Postoperative Histological Changes in Polypose Rhinosinusitis

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Abstract The aim of this study was to evaluate the effect of surgery on the histology of nasal mucosa in patients with nasal polyposis and the comparison/also to compare it with normal population. This case-control study was conducted on 20 patients at the Otorhinolaryngology-Head and Neck Surgery Department, Qaem Hospital, Mashhad University of Medical Sciences during October 2007 to June 2008.

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Patients with polyposis and patients with septal deviation who were candidate for septoplasty were considered as case and control groups, respectively, including 10 subjects in each. Specimens of polyp tissue and the inferior conchae (mucosa) were taken during sinus endoscopy from the case group. One month later, another specimen was taken from the inferior conchae (mucosa). Moreover, specimens of the inferior conchae (mucosa) were taken of the control group. Percentage of goblet cells among the epithelial cells was determined for each group. Goblet cell percentage found to be 15.7% in polyps, consistent with significant difference with that of in postoperative (13.3%) and in preoperative nasal mucosa specimens (39.86%), ($P = 0.043$ and $P = 0.03$, respectively). Goblet cell percentage was 39.86% and 4.9% in the case and control groups, in that order, which were significantly high ($P < 0.001$). Percentage of goblet cells showed to be lower in polyps than mucosa. Also percentage of goblet cells in postoperative nasal mucosa specimens was significantly lower than pre-operative specimens. Therefore, surgery has additional benefit of histological improvement rather than opening nasal airway.

Keywords Nasal polyposis · Goblet cell · Surgery · Endoscopy

Introduction

Nasal polyp is the most common benign nasal tumor, and anterior ethmoidal cells are the most common site of origin [1]. Nasal polyposis is an inflammatory disease in the nasal mucosa and paranasal sinuses. It may cause edematous mass formation in nasal cavity, nasal obstruction, rhinorrhea, hyposmia, and finally influences the quality of life.

The prevalence of nasal polyposis varies from 1 to 4% in general population and increases as the age goes up; it reaches to the peak at the age of 50 [2]. In case of observing nasal polyps in children particularly younger than 10 years old, the physician should investigate for the cystic fibrosis with a sweet test [3]. Males are affected to nasal polyposis as twice more as females [3].

In general, less patients are atopic, and only 0.5% of atopic patients have nasal polyp [2]. Although existence of polyps in nasal cavity refers to allergic causes. This entity is not implied as an independent disease but a sign of various processes and diseases [4].

The only definite treatment of nasal polyposis is removing the basic causes. However, this protocol cannot be followed in many cases. Thus, symptomatic treatments have become the most common way of treatment. These therapeutic regimens often have undesirable side effects too, some of which may be severe. The most common prescribed medications are systemic and topical corticosteroids, decongestants, and antihistamines. As of the main treatment modalities, surgery usually requires to be repeated several times. It is believed that surgery is performed to relieve the nasal air way obstruction which is a chief complaint of most patients. Nevertheless, it may result in such problems as rhinorrhea and congestion with different durations [5]. In this study, we counted post-surgical and presurgical number of goblet cells, which are considered to be the second most common cellular component in the nasal mucosa, in patients suffering nasal polyposis, and then compared the findings with the control group.

Methods

This prospective, controlled study was performed on a number of 10 patients with nasal polyps as the case group and 10 with septal deviation or nasal deformity undergoing endoscopic sinus surgery (ESS) and septo/septorhinoplasty, respectively as the control group at the Otorhinolaryngology-Head & Neck Surgery Department, Qaem Hospital, Mashhad University of Medical Sciences during October 2007 to June 2008. The study was approved by the Medical Ethics Committee of Mashhad University of Medical Sciences. The patients also completed a consent form before entering to the study.

It was the first time of nasal problem for the case group, and they had not been under any medical treatments for at least one month before the nasal procedure. In the control group, there was no history of allergy, nasal surgery, or systemic disease such as granulomatose disorders, congenital or acquired immune deficiency, and hereditary disease (cystic fibrosis) to influence the nasal mucosa.

The specimens of polyp tissue and inferior turbinate mucosa (IT) from the study group were obtained via nasal endoscopy. Furthermore, taking the specimen from IT of the study group was repeated one month later under a local anesthesia at the office. They patients were only administered amoxicillin and acetaminophen as antibiotic and analgesic, respectively, for a few days post- surgery.

The control group included of the slides of specimens from IT. The specimens were prepared and examined by light microscopy after Hematoxylin and Eosin stains. The number of goblet cells in every surgical specimen was calculated in 10 areas in 400× high-magnification field. Then the mean number of goblet cells and the number of cells in the epithelial layer of tissues (polyp or IT) were also obtained.

Data were analyzed with SPSS software (version 11.5, SPSS, Inc., Chicago, IL) using independent and paired *t* test with a *P* value of less than 0.05.

Results

Demographic and clinical characteristics of the patients in both case and control groups have come in Table 1. The mean age for the case and control groups was 32.9 ± 4.36 and 33.4 ± 9.87 years, respectively. Male:female ratio was also 7:3 in the case group and 8:2 in the control group. Age and sex showed no significant difference between two groups.

The percentage of goblet cells in polyps, preoperative, and postoperative nasal mucosa was $15.7 \pm 22.52\%$, $39.85 \pm 20.18\%$, and $13.3 \pm 8.28\%$, in that order. In the control group, goblet cell percentage found to be $4.9 \pm 5.32\%$. Only two subjects in the case group had higher percentage of goblet cells in polyps than preoperative nasal mucosa.

