal deviation during the development period may result in facial asymmetry **[6,7].**

The correlation between the presence of concha bullosa and DNS has been reported in different studies. However, the claim that presence of deviated nasal septum and pneumatization of the concha are potential contributors to the development of sinus disease is still a matter of debate. Some authors believe that the nasal septal deviation or the presence of concha bullosa affect the proper nasal airflow leading to sinonasal obstruction, and hence predispose to sinus disease, while the others showed inconsistent findings **[7].**

Nowadays, computed tomography of the paranasal sinuses is a simple tool for the diagnosis of pathologies. Therefore, it provides a precise and reliable preoperative roadmap for an endoscopic sinus surgeon. Thelow radiation dose, lower costs, shorter scanning time, and the overall accuracy have made the computed tomography technology a preferred method **[8,9].**

Aim of the work:

The purpose of this study is to compare between the effect of concha bullosa alone or with DNS on the incidence of chronic sinusitis and by then decide the medical or surgical intervention will help the patients more.

Material and Methods

Study type:

Prospective clinical and radiological study was conducted on 50 patients with concha bullosa alone or associated with DNS regarding the incidence of developing chronic sinusitis.

Study setting: This study had been carried out in the department of Otorhinolaryngology-Head and Neck Surgery, Faculty of Medicine, MUST University in collaboration with ENT clinic of the memorial Souad Kafafi University Hospital, in Cairo, Egypt.

Study period:

This study was performed in the period of January 2023 till January 2024.

Sampling size:

50 adult patients, aged 18 years or over had been included to obtain the final data in this study.

Ethical considerations:

This study had been approved by Ethical Committee, MUST University.

Sampling method:

A sample of randomized 50 male and female patients above 18 years old having concha bullosa with or without DNS were included in the study, divided into two groups:

- Group A: Patients with concha bullosa alone.
- Group B: Patients with concha bullosa and deviated nasal septum.

Study population:

1- *Inclusion criteria:*

a- Patients presented with symptoms and signs of chronic sinusitis.

b- Patients diagnosed as having either concha bullosa alone or concha bullosa associated with deviated nasal septum.

c- Patients aged 18 years or over.

d- Patients of both genders were included in this study.

2- *Exclusion criteria:*

a- Patients with previous history of nasal surgery.

b- Patients with nasal obstruction due to other causes rather than concha bullosa with deviated nasal septum or concha bullosa alone.

c- Patients presented with acute sinusitis.

d- Patients not willing for the study and not available for follow-up.

e- Patients aged younger than 18 years.

Study tools and procedures:

A definite protocol for evaluation was followed for each patient. All participants were subjected to the following:

A- Witten consent.

B- History documentation:

1- Personal history including name, age, sex, residence, marital status and occupation.

2- Present History including nasal obstruction, nasal discharge, smell disorders, facial pain, post nasal drip, headache, bad breath, ear ache and sorethroat.

3- Past medical history: Diabetis mellitus, Hypertension, Immunocompromisation, Bronchial asthma, ...etc.

C- Otorhinolaryngologic Clinical & physical examination:

1- Inspection of external nose, vestibule, swellings and skin changes over the paranasal sinuses

2- Palpation: For any sinus tenderness

3- Examination of the nasal cavity for signs of chronic sinusitis by Anterior and Posterior rhinoscopy or by nasal endoscopy: Karl–Storz 4-mm rigid 0° and 30° with 18-cm Hopkins lens rigid endoscopes were used.

D- Radiological evaluation:

Computed Tomography (CT) of the nose and paranasal sinus axial and coronal cuts without contrast.

E- Intervention:

Patients were given medical treatment in the form of topical steroids, topical decongestants, antibiotics, nasal irrigations, oral steroids and antihisaminics and were followed-up monthly up to 3 months then evaluated by doing CT PNS. Patients were only diagnosed as having chronic sinusitis if failed medical treatment for 12 weeks and the CT PNS showed opacified sinuses.

Results

Patient's characteristics:

The mean age of the patients was 32.3±10.3 years totally in group (A) was 32.5±10.3 years while in group (B) was 32.1±10.3 years and both ranged (18-62 years). Gender distribution in group (A) involved 17 males (58.6%) and 12 females (41.4%) while in group (B) involved 9 males (42.9%) and 12 females (57.1%). There was no statistically significant difference between both groups for age (*p*–value=0.246) and gender (*p*-value=0.234). All Data are presented in Table (1).

