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Grafting to denuded nasal cavity for prevention of recurrent nasal polyposis by endoscopic sinus surgery

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ABSTRACT

Background: The objective of the study was to avoid nasal polyposis occurrence after recurrent FEES.
Methods: 87 patients undergoing recurrent FESS due to recurrent nasal polyposis, after completing all steps of FESS the placement of normal nasal mucosa from inferior turbinate or nasal septum instead of the mucosa of the fovea ethmoidalis and lamina papyracea was done.
Results: There were nasal obstruction improvement in 79 patients (90.8%), but there were 8 patients (9.2%) had recurrent nasal polypi causing nasal obstruction. There was smell improvement in 38 patients (71.7%) out of 15 patients (28.3%).
Conclusions: The nasal cavity grafting in FESS of recurrent nasal polyposis with nasal septal or inferior turbinate mucosa had promising results in prevention of nasal polyposis recurrence. These results made a recommendation of nasal cavity grafting during primary FESS of nasal polyposis.

Keywords: Grafting, Nasal mucosa, Endoscopy, Nasal polyposis

INTRODUCTION

The incidence of nasal polyposis is about 1-4%, it may be due to local or systemic disease; local disease as in chronic rhinosinusitis (CRS) and allergic fungal rhinosinusitis; systemic disease as in aspirin-exacerbated respiratory disease, Churg-Strauss syndrome, and cystic fibrosis. Nasal polyps may not respond to medical treatment in the form of local intranasal corticosteroids spray that used as maintenance therapy, oral corticosteroids are used in short courses to prevent exacerbation attacks of nasal polyposis. The evidence for short- and long-term antibiotics use has minimal effect on nasal polyposis treatment; functional endoscopic sinus surgery is a therapeutic option for nasal polyposis that not responds to medical management.[1]

The American Rhinologic Society (ARS), and the Sinus and Allergy Health Partnership (SAHP) redefined chronic rhinosinusitis as "a group of disorders characterized by inflammation of the mucosa of the nose and paranasal sinuses about 12 successive weeks", This diagnosis needed 2 major factors or 1 major factor plus 2 minor symptoms or nasal purulence on examination. Facial pain alone was not suggestive of CRS, if other nasal symptoms or signs were absent. The objective confirmation was by means of direct visualization or radiological studies.[2]

Nasal polyposis occurs due to severe eosinophilic inflammation, according to cytokine mediator and cell profiles, chronic sinonasal disease in Caucasians may be differentiated into different subgroups as chronic rhinosinusitis without nasal polyps, chronic rhinosinusitis with nasal polyps, and nasal polyps in cystic fibrosis patients, nasal polyps had a Th2 polarization with high IL-5 concentrations, however CRS without polyps had a Th1 polarization with increased levels of IFN-gamma. In

patients with nasal polyp Staph aureus colonization is found which increased in asthmatic patients and in aspirin sensitivity patients.[3]

There is no accurate study or evidence about the effect of different types of surgery versus medical therapy for chronic rhinosinusitis with nasal polyps. These studies do not suggest that one treatment is more effective than another in form of patient-reported symptom scores and measurements of the quality of life. The only positive finding from these several studies is that examining different comparisons must be treated with accurate caution, especially when there is no sure the clinical significance. Further research should be done to study this problem, which has a significant effect on the quality of life and healthcare service usage, is modified.[4]

Aim of the study

To cover denuded bones with normal nasal mucosa from inferior turbinate or nasal septum instead of the mucosa of the fovea ethmoidalis and lamina papyracea was done after nasal endoscopy to prevent recurrence of nasal polyps especially its origin at the skull base and the lamina papyracea.

METHODS

Patients

This study was conducted at Benha University hospital; Faculty of Medicine, ENT department between the periods from July 2014 to July 2016, institutional ethical committee approval and written informed consent were taken from all patients before the onset of the study. This study was conducted on 95 patients who had recurrent nasal polyposis after FESS and would undergo another FESS, 8 patients were excluded from this study as they were lost during follow up. The total number of this study was 87 patients. They were 51 males, (58.6%) and 36 (41.4%) females included in this study, aged from 28 to 54 years old. With the mean age of males was 39.7 years, the mean age of females was 36.3 years. The Surgeons who did these operations had nearly equal competence.

