



Effect of posterior nasal neurectomy on recurrence rate in allergic rhinosinusitis with nasal polyposis

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Abstract:

Introduction: Chronic rhinosinusitis (CRS) is a chronic inflammatory state described by nasal and paranasal sinuses mucosal inflammation. Nasal polyps are defined as inflammatory outgrowths that typically arise from ethmoid sinuses and have the tendency to recur after surgery .

Objective: To search for the role of posterior nasal neurectomy (PNN) in management of recurrent cases and improvement of allergic symptoms.

Patients and methods: Fifty candidates were included in our study who had Functional Endoscopic Sinus Surgery (FESS) alone on the right side and FESS combined with posterior nasal neurectomy on the left side.

Results: No discrepancy regarding recurrence of nasal polyps after our procedure was found (P value=0.09), while allergic symptoms like nasal rhinorrhea and sneezing have markedly improved (p value< 0.001).

Conclusion: PNN is a minimally invasive technique which can be done to treat sneezing and rhinorrhea.

Keywords: Chronic rhinosinusitis with nasal polyposis, Posterior nasal neurectomy

Introduction

Regarding to The european position paper on rhinosinusitis and nasal polyps (EPOS), CRS is diagnosed clinically supported by the radiological finding with nasal endoscopic examination or relying on the symptoms without radiology or nasal endoscopic examination.¹

Allergic rhinitis (AR), an immunoglobulin (Ig) E-mediated disease, is a universal medical issue that can lead to major disabilities.²

About 50% of individuals worldwide with allergic rhinosinusitis have a clinically or radiological diagnosis of CRS. Increasing level of total IgE is considered a high risk factor for the presence of severe CRS and increasing sensitivity to a lot of allergens.³

Nasal polyps are inflammatory pedunculated masses caused by chronic mucosal inflammations that mostly come out from the middle meatus and ethmoid region.⁴

Histopathologically, nasal polyps are mucosal edema that is described by thickening of the basement membrane, epithelial layer proliferation, hyperplasia of the glands, edema, fibrosis, and stromal layer cellular infiltration.⁵

Therapy should be directed to enhance ventilation and sinus drainage, moreover prevent the recurrence.⁶ FESS is a minimally invasive surgical manoeuvre which aim to make the ostia under vision.⁵

PNN is especially effective for patients with severe rhinorrhea as the interruption of parasympathetic nerve fibers can markedly suppress the nasal secretion.⁵ The efficiency of this procedure is associated with decrease in secretions of the mucous glands and thickening of the basement membrane.⁷

The aim of this study was to search for the role of PNN in management of recurrence and improvement of allergic symptoms in patients with nasal polyps.

Patients and methods:

The study protocol was reviewed and approved by the medical ethics committee of Assiut College of medicine. (IRP NO.17101077)

Our study is quasi experimental study including fifty patients who had allergic CRS with nasal polyposis, who underwent FESS alone on the right side and FESS plus PNN on the left side.

Inclusion criteria of our study were the patients who were diagnosed as allergic CRS with nasal polyps older than 18 years of both genders, but we exclude pregnant patients, patients who have malignant neoplasm of PNS, craniofacial anomalies, aspirin sensitivity or having contraindication to anaesthesia.

To establish parameters of allergic CRS with nasal polyps, we went through medical history, clinical examination using 0 nasal endoscope

KARL STORZ Germany, laboratory tests as total serum IgE and IgE specific inhalants allergens by using allergy screen kits A 0070 Panel 2A EGY (Respiratory allergens) 12 test membranes with 17 allergens, immunoblot for analyzing specific IgE in human serum, and multislice CT imaging according to modified Land Mackey score as it's classifies the inflammatory condition of each sinus into four levels using intervals of 33% and using a 4-point system to determine the inflammation level as for the sinuses level 1 =1-33%inflammation, level 2=34-66% inflammation, level 3 =67-99% inflammation and level 4 =100% inflammation.⁸

Sinonasal outcome score-22 (SNOT-22) was introduced in our study, as it is a questionnaire to assess life quality of patients. It is used to evaluate the surgical treatment of patients with CRS to fulfill data before intervention and to follow up patients postoperatively.⁹

All surgeries were done under general inhalational hypotensive anaesthesia delivered through endotracheal intubation in the supine position with the head slightly elevated.

Operative data: All patients were submitted to FESS bilaterally and posterior nasal neurectomy on the left side only.

As for PNN, we used adrenaline 1/200000 to ensure coagulation around the posterior end of the middle turbinate. The mucosa was removed from the bone surface along the long axis of the middle turbinate anteriorly; the mucosal layer was dissected to the middle turbinate end to show the sphenopalatine foramen. After exposing the neurovascular bundle, its coagulation is recommended. All candidates were advised to use intranasal steroid spray for 3 months after our intervention.

