Endoscopic Approach to Middle Turbinate Squeeze Syndrome

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Abstract Middle turbinate squeeze syndrome (MTSS) refers to sino-nasal headache due to intense contact between the middle turbinate and the nasal septum and/or between middle turbinate and other structures in the lateral nasal wall. This study was intended to evaluate the efficacy of precise endoscopic surgical treatment of MTSS. This is a prospective study of 126 patients with refractory cephalgia due to endoscopically confirmed MTSS who underwent functional endoscopic naso-sinus surgery (FENS) wherein the contact points and ostio-meatal complex obstruction were endoscopically relieved. 91% of cases reported improvement/resolution of headache and 95% of cases had relieved contact points as documented endoscopically. This surgery was also found to facilitate resolution of sinus disease, both radiologically (in 64% of cases) and endoscopically (in 94% of cases). Cephalgia caused by MTSS can be effectively treated by an ultra-conservative endoscopic approach.

Keywords Cephalgia · Naso-sinus headache · Middle turbinate syndrome · Contact neuralgia · Uncinate process · Supra-bullar approach · Endoscopic sinus surgery

Introduction

Ever since Sluder in the early 1900s described ‘sphenopalatine neuralgia’ as causing headache due to contact

points between different structures within the nasal cavity, several studies have evaluated and established the role of contact neuralgia in the causation of naso-sinus cephalgia [1]. Williams (1954) advocated removal of middle turbinate in the treatment of what he described as ‘nasal contact headache’ [2]. Ryan and Ryan (1979) also described headache caused by middle turbinate compression [3]. Morgenstien and Krieger (1980) described various middle turbinate syndromes and suggested safe and effective treatment of these by middle turbinectomy. They described middle turbinate syndromes due to contact between middle turbinate and nasal septum (septo-turbinal compression) and/or due to contact between the middle turbinate and other lateral nasal wall structures (example: bulla-turbinal compression) [4]. Headache could also be caused by associated ostio-meatal complex obstruction and consequent sinusitis or due to vacuum headache. Trevino and Gordon (1993) described the middle turbinate syndrome as a condition wherein the middle turbinate is tightly pressed against the olfactory area of the septum [5]. Greenfield et al. (1986) reported referred pain by specific noxious stimuli applied to various regions of nasal cavity. They found that stimulation of middle turbinate caused pain in the temple, zygoma, inner canthus of the eye and forehead. They attributed this to liberation of vasoactive amines in afferent sensory neural fibers which terminate in sensory nucleus of trigeminal nerve [6]. Stammberger and Wolff (1988) described release of a neuropeptide, the P-substance in the contact points of the nasal cavity [7]. El-Silimy ‘O highlighted the place of endonasal endoscopy in the relief of middle turbinate sino-nasal headache syndrome [8]. Relief from headache could be achieved by relieving the contact/anesthetizing the contact area by placing cotton strips soaked in decongestant solution and/or 4% Lignocaine solution. This is a confirmatory test for contact neuralgia

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and management of these contact points should relieve this naso-sinus headache. This prospective study was done to evaluate the role of nasal endoscope in precise diagnosis and treatment of MTSS.

Patients and Methods

This study was conducted in the Department of ENT-Head & Neck surgery of Kasturba Medical College & Hospital, Manipal between the years 2000–2006 (7 years). 164 patients with chronic headache who had endoscopically confirmed middle turbinate squeeze syndrome were prospectively evaluated for the efficacy of its endoscopic management. All the patients above 10 years of age who reported subjective headache relief on endoscope assisted decongestion and anesthesia of contact areas and those who could be followed up for at least 6 months, post treatment were included in this study. A detailed history taking and thorough ENT, neurological and ophthalmologic evaluation was done in all cases. Patients with evaluation suggestive of associated other causes of headache were not included in this study. Plain radiograph of the paranasal sinuses (occipeto-mental view) was done as a baseline radiological investigation. In affordable patients and when medical measures failed to relieve the headache, coronal

CT imaging of the paranasal sinuses was also done to confirm the status of the ostio-meatal complex and sinus mucosa and the contact points between the middle turbinate and septum/lateral wall structures (Fig. 1). The severity of headache was graded by visual analogue scores (VAS) between 0 and 4. Of the 164 patients, 126 patients who did not satisfactorily respond to medical measures were taken up for functional endoscopic naso-sinus surgery (FENS) wherein the contact points and ostio-meatal complex obstruction were relieved by an ultraconservative endoscopic endonasal approach. This surgery included endoscopic septoplasty, specifically directed in relieving contact points, infero-lateral partial resection of the middle turbinate (Fig. 2) and physiological sinusostomy with uncinate process preservation as and when indicated endoscopically and/or radiologically [9, 10, 11]. Angled nasal endoscopes (30° and 70°) were used. In a case of radiologically isolated frontal sinusitis, the frontal recess was palpated anterior to the bulla ethmoidalis by a ball probe and opened using a curette/upturned tru-cutting forceps by a suprabullar approach. Dental wax plates were placed in both the nasal cavities extending into the middle meatus which was left in situ for a week. These plates helped as a septal splint and as spacer in the middle meatus, preventing synechia formation [12, 13]. If there was excessive intra-operative bleeding, the middle meatus and

