Original Article

Refractory rhinogenic contact point headache: Causes and role of surgical management

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Introduction: Rhinogenic contact point headache (RCPH) is due to contact between adjacent nasal mucosa causing mechanical and chemical changes leading to referred headache. It generally remains undiagnosed and is commonly mistreated with self-medication chronically without substantial benefit. Such a headache is generally refractory to medical management and causes a chronic agony to the patient and the treating clinician. **Aim:** The aim of the study was to find out the most common mucosal contact points in the nose and to evaluate the usefulness of surgical outcome in patients with RCPH which is unrelated to active inflammatory or allergic pathology. **Materials and Methods:** A total of 120 patients were selected after clinical and radiological evaluations having a headache due to rhinogenic mucosal contact points. Headache parameters were recorded in terms of intensity, duration, and frequency and then correlated at 1, 6, and 12 months after surgery. The outcome of surgery was then evaluated statistically. **Observation and Results:** The patients with septal spur and concha bullosa had a more severe headache than in deviated nasal septum and other conditions. Overall, 89.16% of patients showed improvement in headache after surgery while 10.84% could not appreciate any benefit. There was substantial relief in symptoms soon after surgery but the complete effect of surgical outcome was evident at a longer follow-up of 1 year. **Conclusion:** Our results suggested that surgical correction of nasal mucosal contact points can be very helpful in a headache which is not usually diagnosed or treated by medical management.

KEY WORDS: Anatomical variation, concha bullosa, endoscopy, paradoxical turbinate, rhinogenic contact point headache, rhinogenic headache, septal spur

INTRODUCTION

Headache (Gk: Cephalalgia) is a common complaint and is one of the most common reasons that bring a patient to a hospital. Headache itself is not a disease but only a symptom of ongoing underlying pathology. Due to the multifactorial causation of headache ranging from migraine, tension headache, rhinogenic and vascular headache, headache due to refractory errors, temporomandibular joint arthralgia, and even brain tumors,[1] a multidisciplinary approach involving otorhinolaryngological, ophthalmological, neurological, psychological, and oromaxillofacial evaluation is important to diagnose the causative factor. It is a commonly mistreated with self-medications by the patient and the results remain unsatisfactory, seriously affecting patient's normal work and the quality of life.

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Headache may remain undiagnosed despite detailed medical examination and investigations. The majority of these

undiagnosed cases may be of a rhinogenic headache. Such cases were classified into three groups by Stammberger and Wolf[2] as (1) those with headache as a result of acute and chronic inflammation of the lining of the sinuses; (2) those with headache not caused by diseases of the sinuses, such as patients with allergic and nonallergic rhinitis or vascular problems; and (3) those with headache of sinonasal origin where its inflammatory origin cannot be confirmed. Headache in this third group is mostly due to pressure on adjacent mucosal surfaces in the nose and paranasal sinuses due to alteration in nasal anatomy. The presence of these contact points is considered to be a trigger for such a headache.

The international classification of headache disorders in 2004 included mucosal contact headache as a secondary headache disorder.[3] It states that endoscopic or radiological evidence positive cases of contact points are included in this group. It describes mucosal contact headaches as variations in mucosal congestion and the headache must relieve within 5 min following the application of topical anesthesia to the contact point. It further states that headache must improve within 7 days after surgical removal of the mucosal contact points.

Due to the fact that nasal contact points are seen in people who do not have a headache, rhinogenic contact point headache (RCPH) is a subject of controversy. In recent years, people have made some researches on the mechanism of nasal mucosa contact headache. Wolff[4] in 1948 hypothesized that RCPH is a referred pain. Stimulation of nasal mucosa results in the reflex headache in area of cutaneous distribution of V1 and V2 division of trigeminal nerve. It is due to the fact that sensory neurons with receptors in nasal mucosa and those in cutaneous area of forehead, glabella, temporozygomatic area and medial canthus synapse over the same neuron in the sensory nucleus of trigeminal nerve.[5]

