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ORIGINAL ARTICLE

A Comparative Study of Symptom Scores in Patients Undergoing Posterior Lateral Nasal Neurectomy with Medical Management for Allergic Rhinitis

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Abstract Allergic rhinitis is an IgE mediated reaction against inhaled allergens. Patients not responding to medical treatment require surgery. Most surgical procedures reduce erectile tissue of inferior turbinates. Vidian neurectomy reduces nasal hyperreactivity and secretions by reducing parasympathetic supply, but results in loss of lacrimation. Transnasal posterior nasal neurectomy is more selective denervation procedure which preserves lacrimation. There are few studies documenting the outcome of posterior lateral nasal neurectomy. Posterior lateral nasal neurectomy can be good treatment option for perennial allergic rhinitis. To assess and compare the symptom scores in patients undergoing posterior lateral nasal neurectomy and medical management for allergic rhinitis. This prospective study included 50 patients diagnosed as perennial allergic rhinitis as per the ARIA guidelines. 25 patients underwent posterior lateral nasal neurectomy and 25 patients underwent medical management using fluticasone nasal spray and Montelukast with Levocetirizine. Pre and post-treatment Total nasal symptom scores and mini rhinoconjunctivitis quality of life questionnaire scores were compared. Symptoms reduced significantly in both surgery and medical management group. However in surgery group, more patients showed more than 50% improvement in symptoms. Posterior lateral nasal neurectomy is minimally invasive treatment for patients with perennial allergic rhinitis not responding to or not complying with medical treatment.

Keywords Posterior lateral nasal neurectomy · Perennial allergic rhinitis · Intranasal steroids · Montelukast · Levocetirizine · Vidian neurectomy

Introduction

Allergic Rhinitis is defined as a symptom complex of sneezing, nasal pruritis, airflow obstruction and clear nasal discharge caused by IgE mediated reactions against inhaled allergens and involving mucosal inflammation driven by T helper-2 (Th2) cells. [1]

Reported prevalence of Allergic Rhinitis based on nasal symptoms in India ranges between 20 and 30%. [2] Allergic Rhinitis contributes to missed or unproductive time at work and school, disturbed sleep and day time somnolence in both children and adults. Therefore Allergic Rhinitis significantly affects the quality of life. An increasing prevalence of allergic rhinitis and asthma has also been reported in the Indian subcontinent. [3]

The Allergic Rhinitis and its Impact on Asthma (ARIA) categorized Allergic Rhinitis (AR) into seasonal allergic rhinitis (SAR) and perennial allergic rhinitis (PAR). SAR is triggered by a wide assortment of outdoor allergens, especially pollens. PAR is commonly brought about by indoor allergens that are present throughout the year, such as dust mites, molds, insects (cockroaches), and animal dander. [4]

The treatment options include pharmacotherapy, immunotherapy and surgical management. Intranasal

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glucocorticoids are the most common line of treatment. Other drugs include oral and topical antihistamines. However, these drugs give temporary relief and are associated with adverse effects such as headache, dryness of nose and throat, suppression of local immunity and epistaxis. Leukotriene antagonists like Montelukast provide relief by reducing nasal congestion and mucous production. [5] Allergen immunotherapy is expensive, less accessible and has the potential to cause life-threatening exacerbation of asthma or anaphylaxis. [6]

Surgical management can be considered if medical management fails to provide adequate relief. Surgical treatment reduces nasal obstruction and improves sleep quality. [7]

Vidian neurectomy reduces nasal hyperreactivity and secretions by decreasing the parasympathetic activity. However, it can lead to loss of lacrimation or keratoconjunctivitis sicca. Other surgical options include inferior turbinoplasty, LASER resection of inferior turbinate, submucosal diathermy, radiofrequency ablation of inferior turbinate, mini inferior turbinoplasty tunnelling technique, posterior nasal neurectomy. [5]

Posterior lateral nasal neurectomy is a selective denervation procedure where transnasal sectioning of the posterior nasal nerve is done. This surgery being more selective reduces the complications of vidian neurectomy and is minimally invasive. In literature, other short term studies have reported good outcome with posterior nasal nerve transection.

If popularized, it may be one of the most effective treatment options for severe intractable AR. However, it still remains surgical (invasive treatment) and there are only a few studies documenting the outcome and there is paucity of literature. Our study aims to document and compare the symptom scores [Total nasal symptom score (TNSS) and Mini Rhinoconjunctivitis Quality of Life Questionnaire (MiniRQLQ)] in patients undergoing endoscopic bilateral posterior lateral nasal neurectomy and medical management using intranasal corticosteroid, antihistamine and leukotriene antagonist.

