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Recurrent sinonasal polyposis after the endoscopic sinus surgery

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ABSTRACT

Nasal polyposis is one of the chronic airway diseases, which affects the patient's quality of life in different ways. There are various complications along with nasal polyposis, which might be cured by drug administration. Due to failure of pharmacotherapy effects, various surgical approaches might be useful to resect the polyps with the possibility of polyposis recurrence after the surgery. In this study, we aimed to review different studies about the etiology and prevalence of recurrent nasal polyposis and the efficacy of endoscopic sinus surgery in reducing the incidence of recurrent nasal polyposis. We searched the PubMed and google scholar for the relevant articles. Based on the studied articles, there are various factors including the history of inflammatory diseases, the severity of polyposis, etc., which affect the long-term efficacy of surgical intervention.

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Introduction

Nasal polyposis (NP) is one of the chronic severe airway diseases. It is known as a non-neoplastic inflammatory process of nasal mucosa that eventually leads to the outgrowth of abnormal masses inside the mucosa of nasal cavity and paranasal sinuses. The polyps are most frequently detected in middle meatus and ethmoid region. They are usually bilateral and multiplex with soft, transparent, the hallmark cells in sinonasal polyposis. Infiltrated eosinophils in nasal polyp tissue syntheses the transforming growth factor beta (TGF-β), which leads to the specific grape like clusters and without bleeding (1). They contain loose connective tissue, edema and pro-inflammatory cells, which are mostly eosinophils (almost in 85% of NP). Due to high rate of eosinophils

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in nasal polyp's tissue, they are proposed as structural changes of nasal polyps such as fibrosis of stromal and thickening of membrane. TGF-β and interleukin 5 (IL-5) produced by eosinophils contributes in the pathogenesis of NP (2,3). Different disease conditions such as asthma, chronic sinusitis, and aspirin sensitivity are related to the higher risk of NP occurrence.

NP is a chronic health complication, which affects the patient's quality of life more that other chronic diseases (4).

Nasal obstruction is the major symptom of sinonasal polyposis, which shows various intensity based on the polypsis and location. Nasal congestion, anosmia, rhinorrhea, postnasal drip, headache, hyposmia/anosmia, loss of smell and coughing are other common presentations of NP. In one study, it is demonstrated that small size polyps lead to lower level of sinonasal complications (5).

Diagnosis and treatment methods

Conventional radiography is not sensitive enough to use for NP investigations. This method can only illustrate the opacification of the involved sinuses. Performing nasal endoscopy and computed tomography before any intervention usually provides considerable data about the initial diagnosis of bilateral and symmetric NP. Nasal endoscopy is known as the gold standard method for NP diagnosis. For the unilateral NP, more diagnostic procedures are required (6).

Different medical treatments have been used for reducing the NP irritating presentations (e.g., nasal obstruction, congestion and sinus inflammation) in patients. The main purpose of pharmacotherapy or even sinonasal surgery is providing a sinonasal environment without any stimuli for polyp development. Topical and oral steroids, macrolide antibiotics, diuretic nasal washes and intrapolyp steroid injection are among different methods. Applying corticosteroids are the most significant medical treatment among wide range of pharmacotherapy method, which have been applied pre- or postsinonasal surgical interventions for obtaining more success. The mechanism of corticosteroids is mainly through decreasing the infiltration of eosinophils and production of IgE by increasing the expression of anti-inflammatory genes, or enhancing the apoptosis of inflammatory cells (7,8).

In different conditions, applying medication would not be sufficient for NP treatment, which leads to use of sinonasal surgeries. Polypectomy and endoscopic sinus surgery (ESS) are surgical options, which have shown considerable efficacy in treating inflammatory diseases of paranasal sinuses. Although there might be various side effects along with performing surgical interventions, considerable levels of reduction in NP complications and improvement in patient's quality of life have been observed (9).

Although the prevalence of NP is still a controversial issue, the general prevalence of NP has been estimated to be low in general population (range from 1-4%), with higher frequency in adults compared with children under 10 (10).

