Role of endoscopy in rhinogenic contact headache not responding to medical treatment

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Objective
To assess the role of various anatomical variation of the nose in the pathogenesis of contact point rhinogenic headache of noninfective or organic cause and to evaluate the role of endoscopic surgery with removal or correction of the anatomical variation that caused headache in the management.
Patients and methods
This study included 30 patients with refractory or resistant headache for more than 1 year and diagnosed to have sinonasal anatomical variations. They were presented to the outpatient clinics of Al-Zahraa University Hospital in the period from May 2015 to May 2018. There ages ranged from 18 to 34 years. A total of 20 (66.7%) patients were males and 10 (33.3%) were females. Data from this group were analyzed retrospectively.
Results
Multiple anatomical variations were noted by endoscopy and computed tomographic scans in 30 patients. These variations included septum deviation in 30 (100%) patients followed by hypertrophied inferior turbinate in 15 (50%) patients then concha bullosa in 14 (46.7%) patients. In these 30 patients, 25 (83.3%) cases showed complete cure, three (10%) cases showed improvement, whereas two (6.7%) cases were unsatisfied.
Conclusion
Minor intranasal anatomical variations or hidden infection may be the cause of primary headache misdiagnosed as a headache of unknown etiology. The functional endoscopic sinus surgery had succeeded in eliminating or significantly reducing headache attacks.

Keywords:
contact headache, headache, rhinogenic headache

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Introduction

Patients with facial pain present a diagnostic challenge. Difficulties in management arise because of the frequency of referred pain and overlap in symptoms between of different conditions; painful stimuli affecting facial structures are mostly transmitted via afferents in the trigeminal nerve to the spinal tract in brain stem. The most sensitive area of the nose is the lateral wall which when stimulated by impacted nasal septum can cause referred trigeminal pain and chronic headache [1].

The essence of the problem is how to diagnose the cause quickly and effectively. A careful history is central in establishing a correct diagnosis. It is possible that pressure exerted by septal deviations and adjacent sensory nerves can produce pain, what has been called 'the anterior ethmoidal nerve syndrome' [2].

Sinonasal diseases are well known for causing referred headache and facial pain over the area of the affected sinus and may be associated with relevant nasal and sinus symptoms, such as nasal obstruction, purulent rhinorrhea, posterior nasal drip, foul smell, and hyposmia, where the most common cause of this disease entity is sinusitis [3].

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. In 1948, Walff showed that stimulation of the middle turbinate and nasal septum, both innervated by the anterior ethmoidal nerve, cause pain in the medial canthus area and supraorbital region. In 1980, Morgenstern and Krieger described a middle turbinate headache syndrome having atypical pattern of pain without being associated with any signs of sinus infection. It did not take too long of a time to recognize sinonasal abnormalities such as septal spurs and a

pneumatized middle or superior turbinate, as causes of typical headaches [4].

Many people with facial pain suggestive of sinus disease are proved through extensive investigations to have intranasal pathology without sinusitis; the middle turbinate in close proximity to other mucosal surfaces has been implicated as a possible cause of the contact point rhinogenic pain [5].

In 2004, mucosal contact headache was added as a secondary headache disorder in the international classification of headache disorders. The guide described mucosal contact headache as variation in mucosal congestion mediated by gravitational changes. The criteria in the guide require abolition of headache within 5 min following the application of topical anesthesia to the contact point area and improvement of the headache in less than 7 days after removal of mucosal contact point [6].

Various surgical modalities are done for management of headache, for example, submucous resection of nasal septum and partial middle turbinectomy. Patients are relieved of their headaches if the headaches are most intense over the frontal region, pressure like in nature. It is possible that headaches recur in the long term, and it is postulated that central mechanisms may play a role [7].

Patients and methods

This study included 30 patients complaining of contact headache of at least 1-year duration and resistant to medical treatment. All procedures performed in the study involving human participants were in accordance with the ethical standards of the institutional and or national research comitte and with the 1964 Helsinki declaration and its later amendment or comparable ethical standards. Their ages ranged from 18 to 34 years with mean age of 26.03±5.97 years. Twenty (66.7%) of them were males and 10 (33.3%) were females. This study was approved by Research Ethics Committee of Faculty of Medicine for Girls, Al-Azhar University.

