Surgical treatment of rhinogenic contact point headache
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Introduction
Patients with facial pain present a diagnostic challenge. Rhinogenic facial pain is that pain caused by contact of the nasal mucosal surface in the absence of inflammation. Difficulties in managing them are due to the frequency of referred pain and the overlap in symptoms with other conditions. Painful stimuli affecting facial structures are mostly transmitted through afferents in the trigeminal nerve to the spinal tract in the brain stem [1].

The most sensitive area of the nose is the lateral wall which when stimulated by the impacted nasal septum can cause referred trigeminal pain and chronic headache [2].

The core of the problem is how to diagnose the cause quickly and effectively. A careful history taking is important in establishing a correct diagnosis. It is possible that the pressure caused by septal deviations on adjacent sensory nerves can cause pain, which is called ‘the anterior ethmoidal nerve syndrome’ [3].

In addition to their direct neurological effects, reflex changes may be due to septal anomalies which affect the nasal reflexes leading to autonomic vascular disturbance resulting in nasal congestion and headache [3].

Aim
The aim of the study was to search for the role of correction of abnormalities of the nasal cavity in rhinogenic contact point headache and to evaluate its role in the treatment of this type of headache.

Patients and methods
The study included 20 patients who were recruited from September 2016 till December 2016 with rhinogenic contact headache of more than 1-year duration. Evaluation of surgical management for these cases was done as regards improvement of headache duration, intensity, and frequency over a follow-up period of 3 months at least after the operation.

Results
In all, 20 patients were included with ages in the range from 19 to 45 years; 11 of them were men and nine were women. Sixteen cases showed complete cure, two showed improvement, and two showed unsatisfied results. Deviated septum was found in 17 (85%) cases, concha bullosa in seven (35%) patients, and hypertrophied inferior turbinate in six (30%) patients. More than one anatomical variation was encountered in most of the cases. The two failed cases showed preoperative long duration since they started to complain of headache and longer duration of each headache attack.

Conclusion
Intranasal anatomical variations play a role in the pathogenesis of contact rhinogenic headache and the surgical treatment of these anatomical variations helped in improving contact headache.

Keywords:
anatomical variations, contact headache, rhinogenic
contact point rhinogenic pain. Surgical correction appears to improve properly selected patients [4].

**Important anatomical variations**

Paradoxically bent middle turbinates: the concavity of the turbinate points toward the septum. It usually occurs on both sides. It is a normal variant, but the highly pronounced bent may cause narrowing of the middle meatus area.

The upward convex middle turbinate may appear as a concha bullosa. The edge of this middle turbinate may be curved to the lateral nasal wall and surrounds the middle meatus.

Concha bullosa: the vertical bony lamella of the middle turbinate can have a variety of curvatures. The head of the turbinate may be convex, but in the posterior part it may show a paradoxical curvature. Incidence of this variation in the literature varies from 5 to 20%. It is higher in patients with headache (60%) and more in men. It may present on both sides in half of the cases. Unilateral cases are usually associated with a deviated septum [5]. If the pneumatization of the concha is severe it may cause problem by its size like severe nasal obstruction. It is lined with respiratory mucosa making it liable to infection and obstruction [6].

Anterior extension of the middle turbinate beyond its attachment by more than 1 cm and thus overlapping the uncinate process by a sizable margin and may even overlie a portion of the agger nasi [3].

An accessory or secondary turbinate may also cause local obstruction by its position [7]. It arises from the lateral wall above the infundibulum and uncinate, and curves medially.

The uncinate process may deviate medially into the middle meatus or laterally into the infundibulum. Massive pneumatization of the uncinate may cause an uncinate bulla [8].

Double uncinate process is a rare condition. The lamina papyracea if related to the vertical part of UP it may become dehiscent, so it may be injured during uncinectomy [9].

Aggar nasi cells, if very large or if extends posteriorly, it may narrow the fronto recess mechanically. Complaints arising from isolated aggar nasi disease may be very strange and only a sensation of pressure between the eyes with tenderness or pain over the medial palpebral ligament [10].

Haller cells are ethmoidal cells that extend into the floor of the orbit above the maxillary sinus ostium, and if enlarged can occlude the posterior part of the ethmoid infundibulum and the ostium of the maxillary sinus from above. If these cells are diseased, the maxillary sinus ostium may be occluded, and the sinus becomes diseased [2].

Deviated nasal septum: deviation may affect only the cartilage, bone or both.

Anterior dislocation into one of the nasal cavities: this can be seen better by looking at the base of the nose when the patient’s head is raised backwards.

C-shaped deformity: septum is deviated in a C-shaped curve to one side. The wide side of the nasal cavity may have compensatory hypertrophy of turbinates.

S-shaped septal deformity: septum may show an s-shaped curve either in the vertical or the anteroposterior plane. Such a problem may cause bilateral nasal obstruction.

Spurs: a spur is a shelf-like projection found at the junction of the bone and the cartilage. A spur may cause pressure on the lateral wall and causes headache.

Spurs are thought to be due to organized hematoma or due to overriding of dislocated septal fragments.