Polymodal receptor hypothesis states that mechanical pressure on mucosa can cause release of neuropeptides leading to local vasodilatation and mucosal edema, which further increases the contact point pressure and this vicious cycle continues.[2] The prominent explanation for this is the production of neurotransmitter substance P and calcitonin gene-related peptide which is found in abundance in normal mucosa of area of the nasal septum and middle turbinate.[6,7] Substance P generates an orthodromic axonal reflex toward the cerebral cortex through unmyelinated C fibers carrying pain sensation. It also starts an antidromic impulse which results in the release of even more substance P in nasal mucosa which mediates vasodilatation and hypersecretion along with smooth muscle contraction which further increases mucosal edema and increases the pre-existing pressure and therefore further increases the area of the contact point. The onset and duration of pain coincide with the beginning and duration of the nasal cycle.[2]

With the help of computed tomography (CT) scan and diagnostic nasal endoscopy, it has now become possible to access and visualize the otherwise difficult areas of nasal cavity often missed on routine clinical examination and plain radiology. With the help of these modalities, after confirming the presence of anatomical variation targeted surgical approach can be planned for a particular case. The study was taken up to identify the various clinical conditions in which the nasal anatomical variations may contribute to the pain symptoms and how to effectively treat them.

Aim and Objectives

The aim of this study was to find out the most common mucosal contact points in nose and to evaluate the usefulness of surgical outcome in patients with RCPH due to nasal anatomical variations which are unrelated to active inflammatory or allergic pathology.

MATERIALS AND METHODS

This prospective study was conducted in the Department of Otorhinolaryngology and Head Neck Surgery, Rohilkhand Medical College and Hospital, Bareilly, India. A total of 135 patients of all age group attending or being referred to ear, nose, and throat (ENT) outpatient department with a rhinogenic headache nonresponsive to medical management were included in the study. A written consent was obtained from the patients. The study was conducted after taking due permission from the institutional ethical clearance committee. The time period of this study was May 2016–April 2017. The effect of surgical treatment was assessed in the follow-up period of 12 months. A total of 15 patients were lost to follow-up and hence were excluded from the study.

Inclusion Criteria

Patients with headache for more than 1 year, refractory to medical management (intranasal fluticasone, decongestant, and saline washing for at least 6 months), and having headache for at least 6 months. The subjects were subjected to Lidocaine test[6] in which cotton pledges soaked in 5% xylocaine[7] were applied in nose for 10 min and those patients who reported more than 50% relief in headache were included in the study.

Exclusion Criteria

All the patients of headache with non-ENT causes such as migraine, tension headache, hypertension, cervical spine disorders, refractory error, temporomandibular joint pathology, autoimmune disorders, neurological causes, and gynecological and psychological disorders were excluded from the study. Patients were also excluded if they had a history of acute sinusitis or allergic and atrophic rhinitis in the past 6 months, or a history of any surgery on the nose or the sinuses.

Methodology

A detailed history of headache consisting of onset, site and radiation, type and duration, frequency, intensity, aggravating and relieving factors, and other associated symptoms was taken. Nasal examination in form of anterior rhinoscopy and functional examination was performed.

To confirm the diagnosis, X-ray paranasal sinuses (PNS) (Water's view) was done in all the patients. CT PNS was done in

47 patients who were found to have evidence of some pathology or anatomical variation. Diagnostic nasal endoscopy under topical anesthesia was performed in all the patients to visualize and document the condition of the nasal septum, nasal mucosa, turbinates, and meatuses. Some patients had bilateral or multiple findings but only the contact point forming attribute was taken into account.

The three main parameters recorded for headache were the duration (h/day), frequency (days/month), and intensity of headache. Intensity was recorded according to an international visual analog scale (VAS) of 10 cm marked as no pain (0) at one end and maximum pain (10) on another end. VAS divided pain into the following levels: 0–2 – relatively painless; 3–4 – mild pain; 5–6 – moderate pain; 7–8 points – severe pain; and >8 was the severest form of pain.[8]

History, examination, and investigations were assessed and recorded, the probable cause and extent of pathology were established, and patients were taken up for surgery. Surgical management comprised conventional endonasal septoplasty in cases of deviated nasal septum (DNS). In cases of small septal spurs (SS), endoscopic septoplasty was performed while broad base spurs were treated by conventional septoplasty. Concha bullosa (CB) was managed by lateral or submucosal resection. Uncinectomy was done if uncinate was pneumatized or medially/laterally bent. Overpneumatized bulla ethmoidalis and agger nasi cells narrowing frontal recess were removed as part of functional endoscopic sinus surgery (FESS). A paradoxical middle turbinate was resected, leaving the superior part of turbinate in place. Inferior turbinate if enlarged was cauterized.

