Effect of Endoscopic Lateral Lamellectomy in Concha Bullosa Induced Rhinogenic Headache

Original Article

Mostafa Talaat[1], Ehab Nada[2], Abdel-Moneim H. Hamad[1]

Department of Otolaryngology, Faculty of Medicine, [1]Minia University, [2]Misr University for Science and Technology, Egypt.

ABSTRACT

Purpose: To assess the effect of surgical intervention (endoscopic lateral lamellectomy) in relieving the contact point headache induced by Concha bullosa.

Patients and Methods: 20 patients with persistant headache for one year or more presented in the period from June 2018 to February 2020. Surgical intervention was done according to C.T nose and paranasal sinuses in each case , bilateral endoscopic lateral lamellectomy was done in 35%, unilateral endoscopic lateral lamellectomy in 65%.

Results: In the current study, and according to MIDAS score of headache there was 10% of patient with mild disability (MIDAS Grade II), 50% with moderate disability (MIDAS Grade III) and 40% with sever disability (MIDAS Grade IV) preoperatively, MIDAS score ranged from 8-39 with mean score of 20.3 ± 8.89. 3 months postoperatively all the patients were with little or no disability (MIDAS Grade I), MIDAS score ranged from 0-4 with mean score of 1.7 ± 1.21, the *p value* is *<0.001*.

Conclusion: Concha bullosa is considered one of the most important factors in the development of contact point rhinogenic headache and this headache can be cured or significantly improved after endoscopic lateral lamellectomy with no or minimal complications providing that accurate selection of the patients and skilled surgeon.

Key Words: Concha-bullosa, headache, lateral-lamellectomy, sinus.

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Corresponding Author: Abdel-Moneim Hamad, MD, Department of Otolaryngology, Faculty of Medicine, Minia University, Minia, Egypt. **Tel.:** +20/0107665549, **E-mail**: Abd.monem.ent@gmail.com

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INTRODUCTION

Headache is such a common symptom that 80% of the population experiences headaches at least once a year. Rhinogenic or sinusogenic headache gained recognition from the otolaryngology and neurology communities. Rhinogenic headache, in the absence of an inflammatory sinus disorder, is a highly controversial topic gaining much attention with advance in endoscopic sinus surgery[1]

It has multiple synonyms in the literature including rhinopathic headache, sinogenic headache, middle turbinate headache, nasal spur headache, four finger headache, sinus headache, Rhinogenic contact point headache(RCPH), and Sluder headache.

Contact headache or referral headache caused by friction and pressure from the middle turbinate on the septum or lateral wall of the nose may be due to nasal mucosal obstruction or by compression of the middle turbinate (bullous turbinate).[2] High index of suspicion is required for diagnosis with careful clinical history, anterior rhinoscopy, computed tomography (CT), and confirmation by a xylocaine test.[3]

The most common anatomic variation of the nose and paranasal sinuses is concha bullosa (CB), which is the process of pneumatization of the middle turbinate. It affects about a quarter of the general population. Headache, nasal obstruction, and decreased sense of smell are among the most common symptoms of this syndrome. The most common symptom is headache, which can be caused by a contact between the CB and other structures of the nasal cavity. CB is observed in 53% of cases of sinusitis, either unilateral or bilateral[4]. CB may be classified as lamellar, bulbous, or extensive according to the location of pneumatization of middle concha, but there is no link between types of CB and sinus disease.[5,6]

In cases where the nasal septum is severely deviated, pneumatized middle turbinate (concha bullosa), or medially displaced middle turbinate by enlarged ethmoidal bulla, the medial wall of the nose is stimulated by contact between the middle turbinate and the nasal septum, and thus contact edema between mucosal surfaces and release of pain mediators resulting in pain radiating along nerve fibers. Many people with facial pain suggestive of sinus disease are ultimately proved through extensive investigations to have intranasal pathology without sinusitis.

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The middle turbinate in close relation to other mucosal surfaces has been associated with contact point headache or facial pain. Surgical removal appears to provide relief in correctly selected patients[7]. So, Concha bullosa is considered one of the most important factors in the development of contact point rhinogenic headache and this headache can be cured or significantly improved after endoscopic lateral lamellectomy with no or minimal complications providing that accurate selection of the patients and skilled surgeon.