Selection criteria

These patients should have bilateral nasal polyposis. There no tumors or other pathology were detected in the previous biopsies that taken from polyps. There were no related diseases as bronchial asthma or aspirin intolerance. There were no systemic diseases as hypertension, diabetes, immunological diseases. There were no patients receiving any type of medical treatment, there were no addict patients.

Nasal obstruction in this study was graded into three categories, mild with intermittent symptoms without affection of nasal obstruction, moderate with intermittent symptoms while most the time is obstructed, severe were they nearly obstructed all the time.

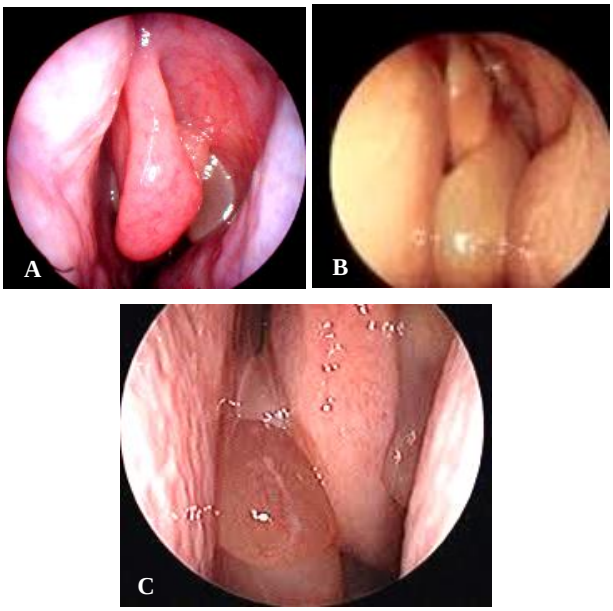

Figure 1: Grading of nasal polyps. (A): Grade 1 nasal polyps; (B): Grade 2 nasal polyps; (C): Grade 3 nasal polyps.

Patients underwent questionnaire assessment of olfaction. Olfaction was an important physiological function of the nose and important for study success. By nasal endoscopy, nasal polyposis were staged in 3 categories according to Malm scale: grade 1, polyps limited to middle meatus; grade 2, polyps extending below middle turbinate and grade 3, polyps were massive and closed all the nasal cavity. CT scan was done to evaluate extent of the disease and the surgical anatomy.

Functional endoscopic sinus surgery with optimal anterior to posterior approach was done under GA. The operation steps were depending on extent of the disease. Nasal mucosa grafts were taken from the inferior turbinates, nasal septum and the floor of nasal cavity (Figure 2 and 3).

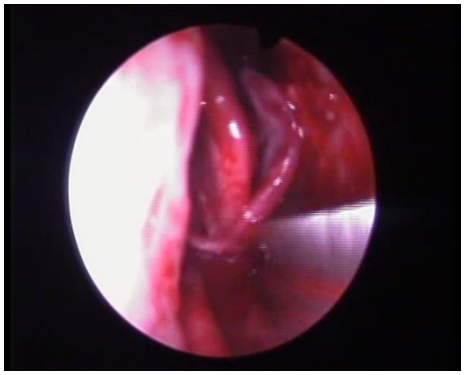

Figure 2: Nasal mucosa grafts taken.

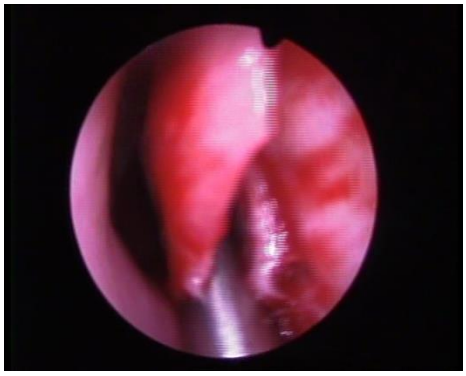

Figure 3: Nasal mucosa grafts taken from nasal septum from the inferior turbinate.