The incidence rate of the NP is dependent on the studied population. According to the investigations, elderly and patients with cystic fibrosis, Churg-Strauss syndrome, sarcoidosis and asthma are at higher risk for NP (11,12).

The etiology of NP

Although there are multiple predisposing factors in the development and pathogenesis of NP, but the exact causes are under debate. NP occurs almost due to unknown or idiopathic causes and has high relapse tendency, which leads to complex treatment

and management processes. Several factors have been proposed historically as the predisposing elements to NP occurrence. The chronic inflammation inside nasal sinuses or the nasal cavity, which leads to the formation of nasal polyps, can be the result of different stimuli that activate the inflammatory cascades including mechanical trauma after surgery, bacteria, viruses, fungi, and environmental allergens. The eosinophilic inflammatory mechanisms are the superior reason for the formation of NP in almost 80% of patients, which may be along with diseases including asthma and aspirin sensitivity (13).

Based on one study on chronic rhinosinusitis, the bacterial infections do not interfere in the pathogenesis of nasal polyps (14). The possible association of fungi with the incidence of NP was studied through microscopic and polymerase chain reaction (PCR) techniques in 2007 by Aydil et al. which showed that the occurrence of fungi colonies are most common in patients with nasal polyps (15).

Unusual situations such as lymphangiogenesis deficiencies, low levels of nitric oxide, increased expression of metalloproteinase could lead to the formation of nasal polyps (1,16).

There is little data regarding the pro-inflammatory cells, which contribute in the development of NP through activation of inflammatory cascades. According to recent studies, cytokines are the major elements involved in the pathogenesis of NP. Using immunohistochemistry staining, the increased level of interleukin (IL)-3, IL-5, granulocyte-macrophage colony-stimulation factor (GM-CSF), tumor necrosis factor and interferon have been detected in NP compared with control samples (17,18). These mediators are pro-inflammatory cells, which induce the eosinophil activation and NP development. Leukotrienes (LCT4) are important inflammatory mediators which are produced in eosinophil cells from arachidonic acid and contribute in NP formation by increasing the contraction of smooth muscles and promoting vascular infiltration of airways (19).

Nasal polyposis recurrent

There are various evidences regarding the prevalence of the recurrent NP in patients who had been under endoscopic sinus surgery due to unilateral or bilateral polyposis. It has been estimated that the recurrence rate of sinonasal polyposis varied from 15% to 25% (20).

According to the study of Wynn et al. the history of patient's inflammatory disease is an influential factor, which increases the recurrence rate of NP and also the requirement for revision sinonasal surgeries. In this study, 80% of patients with asthma who had been under the ESS revealed the sinonasal polyposis recurrence in comparison with 40% of patients without ashtma. It is also observed in this study that 73% of patients with the history of allergy, which experienced the ESS, developed the recurrent sinonasal polyposis (21). Based on results from different studies, lower achievements of ESS method in decreasing the recurrent NP, not only would be due to patients history of inflammatory diseases but also can be the consequent of the severity of the primarily sinonasal polyposis (21). It has been also indicated that patients with various previous surgical intervention are most prone to the revision operations and recurrence of the polyposis in comparison with patient who have not experienced any surgical intervention. The trauma resulted from the surgery can affect the incidence of polyposis.

Recent studies have proposed various novel tools for removing the polyps in patients with NP such as KTP laser,

Nd:YAG laser, coblation surgery. These methods are flexible to be performed, are associated with lower blood loss during the operation, and result in progression of hemostasis. Further investigations are required to support the efficacy of novel surgical methods (22). Meticulous endoscopic surgery is proposed as a safe method with high rate of achievement in reducing the recurrent NP (23).

The chronic rhinosinusitis can present with or without polyposis. Based on previous studies, in situations that NP appears in addition to rhinosinusitis, patients not only show lower improvements after the surgery, but also are more prone to the relapse of polyposis after the FESS. Therefore, the requirement rate for revision surgery increases in patients having chronic rhinosinusitis with sinonasal polyposis compared with those who do not have nasal polyps (21).