PATIENTS AND METHODS:

Twenty patients with persistent headache for one year or more presented in the period from June 2018 to February 2020, 7 males and 13 females. Their age ranged from 13 to 45 years. All patients were informed about the study details through information sheet, and specific informed consent for this study was signed.

Surgical procedures were recommended and done based on (Inclusion criteria):

1. C.T findings proved concha bullosa in each case;

2. Positive Lidocaine test and

3. Recurrence of symptoms after initial improvement with medical treatment for 1 month.

Exclusion criteria included:

1. Previous sinonasal surgery

2. Extensive nasal polyps mimicking contact points and

3. Sinusitis and allergic rhinitis: exclusion was done by clinical examination and CT scans.

The Migraine Disability Assessment Questionnaire (MIDAS) is a self-administered seven-item (five-score) questionnaire designed to assess headache-related disability. The MIDAS Questionnaire was created to enhance physician-patient communication and to help identify headache patients who require intensive care.[8] Preoperative MIDAS was done (Appendix I).

Local anesthetic test were done during the attack of headache, (so it is not done for all patients), a piece of cotton was prepared by soaking it in lidocaine 2% and adrenaline, 1:200.000. This piece of cotton was put at the site of contact point headache in the nasal cavity and left for 5 minutes till the local anesthetic become effective. Positive test is considered if the patient experiences improvement of headache severity more than 50% by asking the patient if there is decrease in headache severity and the percentage of decrease from original headache.

Medical treatment was described in the form of local steroids (Mometasone nasal spray for one months), systemic decongestant(pseudoephedrine tablets, 120 mg twice daily for 10 days) and antihistaminic (levocetirizine tablets 5 mg once daily for one month) Stoppage of medical treatment causes recurrence of symptoms after initial improvement.

Surgical procedures:

Endoscopic lateral lamellectomy was done for all cases (partial lateral lamillectomy of the concha bullosa), right, left or bilateral according to case.

ESS was done under general anesthesia after complete lab investigations and internal medicine consultation for fitness of the case for hypotensive anesthesia.

Pledgets soaked with adrenaline; 1:200.000 for decongestion was put at the site of contact point in the nasal cavity. Submucosal injection of saline adrenaline 1:200,000 with spinal needle 27 was done endoscopically in middle turbinate. Cottonoids soaked with xylometazoline were put in middle meatus, between middle turbinate and nasal septum and on the lower surface of middle turbinate, then waiting for about 10 minutes. Removal of all cottonoids and pledgets. The anterior surface of middle turbinate was incised by specific plane knife separating it into medial and lateral sides. Removal of the lateral bony lamellae. Preservation of the upper part of the lateral bony lamellae is very important. Avoidance of anatomical trauma and trying to preserve the medial MT wall and especially the superior union with the cribriform lamina, to avoid intracranial complications and fistulae. The middle meatus and nasal cavities were packed with Merocel IVALON® Nasal Packing injected with saline adrenaline and covered with antibiotic cream then removed after five days to avoid adhesions (Fig. 1-5).

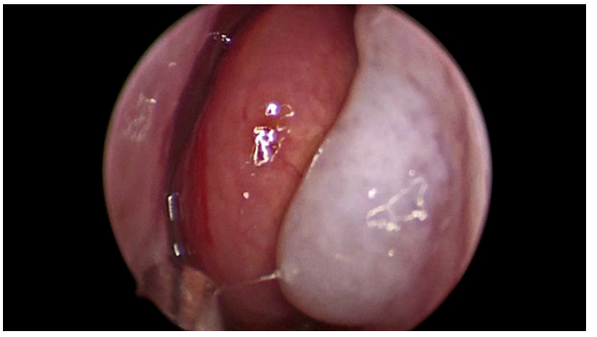


Fig. 1: Left sided Concha bullosa (CB) which is of the middle turbinate pneumatization one of the anatomic variations of the sinonasal region