The follow-up period was 12 months. In follow-up visits, any crusting or synechiae if present were removed under endoscopic guidance. The study parameters of headache were recorded preoperatively and at 1 month, 6 months, and 12 months after surgery with the help of a preformed questionnaire.

Statistical Analysis

Data obtained were statistically analyzed with RStudio© software using R language. The values were evaluated using descriptive methods and presented as mean ± standard deviation. We used *post hoc* analysis of variance (ANOVA) Tukey test for comparison between groups. Analysis of correlation was done by use of a paired *t*-test. The results were expressed at a significance level of $P < 0.05$.

OBSERVATIONS AND RESULTS

Of the 120 patients evaluated, 26 patients were referred from the department of internal medicine, 23 from the department of ophthalmology, and 14 patients from the department of psychiatry. The age of patients ranged from 16 to 63 years. The age of presentation showed a skewed distribution with mean of 37.48 ± 9.65 years. The highest proportion 41 (34.16%) was of the age group of 21–30 years. In our study group, 53 (44.16%) were males and 67 (55.84%) females with a male to female ratio of 1:1.26 [Table 1].

Anatomical variations detected after clinical and radiological evaluation were – DNS in 28 (23.33%) and SS was present in 26 (21.67%) patients. CB was seen in 20 (16.67%) and enlarged bulla ethmoidalis (BE) in 12 (10.00%) patients. Other significant findings were paradoxical middle turbinate, inferior turbinate hypertrophy (ITH), malformed uncinate (MU), and nasal polyp in middle meatuses [Table 1].

Maximum patients presented with headache in the glabella/frontal region 41 (34.16%) and were followed by those who complained of multicentric headache 23 (19.16%) and in frontotemporal region 21 (17.50%). Even though glabellar and frontal headache was equally seen in both males and females, periorbital and temporozygomatic headache was seen more in females. However, this observed difference in location of headache among different gender was found to be statistically insignificant [Table 2].

The most common mucosal contact zones were seen in between middle turbinate and nasal septum 58 (48.33%) followed by contact points between the middle turbinate and BE. Least contact points were seen between inferior turbinate and nasal septum 16 (13.34%) [Table 3].

Table 1: Age and sex distribution of nasal findings in patients

Nasal finding	Age in years												Total (%)
	11–20 *n*=10		21–30 *n*=41		31–40 *n*=32		41–50 *n*=23		51–60 *n*=11		61–70 *n*=3		
	M	F	M	F	M	F	M	F	M	F	M	F	
Deviated nasal septum	1	2	4	6	3	3	3	3	2	1	-	-	28 (23.33)
Septal spur	-	2	3	6	2	3	2	2	2	1	2	1	26 (21.67)
Concha bullosa	1	-	1	5	4	3	2	2	2	-	-	-	20 (16.67)
Paradoxical turbinate	1	-	2	2	1	1	-	1	-	1	-	-	9 (07.50)
Inferior turbinate hypertrophy	1	1	3	3	2	2	-	1	-	-	-	-	13 (10.83)
Malformed uncinate	-	-	-	1	-	1	1	-	-	-	-	-	3 (2.50)
Enlarged bulla ethmoidalis	-	-	1	2	1	2	2	2	1	1	-	-	12 (10.00)
Nasal polyp	-	1	-	2	1	3	1	1	-	-	-	-	9 (7.50)
Total	4	6	14	27	14	18	11	12	7	4	2	1	120