Nondeviated septum is present in only a small percentage of patients (about 7.5 to 23%) while septal deformities are more common [11].

**Mechanism of referred headaches from sinonasal areas**

The nasal mucosa contains all types of receptors: the touch, heat and cold, pressure, and vibration. All these stimuli are felt in the form of pain. The pain may be felt in the nose and/or radiated to the skull as headache [12].

The investigations revealed that the lateral wall of the nose, especially the turbinate, is more sensitive than the mucosal lining of other areas of the nose and the paranasal sinuses. The sinus mucosa is insensitive, but pressure on the sinus ostia can produce pain [12].

The mucosal areas at the site of stimulation whether by local tissue injury or inflammation are probably associated with changes in microvascular supply, resulting in reflex congestion of the tissues; such areas of local injury and inflammation may contain an increase in the concentration of vasoactive amines (potent biological substances associated with pain induction or lowering the pain threshold) [13]. Pharmacologic studies have revealed that there are other chemical mediators besides the neurotransmitters noradrenaline and acetyl.
choline. These have been identified as the neuropeptides and are the main important factors involved in pain induction [14]. The most important one for mucosal function is substance P [6]. The edema is enhanced by a simultaneous histamine release from the mast cells triggered by substance P release as well [15].

Headache may also result from intranasal inhalation of chemical irritants and pollutants that affect the olfactory and trigeminal systems. These irritants act centrally via trigeminal pathways resulting in reflex intracranial liberation of substance P and other neuropeptides [6].

Diagnosis

One should depend heavily on the patient’s history, diagnostic nasal endoscopy, and coronal computed tomography (CT) scanning to diagnose rhinogenic headache [16].

In the absence of inflammatory disease, areas of mucosal contact should be the focus of attention. If the patient has a headache at the time of examination, areas of mucosal contact should be anesthetized topically with endoscopic visualization [12].

Negative findings with anterior and posterior rhinoscopy and conventional radiographs do not necessarily rule out a sinus-related headache. Stammberger and Wolf stated that only a combination of diagnostic nasal endoscopy with CT provides sufficient information to make this diagnosis [17].

Surgeries were decided according to endoscopic and CT scan findings, and includes:

1. Septoplasty which is performed successfully as traditional septoplasty and endoscopic septoplasty techniques
2. Endoscopic septoplasty was refined and performed accurately under vision. Also, targeted septoplasty to remove an isolated spur is possible [18].

Surgery of the middle turbinate

The lateral aspect of the concha bullosa can be resected. It is important to avoid excessive removal of the medial aspect of the concha because of the attachment of medial lamella to the skull base [19].

Surgery of the inferior turbinate

Many surgical procedures have been described for the treatment of inferior turbinate hypertrophy:

1. Turbinate lateralization: the aim is to change the angle at which the turbinate attaches to the maxillary and palatine bones, thus improving the airflow through the central aspect of the nasal cavity [20]

2. Soft tissue reduction: the soft tissue components of the turbinate can be reduced using different methods. Monopolar or bipolar cautery and radiofrequency have all been used. Each of these methods depends on the creation of an area of submucosal injury, which heals by fibrosis and scarring, causing reduction of the turbinate volume [21]

3. Bone resection: submucosal resection of the bony turbinate is indicated if the bony component is the main contributor to hypertrophy. The need for this type of surgery is best determined by careful examination of the turbinate before and after decongestion. It may be indicated if the orifice evaluation shows persistent turbinate hypertrophy after decongestion [20].

Patients and methods

This study included 20 patients with refractory or resistant headache for more than 1 year. They were presented to the outpatient clinics of Kasr Al Aini Hospital, Cairo University, Faculty of Medicine from September 2016 to December 2016. These patients had a long history of about 1 year of recurrent attacks of headache (four or more attacks/month) which was resistant, in most cases, to the usual analgesics, antimigraine therapy, and nonsteroidal anti-inflammatory drugs. Their ages ranged from 19 to 45 years. The patients underwent regular ENT history taking and examination protocol. Ethical approval of our trial was taken from the authorities and written consent was taken from the patients.

Headache analysis was done from the point of onset, course and duration, site of pain and its radiation. Character and severity of pain were analyzed.

Local anesthetic test is done when the patient is within the headache attack. A piece of cotton soaked with lidocaine HCl (xylocaine) 2%; adrenaline 1:200 000 is put in the nose at the site of middle turbinate contact with the lateral nasal wall at the side of headache.

We leave the cotton for about 3–5 min until the local anesthetic become effective and the patient is asked for his headache severity in relation to the original headache. The test is positive if the patient’s headache improves by more than 50%; the nose is reexamined after the application of the decongestant and any abnormalities in the septum and middle turbinate are reported using nasal endoscopy. The test is repeated for two times at different times for every patient to exclude false negative results.
Axial and coronal CT of the nose and paranasal sinuses were done.

If the patient improved no further management is done, if there is no improvement we proceed to surgical intervention.