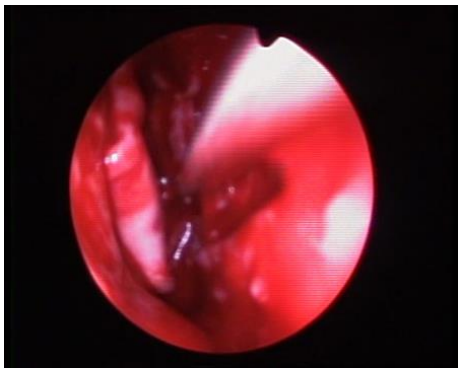

Figure 4: Mucosa grafts placed over lamina paparycea.

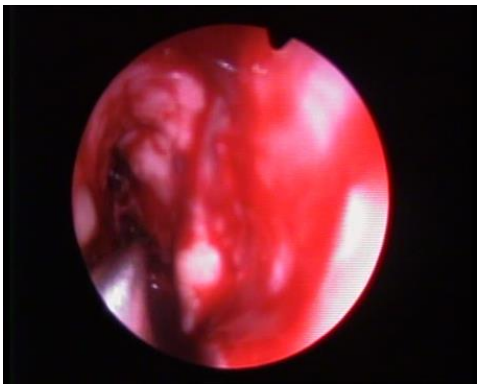

Figure 5: Mucosa grafts covering lamina paparycea and fovea ethmoidalis.

The denuded bones that presented in the nasal cavity after complete removal of nasal polyposis in FESS were covered by nasal mucosa from inferior turbinates (posterior inferior end), nasal septum and nasal floor). One graft usually did not cover the whole cavity, so several grafts would be taken as one graft may be not enough to cover the all nasal cavity and placed it in mosaic manner to cover the cavity. Starting with the ethmoid area then the roof and the lamina paparycea, So the all nasal cavity was covered (Figure 4 and 5), The complete covering of the all nasal cavity could be happened when the mucosa of the septum was adherent and safe dissection could not be happened without complications. So small space between the grafts was applied trying to nearly cover the all nasal cavity then the grafts would be covered by sergicell, then packing the nose by merocel that would be removed 48 hours after the operation, postoperative medical treatment would be in form of (antibiotics, corticosteroids and nasal douches). Patients would be followed up every week for 2 months by sinuscopic examination then every month for 2 years according to this study protocol.

RESULTS

A total 87 patients who had recurrent nasal polyposis after FESS and would undergo another FESS, at the period from July 2014 to July 2016; 51 males, (58.6%) and 36 (41.4%) females were included in this study, aged from 28 to 54 years old With the mean age of males was 39.7 years, the mean age of females was 36.3 years.

Table 1, there were 13 patients in category I that complaining of mild nasal obstruction before undergoing revision FESS,9 patients improved after FESS (69.2%) while 4 patients did not improve after FESS (30.8%), there were 22 patients in category II that complaining of moderate nasal obstruction before undergoing revision FESS, 20 patients improved after FESS (90.9%) while 2 patients did not improve after FESS (9.1%), there were 52 patients in category III that complaining of severe nasal obstruction before undergoing revesion FESS, 50 patients improved after FESS (96.2%) while 2 patients did not improve after FESS (3.8%),this study showed that the recurrence rate of nasal polyposis that caused nasal obstruction in absence of other causes like infection or adhesion was (9.2%) but the improvement was in (90.8%) with P value 0.001 that was highly significant.

As given in Table 2, there were 9 patients in Grade I nasal polyposis before undergoing revision FESS,6 patients improved after FESS (66.7%)while 3 patients did not improve after FESS (33.3%), there were 25 patients in grade II nasal polyposis before undergoing revision FESS, 22 patients improved after FESS (88%)while 3 patients did not improve after FESS (12%), there were 53 patients in Grade III nasal polyposis before undergoing revision FESS, 51 patients improved after FESS (96.2%)while 2 patients did not improve after FESS (3.8%), so this study showed that after revision FESS and grafting, there were 79 patients that would be improved (90.8%) and had no recurrent nasal polyps while there were 8 patients that would not improve (9.2%) and had recurrent nasal polyps,, with P value 0.001 that was highly significant.

Smell with its relation to taste sensation was a very important indicator of improvement after FESS. The polyps' grade to anosmia was estimated. The change of smell was estimate only subjectively by questionnaire but it was important indicator that grafting did not interfere with smell.

Table 1: Distribution of the patients' pre and postoperatively according to nasal obstruction.