All patients were subjected to the following:

(1) History taking:
   (a) Personal history: age, sex, marital state, residence, and special habits.
   (b) Analysis of headache.
      (i) Onset, course, and duration.
      (ii) Site of pain and radiation areas: unilateral or bilateral, temporal, frontal, parietal, orbital, supraorbital, nasal, zygomatic, maxillary, occipital, and/or ear pain.
      (iii) Characteristics of pain: dull aching or pulsating.
      (iv) Severity of pain. What increase or decrease it and diurnal variation.
   (c) Present and past history of ENT diseases and/or operations, including
   Nose: obstruction, discharge, sneezing, epistaxis, allergy, lacrimation, previous surgery, etc.
   (d) Present and past history of relevant neurological or general diseases such as brain tumor, trigeminal neuralgia, and cervical disc prolapse.
(2) Examination:
   (a) General examination; abdominal, chest, and complete head and neck examination (cranial nerves, temporomandibular joint, muscle of mastication, and scalp vessels); and neurological examination.
   (b) Nasal examination.
   (c) Anterior rhinoscopy, noting any congestion, septal deviation, spurs, turbinate hypertrophy, discharge, polypi, adhesions, etc.
   (d) Nasal decongestion to allow better examination of the nose and to see the response of mucosa to decongestion, mucosal contact between the septum and middle turbinate was specially observed.
   (e) Local anesthetic test.
   This test is done during the attack of headache. The nose is decongested then a piece of cotton soaked in lidocaine HCL (xylocaine) 2%, adrenaline, 1 : 200 000 is put in the nose at the site of contact between middle turbinate and septum, between septum and inferior turbinate or in any other suspected contact area in the ipsilateral side of headache.
   (f) The cotton is left for 3–5 min till the local anesthetic become effective and the patient is asked whether his headache severity is decreased or not and noting the degree of this decrease by percentage from the original headache. A positive test is considered if the patient experiences improvement of headache severity more than 50%. The nose is re-examined by anterior rhinoscopy and endoscopy after the application of the decongestant, reporting any abnormalities in septum and middle turbinate, and then nasal endoscopy is done. The test was repeated for at least two times in different occasions for each patient.

(3) Nasal endoscopy.
Specially reporting on:
  (a) Middle turbinate hypertrophy, pneumatization, and abnormal shape (concha recurvata), etc.
  (b) Uncinate process, its size, and any abnormalities.
  (c) Large bulla ethmoidalis.
  (d) Hiatus semilunaris and presence of pus in their vicinity.
  (e) Nasopharynx, nasopharyngeal lymphoid tissue, and Eustachian tube.
  (f) Ear, throat, and larynx examination, with special emphasis on external canal and tympanic membrane.

(4) Radiological investigation:
Axial and coronal computed tomographic (CT) assessment of the sinonasal tract was done for each patient.

(5) Medical treatment:
  (a) Medical treatment was given to all patients before CT scan.
  (b) Medical treatment was given according to the cause in the form of the following:
    (i) Nasal decongestant drops twice daily.
    (ii) Antihistamines.
    (iii) Antibiotics if there are suspected infection.
    (iv) Occasionally, local corticosteroids or long-acting steroid injection were given.
  (c) CT scan was then done after primary course of medical treatment for 10 days.
  (d) A second and third course may be given especially local steroids for 1–2 months if there was no response to the first course.
  (e) If the patient improved, then no further management is done, and if the patients is not improved, then we proceed to surgery if the patient agrees.

(6) Surgical treatment:
  (a) Criteria for surgery:
    (i) Patient experiences headache which can be referred from the nose in region of trigeminal nerve distribution, for example, frontal, orbital, supraorbital, maxillary, temporal, and parietal.
    (ii) Duration of headache more than 1 year.
    (iii) Patient not responding to several trials of medical treatment (at least three courses).
    (iv) Presence of contact between part of lateral wall and septum on clinical and endoscopic examination and in CT images.
    (v) Positive local anesthesia test result.
  (b) Surgical procedures:
    These were tailored according to endoscopic and CT scan findings. This includes the following:
    (i) Septal operation, mucous septoplasty, or endoscopic resection of septal spurs.
    (ii) Middle turbinate operation, conchoplasty, or turbinoplasty, done in some cases of concha bullosa (resection of lateral lamina of the concha bullosa, i.e., lateral wall of the turbinate sinus).
    (iii) Inferior turbinate operation, partial inferior turbinectomy or submucous diathermy.
  (c) Postoperative care and follow-up.

Patients were followed up on daily basis for the first 1 week, on weekly basis for the first 1 month, on monthly basis for the first 1 year, and every 3 months thereafter. Follow-up period ranged from 12 to 36 months (mean, 18months). Data regarding headache severity, frequency, and duration were specifically emphasized. In every office visit, patients underwent nasal endoscopy. Postoperative coronal CT was done for each patient within the third month of postoperative period.