Fig. 1 CT imaging of the nose and para-nasal sinuses of few patients showing middle turbinate in contact with the septum/lateral nasal wall.

a Gross deviated nasal septum to the left and a concha bullosa on the right side with septoturbinal compression (left) and lateral turbinal compression (right). **b** Septoturbinal and bulla-turbinal compression on the right side. **c** Deviated nasal septum to the left and bilateral concha bullosa. **d** Deviated nasal septum to the left and bilateral concha bullosa

Fig. 2 Intra-operative endoscopic photographs showing. **a** Middle turbinate being squeezed between the septum and lateral nasal wall (ST: septo-turbinal compression, LT: lateral turbinal compression, S: septum, IT: inferior turbinate, MT: middle turbinate). **b** The deviated septal framework during endoscopic septoplasty. **c** Relieved contact between the septum and middle turbinate after endoscopic septoplasty. **d** Relieved contact between middle turbinate and lateral nasal wall after endoscopic middle turbinoplasty (infero-lateral partial resection)

nasal cavities were packed with ribbon gauze strips soaked in Vaseline and were removed on the next day. These patients were called back for endoscopic cleaning of the operated nasal cavities on the 3rd post-operative day and at the end of 2nd post-operative week. Patients were advised regular saline nasal douching and use of Fluticasone nasal spray once a day for 1 month. Antihistamines were prescribed if patient had associated nasal allergy for one month and later on whenever required basis. Subjective evaluation of the efficacy of endoscopic naso-sinus surgery was done at the end of 6 months by comparing the visual analogue scores. Objective evaluation was done by nasal endoscopy and by plain radiograph of the paranasal sinus (occipeto-mental view).

Observations and Results

Of the 126 patients who underwent 'Functional endoscopic naso-sinus surgery (FENS)', 74 were females and 52 were

males. Age of the patients ranged from 10 to 64 years with a mean of 28 years. Most of the patients (84%) belonged to the age group between 20 and 40 years. 23% of cases had radiological changes in the frontal and/or maxillary sinuses in the plain radiographs but CT imaging showed sinus disease in 53% of cases, predominantly in the anterior ethmoid sinus. On endoscopy, 26% of the nasal cavities ($n = 252$) had septo-turbinal compression alone and 47% had in addition, contact between middle turbinate and other lateral nasal wall structures (lateral turbinal compression). Lateral turbinal compression alone was seen in 20% of the nasal cavities. Details of the various contact points are shown in Table 1. Features of nasal allergy were seen in 42% of cases. Surgical details are given in Table 2.

The follow-up period of the patients ranged from 6 months to 6.5 years with a mean of 9 months. Subjective evaluation of the surgery done by comparing the visual analogue scores of headache pre and post surgery is shown in Table 3. Objective evaluation by nasal endoscopy showed relief from contact areas in 95% of cases.

Table 1 Details of the various contact points on pre-operative diagnostic nasal endoscopy

No.	Contact point	No of sides (126 patients X2 = 252 sides)	%
1.	Septo-turbinal	66	26
2.	Lateral turbinal	50	20
3.	Septo-turbinal + Lateral turbinal	118	47
4.	No contact points	18	7

Radiological resolution of sinus disease as on plain radiographs (23% of cases) was seen in 64% of patients and endoscopic resolution of the ostio-meatal complex disease was seen in 94% of all cases. Patients with nasal allergy fared poorly when compared to those without features of nasal allergy.

Discussion

The middle turbinate compression is more commonly seen in patients with anatomical variations of the nasal cavity like septal deviation, spur, pneumatized middle turbinate (concha bullosa), etc. or due to a hypertrophic middle turbinate or polypoidal turbinate which could be due to associated nasal allergy.

Morgenstein and Krieger (1980) described two varieties of middle turbinate syndromes that produce well defined pattern of pain and obstruction [4]. One is primarily characterized by pain (the four finger headache) and consists of 3 features.

- (1) Septo-turbinal compression (with or without septal deviation)
- (2) Bulla-turbinal compression and
- (3) Sinus ostial closure.