All patients	Pre (total cases)	Post (not improved)		Improvement		Z test	P value
		No	%	No	%		
Category I mild nasal obstruction	13	4	30.8	9	69.2	1.5	0.067
Category II moderate nasal obstruction	22	2	9.1	20	90.9	6.68	0.001**
Group III severe nasal obstruction	52	2	3.8	50	96.2	17.31	0.001**
Total	87	8	9.2	79	90.8	13.17	0.001**

Table 2: Distribution of patients according to extension of polyps' pre and post-operative by endoscopic examination by nasal endoscopic examination.

Nasal polyps	Pre (total cases)	Post (not improved)		Improvement		Z test	P value
		No	%	No	%		
Grade I	9	3	33.3	6	66.7	1.06	0.144
Grade II	25	3	12	22	88	5.85	0.001**
Grade III	53	2	3.8	51	96.2	17.66	0.001**
Total	87	8	9.2	79	90.8	13.17	0.001**

Table 3: Distribution of the patients' pre and postoperatively according to smell.

Impaired sense of smell	Pre (total cases)	Post (not improved)		Improvement		Z test	P value
		No	%	No	%		
Grade I	3	2	66.7	1	33.3	0.612	0.27
Grade II	9	5	55.6	4	44.4	0.335	0.37
Grade III	41	8	19.5	33	80.5	4.93	0.001**
Total	53	15	28.3	38	71.7	3.51	0.001**

Figure 6: Endoscopic view showing the mucosal graft one month after the surgery.

Table 3, there were 3 patients in Grade I nasal polyposis with impaired smell before undergoing revision FESS, one patient improved after FESS (33.3%) while 2 patients did not improve after FESS (66.7%), there were 9 patients in Grade II nasal polyposis with impaired smell before undergoing revision FESS, 4 patients improved after FESS (44.4%) while 5 patients did not improve after FESS (55.6%), there were 41 patients in Grade III nasal polyposis with impaired smell before undergoing revision FESS, 33 patients improved after FESS (80.5%) while 8 patients did not improve after FESS (19.5%), there were 34 patients not complaining of change sense of smell due to their nasal polyps, So this study showed that after revision FESS and grafting, there were 53 patients (60.9%) were suffering from impaired smell, 38 patients improved after FESS (71.7%) while 15 patients did not improve after FESS (28.3%), with P value 0.001 that was highly significant.

Table 4: Distribution of the patients according to post-operative complication.

Type of complications	Number of patients	Percentage (%)
Intra operative bleeding	2	2.2
Postoperative bleeding	2	2.2
Postoperative infection	4	4.4
Rejection of the graft	3	3.4
Synechiae	7	8.04
Septal perforations	5	5.7
Lamina papyracea Perforation	2	2.2

As shown in Table 4 there were no major postoperative complication in this study, there were 2 patients with Intra operative bleeding (2.2%), there were 4 patients with postoperative bleeding (2.2%), there were 4 patients with postoperative infection(4.4%), there were 3 patients with graft rejection (3.4%), there were 7 patients with

synechiae (8.04%), there were 5 patients with septal perfotion (5.7%), there were 2 patients with lamina papyracea perfotion (2.2%).

DISCUSSION

Nasal polyposis is a disease that shows inflammatory paranasal sinus mucosa outgrowth caused by chronic mucosal inflammation arises from sites of the middle meatus and ethmoid region. Patients with nasal polyposis usually complain of nasal congestion, nasal obstruction, and anosmia or hyposmia. It appears as semi-translucent, pale gray nasal growths but nearby mucosa looks erythematous or pink. It common appears in patients with severe asthma, CRS, aspirin-exacerbated respiratory disease (AERD), cystic fibrosis, Churg-Strauss syndrome and ciliary dyskinesia syndromes. Nasal polyposis shows raised eosinophils, mast cells, and IgE. Staphylococcal super-antigens can play an important role in the Th2 type of chronic eosinophilic inflammation that seen observed in nasal polyposis. Epithelial barrier malfunction decreased levels of antimicrobial, local steroid spray is effective in reducing the size of polyp, rhinorrhea, nasal congestion, and the quality of nasal airflow. Oral steroid course followed by maintenance dose with local steroid in severe cases. FESS is indicated in severe cases that not respond to medical treatment. Aspirin desensitization can reduce the need to FESS in patients with AERD.[5]