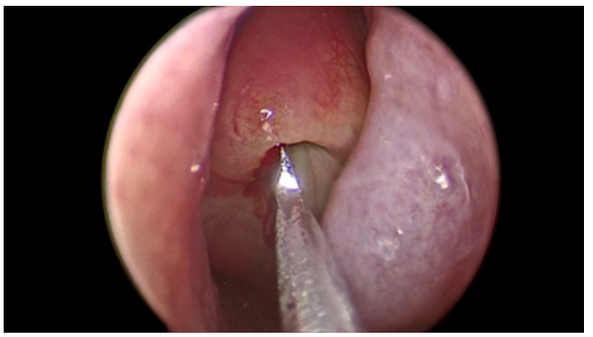


Fig. 2: Incision is taken with plane knife on the anterior surface of middle turbinate separating it into medial and lateral sides.

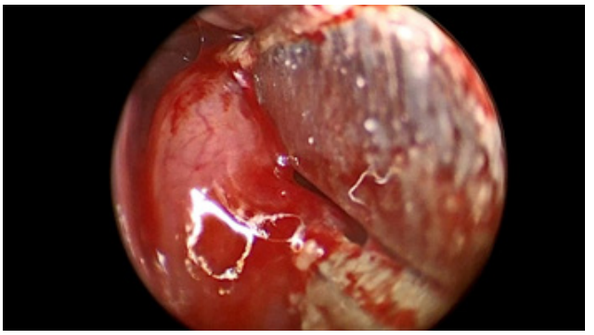


Fig. 3: The middle turbinate anterior surface is separated it into medial and lateral sides by scissor

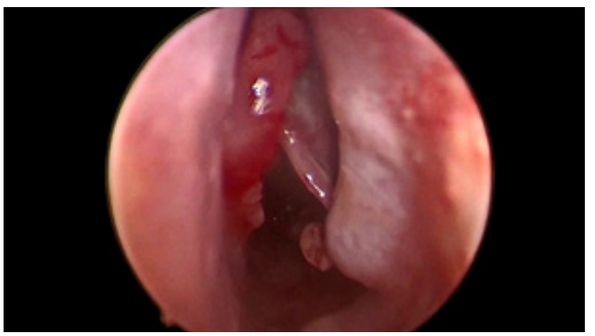


Fig. 4: The middle turbinate anterior surface is separated it into medial and lateral sides

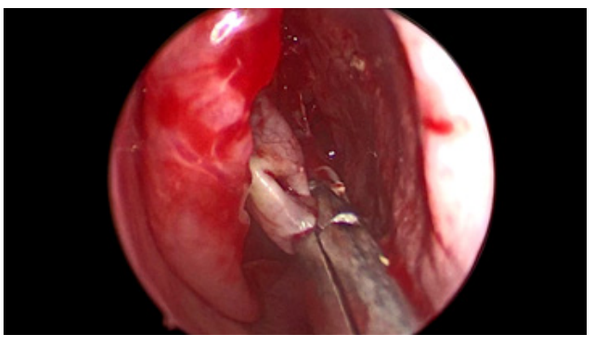


Fig. 5: The lateral bony lamellae are removed except in its upper part

Postoperative Follow-up:

• Follow-up was done for 3 months for all patients post-operative. The follow up was every week for the first one month, then every month in the second and third months. Patients were advised to do regular nasal douching Local anaethesia with xylocaine spray in the nasal cavity waiting for 10 minutes and then patients were examined for removal of any blood clots or crustation by HOPKINS II 30^{o}, 4mm telescope. Evaluation of the headache by the migraine disability assessment (MIDAS) questionnaire after 3 months.

• Statistical analysis:

All data were collected using statistical package for social science (SPSS) program for windows version 20, quantitative data was presented as mean ± standard deviation (SD) while, qualitative data were presented by frequency distribution and percentage (%). Results were expressed as tables and figures. Chi square test was used to compare between proportions, Correlation was performed using Pearson and Spearman correlation coefficient (r). The probability of error < *0.05* was considered significant and highly significant at *P value* < *0.001*.

