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Rhinogenic headache, study of some etiological factors and evaluation of their corrective surgical outcome

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Abstract
Objective: To investigate the role of some etiological factors in occurrence of rhinogenic headache and to evaluate their corrective surgical outcome.
Patients and methods: A prospective interventional self-controlled study included 60 patients with refractory headache of more than one year duration and diagnosed by endoscopic examination and C T scans, to have anatomical nasal abnormalities as deviated nasal septum, hypertrophied inferior turbinate and concha bullosa. The age of the patients ranged from 18 to 47 years (35 males, 25 females).
Results: anatomical nasal abnormalities were diagnosed by nasal endoscopy and confirmed by CT scans as deviated nasal septum in 45 patients(75 %), hypertrophied inferior turbinate in 35 patients (58.3%) and concha bullosa in 15 patients (25%). In these 60 operated cases 30 cases (50 %) showed complete cure from headache, but16 cases (26.6 %) showed improvement of headache with total success 46 cases (76.6 %) while 14 cases (23.3 %) showed no improvement.
Conclusion: Rhinogenic headache may be produced by some anatomical nasal abnormalities, such complaint can be cured or significantly improved after surgery with no or minimal complications provided that accurate selection of the patients is done.

Keywords: headache-Rhinogenic headache-contact headache

Introduction
Facial pain of sinus and nasal origin in the absence of inflammatory sinonasal disease is a clinical entity that has received attention in both otorhinolaryngology and neurology societies [1].
One of the most common causes of this disease entity is sinusitis. However, patients may present with severe and intractable headache with radiation to periorbital or facial areas, although patient history, physical examination, and laboratory data demonstrate no active disease of the head and neck or sinonasal region [2].
Over the years many theories have been proposed to explain exact pathophysiology of primary headaches with a possible nasal origin until the advent of nasal endoscopy and computed tomography scanning (CT) has greatly challenged this problem [3].
The exact pathophysiology and treatment of rhinogenic headache, however, are still matters of debate [3].
In 2004, mucosal contact headache was added as a secondary headache disorder in the International Classification of Headache Disorders [1].

Patients and methods
60 patients 35 males, 25 females with refractory headache suffering for more than one year are included and subjected to the flowing Full history taking (personal, present, past) including otolaryngological or ophthalmological complaint then complete analysis of headache was done regarding to:
Onset, course, duratsion, Site of pain: Unilateral or bilateral, temporal, frontal, parietal, orbital, supraorbital, nasal, zygomatic, maxillary, central and/or occipital.
Character and severity of pain, what increase or decrease it and diurnal variation.

Examination
Full evaluation by an ophthalmologist, neurologist, dentist and internist was done. Then nasal examination by anterior rhinoscopy, noting any congestion, septal deviation, spurs, turbinate hypertrophy, discharge, polypi or adhesions.

Nasal endoscopy
Was done with Special attention to any contact point between the middle or inferior turbinate and the nasal septum. Also to any anatomical abnormality as deviated septum, septal spur, hypertrophied middle or inferior turbinate.

Local anesthetic test
This test was done during the attack of headache, (so it was not done for all patients) and accordingly patients were divided in to 3 groups
- Group A: positive local anesthetic test
- Group B: negative local anesthetic test
- Group C: local anesthetic test was not done (there was no attack of headache during period of admission)

Non-contrast coronal and axial CT (Siemens SOMATOM emotion 16 slice machine) of the nose and paranasal sinuses was done to all patients after primary course of medical treatment for 2 weeks.
Preoperatively, headache was evaluated by the headache impact test (HIT) questionnaire which was developed to measure a wide spectrum of the factors contributing to the burden of headache [4]. And resulted in the following categories:
1. Score is 60 or More = Extremely Severe Headaches.
2. Score is 56 – 59 = Severe Headaches.

3. Score is 50 – 55 = Moderate Headaches.
4. Score between 36 and 49 = None to Mild Headaches [5, 6].

Surgical treatment was done after failure of medical treatment.