In this study, there were 13 patients in category I that complaining of mild nasal obstruction before undergoing revision FESS,9 patients improved after FESS (69.2%) while 4 patients did not improve after FESS (30.8%), there were 22 patients in category II that complaining of moderate nasal obstruction before undergoing revision FESS, 20 patients improved after FESS (90.9%)while 2 patients did not improve after FESS (9.1%), there were 52 patients in category III that complaining of severe nasal obstruction before undergoing revision FESS, 50 patients improved after FESS (96.2%) while 2 patients did not improve after FESS (3.8%), this study showed that the recurrence rate of nasal polyposis that caused nasal obstruction in absence of other causes like infection or adhesion was 9.2% but the improvement was in 90.8%.

Brescia et al stated that even after accurate FESS, there were a highly significant number of patients with nasal polyposis had recurrent polyps. The aim of this study was to apply statistical models to detect clinical, laboratory and pathological variables that might predict the recurrence of nasal polyposis after FESS. The study patients were 143 that underwent FESS by the same surgeon in the period of 2010 to 2013, 21 patients had recurrent nasal polyps. With the incidence of recurrence in the eosinophilic type was more than non-eosinophilic type (p=0.020). The disease-free interval was statistically significant shorter in patients of eosinophilic-type (p=0.003) among the patients who developed a recurrence. Univariate statistical models showed significant relation between the recurrence of nasal polyposis and age (p=0.035), allergy (p=0.014), and eosinophilic granulomatosis with polyangiitis (p=0.01). The multivariate model presented that there was histological evidence between the eosinophilic type and the recurrence of nasal polyposis (p=0.033).[6]

Olszewski et al stated that in their study they did 278 polipectomies, 6 months after FESS, by endoscopic examination there were patent paranasal sinuses ostiums, there were no inflammatory traits as swelling, redness of the nasal mucosa or any pathological secretion. There was adequate nasal patency in 93.7%, patients sensed of the blood flowing down to the mouth in 20.4%, mucorrhoea in 2.8%, impaired smell in 17.6% and headache in 2.8%.[7]

In this study, there were 9 patients in Grade I nasal polyposis before undergoing revision FESS,6 patients improved after FESS (66.7%)while 3 patients did not improve after FESS (33.3%), there were 25 patients in grade II nasal polyposis before undergoing revision FESS,22 patients improved after FESS (88%) while 3 patients did not improve after FESS (12%), there were 53 patients in grade III nasal polyposis before undergoing revision FESS, 51 patients improved after FESS (96.2%) while 2 patients did not improve after FESS (3.8%), so this study showed that after revision FESS and grafting, there were 79 patients that would be improved (90.8%) and had no recurrent nasal polyps while there were 8 patients that would not improve (9.2%) and had recurrent nasal polyps.

Wynn and Har carried out a study on 118 patients. (50%) of them were asthmatic, (79%) of them were allergic. After FESS, 71 patients (60%) had recurrent nasal polyposis. 55 patients (47%) needed revision FESS, but only 32 patients (27%) underwent revision FESS, The history of asthma or previous FESS might predict more risk of recurrence (P<0.005, P<0.001) and revision FESS rates (P=0.02, P<0.001). Also the allergy history could predict recurrence and the need of revision FESS (P<0.001, P<0.001).[8]

Hilka et al in their study on 164 patients suffering from chronic sinusitis and needing FESS, 94 patients would be submitted to a detailed statistical analysis one year after FESS. Patients would be divided into 2 groups (polypoid or hyperplastic) sinusitis groups according to histological and morphological appearances of tissues, The polypoid group presented a more recurrent rate (47%) than in hyperplastic sinusitis group (8.6%). Bronchial asthma and allergy did not affect had the recurrence rate in hyperplastic sinusitis group but affected it in polypoid group, that increased when patients were atopic.[9]

Nasal dermoplasty were done in 5 patients with recurrent nasal polyposis. There were 3 patients showed good graft uptake while failed in 2 patients. Symptoms and complain of 4 patients improved postoperation but

disimproved in one patient. Polyps were recurrent but not in the grafted areas. This technique would be promising in prevention of recurrent nasal polyposis while it needed more time and researches to proven its efficacy.[10]

The idea of skin replacement instead of the diseased mcosa would not be a new idea, it would be safe and effective technique, it would give birth to the dermoplasty technique for recurrent nasal polyposis.[10]

In this study the placement of normal nasal mucosa from inferior turbinate or nasal septum instead of the mucosa of the fovea ethmoidalis and lamina papyracea would be a new idea.