RESULTS:

This study included 20 patients complaining of contact headache for one year duration or more with failure of medical treatment.

Age of the patients ranged from 13 to 45 years with Mean ± SD was 28.2±10.5 as shown in (Table 1).

Twenty patients consisted of 7 males (35%) and 13 females (65%) presented with contact headache for one to seven years (Fig. 6).

There were multiple symptoms associated with headache observed in 11 patients (55%) all of them complaining of nasal obstruction while 2 patients suffered from nasal discharge (10%) one with earache (5%) and one with lacrimation (5%) as observed in (Tables 2 and 3) (Fig. 7).

Clinical and radiological diagnosis (CT nose and paranasal sinuses) was done which revealed right concha bullosa in 7 cases (35%), left concha bullosa in 6 cases (30%) and bilateral concha bullosa in 7 cases (35%) (Table 4)

C.B presentation was classified as Lamellar type in 11% of cases (3 cases) while bollous type in 48% of cases (13 cases) and extensive type in 41% of cases (11 cases) (Fig. 8).

C.B presentation classification were (Table 4)

• Type 1: Lamellar 11% (3 cases).

• Type 2: Bollous 48% (13 cases).

• Type 3: Extensive 41% (11 cases).

Surgical procedures were done according to C.T findings in each case as shown in (Table 5). From the data collected after surgery, bilateral endoscopic lateral lamellectomy was done in 35%, unilateral endoscopic lateral lamellectomy in 65%. The surgical procedures done in the study according to pathology.

In the current study, and according to MIDAS score of headache there was 10% of patient with mild disability (MIDAS Grade II), 50% with moderate disability (MIDAS Grade III) and 40% with sever disability (MIDAS Grade IV) preoperatively, MIDAS score ranged from 8-39 with mean score of 20.3 ± 8.89.

3 months postoperative all the patients were with little or no disability (MIDAS Grade I), MIDAS score ranged from 0-4 with mean score of 1.7 ± 1.21, the *p value* is *<0.001* (Table 6).

No major complications were encountered with follow up in the postoperative period.

Synechiae of the middle turbinate to the lateral nasal wall was observed as the most common minor complication in one patient. This required division of the synechiae and repacking of the area of middle meatus.

Table 1: Age, sex distribution and duration of headache

		N=20
Age	*Range*	(13-45)
	Mean ± SD	28.2±10.5
Sex	*Male*	7(35%)
	Female	13(65%)
Duration of Headache (years)	*Range*	(1-7)
	Mean ± SD	2.9±1.7

Table 2: Associated symptoms

		N=20
Associated Symptoms	*No*	9(45%)
	Yes	11(55%)
Associated Symptoms	*Obstruction*	11(55%)
	Discharge	2(10%)
	Earache	1(5%)
	Lacrimation	1(5%)

Table 3: shows the 20 patients who had fulfilled the surgical inclusion criteria and were considered to have rhinogenic contact point headache

Case number	Sex	Age	Duration of Headache(years)	Associated Symptoms
1	M	18	2	Obstruction
2	F	17	2	Obstruction
3	F	22	7	–
4	M	32	1	–
5	F	32	6	Obstruction + Discharge
6	F	23	2.5	–
7	F	40	4	–
8	M	19	1	–
9	F	40	3	–
10	F	45	3	Obstruction
11	F	40	3.5	Obstruction
12	F	16	1	–
13	F	16	2	Obstruction + earache
14	M	40	1	–
15	F	28	4	–
16	M	26	5	Obstruction + lacrimation
17	F	45	4	Obstruction
18	M	24	2	Obstruction
19	F	13	2	Obstruction + Discharge
20	M	28	2	Obstruction

Table 4: Site of C.B

CT Findings		N=20
Site of C.B	RT	7(35%)
	LT	6(30%)
	Bilateral	7(35%)

Surgical procedures were done according to C.T findings in each case as shown in Table 5