The recurrence of NP after the sinonasal surgery is prevalent but the frequency and intensity of relapse vary based on the medical treatment, which might be used after any surgical intervention. Although the FESS is an effective procedure, its long-term efficacy is a controversial issue. Based on retrospective study of Cornet in 2013, the majority of children who suffered from chronic rhinosinusitis with nasal polyps and had experienced FESS, showed considerable improvement regarding the quality of life and long-term effects of ESS (24).

It has been proposed that patients with asthma and aspirin sensitivity are at higher risk for recurrent NP after the surgery (25). In the clinical trial of Virolainen in 1980, the preventive effect of beclomethasone dipropionate administration on recurrence of polyposis after the radical ethmoidectomy of patients was evaluated. In this study, after a follow-up duration of 1 year, only 46% of patients consumed beclomethasone dipropionate, revealed the NP recurrence which was lower than the 87% of patients in placebo group that revealed recurrence of NP (26). In various trials, prophylactic administration of flunisolide after the surgery was suggested for obtaining more comprehensive and beneficial results regarding the decreased rate of recurrent NP and nasal symptoms such as running nose, stuffiness and sneezing (27,28). Based on some investigations, using budesonide nasal spray in patients with the history of surgery or recurrent NP has revealed more improvements on reduction of the recurrence rate in comparison with patients with first time evulsion (29,30). In the study of Dijkstra et al. the rate of recurrent NP was evaluated using fluticasone propionate aqueous nasal spray (FPANS) in patient who has been under the FESS for 1 year follow-up. In this study, the postoperative application of FPANS did not reduce the recurrence rate of NP compared with placebo group (31). Another study which applied amphotericin B as antifungal medication for 6 months after the FESS, achieved the similar result with the Dijkstra and did not reveal any beneficial effect through pharmacotherapy (32). Data regarding some articles studied the recurrence of sinonasal polyposis are summarized in Table 1.

According to the study of Klapan et al. in 1995, a follow-up duration of 18 months after surgery resulted in the highest concentrations of leukotriene (LCT4) in group of patients showed recurrent NP after the surgery. In this study which applied radioimmunoassay technique, LCT4 (a lipoxygenase products of AA), was proposed as a prognostic parameter of incidence of the NP recurrence. LTC4 optimizes the sinonasal environment for nasal polyps formation through increasing the vascular dilatation, stromal edema and infiltration (33). According to studies,

Table 1. Summarized information of different studies on recurrent nasal polyposis

Author Year (Reference)	Patients	Medical intervention	Follow-up duration	Recurrence rate of Nasal polyposis (NP)
Dingsør 1985 (27)	Total: 37	Flunisolide 2×25 mcg in each nostril twice daily	1 year after the surgery	Reduction of NP number (0.05) and size (0.03) in treatment group
Gulati 2001 (29)	Treatment gr:38 Placebo gr:25 Age: 18-65	Budesonide nasal spray two puffs of 50 mg twice a day each nostril	9 months after the surgery	Recurrent observed in 25% of treatment gr. and in 80% of placebo group
Dijkstra 2004 (31)	Total: 162 Men: 92 Female:70 Age: 18-78	Fluticasone propionate aqueous nasal spray (FPANS) Group1: 400mg Group2:800mg Group 3: placebo	1 year after FESS	Recurrence rate: Gr1/Gr3:1.22 (95% CI :0.70–2.13) Gr2/Gr3:1.48 (95% CI :0.86–2.66)
Hashemi 2011 (32)	Total: 50 Age: 17-64 years Treatment (gr1):25 Placebo (gr2):25	Amphotericine B (50 mg in 500 still water twice daily)	6 months follow-up after FESS	Gr1:84% of patients improved 14% unchanged Gr2:88% improved 12% unchanged No significant relation was observed between gr1 and gr2
Hoseini 2012 (23)	Total: 100	No medical intervention	2 years after meticulous endoscopic surgery	Recurrence rate: 8% P-value: 0.014

applying antibiotics, local or systemic corticosteroids after the surgery are considered to be influential in controlling and reducing the incidence of recurrent NP and also would increase the efficacy of polyposis surgery (34).