Surgical procedures were decided according to endoscopic and CT scan findings, and includes:

1. Nasal septal operation according to the abnormality
2. Middle turbinate operation; turbinoplasty, in cases of concha bullosa (removal of lateral part of the concha bullosa)
3. Inferior turbinate operation; partial inferior turbinectomy
4. Resection of the wall of big bulla ethmoidalis and uncinate process.

All patients were asked to quantify the frequency, duration, and intensity of their headache preoperatively and postoperatively according to the pain rating scale from one to ten. The patient was considered cured if the duration and frequency of attacks were abolished after the operation; the patient was considered improved if the duration and frequency of attacks were diminished for at least 50% of the preoperative state, and if not failure was considered.

**Results**

This study included 20 patients complaining of contact headache of at least 1-year duration and resistant to medical treatment. Their ages ranged from 19 to 45 years with a mean age of 31.85 ± 8.53 years. Eleven of them were men (55%) and nine were women (45%).

In this study, 20 patients were operated upon and 18 (90%) cases showed improvement or complete cure; 16 of them (80%) showed complete cure, while two (10%) cases showed improvement only. Two (10%) cases showed failure.

As regards frequency of headache attacks 16 patients were cured and showed no attacks at all after the operation; two patients showed marked improvement as the attacks decreased to more than 50% of their original frequency preoperatively. Two cases failed and were complaining of headache in almost near the same number of attacks as their preoperative condition (Table 1 and Figs. 1–4).

**Discussion**

Many theories have tried to determine the exact pathophysiology of headache with nasal origin until the use of nasal endoscopy and computed tomography has helped in this topic [22].

Stammberger and Wolf in 1988 noted that many sinonasal anatomic variations might cause headache by narrowing of the ethmoid recesses. These abnormalities should not be considered disease. The contact of mucosal surfaces may interfere with the drainage of the sinuses causing hypoxia that causes mechanical stimulation that causes pain [14].

After rhinoscopic and endoscopic examination and CT of the paranasal sinuses, it is important to perform the lidocaine test. It can help not only the diagnosis of this type of headache, but also acts as an indicator of the future result of surgical removal of mucosal contact [22].

The biggest series, which was presented by Huang et al. [23] in 2008 included 66 patients who were divided into three groups: with deviated nasal septum, with concha bullosa, and with Haller’s cell. After the surgical treatment, the authors found a decrease in intensity and frequency of headache in 81.8% of the patients.

Parsons and Batra [24] in 1998 demonstrated an improvement of 91% in a retrospective study including 34 patients with contact between the septum and turbinates.

<table>
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<tr>
<th>Finding</th>
<th>n (%)</th>
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<tr>
<td>Deviated septum</td>
<td>17 (85)</td>
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<tr>
<td>Concha bullosa</td>
<td>7 (35)</td>
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<tr>
<td>Hypertrophied inferior turbinate</td>
<td>6 (30)</td>
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Table 1 Frequency of anatomical variation findings in the cases of the study
This study is a prospective study of rhinogenic contact point headache that is caused by anatomical anomalies of the septum and the lateral nasal wall diagnosed using diagnostic nasal endoscopy and computed tomography. It also evaluates the efficacy of endoscopy in the treatment of rhinogenic headaches.

Clinical and endoscopic examination in this study during headache showed that contact points were present between the septum and a part of the lateral wall of the nose in all cases (100%).

Deviated nasal septum (85%) and different types of middle turbinate variations (35%) were the most common causes. This matches with Ramadan who reported patients with headache due to septal deviation [25].

The encountered middle turbinate anomalies in this study included concha bullosa (35%). This matches with the study of Clerico and Fieldman [26].

Large concha bullosa was encountered in 35% of cases in this study. This shows that it plays an important role in the mucosal contact causing headache. This matches with Stammberger and Wolf [14] but comes in contrast to the study of Yousem et al. [8], who denied this conclusion.

Hypertrophied inferior turbinate was encountered in 30% of cases in this study and this finding matches with the studies of Greenfield [27,28].

In this study, almost all the cases with deviated septum (85%) were cured or improved after septoplasty surgery and this matches with the study of Clerico [29], who reported that in 30 patients headache improved after nasal septum surgery.

In this study, all the cases with hypertrophied inferior turbinates (30%) were cured after partial inferior turbinectomy and this matches with the studies of Greenfield [27,28].

Surgical correction of cases with concha bullosa in this study (35%) had relieved the headache and this matches with the Stammberger study [3] which reported that 10 patients with headache improved after surgery of concha bullosa.

In this study, headache intensity, frequency, and duration of the attack had totally cured in 16 cases, improved to its half or less in two cases while two cases showed failure of improvement as regards the three parameters.

The two failed cases showed complaints of psychological problems postoperatively and received psychiatric medication, that is mainly the cause of persistent headache postoperatively.

**Conclusion**

Nasal anatomical variations play an important role in the development of contact rhinogenic headache and this headache can be cured or significantly improved after surgical correction of deformities encountered in every single case.
Exclusion of any social, physical, or psychological changes that affect the patient postoperatively is mandatory to have clear results regarding improvement after surgery.

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Conflicts of interest
There are no conflicts of interest.

References