Case number	C.T. scan findings	Type of CB	Type of surgery
1	Bilat. Concha bullosa	Rt.2+Lt.3	Bilat.endoscopic lateral lamellectomy
2	Lt. Concha bullosa	Lt.2	Lt.endoscopic lateral lamellectomy
3	Rt. Concha bullosa	Rt.2	Rt.endoscopic lateral lamellectomy
4	Lt. Concha bullosa	Lt.3	Lt.endoscopic lateral lamellectomy
5	Rt.Concha bullosa	Rt.3	Rt..endoscopic lateral lamellectomy
6	Bilat. Concha bullosa	Rt.2+Lt.2	Bilat.endoscopic lateral lamellectomy
7	Bilat. Concha bullosa	Rt.3+Lt.2	Bilat.endoscopic lateral lamellectomy
8	Rt. Concha bullosa	Rt.2	Rt.endoscopic lateral lamellectomy
9	Rt. Concha bullosa	Rt.3	Rt.endoscopic lateral lamellectomy
10	Bilat.Concha bullosa	Rt.3+Lt.3	Bilat.endoscopic lateral lamellectomy
11	Bilat. Concha bullosa	Rt.2+Lt.2	Bilat.endoscopic lateral lamellectomy
12	Lt. Concha bullosa	Lt.2	Lt.endoscopic lateral lamellectomy
13	Rt. Concha bullosa	Rt.3	Rt.endoscopic lateral lamellectomy
14	Lt. Concha bullosa	Lt.3	Lt.endoscopic lateral lamellectomy
15	Rt. Concha bullosa	Rt.3	Rt.endoscopic lateral lamellectomy
16	Bilat. Concha bullosa	Rt.2+Lt.3	Bilat.endoscopic lateral lamellectomy
17	Bilat. Concha bullosa	Rt.3+Lt.3	Bilat.endoscopic lateral lamellectomy
18	Lt. Concha bullosa	Lt.2	Lt.endoscopic lateral lamellectomy
19	Lt. concha bullosa	Lt.2	Lt.endoscopic lateral lamellectomy
20	Rt.Concha bullos	Rt.2	Rt..endoscopic lateral lamellectomy

Table 6: Headache score

		Preoperative	Postoperative	*P value*
		N=20	N=20	
Headache score	Median (IQR)	18.5 (13.5-25.5)	2 (1-3)	*<0.001**