1. In all patients with siginificant nasal septum deviation or septal spur endoscopic septoplasty was performed.
2. Turbinoplasty was done for cases presented by concha bullosa (partial lateral lamillectomy of the concha bullosa).
3. For inferior turbinate hypertrophy conservative partial turbinectomy was performed.

Follow-up period was 6 to 18 months. Patients were followed up every week for the first one month then every month after that. Patients were encouraged to report on the current status of their headache and any interval change during every visit to ENT clinic.

Postoperative assessment stressed for different anatomical areas in order to identify any residual pathology and the presence of any complications.

Postoperative assessment of headache

Data regarding headache frequency (headache-related disability) was obtained from all patients in the last 1 month pre-operatively and 6 monthes post operatively according to headache impact test (HIT) score.

Results

This study included 60 patients complaining of headache of rhinogenic origin and resistant to medical treatment for more than one year.

Table 1: Demographic characteristics of the studied patients (n=60).

Age (Years):	
(Range) Mean ± SD	(18-47) 29.35 ± 14.34
Sex: n (%)	
Male	35 (58.3)
Female	25 (41.7)

Table 2: Duration and Location of headache of the studied patients.

Duration of headache (Years):	
(Range) Mean ± SD	(1-7) 4.30 ± 3.16
Location of headache: n (%)	
Fronto-orbital	24 (40%)
Fronto-temporal	12 (20%)
Peri-orbital	10 (16.7%)
Frontal	10 (16.7%)
Other	4 (6.7%)

Results of clinical and endoscopic examination

1. Contact between the lateral wall of the nose and septum: There was definite mucosal contact between the lateral wall of the nose and septum in all cases of the study (100%).

2. Pathological findings: In all cases there were nasal pathology, involving either lateral wall of the nose or the septum as: deviated septum, septal spur, hypertrophied middle or inferior turbinate.

3. Local anesthetic test

Table 3: Results of local anesthetic test of the studied patients.

Results of local anesthesia test: n (%)	
Group A (Positive)	20 (33.3%)
Group B (Negative)	15 (25%)
Group C (Not done)	25 (41.7%)

Table 4: Frequency of surgical procedures done for the studied patients.

Surgical procedures done: n (%)	
Septal correction (septoplasty)	45 (75)
Partial inferior turbinectomy	35 (58.3)
Removal of lateral lamella of the middle turbinate	15 (25)

Table 5: Results of headache impact test (HIT).

	Pre-operative HIT	**Post-operative HIT**	**p-value**
Group A			
(Range) Mean ± SD	(50-58) 53.95 ± 2.32	(36-58) 41.70 ± 6.81	0.001*
Group B			
(Range) Mean ± SD	(51-58) 54.67 ± 1.98	(36-58) 48.67 ± 6.72	0.001*
Group C			
(Range) Mean ± SD	(50-58) 53.68 ± 2.23	(36-56) 44.20 ± 7.38	0.001*

Independent – sample T test was used
* P. value<0.05 is significant

There was statistically significant difference between pre-operative and post-operative headache impact test (HIT) in the three groups of the study. And this means that the three groups got benefit from surgery

Table 6: Results of surgery according to local anesthesia test.

	Group A (20)	**Group B (15)**	**Group C (25)**	**p-value**
Results of surgery: n (%)				
Cured	14 (70%)	3 (20%)	13 (52%)	0.001*
Improved	4 (20%)	6 (40%)	6 (24%)	
No changes	2 (10%)	6 (40%)	6 (24%)	

Chi-square test was used
* P. value<0.05 is significant

There was statistically significant difference between the three groups regarding improvement of headache although all of them got benefit from surgery.