In conclusion, based on the articles studied in this review, the incidence of polyposis recurrence after the surgical intervention is known to be common but several conditions can increase this recurrence. Although the surgical tools have shown considerable success in diminishing the sinonasal polyposis, history of previous Surgeries and the severity of polyposis before the surgery, the presence of diseases such as asthma, aspirin intolerance and etc., are factors which increase the recurrent polyposis rate or the requirement for revision surgery. Severe and accurate postoperative control of any slight recurrency should be intensively evaluated. To reduce the requirement for revision surgery or the incidence of recurrent polyposis, severe medical regimens are suggested pre and postsurgical interventions.

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Conflict of Interest

The authors declare no conflict of interest.

References

1. Bachert C, van Zele T, Gevaert P, et al. Superantigens and nasal polyps. Curr Allergy Asthma Rep. 2003;3:523-531.
2. Ohno I, Nitta Y, Yamauchi K, et al. Transforming growth factor beta 1 (TGF beta 1) gene expression by eosinophils in asthmatic airway inflammation. Am J Respir Cell Mol Biol. 1996;15:404-409.
3. Bachert C, Wagenmann M, Hauser U, et al. IL-5 synthesis is upregulated in human nasal polyp tissue. J Allergy Clin Immunol. 1997;99:837-842.
4. Gliklich RE, Metson R. Effect of sinus surgery on quality of life. Otolaryngol Head Neck Surg. 1997;117:12-17.
5. Larsen K, Tos M. The estimated incidence of symptomatic nasal polyps. Acta oto-laryngologica. 2002;122:179-182.
6. Dai LB, Zhou SH, Ruan LX, et al. Correlation of computed tomography with pathological features in angiomatous nasal polyps. PloS one. 2012;7:e53306.
7. Tao Z, Kong Y, Xiao B, et al. Effects of corticosteroid on eosinophils and expression of transforming growth factor beta 1 in nasal polyps. Lin chuang er bi yan hou ke za zhi. 2003;17:474-475.
8. Benson M. Pathophysiological effects of glucocorticoids on nasal polyps: an update. Curr Opin Allergy Clin Immunol. 2005;5:31-35.
9. Batra PS, Kern RC, Tripathi A, et al. Outcome analysis of endoscopic sinus surgery in patients with nasal polyps and asthma. Laryngoscope. 2003;113:1703-1706.
10. Johansson L, Akerlund A, Holmberg K, et al. Prevalence of nasal polyps in adults: the Skovde population-based study. Ann Otol Rhinol Laryngol.2003;112:625-629.
11. Settipane GA. Epidemiology of nasal polyps. Allergy Asthma Proc. 1996;17:231-236.
12. Hadfield PJ, Rowe-Jones JM, Mackay IS. The prevalence of nasal polyps in adults with cystic fibrosis. Clin Otolaryngol Allied Sci. 2000;25:19-22.
13. Huvenne W, van Bruaene N, Zhang N, et al. Chronic rhinosinusitis with and without nasal polyps: what is the difference? Curr Allergy Asthma Rep. 2009;9(3):213-220.
14. Arkin A, Arzguli K, Abdurusuli, et al. Bacteriology of ethmoidal sinus in chronic rhinosinusitis with and without nasal polyps. Lin chuang er bi yan hou tou jing wai ke za zhi. 2011;25:482-485.
15. Aydil U, Kalkanci A, Ceylan A, et al. Investigation of fungi in massive nasal polyps: microscopy, culture, polymerase-chain reaction, and serology. Am J Rhinol. 2007;21:417-422.