- Wilcoxon Signed rank test
- *: Significant Difference at *P value < 0.05*

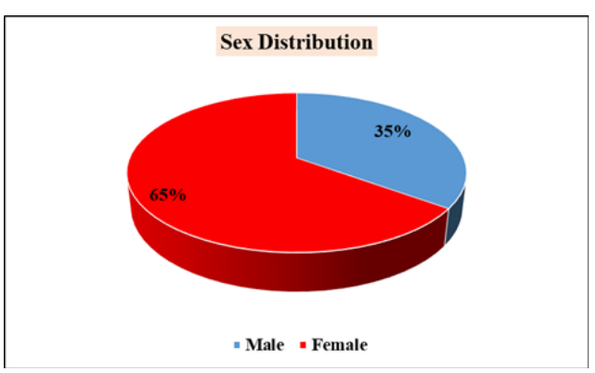


Fig. 6: Sex distribution

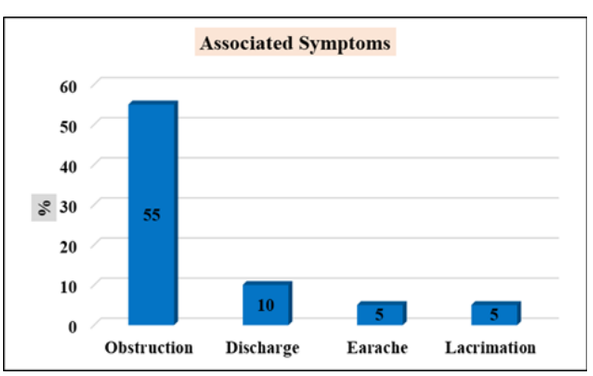


Fig. 7: Associated symptoms

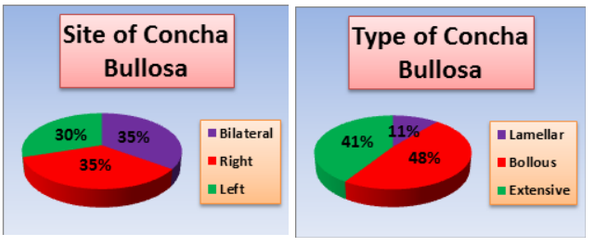


Fig. 8: Type and site of concha bullosa

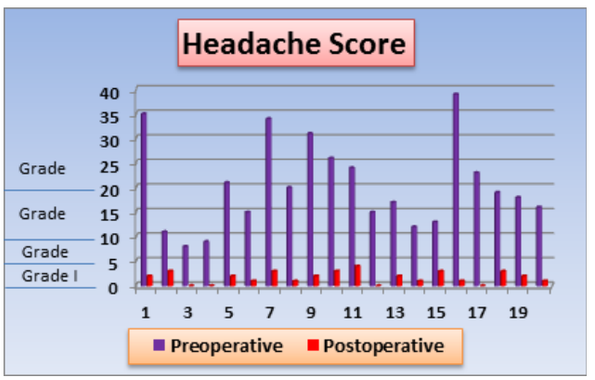
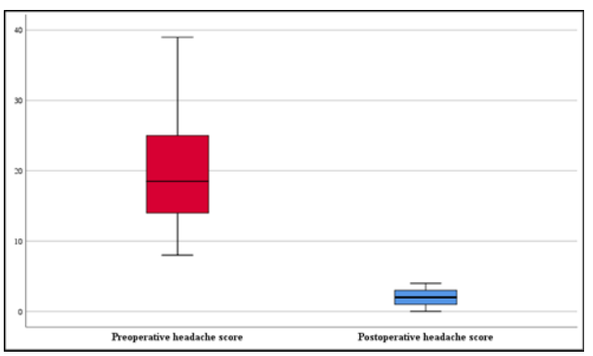


Fig. 9: Showing preoperative and postoperative headache score.



DISCUSSION

Several hypotheses have been proposed over the years to illustrate the definite pathophysiology of a primary headache with a possible nasal cause prior to the emergence of nasal endoscopy and CT.[9]

Besides their resistance to normal medical measures for treatment of headache, patients with nasal contact point headache usually exhibit endoscopic findings and/or radiological changes in the sinuses in the form of anatomical differences and / or mucosal disease[10]. However, the exact pathophysiology and treatment of nasal contact point headache are still unknown.[9]

Stammberger and Wolf, (1988) noted that many anatomic variations of the nose and paranasal sinuses may cause to headache by narrowing the ethmoid recesses. These anatomic variations, shouldn't be considered disease. When opposing mucosal surfaces come in contact, that may result in impedence of the ventilation and drainage of the larger sinuses with resulting hypoxia that serves as a mechanical stimulus that triggers referred pain[11].

The 'concha bullosa' is a popular anatomical variant that can cause contact headache, even in children.[12]

Morgenstein and Krieger were the first to characterise the middle turbinate headache syndrome.[13] Stammberger and Wolf have gone over the pathophysiology in great detail.[11]

This study is a prospective study of rhinogenic contact point headache that result from concha bullosa employing diagnostic nasal endoscopy (DNE) and coronal computed tomography (CT). It also evaluates the efficacy of middle turbinate endoscopic lateral lamellectomy in its treatment.

Clinical examination and endoscopic examination and computed tomography of patients of this study showed that mucosal contact was present between middle turbinate and septum or a part of the lateral wall of the nose in 20 patients (100% of cases).

Clinical and endoscopic examination revealed that many anatomical variations were associated with concha bullosa as deviated septum in 12 cases (60%), hypertrophied inferior turbinates in 7 cases (35%), and large bulla ethmoidalis in 2 cases (10%). This matches with Paksoy *et al*, in 2008 who found that in 60% of cases deviated septum was accompanied by CB[14]. CB and deviated septum are frequently reported together and a relationship has been suggested by[14,15] but Kyle in 2010, found that only 19.5% of patients with septal deviation had concha bullosa[16].