Goblet cells percentage in polyps (15.7%) and postoperative nasal mucosa specimens (13.3%) was lower than that of in preoperative (39.86%), consistent with significant difference ($P = 0.043$ and $P = 0.03$, respectively). Goblet cells percentage in the case group was 39.86%, which was significantly higher than in the control group with 4.9% of goblet cells ($P < 0.001$) (Figs. 1, 2, 3).

Table 1 Demographic information

Group	Gender		Age (mean)
	Male	Female	
Case	7	3	32.90 ± 4.36
Control	8	2	33.40 ± 9.87
<i>P</i> value	0.60		0.92

Fig. 1 Goblet cells before *right* and after *left* polypectomy, using H&E staining. Goblet cells are illustrated by arrows. Reduction after the surgery is detected

Fig. 2 Goblet cells detected in nasal polyps *right* are more than that detected in preoperative nasal mucosa *left*. Goblet cells are illustrated by arrows. H&E staining was used

Fig. 3 Goblet cells in postoperative case *right* and preoperative control nasal mucosa *left*, reduction after the surgery is detected. Goblet cells are illustrated by arrows. H&E staining was used

Discussion

The prevalence of allergic rhinitis is 10% of general populations, and nasal polyps were found in 1–4% of Americans [2, 6, 7]. These patients occasionally suffer from symptoms such as rhinorrhea, nasal obstruction, hyposmia or anosmia. They often take various medications which have relieving effect on the symptoms but may cause side effects that can be severe.

Surgery needs to be repeated for several times, but it seems that surgery has positive effects in addition to

opening of the nasal airway since the patients reported about elimination of many of their symptoms.

This study focused on histological changes of nasal mucosa especially the amount of goblet cells as the second most frequent cellular component of nasal mucosa and as the responsible for nasal secretion [8]. As a result, the number of goblet cells were significantly lower in postoperative than nasal polyp specimens ($P = 0.043$). Similarly, goblet cells in postoperative nasal mucosa considerably decreased in number and reached to one third of that of in preoperative ($P = 0.03$). The lowest

percentage of goblet cells found in the control group and there was a significant difference with that of preoperative as well as postoperative mucosa.

Malekzadeh et al. [9] found that the number of goblet cells in nasal polyps was lower than in the nasal mucosa in chronic rhinosinusitis.

Assanasen et al. [1] and Pawanker et al. [2] also indicated that polyps have the lower amount of goblet cell than preoperative nasal mucosa, as found in the present study. Nevertheless, Kitapci et al. [5] and Greenberg [10] reported increased number of goblet cells in nasal polyps.

However, Kitapci et al. [5], similar to this study, reported a postoperative reduction of goblet cells in the nasal mucosa, and they concluded that this finding could lead to reduction of rhinorrhea, which can be explained in two ways. The first way is improving the nasal air flow can lead to a process that will cause mucosa to become normal, as seen in entrance of ventilation tube into the tympanic membrane for OME (otitis media with effusion). The second way is the reduction of inflammatory mediators in the nasal mucosa by removing the inflammatory mucus and polyp.

This improvement is not perfect and complete because still there will be considerable amounts of goblet cells in nasal mucosa compared to the normal mucosa and it may require complementary treatments such as steroids.

In summary, the surgery has dual effects on patients suffering nasal polyposis comprising opening of the nasal air way and reduction of goblet cells in the nasal mucosa.

Key Message

Compared to mucosa, the percentage of goblet cells in polyps found to be lower. Moreover, postoperative nasal mucosa specimens showed significantly lower percentage of goblet cells compared with preoperative specimens. Therefore, surgery has additional histologic improvement in addition to opening of the nasal airway.

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References

1. Assanasen P, Naclerio RM (2001) Medical and surgical management of nasal polyps. *Curr Opin Otolaryngol Head And Neck Surg* 9:27–36
2. Pawanker R (2003) Nasal polyposis: an update. *Curr Opin Allergy Clin Immunol* 3(1):1–6
3. Ferguson BJ, Johnson JT (2005) Infectious causes of rhinosinusitis. In: Cummings CW, Flint PW, Harlier LA et al (eds) *Cummings Otolaryngology-Head & Neck Surgery*, Vol. 2, 4th edn. Mosby, Philadelphia, p 1187
4. Adkinson NF, Yunginger JW, Busse WW, Bochner BS, Holgate ST, Simons ER (2003) *Middleton's allergy: principles and practice* (book online). 6th edn. Mosby, Philadelphia. Available at: MD Consult. Accessed April 11, 2008
5. Kitapci F, Muluk NB, Atasoy P, Koc C (2006) Role of mast and goblet cells in the pathogenesis of nasal polyps. *J Otolaryngol* 35(2):122–132
6. Aygun N, James Zinreich S (2005) Radiology of the nasal cavity and paranasal sinuses. In: Cummings CW, Flint PW, Harker LA, Haughey BH, Richardson MA, Robbins KT et al (eds) *Cummings Otolaryngology-Head & Neck Surgery*, Vol.2, 4th edn. Mosby, Philadelphia, p 1172
7. Lane AP, Kennedy DW (2003) Sinusitis and polyposis. In: Snow JB, Ballenger JJ (eds) *Ballenger's Otorhinolaryngology Head and Neck Surgery*, 6th edn. BC Decker, Spain, p 764
8. Goblet cell. 2008. Available at: http://www.en.wikipedia.org/wiki/Goblet_cell. Accessed April 18, 2008
9. Malekzadeh S, Hamburger M, Whelan P, Biedingmaier JF, Baraniuk JN (2002) Density of middle turbinate subepithelial mucous glands in patients with chronic rhinosinusitis. *Otolaryngol Head Neck Surg* 127(3):190–199
10. Greenberg J. Current management of nasal polyposis. 1998. Available at: <http://www.bcm.edu/oto/grand/090398.html>. Accessed April 11, 2008