Table (1): Demographic data: Comparison of the tested groups (group A & group B).

	Total	Group A n=29 (%)	Group B n=21 (%)	*p*-value
Age (yrs.):				
Mean ± SD	32.32±10.3	32.5±10.3	32.1±10.3	0.246
Range	18-62	18-50	21-62	
Sex:				
Female	24 (48%)	12 (41.4%)	12 (57.1%)	0.234
Male	26 (52%)	17 (58.6%)	9 (42.9%)	

Groups of the patients:

Group A included 29 patients (58%) with CB alone either bilateral in 10 patients (34.5%) or unilateral in 19 patients (65.5%). Unilateral CB are furtherly subdivided into 10 patients with right sided CB (34.5%) and 9 patients with left sided CB (31%) represented in pie Chart (1).

Group B included 21 patients (42%) presented with CB associated with DNS divided into a group of 3 patients with DNS and bilateral CB (14.3%) and another group of 18 patients with DNS and unilateral CB (85.7%). The last one was rather divided into 13 patients with left sided CB (62%) and 5 right sided CB (23.7%) represented into Fig. (1).

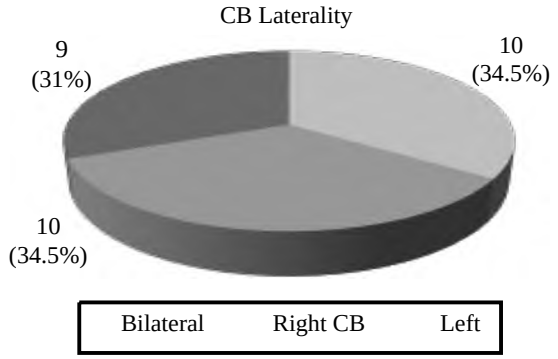

Chart (1): Pie chart representing CB laterality in Group A among study patients.

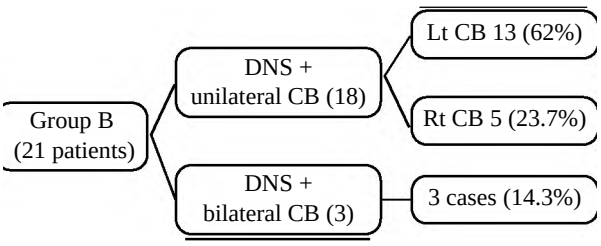

Fig. (1): Group B patients' distribution regarding the side of CB with DNS.

Incidence of chronic sinusitis among the participants:

Regarding the incidence of sinusitis among the study groups, chronic rhinosinusitis occurred in 17 (34%) patients out of total 50 patients including 10 (59%) patients of group A and 7 (41%) patients of group B. The mean age of the patients with chronic sinusitis was 32.4±11.9 years and was absent in 33 cases with mean age of 31.4±9.6 years (*p*-value= 0.738). Regarding the gender of the patients there were 9 males (52.9 %) and 8 females (47.1%).

Regarding group A, sinusitis occurred in 10 patients (34.5%) out of 29 patients including: 3 cases with bilateral CB, 4 patients with left sided CB and 3 patients with right sided CB. While in group B, sinusitis occurred in 7 patients (33.3%) out of 21 patients figured according to CB side into 1 bilateral CB patient, 4 patients with left sided CB and 2 patients with right sided CB. According to DNS in group B, sinusitis occurred in 3 patients with DNS to the right side, 2 patients with DNS to the left side and 2 patients with S shaped deviation (Table 2).

Table (2): Incidence of Sinusitis in Groups of the patients.

	N (%)
Sinusitis:	
No	33 (66)
Yes	17 (34)
Group A 10 patients (59%):	
No sinusitis	19 (65.5)
Yes	10 (34.5)
With Bilateral CB	3
With unilateral RT CB	3
With unilateral LT CB	4
Group B 7 patients (41%):	
No sinusitis	14 (66.7)
Yes	7 (33.3)
With Bilateral CB	1
With unilateral RT CB	2
With unilateral LT CB	4
With S shaped DNS	2
With RT deviated DNS	3
With LT deviated DNS	2

In this study, after comparing the clinical and the radiological results by doing Computed Tomography of the nose and paranasal sinus without contrast (axial and coronal cuts), we found thatall the 17 patients presented with chronic sinusitis had maxillary sinusitis (100%), 6 patients (35.3%) had ethmoidal sinusitis, Sphenoid sinuses were diseased in 3 patients (17.6%) and frontal sinusitis occurred in 2 patients (11.7%).