The encountered types of CB seen by CT scanning in this study were 3 concha bullosa of lamellar type (11%), 13 CB of bollous type (48%) and 11 CB of extensive type (41%). Badran in 2011[17] found that (17%) of the conchae bullosa were lamellar type, (46.8%) were bulbous and (36.2%) were extensive and Hatice *et al*., in 2005[6] found that (20.68%) of the conchae bullosa were lamellar type, (32.17%) were bulbous type and (46.95%) were extensive. There is no consensus on the frequency of CB or frequency of types of CB. The variances may be due to differences between the study groups, differences in pneumatization parameters and the analytical methods used.

In this study 7 cases (35%) were males and 13 cases (65%) were females, this is matched with Badran

2011[17],who found that (36.2%) of cases were males and (63.8%) were females, in Subramanian's study 2005[18]. In comparison to males, females had a higher incidence of concha bullosa (58.9%).

This study found bilateral CB in 7 cases (35%) and unilateral CB in 13 cases (65%), which agrees with Badran 2011's findings that unilateral CB is more common than bilateral CB, but differs from Hatice *et al*., 2005 and Devrimet *et al*., 2011's findings that bilateral CB is more common than unilateral CB (70 percent)[1,6].

Some authors claim that RCPH is a central process and that surgical intervention is unnecessary[19]. While many studies report successful outcomes[12,20,21].

Brown and Stamberger preferred lateral lamellectomy rather than a medial lamellectomy or crushing of the concha bullosa[22]. In our study, a surgical correction was performed (endoscopic partial lamellectomy of the middle turbinate) and all patients had little or no disability, and this corresponds to Anselmo-Lima *et al*., 1997[3] who reported 5 patients suffering from a bullous turbinate, which causes central headache syndrome and a complete resolution of post-operative headache in all of their patients, Devrim *et al*., 2011[1] showed that all patients had a subjective decrease in the severity and frequency of pain after surgery, a Stammberger study in 1991 which reported improvement in 10 patients with headaches after surgical correction of bullous concha and Badran 2011, found that 46 patients had Full or partial improvement, and not a single patient improved. This is comparable to Morgenstein and Krieger 1980,[13] who found no improvement in 9.5% of cases, and also the results reported in the literature of Parsons and Batra., 1998; Tosun *et al*., 2000; Gerbe *et al*., 1984[12,23,24] disagree with our results.

We chose to evaluate our patients with a MIDAS score rather than with simple scoring alone in order to yield the efficacy of the operation on the life style of the patients.

It must be emphasized that although postoperative nasal endoscopy yielded the resolution of suspected contact areas, MIDAS score of the patients ranged from 0-4 (MIDAS Grade I; little or no disability) that mean total alleviate of headache wasn't achieved in all patients. This finding may point to the fact that there may be additional underlying mechanisms provoking pain other than mucosal contact. In light of these results and despite the seemingly rewarding surgical results of this clinical entity, it is strongly suggested that further quantitative and objective methods are necessary to evaluate the real surgical outcome.

CONCLUSION

Concha bullosa is considered one of the most important factors in the development of contact point rhinogenic headache and this headache can be cured or significantly improved after endoscopic lateral lamellectomy with no or minimal complications providing that accurate selection of the patients and skilled surgeon.

CONFLICT OF INTEREST

There are no conflicts of interest.

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Appendix I

Questions Included in the MIDAS Questionnaire

Question Number	Question
1	On how many days in the last 3 months did you miss work or school because of your headaches?
2	How many days in the last 3 months was your productivity at work or school reduced by half or more because of your headaches? (Do not include days you counted in question 1 where you missed work or school.)
3	On how many days in the last 3 months did you not do household work because of your headaches?
4	How many days in the last 3 months was your productivity in household work reduced by half or more because of your headaches? (Do not include days you counted in question 3 where you did not do household work.)
5	On how many days in the last 3 months did you miss family, social, or leisure activities because of your headaches? A) On how many days in the last 3 months did you have any headache? (If a headache lasted more than 1 day, count each day.) B) On a scale of 0-10, on average, how painful were these headaches