From this table we can conclude that:

- In group A (positive local anesthesia test) 18 patients (90%) got benefit from surgery
- In group B (negative local anesthesia test) 9 patients (60%) got benefit from surgery
- In group C (local anesthesia test was not done) 19 patients (76%) got benefit from surgery

In these 60 operated cases 30 cases (50 %) showed complete cure from headache, while16 cases (26.6 %) showed improvement of headache with total success 46 cases (76.6 %) and 14 cases (23.3 %) showed no improvement.

Discussion

This prospective interventional self-controlled study was

Done to evaluate the possible causes of rhinogenic headache specially the role of some anatomical variations of the nasal septum and lateral nasal wall using multi slice CT and endonasal endoscopic procedures and also assessing the efficacy of endoscopic nasal surgeries in treatment of such headaches.

Regarding to the duration of headache our results showed that the duration of headache ranged from 1 to 7 years with the mean duration 4.3 years which agrees with the study of El Hoseny Sherief et al., (2012) who reported that the duration of headache ranged from 1 to 10 years with the mean duration 4.5 years [7] and Rai UL et al., (2018) who reported that the duration of headache ranged from 1 to 10 years with the mean duration 6.4 years [8]

headache was found fronto-orbital in 24 patients (40%), fronto-temporal in 12 (20%), periorbital in 10 (16%) and frontal in 10 (16%) in our series which differ from Hammad Moustafa S. and Gomaa Mohammed A., (2012) who reported that the most common location of headache was frontal area 71% followed by glabella and nose 30% [9], and Rai UL et al., (2018) who reported that location of headache was frontal region 82%, periorbital region 34% and nasal region 32% [8]

Various anatomical variations had been implicated as a possible cause of rhinogenic induced headache in the absence of sinusitis. In this respect, deviated nasal septum (75%) was the commonest cause in our study. This comes in agreement with Mokbel et al., (2010) who reported deviated nasal septum in all cases of their study (100 %) [10] and Rai UL et al., (2018) who reported deviated nasal septum in all cases of their study (100 %) [8] while disagrees with Hammad Moustafa S. and Gomaa Mohammed A., (2012) Who reported deviated nasal septum in just 50 % of cases [9] and Kanitha MS et al., (2017) who reported deviated nasal septum in only 14 patients (26 %) [11]

In our study, hypertrophied inferior turbinate was encountered in more than half of cases (58.3%) which disagrees with Mokbel et al., (2010) who reported a small incidence of hypertrophied inferior turbinates (37 %) [10].

Examination of patients of this study showed that mucosal contact was present between septum and middle turbinate (concha bullosa) in 15 cases (25 %). This comes in agreement with *Clerico et al, (1996)* [3] and *Stammberger, (1991)* [12] also comes in agreement with Hammad Moustafa S. and Gomaa Mohammed A., (2012) who reported concha bullosa in 11 patients (27.5 %) [9] and Hazem et al., (2014) who reported concha bullosa in 6 patients (30 %) [13] while a bigger incidence is shown by Kanitha MS et al., (2017) who reported concha bullosa in 21 patients (44 %) [11]

In our series, concha bullosa was confirmed as a headache cause which matches with the results obtaind by *Stammberger and Wolf, (1988*) [14]. Whereas, *Yousem et al., (1991)* denied this conclusion as they reported that the presence of a concha bullosa does not increase the risk of sinus headache [15].

Local anesthetic test was done in number of cases in our study and found that (33.3 %) positive & (25 %) negative cases while it was not applicable in (41.6 %)

It was used by some authors like Mokbel et al., (2010) who found that (70.8%) positive&(29.1%) negative **[10]** and Hammad Moustafa S. and Gomaa Mohammed A., (2012) [9], Hazem et al., (2014) [13] and Rai UL et al ., (2018) [8] who reported positive local anesthetic test in all cases of thier studies**.**

Headache impact test (HIT) questionnaire was used to evaluate preoperative & postoperative headache and found that the preoperative mean of HIT was 53,54and 53 in groups ABC respectively while the postoperative mean was 41,48 and 44 in groups ABC respectively.