The overall duration of headache was 12.25 ± 4.37 h/day. Duration of headache was highest in cases of SS with a mean of 14.58 ± 3.14 followed by paradoxical turbinate (12.11 ± 1.97) and DNS (11.81 ± 3.36). This difference in duration of headache among various diseases was found to be statistically significant ($P < 0.001$). The overall frequency of headache came out as 11.38 ± 4.07 days/month. The frequency of headache was seen more in patients having SS (16.46 ± 1.36) followed by CB (12.50 ± 1.38) and DNS (13.41 ± 1.42). Nasal contact point formed due to nasal polyp and ITH had the lowest duration and frequency of headache in our study subjects. This difference in frequency of headache among various diseases was found to be statistically significant ($P < 0.001$). Patients expressed the severity of their headache on a scale of 0–10 according to VAS with a mean of 7.67 ± 1.63 in patients with CB, 7.54 ± 1.26 for SS, and 6.37 ± 1.39 for DNS. Nasal polyp though presented with a large area of contact zone had a VAS score of only 3.78 ± 0.83. The overall mean of VAS score was 6.22 ± 1.66. This difference in intensity of headache among various diseases was found to be statistically significant ($P < 0.001$) [Table 4].

Table 2: Region of headache

Region of headache	Number of cases		Total (%)	*P*-value
	Male	Females		
Glabella/frontal	19	22	41 (34.16)	0.84
Temporozygomatic	6	11	17 (14.16)	
Frontotemporal	11	10	21 (17.50)	
Periorbital	7	11	18 (15.02)	
Multicentric	10	13	23 (19.16)	
Total	53	67	120	

Table 3: Contact points

Location	Number of patients (%)
Middle turbinate–nasal septum	58 (48.33)
Middle turbinate–ethmoid bulla	28 (23.33)
Middle turbinate–lateral wall	18 (15.00)
Inferior turbinate–nasal septum	16 (13.34)

A targeted surgical intervention was performed to preserve the maximum possible normal anatomy and physiology. The most common surgical intervention performed was septoplasty 44 (51.36%) and FESS 26 (21.67%). CB exteriorization was done in 16 (13.33%) of cases. The distribution of surgical procedures is summarized in Table 5.

In our study, the patients were followed up at 1 month, 6 months, and 12 months after surgical intervention. The

Table 4: Pre-operative headache parameters

Nasal finding	Mean±SD		
	Duration of headache (h/day)	Frequency of headache (days/month)	Intensity of headache (VAS)
Deviated nasal septum	11.81±3.36	13.41±1.42	6.37±1.39
Septal spur	14.58±3.14	16.46±1.36	7.54±1.26
Concha bullosa	10.35±1.41	12.50±1.38	7.67±1.63
Paradoxical turbinate	12.11±1.97	6.89±1.93	4.67±1.80
Inferior turbinate hypertrophy	6.38±1.39	8.53±1.13	5.46±0.66
Malformed uncinate	9.67±1.58	6.75±1.10	5.33±0.66
Bulla ethmoidalis	11.10±2.05	10.33±1.23	5.67±1.23
Nasal polyp	4.89±2.05	3.11±0.78	3.78±0.83
Total	12.25±4.37	11.38±4.07	6.22±1.66
P-value (analysis of variance)	<0.001	<0.001	<0.001

VAS: Visual analog scale, SD: Standard deviation

Table 5: Surgical intervention

Surgical procedure	Number of patients		Total (%)
	Male	Female	
Septoplasty	18	26	44 (51.36)
Spurectomy	6	4	10 (8.33)
Concha reduction	7	9	16 (13.33)
Turbinectomy	5	3	8 (6.67)
Inferior turbinate cauterization	6	7	13 (10.83)
Simple uncinectomy	1	2	3 (2.50)
Functional endoscopic sinus surgery	10	16	26 (21.67)
Total	53	67	120

pre-operative values and its comparison with post-operative values are demonstrated in Table 6. The mean difference between pre-operative and post-operative headache duration, frequency, and intensity was calculated with the help of repeated exposure ANOVA. The significant difference between pre-operative and 1-month post-operative headache duration was found in cases of CB (mean difference 5.16 ± 0.75), DNS (5.74 ± 1.89), SS (6.96 ± 2.10), BE (8.16 ± 0.83), paradoxical turbinate (7.55 ± 1.13), and polyp (1.77 ± 0.44). In case of MU, mean difference in headache duration (4.66 ± 0.57) was insignificant.