Objective

To document and compare the pre-treatment and post-treatment symptom scores in patients undergoing posterior lateral nasal neurectomy and medical management for allergic rhinitis.

Materials and Methods

This prospective study was conducted in 50 patients with Perennial Allergic Rhinitis, neutrophilic type, who presented to the Otorhinolaryngology department in a rural tertiary care hospital from November 2018 to May 2020. The study was approved by Institutional ethics committee with No. SDUMC/KLR/IEC/170/2018-19.

Patients aged 16 to 65 years, diagnosed as Perennial Allergic Rhinitis, as per the ARIA guidelines having 3 or more of the typical symptoms of Allergic Rhinitis including nasal discharge, repeated bouts of sneezing, nasal pruritis and nasal obstruction symptoms for more than 1 h on most days throughout the year for a period of atleast 2 years were included in the study.

Patients with drug induced and hormonal causes of Rhinitis, nasal polyp, previous history of nasal surgeries, bleeding diathesis were excluded from the study. Patients who had used topical steroid nasal sprays, oral or topical antihistamines, oral leukotriene antagonists, oral or topical nasal decongestants in the last 2 weeks were also excluded from the study.

Patients with Perennial Allergic Rhinitis after qualifying the inclusion criteria and exclusion criteria were enrolled in the study after written informed consent regarding their enrollment in the study, type of intervention and follow up. A detailed clinical history was elicited. A meticulous ENT examination was performed. ARIA guidelines and Clinical criteria for diagnosis of Allergic Rhinitis were adopted. Diagnostic nasal endoscopy was done.

Patients were equally allotted to groups- Group A and B using block randomization selecting a block size of 4. In Group A patients, Complete blood count (CBC), Renal function test (RFT), Serum Electrolytes, Coagulation profile, Electrocardiogram(ECG), Chest X-Ray (CXR), Computed tomography of Nose and paranasal sinuses (PNS) were done as a part of General anaesthesia (GA) work up. Patients were given Mini RQLQ and TNSS questionnaires for documentation of pre-operative symptoms. Patients were subjected to Endoscopic bilateral Posterior lateral nasal nerve transection.

Posterior Lateral Nasal Neurectomy Procedure

Under General anaesthesia, with patient in reverse Trendelenberg position, '0' degree 4 mm rigid endoscope was used, along with a high definition camera. Infiltration – 0.5 to 1 ml of 1: 2,00,000 adrenaline solution was injected in the lateral nasal wall, on the posterior part of middle meatus in the area of sphenopalatine foramen using a 25 gauge spinal needle. Semilunar incision was made in the posterior aspect of middle meatus. The

mucoperiosteum was elevated posteriorly and ethmoidal crest identified. (Figs. 1 and 2) Sphenopalatine artery was identified with 3 to 4 posterior lateral nasal nerves surrounding it. Posterior lateral nasal nerve was then separated from the artery and sectioned using microscissors. (Fig. 3) Elevated mucoperiosteum was repositioned and Gelfoam was placed to secure the flap in position. Nasal pack was retained for one day. Pieces of merocel soaked with 1:1,00,000 adrenaline was used to control bleeding if any. Post operatively, patients were advised saline nasal douching, prophylactic antibiotics and analgesics and were discharged after 3 days with advise to continue saline nasal douching and to follow-up after one week and after one month. During the follow-up after one month of surgery, patients were enquired about symptoms if any, a clinical examination including Diagnostic nasal endoscopy was performed and the same questionnaires were given to them to assess TNSS and MRQLQ scores. Patients were followed up for a period of 6 months from the day of surgery. During follow-up, their symptoms were reassessed using Mini RQLQ and TNSS questionnaires, one month and six months post-operatively.

Patients in Group-B received medical management in the form of Topical intranasal atomised Fluticasone spray (delivers 50 mcg per puff) which the patient had used 2 puffs in the morning and 2 puffs in the evening, along with once daily dose of oral Levocetirizine 5 mg with Montelukast 10 mg for a period of 6 weeks and were followed up for a period of 6 months and the pre and post treatment symptom scores were compared after one and six months of medical treatment. Adverse effects if any were documented. The pre-treatment and post-treatment symptom scores were compared and analysed for both groups.