Table 2 Surgical details of functional endoscopic naso-sinus surgery (FENS), tailor made to the indications in 126 patients

No.	Surgery performed	No. of cases (126)	%
1.	Endoscopic septoplasty	103	82
2.	Partial middle turbinectomy	118	94
3.	Partial inferior turbinectomy/ bipolar cauterisation	32	25
4.	Endoscopic sinus surgery with uncinate process preservation	65	52
5.	Endoscopic sinus surgery with uncinate process and bulla ethmoidalis preservation (Supra- bullar approach to frontal sinus)	13	10

Table 3 Subjective evaluation of the surgery done by comparing the visual analogue scores of headache pre and post surgery

Comparison of pre and post treatment visual analogue scores of Headache severity			
No. of cases (%)			
Improved	Resolved	Same	Worsened
73 (58)	41 (33)	9 (7)	3 (2)

The other variety is characterized chiefly by turbinal obstruction (the ‘crowded nose’), which could be

- (1) With septal deviation
- (2) Without septal deviation
- (3) Following rhinoplasty (narrowing of nose)

They described pain due to middle turbinate syndrome as usually intermittent, fluctuating with congestion and decongestion of mucosa, often over the medial canthus, the supra-orbital region and sometimes over the temporal region. When it is bilateral, it presents as the ‘four finger headache’. They attributed this pain to be mediated via the anterior and posterior ethmoidal nerves. Compression between the turbinate and the lateral nasal wall generates pain in the eye, the infra-orbital region and the temporo-zygomatic area. The headache produced by middle turbinate syndromes is often promptly relieved by drugs that produce nasal decongestion. They described the ‘cocaine test’ to anesthetize the contact areas and a positive test (headache relieved by cocaine at contact areas) prognosticates a good surgical result. They felt that middle turbinectomy not only helps in relieving the contact points but also facilitate middle meatal drainage of the anterior group of sinuses. They did not encounter any cases of crusting, drying and atrophic changes of the nasal mucosa following the resective surgery [4]. Even Shih et al., in a prospective study on a small series of 31 cases concluded that middle turbinate resection did not have deleterious effect on the results of endoscopic sinus surgery and that it did not significantly alter the nasal physiology presumably due to relative plasticity of the nasal tissue and its ability to compensate the absence of the middle turbinate [14].

However, we do not recommend total or near-total middle turbinectomy as it can produce ventilatory disturbances especially in patients residing in a less humid environment and in those whose mucosa secretes less, unlike in a patient with allergic rhinitis. Moreover, middle turbinate is a useful landmark for future endoscopic sinus surgeries, if any, which may help in preventing injury to the cribriform plate or the fovea ethmoidalis. We advocate ultra-conservative turbinectomy, resecting only that part which produces contact point and middle meatal obstruction. This usually means infero-lateral resection of the middle turbinate. Care is taken

to preserve the anterior part of the middle turbinate as much as possible as it helps in reducing the deposition of the allergen/bacteriae present in the more contaminated inspired air into the middle meatus. The posterior end is resected more as it facilitates the ventilation of the middle meatus and thus the sinuses during the less contaminated expiratory phase of respiration [10].

Kunachak advocated middle turbinate lateralization for rhinological headache by a minimal invasive endoscopic method wherein the middle turbinate was fractured [15]. We feel that fracture of the middle turbinate should be avoided as it tends to make the middle turbinate more lax and mobile. Infracture can worsen the septo-turbinal compression and outfracture can compromise the middle meatus.

El-Silimy has also emphasized the effectiveness of endonasal endoscopic surgical management in middle turbinate sinonasal headache syndrome [8]. Ramadan in a study on 23 individuals with refractory primary headache in the absence of any significant sinus symptoms found that endoscopic sinonasal surgery was more effective than a non-surgical treatment [16]. Giacomini et al., also advocated septoturbinal surgery in what he called contact point headache syndrome [17]. Goldsmith et al., attributed contact between septum and lateral nasal wall to headaches referred to the ophthalmic division of the trigeminal nerve, the main sensory innervation of the anterior middle turbinate. They called this type of headache as middle turbinate headache syndrome [18].

In our study, 126 patients with headache relieved by endoscopic anesthesia/decongestion of the contact points in the nasal cavity underwent an ultra-conservative endoscopic endonasal surgery to relieve the contact points and the ostio-meatal complex obstruction. On a minimum follow-up period of 6 months, 91% of cases reported improvement/resolution of headache and 95% of cases had relieved contact points as documented endoscopically. This surgery was also found to facilitate resolution of sinus disease, both radiologically (in 64% of cases) and endoscopically (in 94% of cases).

Conclusion

Middle turbinate squeeze syndrome (MTSS) is a common cause of naso-sinus headache which is a result of contact neuralgia, middle meatal/ostio-meatal complex obstruction and/or due to vacuum in the sinuses (Vacuum headache). Nasal endoscope is a very useful tool in the precise

identification of the contact points and the ostio-meatal complex disease. Ultra-conservative endoscopic endonasal septal, turbinal and limited sinus surgery, tailor made to individual patient's naso-sinus status (Functional endoscopic naso-sinus surgery) is an effective and safe treatment for MTSS.

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