Regarding the incidence of chronic ethmoidal sinusitis, it occurred into 6 (35.3%) patients 3 in group A and the other 3 in group B. There were 4 patients with bilateral sinusitis and the other 2 had right sided sinusitis with DNS in the same side and the 2 CB were in different sides one right and the other were left sided.

Maxillary sinusitis occurred in all the 17 patients (100%) divided into 10 patients in group A and 7 from group B (6 cases bilaterally, 8 patients with right sided sinusitis and 3 with left maxillary sinusitis). While chronic frontal sinusitis occurred in 2 patients in group A only (11.8%), Sphenoid sinuses were diseased in 3 patients (17.6%), 2 in group B, one patient in group A andall were in the right side; 2 patients on the contralateral side of the CB and one in the same side of CB and DNS. Thus, the left side was spared in all sinuses except only 3 patients with maxillary sinusitis. Sinusitis occurred in different sinuses in 11 cases, while the other 6 cases had only maxillary sinusitis with free other sinuses (Chart 2).

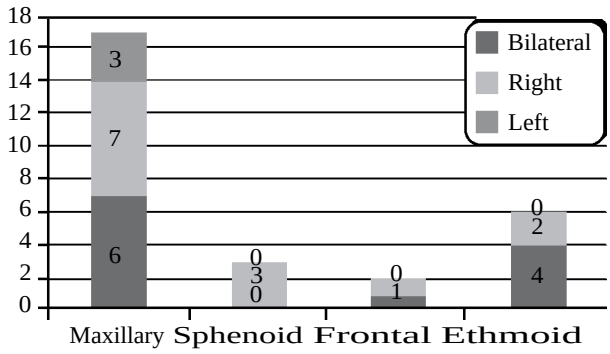

Chart (2): Bar chart representing the different affected sinuses among patients.