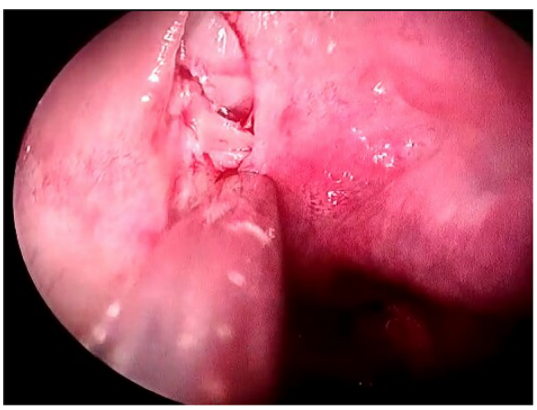

Fig. 1 Curvilinear incision given over the sphenopalatine foramen area and flap raised posterosuperiorly to expose the sphenopalatine bundle

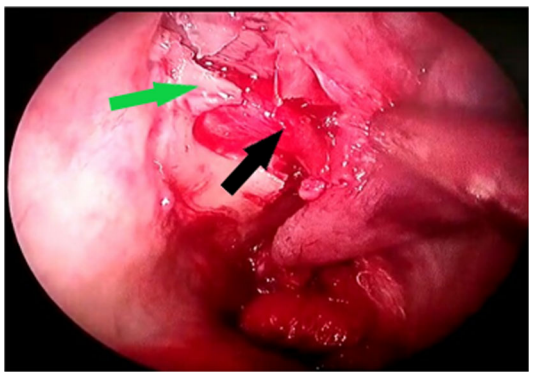

Fig. 2 Ethmoidal crest (Indicated by green arrow) often used as a surgical landmark for identification of sphenopalatine foramen area, Sphenopalatine artery (Indicated by black arrow)in the sphenopalatine foramen

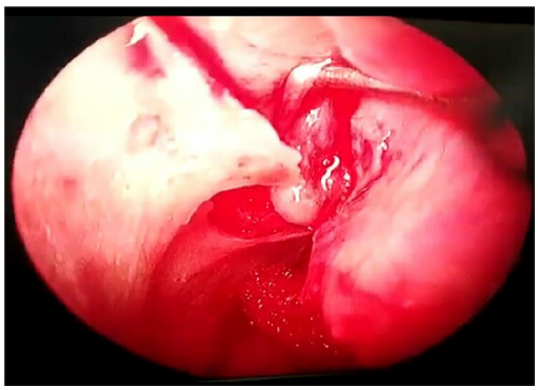

Fig. 3 One of the 4 posterior lateral nasal nerves identified and separated from the sphenopalatine artery using a ball probe before transection

Statistical Analysis

Data was analyzed using SPSS 22 version software. Continuous data was represented as mean and standard deviation. Paired t test was used as test of significance to identify the mean difference between more than two quantitative variables. *P* value (Probability that the result is true) of < 0.05 was considered as statistically significant after assuming all the rules of statistical tests.

Results

Mean age among patients who underwent posterior lateral nasal neurectomy was 29.44 ± 7.687 years and among patients who received medical management was 35.08 ± 14.50 years. There was no statistically significant difference for patient's age between groups.

Among patients who underwent posterior lateral nasal neurectomy, 9 (36%) of the patients were female and 16

(64%) of the patients were male. In the medical management group, 14 (56%) of the patients were female and 11 (44%) of the patients were male.

The baseline total nasal symptom score was 11.96 in surgical group and 10.40 in medical management group. The baseline Mini RQLQ was 56.96 in surgical management group and 46.20 in medical management group.

After one month following posterior lateral nasal neurectomy, TNSS reduced to 3.84. The difference in mean TNSS is statistically significant ($p < 0.001$) which indicates significant relief of symptoms following surgery. At the end of six months post-surgery, there was consistent reduction in TNSS which had further reduced to a mean score of 2.04 indicating further reduction of symptoms with time. (Table 1 and Fig. 4) Though maximum reduction in symptoms occurred within first month post-surgery, there was consistent reduction in symptoms even after one month.

The mean MiniRQLQ score was 56.96 during first evaluation before the surgery. Mean MiniRQLQ scores had reduced to 13.72 when evaluated after 1 month following surgery, indicating significant improvement in quality of life following posterior lateral nasal neurectomy ($p < 0.001$). Following 6 months of surgery, the quality of life still remained better with Mini RQLQ score of 5.88 ($p < 0.001$).

The mean difference in total nasal symptom scores at 6 months was 9.76 and mean difference in Mini RQLQ was 51.04 indicating significant improvement in symptom scores and Quality of life following surgery. No patients reported of xerosis or keratoconjuctivitis sicca. 20 patients had moderate intraoperative bleeding which was effectively controlled using adrenaline soaked pledgets.