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

(1) Frontal recess: persistence postoperative obstruction of this area is a common cause of recurrent or residual disease.
(2) Lamina papyracea: inspection of the entire course of the lamina papyracea was carried out to evaluate the integrity of this structure.
(3) Postoperative adhesions recorded in some cases.
  (a) Criteria of cure, improvement, and failure:
    (i) Data regarding headache severity, frequency, and duration were specifically emphasized. All patients were asked to quantify the frequency, duration, and intensity of their headache preoperatively and postoperatively. Patient was considered cured if the duration and frequency of attacks were abolished after the operation, patient was considered improved if duration and frequency of attacks were diminished for at least 50% of the preoperative state, and otherwise failure was considered.

In every office visit, patients underwent nasal endoscopy. Postoperative axial and coronal CT was done for each patient after 3 months from the operation.

Statistical analysis

Recorded data were analyzed using the statistical package for social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean±SD. Qualitative data were expressed as frequency and percentage.

Results

This study included 30 patients complaining of contact headache of at least 1-year duration and resistant to medical treatment. Their ages ranged from 18 to 34 years with mean age of 26.03±5.97 years. Twenty (66.7%) of them were males and ten (33.3%) were females. The most frequent pathology encountered was deviated septum [30 (100%) patients] followed by hypertrophied inferior turbinate [15 (50%) patients] and then concha bullosa [14 (46.7%) patients]. The duration of headache ranged from 1 to 10 years, with mean duration of 4.07±2.55 years. Most of the patients (53.3%) had headache between 1 and 3 years of duration.

Table 1 shows the frequency of deviated septum (100%), hypertrophied inferior turbinate (50%), and concha bullosa (46.7%) during examination on CT.

Table 2 shows headache duration frequency among the patients, which were as follows: 1–3 (53.3%) years, 4–6 (30%) years, and more than or equal to 7 (16.7%) years of duration.

Table 3 shows the management 'surgical' duration: septoplasty (93.3%), lateral lamellectomy (20.0%), partial inferior turbinectomy (26.7%), and cauterization of inferior turbinate (16.7%)

Table 4 shows the outcome among the patients: cure (83.3%), improvement (10%), and unsatisfied (6.7%).

Discussion

Over the years, many theories have been proposed to explain the exact pathophysiology of primary headaches with a possible nasal origin, until the advent of nasal endoscopy and CT scanning, which has greatly challenged this problem [8].

Table 1 Examination on computed tomographic distribution of the study group

Examination on CT	Total (*N*=30) [*n* (%)]
Deviated septum	30 (100.0)
Hypertrophied inferior turbinate	15 (50.0)
Concha bullosa	14 (46.7)

CT, computed tomography.

Besides their resistance to the ordinary medical anti-headache measures, patients with rhinogenic contact point headache usually show underlying endoscopic and/or radiological sinonasal changes in the form anatomic variations and/or mucosal disease. The exact pathophysiology and treatment of rhinogenic contact point headache, however, are still matters of debate [8].

The diagnosis of contact point headache requires a multidisciplinary approach. Patients with headaches without findings of inflammation of mucosal membranes of the sinonasal region should be examined by a neurologist, ophthalmologist, dentist, and internist to exclude other causes. After endoscopic examination and CT of the paranasal sinuses, it is very 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 success of surgical removal of mucosal contact [8].

CT is able to recognize some pathologic findings that cannot be found on physical examination and is helpful to decide the location and the type of the surgery [9].

Endoscopic surgical treatment affords superior visualization of mucosal contacts, which is important for their limited resection and allows for a more controlled and precise surgery, with minimal trauma.

There are several studies that have analyzed the success of the surgery of contact point headache. The criteria for inclusion and the results were different from study to study. The biggest series, which was presented by Huang *et al.* [10], included 66 patients divided into three groups: with deviation of the nasal septum, with concha bullosa, and with orbitoethmoidal (Haller's) cell. After the surgical treatment, the authors found a reduction of intensity and frequency of headache in

Table 2 Duration (years) distribution of the study group

Duration (years)	Total (*N*=30) [*n* (%)]
1–3	16 (53.3)
4–6	9 (30.0)
≥7	5 (16.7)
Range (mean±SD)	1–10 (4.07±2.55)

Table 3 Management 'surgical' distribution of the study group

Management 'surgical'	Total (*N*=30) [*n* (%)]
Septoplasty	28 (93.3)
Partial inferior turbinectomy	8 (26.7)
Lateral lamellectomy	6 (20.0)
Cauterization of inferior turbinate	5 (16.7)

Table 4 Outcome distribution of the study group

Outcome	Total (*N*=30) [*n* (%)]
Cure	25 (83.3)
Improvement	3 (10.0)
Unsatisfied	2 (6.7)

81.8% of the patients. Parsons and Batra [11] demonstrated an improvement rate of 91% in a retrospective study including 34 patients with contact between the septum and nasal turbinates.