A significant difference was found in frequency for post-operative 1 month follow-up in the case of for CB (mean difference 6.02 ± 1.67), DNS (7.25 ± 1.89), BE (5.58 ± 1.16), paradoxical turbinate (3.33 ± 0.70), and SS (9.55 ± 1.83). In cases of MU (2.66 ± 1.52), reduction in frequency was statistically insignificant (P = 0.94). The mean difference in intensity between pre-operative and 1-month values when compared came out to be statistically significant in cases of CB (3.10 ± 1.89), DNS (2.14 ± 1.02), BE (2.41 ± 1.73), paradoxical turbinate (1.77 ± 1.20), MU (2.33 ± 0.57), and SS (3.34 ± 1.38).

When the patients were recalled at 6 months for follow-up, there was a statistically significant improvement in headache duration in nearly all the patients and frequency and intensity of CB and DNS. The mean difference of frequency in MU (2.00 ± 1.73) was statistically insignificant with P = 0.184. The mean difference of intensity of headache between post-operative 1 month and 6 months in cases of CB, ITH, MU, BE, and paradoxical turbinate was statistically insignificant.

At the end of the study when patients were called for final follow-up at 1 year, it was noted that there was marked reduction from pre-operative values in intensity, duration, and frequency of headache in the majority of conditions and this was statistically significant. In cases of CB, although there was a significant decrease in frequency (10.16 ± 2.40) and duration (8.66 ± 1.21) after a follow-up of 1 year, surprisingly, there was a statistically insignificant difference in intensity of headache (2.33 ± 2.94) with P = 0.75. In cases of MU, the mean difference between pre-operative values of intensity and at 1-year post-operative was 3.33 ± 0.57 with P = 0.01. The patients who presented with nasal polyps did not show any significant difference in intensity at 1-year follow-up visit from pre-operative values clinically with mean difference being only 1.38 ± 0.67 [Table 6].

The overall success rate of this study was denoted by recording patient response in terms of intensity of headache. Of 120 patients, 107 (89.16%) patients responded that they were completely 53 (44.16%) or significantly 54 (45.00%) relieved of the headache whereas only 13 (10.83%) patients stated that they see no significant change in their headache even after 1 year of surgery [Table 7]. None of the patients reported an increase in the intensity, duration, or frequency of headache from the pre-operative levels.

Table 6: Assessment of surgical outcome in terms of headache parameters

Nasal finding	Duration of headache (hours/day)				Frequency of headache(days/month)				Intensity of headache (VAS scale)			
	Before surgery	Post-operative			Before surgery	Post-operative			Before surgery	Post-operative		
		1 month	6 month	12 month		1 month	6 month	12 month		1 month	6 month	12 month
DNS	11.81±3.36	6.07±1.59	4.37±1.47	2.22±1.02	13.41±1.42	6.14±1.26	3.19±1.52	1.96±1.16	6.37±1.39	4.22±1.31	2.92±1.52	2.11±1.85
Septal spur	14.58±3.14	7.62±1.33	5.58±1.17	2.92±0.90	16.46±1.36	6.96±1.42	4.42±1.70	1.89±1.10	7.54±1.26	4.154±1.78	2.80±1.72	2.27±1.87
Concha bullosa	10.35±1.41	4.83±0.75	3.33±0.81	1.33±0.51	12.50±1.38	6.50±1.22	4.54±1.87	2.33±1.86	7.67±1.63	4.67±1.86	4.80±2.65	5.33±3.56
Paradoxical turbinate	12.11±1.97	7.56±1.13	5.33±0.71	2.67±0.55	6.89±1.93	3.56±0.88	2.44±1.10	1.45±0.52	4.67±1.80	2.89±1.62	2.25±0.71	1.67±0.71
ITH	6.38±1.39	2.93±1.12	2.46±0.97	1.31±0.48	8.53±1.13	3.62±1.61	2.92±1.55	1.46±0.97	5.46±0.66	3.46±1.13	3.31±1.18	2.10±1.25
Malformed uncinate	9.67±1.58	6.18±1.55	4.20±0.55	3.33±0.58	6.75±1.10	4.33±1.15	3.33±0.58	1.37±0.65	5.33±0.66	3.10±0.78	2.83±1.55	2.20±1.10
Bulla ethmoidalis	11.10±2.05	8.83±1.33	6.25±1.13	3.16±0.93	10.33±1.23	5.75±1.35	2.92±1.31	1.92±1.08	5.67±1.23	3.25±1.05	2.92±1.24	2.42±2.27
Nasal polyp	4.89±2.05	3.11±0.78	2.68±0.87	2.12±0.33	3.11±0.78	2.75±1.23	2.69±1.12	2.69±1.12	3.78±0.83	2.71±1.26	2.56±1.01	2.40±0.50