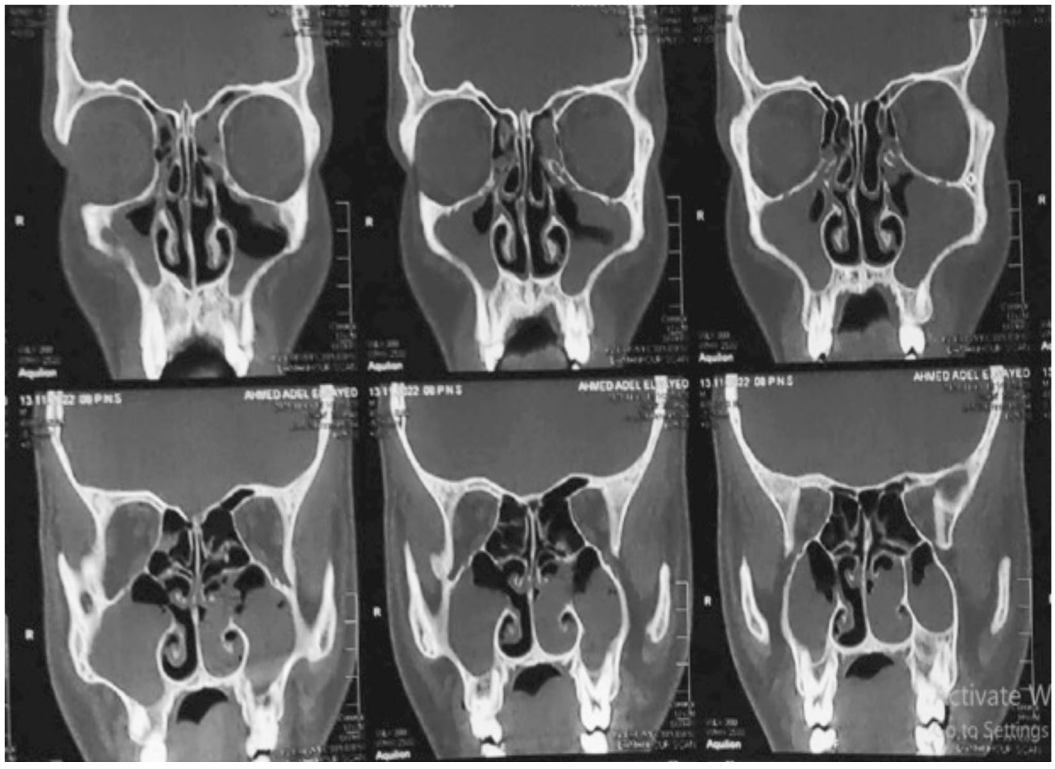

Fig. (2): Coronal CT scan demonstrating a group B patient with bilateral maxillary sinusitis.

Regarding the CB type, of all the 17 patients presented with sinusitis, 6 CB (35.3%) were of lamellar type, 6 (35.3%) were bulbous type and 5 (29.4%) were extensive type.

All the 17 patients diagnosed with chronic sinusitis were given medical treatment in the form of topical steroids, topical decongestants, antibiotics, nasal irrigations, oral steroids and antihisaminics and were followed-up monthly up to 3 months then evaluated by doing CT of nose and paranasal sinuses. Only 6 (35.3%) patients showed response to medical treatment and all were from group A with CB alone except one case from group B. The other 11 patients didnot respond to the medical treatment and underwent either endoscopic sinus surgery (ESS) with partial medial turbinectomy or ESS with septoplasty and partial medial turbinectomy for group B.

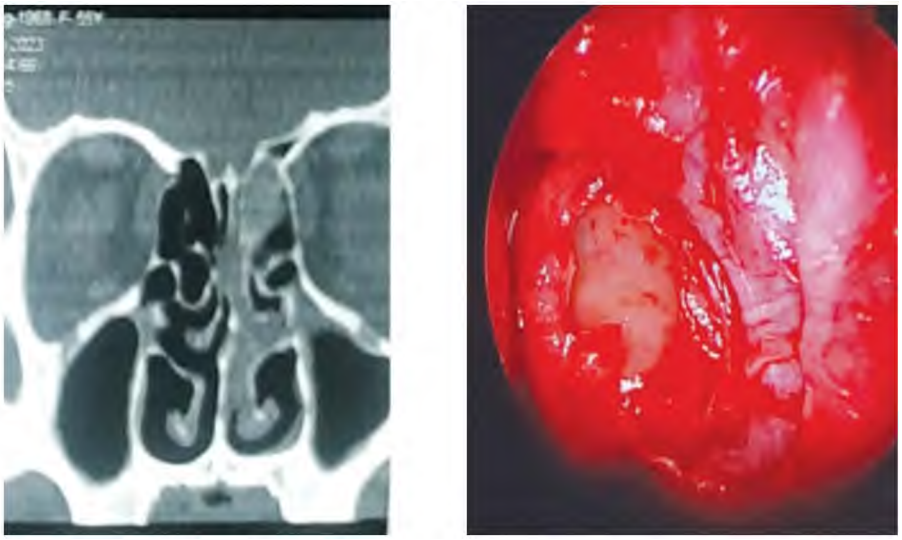

Fig. (3): Coronal CT scan demonstrating Lt ethmoidal chronic sinusitis in a group A patient treated surgically by FESS.

Discussion

Deviated nasal septum is one of the most common variations. It may interfere with the physiology of the nose causing narrowing of the middle meatus which in turn causes nasal obstruction and secondary nasal and sinus infection. It has been reported in the literature that septal cartilage has an important role in facial growth, and that septal deviation during the development period may result in facial asymmetry *[6]*.

The relationship between conchae bullosa and sinusitis is unclear. Although previous studies have suggested that even large conchae bullosa may not cause sinusitis, there appeared to be a correlation between the degree of middle turbinate pneumatization with obstruction at the complex and the prevalence of ipsilateral sinus disease. This association is difficult of quantify, because patients' preoperative sinus complaints were not graded by scale of symptom severity *[10]*.