This study is a prospective study of rhinogenic contact point headache that may result from anatomical variations of the septum and the lateral wall of the nose employing diagnostic nasal endoscopy and coronal CT. It also evaluates the efficacy of endoscopic sinonasal surgery in the treatment of sinonasal-related headaches.

A total of 30 patients were the patients of careful general examination, clinical, and endoscopic nasal examination, with positive local anesthesia test result. Coronal CT scanning of the paranasal sinuses was done for every patient. Surgery was done according to the pathology present in the nose, and the patients were followed up postoperatively for a period ranged from 12 to 36 months (mean, 18 months).

However, a positive local anesthesia test result is required to confirm that the pathology detected by these modalities is the true source of pain. The marked relief of pain after topical anesthesia of the nasal structures is a sound proof of the existence of sinonasal trigger areas. False-negative result may result from severe edema, so local anesthesia did not reach properly the site of contact. In such cases, local anesthesia test has to be repeated after primary decongestion. This test was proved to be mandatory to diagnose the rhinogenic origin of headache in this study.

In this clinical and endoscopic examination, we found that 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 (100%) and inferior turbinate hypertrophy (50%) were the commonest causes.

The encountered middle turbinate variations in this study included concha bullosa (46.7%).

In this finding of CT, concha bullosa was encountered in 46.7% of cases, whereas most literature studies reported that the incidence in normal population is 10%. This shows that concha bullosa plays significant role in mucosal contact causing headache. This comes in agreement with finding of Stammberger [2].

This study confirmed that concha bullosa may predispose to headache or sinusitis. This matches with Stammberger and Wolf [12] and Lidov and Som [13]. However, Yousem *et al.* [14] denied this conclusion. They reported that the presence of a concha bullosa does not increase the risk of sinus headache. This was backed by Bolger *et al.* [15] who stated that the presence of concha bullosa was not significantly more common in patients with chronic sinusitis than in asymptomatic patients.

A large concha bullosa could produce headache by narrowing the infundibulum [12,13].

Moreover, hypertrophied inferior turbinates were another cause of this rhinogenic headache (50%), and these results match with Greenfield [16] and Greenfield [17].

In this finding of CT, hypertrophied inferior turbinate was encountered in 50% of cases. Most literature reported that the incidence in normal population is 11%. This shows that hypertrophied inferior turbinate plays significant role in mucosa contact causing headache. This matches with the finding of Greenfield [16] and Greenfield [17].

The headache was referred in most cases to the orbit and frontal area; however, in 26% of cases, they had also temporal or central headache resembling tension headache, so in cases with tension headache we should seek for a possible rhinogenic origin.

In 80%, dull aching pain was the usual character of headache; however, in 20% of cases, the headache was pulsating or associated with pulsating temporal arteries which may resemble migrainous headache. We may explain that the pulsating characteristic may be owing to irritation of the middle meningeal artery. It is known that sympathetic plexus of this artery sends twigs to the sphenopalatine ganglion which may be irritated by nasal trigger area [18]. Again we should seek for nasal trigger and do local anesthesia test in cases diagnosed as migraine.In this study, deviated nasal septum was encountered in 30 (100%) patients, and most of the patients were improved or completely cured after septal surgical correction (septoplasty). This comes in agreement with Schonsted-Madsen *et al.* [19] who reported

157 patients with headache improved after septal surgical correction. Moreover, Clerico [20] reported 30 patients with headache improved after septal surgical correction.

In this study, hypertrophy of both inferior turbinates was encountered in 15 (50%) patients, and most of the patients showed significant improvement after partial turbinectomy. This matches with Greenfield [16] and Greenfield [17]. In addition, cauterization of both inferior turbante improved nasal obstruction in all patients, and this comes in agreement with Bonaccorsi [21].

In this study, concha bullosa was encountered in 14 (46.7%) patients.

Surgical treatment of this deformity relieved the headache. This finding comes in agreement with the finding of Stammberger [2] who reported 10 patients with headache showed improvement after surgical treatment of concha bullosa.

In this study, there is relation between the age of patient, duration of headache, and outcome of surgical treatment. As the duration of headache complaint and age of patient increase, it will be unlikely for the headache to be cured after surgery.

In this study, two patients failed to show satisfied improvement, with their postoperative headache attacks kept more or less similar to the preoperative ones.

The postoperative CT and nasal endoscopy in these patients showed nasal adhesion owing to inadequate postoperative follow-up.

Conclusion

Minor intranasal anatomical variations or hidden infection may be the cause of primary headache misdiagnosed as a headache of unknown etiology.

The functional endoscopic sinus surgery had succeeded in eliminating or significantly reducing headache attacks.

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Conflicts of interest
There are no conflicts of interest.

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