Table 7: Post-operative assessment of subjective improvement at 12 months

Patient response in headache intensity	Number of patients												Total number of patients (%)
	11–20 years		21–30 years		31–40 years		41–50 years		51–60 years		61–70 years		
	M	F	M	F	M	F	M	F	M	F	M	F	
Complete relief (VAS–0–2)	1	2	5	10	9	8	6	5	2	2	2	1	53 (44.16)
Significant relief (VAS–3–6)	3	3	8	14	4	10	4	4	2	2	-	-	54 (45.00)
No change (VAS–7–10)	-	1	2	2	1	-	1	3	3	-	-	-	13 (10.83)

VAS: Visual analog scale

DISCUSSION

Most of the facial skeleton growth is completed at the age of 20 years and hence mucosal contact point headache due to anatomical variation is most common at this age. According to our study, the majority of the cases of rhinogenic headache were females in the age group of 21–30 years. Male to female ratio in our study was 1:1.26 with 53 (44.16%) males and 67 (55.83%) females. In a similar study by Ghazipour *et al*.,[9] males 57 (58.2%) were more affected than females 41 (41.8%).[9]

While the majority of our patients of headache had DNS, SS, and variation of middle turbinate like CB which usually triggers severe contact headache, patients having MU, nasal polyp, and overpneumatized BE were also seen as the cause of headache in few patients. Zinreich *et al*.[10] reported CB in 34% of cases on CT scan. Contrary to this, headache is less common in nasal polyposis possibly due to reduced innervations of the mucous membrane of polyp. In a study conducted by Bektas *et al*.,[11] CB, DNS, and SS were seen as the most prominent finding in patients with RCPH.

The common sites of headache in our study were glabella/frontal region 41 (34.16%), frontotemporal 21 (17.50%), and headache present in more than one site which was seen in 23 (19.16%). Similar findings were reported by Ghazipour *et al*.[9] and Harly *et al*.[12]

After evaluation, in our study majority of mucosal contact points were seen to be present between the middle turbinate and nasal septum 58 (48.33%) and middle turbinate and ethmoid bulla 28 (23.33%). These findings are in agreement with a study by Morgenstein and Krieger[13] who described a typical headache without any signs of a sinus infection and termed it as a middle turbinate headache syndrome. Welge-Luessen *et al*.[14] included 20 patients with headache and reported contact points between the middle turbinate and nasal septum or between middle turbinate and BE.

In our study, the intensity of headache was highest in cases of CB (7.67 ± 1.63) and SS (7.54 ± 1.26) followed by DNS (6.37 ± 1.39) on the VAS. In a similar study by Peric *et al*.,[15] the intensity of headache due to SS (7.93 ± 0.92), CB (7.18 ± 0.73), and septal deviation (5.91 ± 0.94) was in accordance with our findings. Duration of headache in our study was more in SS (14.58 ± 3.14), followed by paradoxical turbinate (12.11 ± 1.97), enlarged BE (11.10 ± 2.05), and CB (10.35 ± 1.41). Peric *et al*. reported that headache was longer in duration in patients with SS followed by CB and DNS. This is not in agreement with our study. Headache in our study was more frequent in SS (16.46 ± 1.36) and DNS (13.41 ± 1.42) followed by CB (12.50 ± 1.38) and enlarged BE (10.33 ± 1.23). Frequency of headache was higher in the group of patients with SS followed by CB and DNS in the study of Peric *et al*. This was partially in agreement with our study.