Statistical analysis:

Data was collected and analyzed by using SPSS (Statistical Package for the Social Science, version 20, IBM, and Armonk, New York). Quantitative data were expressed as mean \pm standard deviation (SD) while nominal data are given as number (n) and percentage (%).

Chi2 test was implemented on nominal data. Level of confidence was kept at 95% and hence, P value was considered significant if < 0.05 .

Results

Demographic data of our research included fifty patients, ranging between 18 and 68 years with mean age 36.87 ± 12.03 years. Twenty-eight patients (56%) were males while twenty-two patients (44%) were females. Nine patients (18%) have bronchial asthma while three patients (6%) were diabetics. Two patients (4%) had liver disease, one patient (2%) was hypertensive and other patient (2%) had rheumatic heart disease.

All patients had nasal obstruction and discharge. Bilateral, unilateral and alternative obstruction was reported in twenty-seven patients (54%), eleven patients (22%), and twelve patients (24%) respectively.

Regarding to the allergic symptoms, it was found that sneezing was found in twenty-seven patients (54%), lacrimation was found in twenty-six patients (52%), and sniffing in twenty-five patients (50%) and itching was present in nine patients (18%). Also, fifteen patients (30%) had anosmia and 9 patients (18%) had chest symptoms.

Regarding to the radiological findings, Modified lund mackay of the right side was 8.44 ± 4.06 , the left side 9.28 ± 3.33 and the total score was 16.90 ± 6.58 .

The mean level of immunoglobulin E was 659.05 ± 482.21 (IU/mL) with a

range of 20.65-2500 (IU/mL). Frequencies of different Immunoinhalants immunoglobulin E are summarized in Fig 2.

All patients were negative for feather mix. The most frequent positive findings were among asperigillus niger (56%) and candida albicans (56%) followed by mixed grasses (52%), asperigillus fumigatus (52%), sunflower seed (52%) and latex (52%).

During the follow up, there were significant improvement in nasal and allergic symptoms among studied patients at the left side except anosmia in comparison the right side as shown at table 1 ($p < 0.05$).

No recurrence of polyposis was detected in any nostrils after two weeks and after three months. Both sides had insignificant difference as regard frequency of recurrent polyp after six months twenty-three patients (46%) Vs. fifteen patients (30%); $p = 0.07$) and after twelve months fifteen patients (30%) vs. thirteen patients (26%); $p = 0.09$) as shown in Fig 3.

During follow up, there were significant improvements in nasal symptoms SNOT-22 among studied patients as shown at table 2 ($p < 0.05$).



Fig 1: Male patient from our study group (37y) underwent posterior nasal neurectomy at left side. (Cauterized posterior inferior nasal nerve on left side).

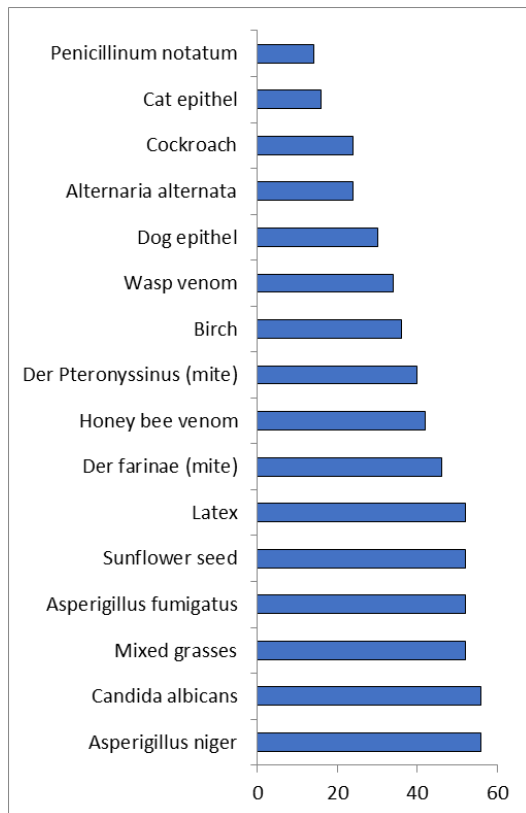


Fig.2 Immunoinhalants immunoglobulin E among studied patients

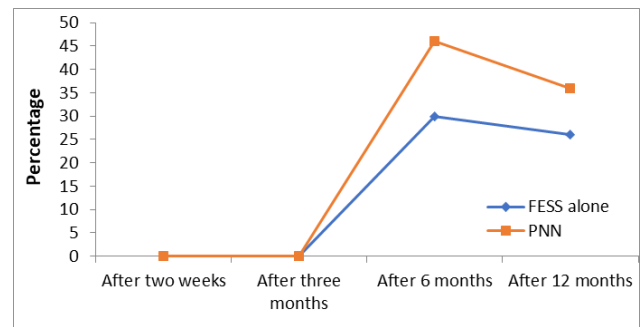


Figure 3: Frequency of recurrent polyps in different nostrils based on procedure

Table 1: Comparison between baseline and follow up allergic nasal symptoms after FESS on RT side and FESS+PNN on left side:

	Baseline	Follow up				P value
		At 2 nd week	At 3 rd month	At 6 th month	after 12 month	
Right nasal obstruction	50 (100%)	44 (88%)	30 (60%)	17 (34%)	10 (20%)	< 0.001
Left nasal obstruction	50 (100%)	43 (86%)	31 (62%)	15 (30%)	8 (16%)	< 0.001
Right nasal discharge	50 (100%)	47 (94%)	47 (94%)	46 (92%)	45 (90%)	0.87
Left nasal discharge	48 (96%)	40 (80%)	28 (56%)	19 (38%)	12 (24%)	< 0.001
Sneezing	27 (54%)	18 (36%)	15 (30%)	9 (18%)	3 (6%)	< 0.001
Sniff	25 (50%)	17 (34%)	12 (24%)	10 (20%)	4 (8%)	< 0.001
Itching	25 (50%)	20 (40%)	10 (20%)	7 (14%)	2 (4%)	< 0.001
Lacrimation	26 (52%)	15 (30%)	13 (26%)	7 (14%)	2 (4%)	< 0.001
Anosmia	15 (30%)	13 (26%)	7 (14%)	2 (4%)	2 (4%)	0.04
Chest symptoms	9 (18%)	5 (10%)	4 (8%)	1 (2%)	1 (2%)	0.04

Data expressed as frequency (%). P value was significant if < 0.05

Table 2: Baseline and follow up nasal symptoms score in studied patients

	Baseline	Follow up			P value
		At 3rd month	At 6th month	After one year	
SNOT-22	3.50 ± 0.15	2.15 ± 0.49	1.18 ± 0.14	0.89 ± 0.18	< 0.001

Data expressed as mean (SD). P value was significant if < 0.05. SNOT-22: 22-item Sino-nasal outcomes test

Discussion :

CRSwNP is a type 2 inflammation-mediated disease of the mucosa of the nose and paranasal sinuse. Patients with CRSwNP manifest many symptoms, including congestion of nasal mucosa, anosmia, and rhinorrhea, which may badly affect the quality of life. After using medical and surgical treatment, including local and systemic corticosteroids and endoscopic sinus surgery, recurrence of nasal polyps was found.¹⁰

Nasal polyposis (NP) is not a high risk medical disorder but greatly affect the quality of life.¹¹ The purpose of functional endoscopic sinus surgery is to allow ventilation and mucociliary clearance of the sinuses. This could be achieved by removal of pathology guided by endoscope.¹² Cutting of parasympathetic nerve fibers abolish nasal discharge so PNN is highly convient for severe rhinorrhea.⁵

As a corner stone to diagnose allergic rhinosinusitis all our patients underwent serum IGE and immunoinhalants IgE to detect allergens and to diagnose allergic rhinosinusitis. Normal serum IGE is up to 100 IU/mL.

Mean level of IgE was 659.05 ± 482.21 (IU/mL) with a range 20.65-2500 (IU/mL) which is almost above the upper limit of normal value. This is in agreement with **Mori, S et al.1993**¹³ who found out in their research that the mean value of nonspecific IgE in the serum was 1060.4 ± 1497.2 IU/mL.

Mori, S et al.1993¹³ also depend on specific IgE against *D. pteronyssinus* in the serum as one of the tools to diagnose allergic rhinitis

So, we measure serum immunoinhalnats IGE to detect which allergen is the most prevalent and found out that the most frequent positive immunoinhalants found were *aspergillus niger* (56%) and *candida albicans* (56%)

followed by mixed grasses (52%), *aspergillus fumigatus* (52%), sunflower seed (52%) and latex (52%).

All our patients (50 patients) underwent functional endoscopic sinus surgery and PNN on the left side and experienced the following:

During follow up, there was significant decrease in most of the nasal and allergic symptoms among studied patients as shown in Table 1 ($p < 0.05$).

We found out that after two weeks, (88%) forty-four patients manifest nasal obstruction at the right side but for the left side (86%) forty-three patients complain of nasal obstruction. After three months, (60%) thirty patients had nasal obstruction on the right side, and (62%) thirty-one patients complain of nasal obstruction at the left side. Endoscopic ex revealed postoperative crustations which were cleaned and suctioned.