The dermoplasty would have 2 disadvantages,the first would be longer time needed(about one hour)than the usual sinuscope,the second would be a delay in the previous activities of the patients due to the leg wound.[10]

Anastasopoulos et al stated that in a female case had Churg-Strauss syndrome with recurrant nasal polyposis. Patient would be undergone modified nasal dermoplasty (NDRP) that was an excellent in management of recurrent nasal polyposis, even with established tendency to nasal polyposis formation. Some sort of modifications of in the original report about the size of needed graft, and the management after the surgery. The main complication was foul odour due to graft keratin debris infection, so NDRP was the only technique that might prevent the recurrence of nasal polyposis.[11]

Sohail et al studied the smell sensation, 18 (36%) patients would be in mild category, 6 (12%) would be in moderate category and 2 (4%) would be in severe category. 22 patients (44%) would have improvement in the smell sensation after 6 months and were placed in mild category, while 3 patients (6%) would be placed in moderate category and one patient (2%) would be in severe category.[12]

In this study, there were 3 patients in Grade I nasal polyposis with impaired smell before undergoing revision FESS, one patient improved after FESS (33.3%) while 2 patients did not improve after FESS (66.7%), there were 9 patients in grade II nasal polyposis with impaired smell before undergoing revision FESS, 4 patients improved after FESS (44.4%) while 5 patients did not improve after FESS (55.6%), there were 41 patients in grade III nasal polyposis with impaired smell before undergoing revision FESS, 33 patients improved after FESS (80.5%) while 8 patients did not improve after FESS (19.5%), there were 34 patients not complaining of change sense of smell due to their nasal polyps, So this study showed that after revision FESS and grafting, there were 53 patients (60.9%) were suffering from impaired smell, 38 patients improved after FESS (71.7%) while 15 patients did not improve after FESS (28.3%).

Rózańska et al presented that there was an improvement in the mean nasal resistance at the first month after FESS that still improved until 6 months after FESS. Significant smell improvement would be detected from the period between the third to the sixth month after FESS, Smell sensation was difficult to improve at the early period (the first month after FESS).[13]

Suzuki et al stated that the incidence of the complication was 0.50%; With CSF leakage was 0.09%, orbital injury was 0.09%, hemorrhage requiring surgery was 0.1%, blood transfusion was 0.18%, and toxic shock syndrome (TSS) was 0.02%. The incidence of the complication rate was more in patients that had (1.40%) with ethmoidectomy with sphenoidotomy (1.40%). Extent of FESS did not present a significant relation with any complication rate.[14]

In this study, there were no major postoperative complication in this study, there were 2 patients with Intra operative bleeding (2.2%), there were 4 patients with postoperative bleeding (2.2%), there were 4 patients with postoperative infection (4.4%), there were 3 patients with graft rejection (3.4%), there were 7 patients with synechiae (8.04%), there were 5 patients with septal perforation (5.7%), there were 2 patients with lamina papyracea perforation (2.2%). There were intraoperative unilateral arterial hemorrhage from sphenopalatine branches and anterior ethmoid artery that seen in 2 (2.2%) cases and all were successfully managed by local adrenaline nasal packs and coagulation using bipolar forceps.

There was no intra orbital bleeding or hematoma affect vision disturbances appeared in at the post-operative follow up period. There was no CSF fluid leak presented in this study cases. There were 2 (2.2%) patients with damaged lamina papyracea. Exposure of orbital fat would be done during operation for these patients; however no major orbital complication occurred.

There were 7 (8.04%) patients had postoperative synechia between turbinate and septum. All cases were managed by excision of synechia. There were 4 (4.4%) patients with postoperative infection, and there were 3 (3.4%) patients with rejection of the grafts. There were 5 (5.7%) patients with septal perforation was showed in 5 (5.7%) because the septal maneuver that was done made in the previous surgeries made taking the grafts from the septal area very difficult.