On using paired *t*-test, the overall mean difference between pre-operative and post-operative 1-month headache intensity (VAS) was 2.55 ± 1.40 (P = 0.000). This difference increased to 4.03 ± 1.74 (P = 0.000) at the end of 1 year. Similarly, the mean difference between the pre-operative duration of headache and at the end of 1 year came out to be 9.94 ± 3.57 which was statistically significant (P = 0.001). The mean difference between frequency of headache before surgery and the end of the study was found to be 9.65 ± 3.91 and this difference was statistically significant with P = 0.000. Parson and Batra[16] retrospectively described 34 patients with headache having contact points who underwent surgery and reported that there was 91% decrease in intensity and 84% decrease in frequency of headache. A study conducted by Das *et al*.[17] reported that after surgery, headache improved in 89.33% which is comparable to our results.

In a study by Sadeghi *et al*.,[6] while the pre-operative surgical headache intensity was 7.4 ± 1.4, there was a significant difference at 1 month after surgery with a mean of 4.1 ± 1.9. There was statistically no significant difference between 1 month and 6-month post-surgery visit. A statistically significant difference was seen when post-operative 6 month and 1-year visits were compared for mean VAS. This study was in agreement with our study. In contrast, a study by Peric *et al*.[15] reported that the headache intensity at 1 month after surgery improved significantly, but not much difference was seen thereafter on further evaluation at 6 months, 1 year, and 2 years. According to their study, the outcome of surgery can be evaluated after 1 month. Contrary to this, Welge-Luessen *et al*.[14] noted that after a long follow-up of 10 years, there was only 65% improvement in headache of patients. Tosun *et al*.[18] in a study evaluating surgical management of 30 cases of mucosal contact area headache, 43% showed complete remission, 47% significantly improved, and 10% had no improvement. Keeping this in mind, in our study, we postulate that even though we see a major improvement in headache intensity, duration, and frequency at first post-operative visit after 1 month, the final outcome evaluation needs a longer follow-up so that durable relief or recurrence of headache can be seen.

The inconsistent result in cases of CB and MU may be due to the fact that surgical correction may have hampered with streamlined airflow in middle meatus resulting in mucosal hypertrophy and blockage of infundibulum leading to recurrence of headache which may be unrelated to primary cause but results in no clinical benefit from surgery to the patient. Future studies need to be done to evaluate this aspect.

In cases of nasal polyp, pre-operative parameters indicated that out of all the other anatomical variations, headache was mild in intensity and also duration and frequency were toward the lower side. This may be due to the fact that the hyperplasic mucosa of nasal polyps has sparse nerve fibers resulting in less release of substance P and other vasoactive substances. In such cases, there was not much difference in headache even after surgery.[19,20]

A VAS scale for headaches is a crude scale and future studies with the focus on more aspects of headache should be done. This study does not have a control group, so placebo effect of surgery cannot be ruled out. Studies with a control group and longer follow-up would predict better about the recurrence pattern of the headache after surgery.

Even after classification of RCPH in 2004, it is not fully understood. In some cases, an absence of headache in early post-operative period may not result in long-term control and headache may recur. In such cases, mucosal contact points may not be the only underlying cause but only trigger points.

This study has emphasized a need for further evaluation of RCPH and its management as in our study, even though post-operative evaluation showed resolution of the mucosal contact points, still around 10.83% patients reported that headache persisted even after surgery. This was also pointed out by Abu-Bakra and Jones[21] in their study in which they stated that RCPH is a central pathology and surgery has no role in its management. Nasal mucosa contact might not be the only etiology behind RCPH. It may be due to other physiological mechanisms which are still unclear as the mechanism of headache is complicated and variable.

CONCLUSION

This study shows the importance of targeted surgical intervention after proper evaluation in patients suffering from refractory RCPH. Early diagnosis and timely surgical intervention can significantly improve the quality of professional and social well-being in the majority of patients. The effect of surgery, though evident soon after surgery, needs long follow-up to show the true extent of effectiveness.

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