As regarding to rhinorrhea, after two weeks (94%) reported watery nasal discharge from the right side and (80%) forty patients from the left side. Follow-up study after three months, (56%) twenty-eight patients complained of nose discharge from the left side and (94%) forty-seven patients reported nose discharge from the right side which is shown in (Table 1).

In our follow- up study, our patients reported improving sneezing at six months (9 patients still complaining of sneezing) and at twelve months (three patients only still complaining of sneezing with P value < 0.001 which is significant. We also reported improvement of left-sided rhinorrhea after six months, (38%) of patients only complain of nasal discharge but at the right side (92%) of patients still complain of watery nasal discharge. Also, after 12 months, twelve patients only complain of left sided rhinorrhea with P value < 0.001 . As for the right side (90%) of patients, complain of

right-sided rhinorrhea with P value= 0.87 ,and this is in agreement with the results of **Ahilasamy et al.2019**⁵ who reported that endoscopic PNN is a little procedure; it can reduce sneezing as well as rhinorrhea and provide better results than vidian neurectomy.

And also in agreement with **Wang et al.2020** reported that endoscopic PNN could greatly relieve rhinorrhea and sneezing symptoms associated with AR. There were no side effects found postoperatively. Sneezing and rhinorrhea were highly improved. Neurectomy is done by using electrocoagulation in a place that is near to the sphenopalatine foramen.²

Also, our results regarding rhinorrhea and sneezing after posterior nasal neurectomy showed an agreement with **Ikedo et al.2008**¹⁴ who observed that posterior nasal neurectomy can inhibit the neurogenic pathway induced by the parasympathetic and sensory denervation.

Ogawa et al. 2007found out that there was significant reduction of IL-5 after PNN in allergic patients. The inflammatory cells in the subepithelial mucous layer, which are major sources of cytokine release, were greatly reduced. PNN is effective with significant relief of severe rhinorrhea patients as the interruption of parasympathetic nerve fibers suppresses nasal secretion. The posterior nasal nerve contains afferent sensory fibers supplying the upper two-thirds of the lateral wall of mucosa in the nasal cavity. This procedure can thereby reduce sneezing, making it superior to vidian neurectomy which coincides with our results.¹⁵

Vidian neurectomy had a significant adverse effect including bleeding, disturbance of nasal anatomy, and dryness of the eye.¹⁶

PNN technique is much easier than viadian neurectomy as the

postganglionic parasympathetic nerve fibers can be easily approached at the sphenopalatine foramen. Also, the intraoperative bleeding from the sphenopalatine artery which is a common complication of this technique can be properly controlled with bipolar coagulation.¹⁷

Li, Song et al.2019¹⁸ found out that the significant improvement of sneezing and rhinorrhea between the experimental group and the control group ($p<.05$) with no significant difference regarding other symptoms as nasal obstruction and olfaction, which is also in agreement with our results except that nasal obstruction has been improved significantly as there was patent airway after FESS, as sneezing has been improved. Left rhinorrhea has been improved but right rhinorrhea didn't improve as we made posterior nasal neurectomy on the left side only.

They also found out in their research that there were no significant differences in the SNOT-22 score between the two groups at all stages after surgery ($p>.05$), and symptoms were alleviated in both groups postoperatively compared with preoperatively ($p<.01$) [18], but our results showed that symptoms have been improved during our follow up shown in (Table 2) . As for SNOT-22, there was a significant improvement in follow up, which is in agreement with **Rudmik, Luke et al.2015**¹⁹ who demonstrate that although 80% of their study patients with SNOT-22 scores over 30 improve by an average of 48% .

As regard recurrence of nasal polyp after FESS **Larsen et al.1997**²⁰ reported that recurrence of nasal polyps after FESS is a major problem that occurs and has a high recurrence rate as 75%.

Wynn and Har-El etal.2004²¹ reported a 60% recurrence rate after surgery in 118 patients with severe nasal

polyposis during a 12- to 168-month follow-up period .

As regarding our research, we investigate the role of posterior nasal neurectomy in alleviating the allergic symptoms which is the main mediator for polyp formation and found out that posterior nasal neurectomy markedly alleviates sneezing and rhinorrhea but has no obvious role in decreasing recurrence of nasal polyp shown in Fig 3 which is in agreement **with Li, Song et al.2019**¹⁸ who found out that the overall symptoms in the two groups are relieved after surgery, but polyp recurrence haven't show any difference.

Conclusion:

To be concluded, PNN is minimally invasive procedure which is easily applicable and safe surgical procedure which can be done to treat intractable allergic rhinitis especially sneezing and rhinorrhea.

Conflict of interest: There is no conflict of interest.

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