Our study included 50 cases divided randomly into two groups: Group A in which patients presented with CB alone and includes 29 patients and group B in which patients presented with CB associated with DNS and includes 21 patients regarding the incidence of chronic rhinosinusitis. The mean age of the patients included is 32.3±10.3 years totally in group (A) was 32.5±10.3 years while in group (B) was 32.1±10.3 years and both ranged (18-62 years). Similar to this results Hatipoğlu et al., *[10]*, included patients has the same mean age but ranged from 14 to 59 years.

Regarding gender distribution in this study, there were 26 males (52%) and 24 females (48%). In many studies female gender was more than males and this happened randomly. In the current study, although the majority (57.1%) of the subjects with DNS were females, there was no statistically significant difference between both genders regarding the presence of NSD (p=0.234). Several studies on the other hand reported that NSD is more commonly seen in males as Lopes et al., *[12]* and Kapusuz et al., *[4]* who explained this by the fact that DNS occurs frequently due to trauma which is more commonly seen in males.

In this study, although females showed lower prevalence of CB (48%), there was no statistically significant difference between both genders (p=0.234). These results came in agreement with several other studies and against others as Bahemmat and Hadian, *[13]* who reported that CB is more common among females.

Our study showed that chronic rhinosinusitis occurred in 17 (34%) patients out of total 50 cases including 10 (59%) patients of group A with CB compared to 7 (41%) patients in group B with CB and DNS. Furthermore, Kapusuz et al., *[4]* reported that severe deviation may be a contributing factor for sinusitis. Hatipoglu et al., *[11]* also found correlation between the degree of septal deviation and the presence of maxillary sinusitis. Similarly, a meta-analysis conducted by Collet et al., *[14]* also failed to find a definite relationship between the degree of DNS and presence of maxillary sinusitis.

A number of studies examined the prevalence of maxillary sinusitis in different study populations. Bolger et al., *[15]*, reported that maxillary sinusitis occurred in 83% of their patients. Bahemmat and Hadian, *[13]* on the other hand reported a lower prevalence of maxillary sinusitis (33.6%). similarly, this study showed that 34% of the studied population had maxillary sinusitis. Again, these variations are mainly related to the differences between the study populations.

For the correlation between CB and maxillary sinusitis, some researchers as Wong et al., *[16]* believe that CB causes sinus obstruction and therefore increases the incidence of maxillary sinusitis. However, others argue that there is no correlation as Uygur et al., *[17]* and Stallman et al., *[18]* who reported that 72% of patients with CB had sinus disease and that 78% of patient without CB had sinus disease. Therefore, they concluded that there was no correlation between the presence of CB and the presence of sinus disease.

One study done by Smith et al., *[19]* regarding the prevalence of CB and DNS and their relationship to the incidence of maxillary sinusitis declared that sinusitis occurred in 50% of the patient population compared to 41% of cases included in group B in our study. This higher percentage may be due to the huge number of the cases included in that study (883 cases) compared to our study (only 50 cases).

While it has been suggested that abnormalities of the concha can predispose patients to obstruction of the sinuses, leading to chronic sinusitis, other studies with findings similar to those in the current study as Stallman et al., *[18]* and Nouraei et al., *[20]* concluded that there was no correlation between the presence of CB and sinusitis. Previous studies that supported the validity of a relationship have typically included a majority of patients with pre-existing chronic sinusitis as Wong et al., *[16]*.

Group A in this study included 10 right sided CB cases (34.5%) and 9 left sided CB cases (31%) and bilateral CB in 10 cases (34.5%). Similar to our study, Hatipoğlu et al., *[11]*, declared that CB were located bilaterally and in the right side more than in the left side. these small differences are probably related to the intrinsic variations of the examined study population.

Group B in our study included patients presented with CB and DNS showed 3 cases with DNS and bilateral CB (14.3%) and 13 cases with left sided CB and DNS (62%) and 5 right sided CB cases with DNS (23.7%). Similar to our study, Ahmed, *[7]* said that concha bullosa is located in the right side less than in the left side in cases with DNS.

Regarding the prevalence of the DNS, it was reported in 21 cases (42%) of the sample size. The nasal septum was deviated to the right side in 11 cases (52.4%) and to the left side into 7 cases (33.3%). This came close to the results obtained by Bahemmat and Hadian, *[13]* who reported that the prevalence of septal deviation was 37%.