16. Kim TH, Lee Sh, Lee HM, et al. D2-40 immunohistochemical assessment of lymphangiogenesis in normal and edematous sinus mucosa and nasal polyp. Laryngoscope. 2007;117:442-446.
17. Allen JS, Eisma R, Leonard G, et al. Interleukin-3 interleukin-5, and granulocyte-macrophage colony-stimulating factor expression in nasal polyps. Am J Otolaryngol. 1997;18:239-246.
18. Ohori J, Ushikai M, Sun D, et al. TNF-alpha upregulates VCAM-1 and NF-kappaB in fibroblasts from nasal polyps. Auris Nasus Larynx. 2007;34:177-183.
19. Parnes SM. The role of leukotriene inhibitors in patients with paranasal sinus disease. Curr Opin Otolaryngol Head Neck Surg. 2003;11:184-191.
20. Meloni F, Stomeo F, Teatini GP, et al. Postoperative recurrence of naso-sinus polyposis. Acta Otorhinolaryngol Ital. 1990;10:173-179.
21. Wynn R, Har-El G. Recurrence rates after endoscopic sinus surgery for massive sinus polyposis. Laryngoscope. 2004;114:811-813.
22. Eloy JA, Walker T, Casiano RR, et al. Effect of coblation polypectomy on estimated blood loss in endoscopic sinus surgery. Am J Rhinol Allergy. 2009;23:535-539.
23. Hoseini SM, Saedi B, Aghazadeh K. Meticulous endoscopic sinus surgery to prevent recurrence of massive nasal polyposis. Journal Laryngol Otol. 2012;126:789-794.
24. Cornet ME, Georgalas C, Reinartz SM, et al. Long-term results of functional endoscopic sinus surgery in children with chronic rhinosinusitis with nasal polyps. Rhinology. 2013;51:328-334.
25. Caplin I, Haynes JT, Spahn J. Are nasal polyps an allergic phenomenon? Ann Allergy. 1971;29:631-634.
26. Virolainen E, Puhakka H. The effect of intranasal beclomethasone dipropionate on the recurrence of nasal polyps after ethmoidectomy. Rhinology. 1980;18:9-18.
27. Dingsor G, Kramer J, Kramer J, et al. Flunisolide nasal spray 0.025% in the prophylactic treatment of nasal polyposis after polypectomy. A randomized, double blind, parallel, placebo controlled study. Rhinology. 1985;23:49-58.
28. Drettner B, Ebbesen A, Nilsson M. Prophylactive treatment with flunisolide after polypectomy. Rhinology. 1982;20:149-158.
29. Gulati SK, Sharma K, Kaur Shergill G, et al. Prophylactic budesonide nasal spray after polypectomy. Indian J Otolaryngol Head Neck Surg. 2001;53:207-209.
30. Hartwig S, Linden M, Laurent C, et al. Budesonide nasal spray as prophylactic treatment after

polypectomy (a double blind clinical trial). J Laryngol Otol. 1988;102:148-151.
31. Dijkstra MD, Ebbens FA, Poublon R, et al. Fluticasone propionate aqueous nasal spray does not influence the recurrence rate of chronic rhinosinusitis and nasal polyps 1 year after functional endoscopic sinus surgery. Clin Exp Allergy. 2004;34:1395-1400.
32. Hashemi SM, Mokhtarinejad F, Karim M, et al. Does amphotericin B nasal douching help prevent polyp recurrence following functional endoscopic sinus surgery? J Res Med Sci. 2011;16:74-88.
33. Jung Tt, Juhn SK, Hwang D, et al. Prostaglandins, leukotrienes, and other arachidonic acid metabolites in nasal polyps and nasal mucosa. Laryngoscope. 1987;97:184-189.
34. Wright ED, Agrawal S. Impact of perioperative systemic steroids on surgical outcomes in patients with chronic rhinosinusitis with polyposis: evaluation with the novel Perioperative Sinus Endoscopy (POSE) scoring system. Laryngoscope. 2007;117:1-28.