Krings et al showed that in study on 78,944 patients that had primary FESS, there were288 major complications could be detected (0.36%) (95% CI 0.32%-0.40%). The incidence of major complication after rate revision FESS (n=19; 0.46%) and primary cases (n=288; 0.36%) was similar (OR=1.26; 95% CI 0.79-2.00), the incidence of major complications (0.36%) that occurred in primary sinuscope was lower than earlier reports. The incidence of major complications (0.36%) that occurred after

revision sinuscope (0.46%) would be found to be look like that of primary cases.[15]

CONCLUSION

The grafting of the nasal cavity in revision FESS of recurrent nasal polyposis with nasal mucosa had promising results that gave recommendation of its usage in primary FESS.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Settipane RA, Peters AT, Chiu AG. Nasal polyps. Am J Rhino Allergy. 2013;27(1):20-5.
2. Benninger MS, Ferguson BJ, Hadley JA, Hamilos DL, Jacobs M, Kennedy DW, et al. Adult chronic rhinosinusitis: definitions, diagnosis, epidemiology, and pathophysiology. Otolaryngol Head Neck Surg. 2003;129(3):1–32.
3. Vancauwenberge P, Van Zele T, Bachert C. Chronic rhinosinusitis and nasal polyposis: the etiopathogenesis revealed? Verh K AcadGeneeskd Belg. 2008;70(5-6):305-22.
4. Rimmer J, Fokkens W, Chong LY, Hopkins C, Rimmer J, Fokkens W, et al. Surgical versus medical interventions for chronic rhinosinusitis with nasal polyps. Surgical Cochrane Database Syst Rev. 2014;12:CD006991.
5. Georgy MS, Peters AT. Chapter 8: Rhinosinusitis. Allergy Asthma Proc. 2012;33(1):24-7.
6. Brescia G, Marioni G, Franchella S, Ramacciotti G, Giacomelli L, Marino F, et al. A prospective investigation of predictive parameters for post-surgical recurrences in sinonasal polyposis. Eur Arch Otorhinolaryngol. 2016;273(3):655-60.
7. Olszewski J, Miłoński. Evaluation results of treatment polyps of nose and paranasal sinuses by endoscopic method. J Otolaryngol Pol. 2008;62(4):400-2.
8. Wynn R, Har-El G. Recurrence rates after endoscopic sinus surgery for massive sinus polyposis. Laryngoscope. 2004;114(5):811-3.
9. Hilka MB, Koch T, Laszig R. Late results of endonasal ethmoid bone operation with special reference to polypus sinusitis. HNO. 1992;40(5):165-9.
10. Anastasopoulos G, Grigoriadis G, Papoutsi S. Modified nasal dermoplasty technique for treatment of recurrent polyposis: preliminary results. J Laryngol Otol. 2013;127(6):595-8.
11. Anastasopoulos G, Machas T, Kegioglou S, Rapti D. Nasal dermoplasty for recurrent polyps in a patient with churg-strauss syndrome. Case Rep Otolaryngol. 2015;2015:192804.
12. Aslam S, Ali M, Ahmed A, Asghar A, Manzar MA. Efficacy Of Functional Endoscopic Sinus Surgery In Recurrent Nasal Polyposis. Pak Armed Forces Med J. 2014;64(1):66-70.
13. Rózańska-Kudelska M, Sieśkiewicz A, Rogowski M, Godlewska-Zoładkowska K. Assessment of olfactory disturbances in the patients with rhinosinusitis and polypi treated by endoscopic sinus surgery. Pol Merkur Lekarski. 2010;28(166):273-6.
14. Suzuki S, Yasunaga H, Matsui H, Fushimi K, Kondo K, Yamasoba T. Complication rates after functional endoscopic sinus surgery: analysis of 50,734 Japanese patients. Laryngoscope. 2015;125(8):1785-91.
15. Krings JG, Kallogjeri D, Wineland A, Nepple KG, Piccirillo JF, Getz AE. Complications of primary and revision functional endoscopic sinus surgery for chronic rhinosinusitis. Laryngoscope. 2014;124(4):838-45.

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