These results came also close to those of Stallman et al., *[18]* who reported that septal deviation was to the right side in 51% of their cases and to the left in 49%. As reported by numerous studies as Lopes et al., *[12]* and Gencer et al., there was no significant predilection to either the right or left side. Also Ahmed, *[7]*, declared that the nasal septum was seen deviated to the right side more than to the left.

For the correlation between DNS and CB, the results of this study came in agreement with Lopes et al., *[12]* regarding the fact that DNS did not increase the incidence of formation of CB. On the contrary, Bahemmat and Hadian, *[13]* found a significant correlation between DNS and CB.

However, regarding the correlation between the side of CB and the direction of DNS, this study showed that there is a statistically significant correlation between the presence of DNS and the presence of contralateral CB (p=0.032). Similarly, Uygur et al., *[17]* and Keles et al., *[21]* found a strong correlation between the presence of a deviated septum and contralateral CB. It could be concluded that DNS may be a factor that prevents the formation of CB on the same side.

Although, the exact mechanism of CB formation is still not completely understood, airflow is considerably reduced in the nasal cavity on the side of the convexity of nasal septum and pneumatization of the middle concha is increased on the contralateral side. This theory might explain the correlation between DNS and the higher incidence of contralateral middle CB *[21]*.

Conclusion:

The incidence of chronic sinusitis occurred more in group A with concha bullosa alone more than group B with concha bullosa and deviated nasal septum. There was minimal differences between genders in all examined parameters. There was no correlation between the incidence of chronic sinusitis and the presence of concha bullosa alone or with

deviated nasal septum. There was correlation between NSD and CB, NSD and maxillary sinusitis, and CB and maxillary sinusitis. However, there was an association between the presence of NSD and contralateral CB.

Additionally, correlation was found between presence of maxillary sinusitis and maximum extension of NSD, presence of CB and severity of maxillary sinusitis. From the previous results it could be concluded that the presence of CB and or NSD increases the risk factors for development of chronic sinusitis.

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مقارنة بين تاثير الحويصلات الهوائية بقرنيات الانف الوسطى بمفردها والمصاحبة لاعوجاج الحاجز الانفى فى معدل حدوث التهابات الجيوب الانفية

تم تصميم هذه الدراسة بعنوان مقارنة بين تاثير الحويصلات الهوائية بقرنيات الانف الوسطى بمفردها والمصاحبة لاعوجاج الحاجز الانفى فى معدل حدوث التهابات الجيوب الانفية المزمنة. وقد شملت دراستنا ٥٠ حالة مقسمة عشوائياً إلى مجموعتين: المجموعة (أ) التى عانى فيها المرضى من الحويصلات الهوائية بالقرنيات الوسطى وحدها وتضم ٢٩ حالة والمجموعة (ب) التى عانى فيها المرضى من الحويصلات الهوائية بالقرنيات الوسطى مع انحراف الحاجز الأنفى وتضم ٢١ حالة.

فى دراستنا، كان متوسط عمر المرضى المشمولين هو ٣٢,٣ ± ١٠,٣ سنة ويتراوح أعمارهم من ١٨ إلى ٦٢ سنة. وفيما يتعلق بالتوزيع حسب الجنس فقد بلغ عدد الذكور المشاركين ست وعشرون حالة أكثر من الإناث (أربع وعشرون حالة). وقد حدث التهاب الجيوب الأنفية المزمن فى سبع عشرة حالة بنسبة (٣٤٪) من إجمالى خمسين حالة بما فى ذلك عشرة حالات من المجموعة أ مقارنة بسبع حالات فى المجموعة ب.

ولقد وجدنا أن جميع هذه الحالات السبعة عشرالمصابة بالتهاب الجيوب الأنفية المزمن فى كلا المجموعتين ظهرت لديهم التهاب الجيوب الأنفية الوجنية تحت العين بمعدل حدوث (١٠٠٪) بينما كانت الجيوب الوتدية جار العين مصابة فى ثلاث حالات. ولقد حدث التهاب الجيوب الغربالية فى ست حالات بينما حدث التهاب الجيوب الجبهية فى حالتين فقط. وحدث التهاب الجيوب الأنفية فى الجانب الأيمن أكثر من الجانب الأيسر. كما أن نسبة الإصابة بالتهاب الجيوب الأنفية أعلى عند الذكور أكثر من الإناث، وترتفع عند المتزوجين عنها عند غير المتزوجين.