Which means that is statistically significant difference between pre-operative and post-operative HIT in the three groups of the study. Which consequently means that the headache of the patient is changed from moderate to non or mild headache.

The HIT was chosen because it was found easy to estimate the degree of headache and its impact on the patient daily activities.

Regarding to deviated septum as a causal factor of headache (45 patients in this study) we found that 76 % improvement or complete cure, this finding is comparable to that obtained by Low and Willatt (1995) 64% [16] and *Schonsted-Madsen et al.,* (1986) 60% [17].

Follow up periods differs greatly in the literature but ranges from 4 to 30 months [7, 8, 10, 13], In this study we followed the patients up to 6-18 months and we think we need a longer follow up period to evaluate headache various studies have shown good success rates of surgical management of contact point headaches like:

Hammad Moustafa S. and Gomaa Mohammed A., (2012): evaluated forty patients with rhinogenic headache. Thirty-two (80%) of the 40 patients in the study showed significant improvement of headache postoperatively and did not require further medical therapy for headache [9]**.**

El Hoseny Sherief et al., 2012 evaluated 25 patients with rhinogenic headache in these 25 patients, 21 cases (84%) showed complete cure from headache after surgery, while 4 cases (16%) showed improvement only [7]**.**

Sudip kr. Das et al., (2013) evaluated 40 patients with clinical evidence of chronic headache with nasal mucosal contact points and who were unresponsive to routine appropriate medical therapy for more than 6 months duration. In this study headache improved in 89.33 % after surgical removal of contact points [18]**.**

Wang MSJ et al., (2017) evaluated 25 patients from the Ear, Nose and Throat clinic (China) who had refractory headache symptoms and were diagnosed as nasal mucosal contact by high-resolution CT without acute sinusitis underwent intranasal endoscopic correction of nasal anatomic abnormalities. Eleven patients (44%) recovered completely from headache symptoms 7 days after the surgery and did not recurred after the surgery. Eight patients (32%) showed partial recovery, and 6 patients (24%) had the same intensity of pain [19]**.**

Kanitha MS et al., 2017 Carried out a prospective study in the Department of Otorhinolaryngology, Government Tirunelveli Medical College Hospital (India). 50 patients with a rhinogenic headache without symptoms and signs of acute and chronic sinonasal inflammation that underwent treatment were included in the study. Effects of surgical treatment for contact point headache (refractory headaches failed to standard pharmacological headache treatments) in 50 patients were assessed in the follow-up period of 12 months. Overall 86% of patients felt marked improvement in their headaches while 8% had moderate and 6% had mild symptoms at the end of the study [11]

Rai UL et al ., 2018 evaluated fifty patients (thirty males and twenty females) attending ear, nose, and throat outpatient department and diagnosed as contact point

headache were selected after a detailed history of symptoms through questionnaires, diagnostic nasal endoscopy, computed tomography scan, and a positive xylocaine-adrenaline test. All the patients underwent surgery.at the end of 12-month follow-up, a success rate of 90% was achieved with surgical intervention [8].

In our study, 60 operated cases, 30 cases (50 %) showed complete cure from headache, while16 cases (26.6 %) showed improvement of headache with total success 46 cases (76.6 %) and 14 cases (23.3 %) showed no improvement.

Patients that showed no improvement of headache in our study may be due to social, socioeconomic factors, organic or psychic disorders that was not discovered before the study.

Conclusion

Rhinogenic headache may be produced by intranasal contact between two mucosal surfaces and this headache can be cured or significantly improved after surgery with no or minimal complications provided that accurate selection of the patients is done.

Recommendations

More detailed studies are recommended including larger number of patients and strict follow up for a longer period of time, also we recommend establishing a specialized sectors in hospitals for headache management due to its major impact in our life style.

More collaboration between otorhinolaryngology, neurology, ophthalmology and internal medicine departments is encouraged as the way to proper evaluation of the headache patient.

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