Among patients who received medical treatment using automised Fluticasone propionate nasal spray and Montelukast with Levocetirizine, total nasal symptom scores reduced from 10.40 to 4.76 after one month following medical treatment and to 3 after six months following medical treatment. (Table 2 and Fig. 5) The mean Mini RQLQ scores also reduced from 46.20 to 13.36 after one month and to 10.52 at six months post medical treatment indicating significant improvement in quality of life after medical treatment.

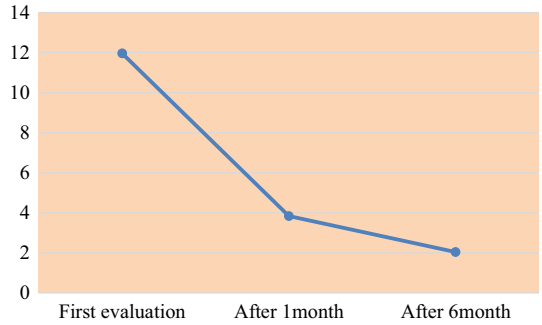

Fig. 4 Graph showing comparison of total nasal symptom score among patients who underwent surgical treatment at various time intervals

Significant difference in symptom scores were observed both following surgery and following medical management. However, the difference in symptom scores from baseline to one month post treatment between groups were statistically significant.A statistically significant difference was found between surgery and medical management group with respect to TNSS and Mini RQLQ difference at one and six months post treatment. Though there was improvement of symptoms in both groups, a greater improvement of symptoms was observed in surgery group. (Table 3 and Fig. 6).

In contrast to the medical management group, where the only 56% patients had more than 50% improvement in symptoms as per the total nasal symptom score, in surgery group, 80% patients showed more than 50% improvement in nasal symptoms. 28% patients in surgery group showed more than 80% improvement in TNSS in contrast to 12% patients in medical management group at the end of 6 months. (Table 4 and Fig. 7).

Table 1 Comparison of total nasal symptom score among patients who underwent posterior lateral nasal neurectomy at various time intervals

TNSS	Mean	Std. deviation	*P* value
First evaluation	11.96	1.904	< 0.001
After 1 month	3.84	2.055	
First evaluation	11.96	1.904	< 0.001
After 6 month	2.04	1.136	

There was a statistically significant difference between first evaluation and evaluation at one month post surgery with respect to TNSS. There was a statistically significant difference in TNSS between first evaluation and evaluation after 6 months

Table 2 Comparison of total nasal symptom score among patients who received medical treatment at various time interval

TNSS	Mean	Std. deviation	*P* value
First evaluation	10.40	2.082	< 0.001
After 1 month	4.76	2.603	
First evaluation	10.40	2.082	< 0.001
After 6 month	3.00	1.915	

There was a statistically significant difference in TNSS between first evaluation and evaluation at one and six months following medical management

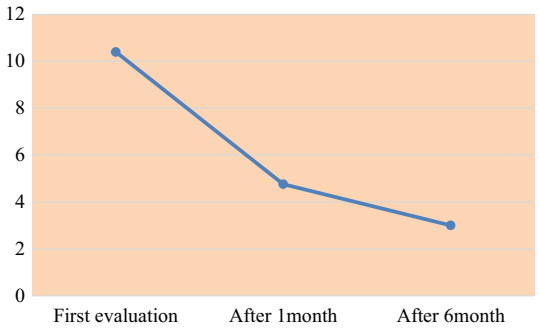

Fig. 5 Graph showing comparison of total nasal symptom score among patients who received medical treatment at various time interval

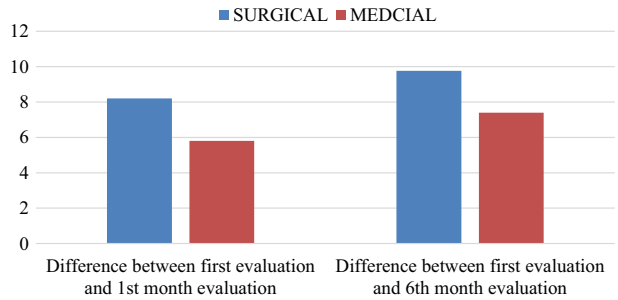

Fig. 6 Graph showing comparison of difference in mean total nasal symptom score between groups

Discussion

The prevalence of Allergic Rhinitis in India has increased over the last few years. Symptoms of Allergic rhinitis affect quality of life and productivity. A complete and permanent cure of allergic symptoms are difficult and this often disturbs the clinician. Though topical steroid sprays with leukotriene inhibitors and antihistamines are commonly used to treat allergic rhinitis, Perennial moderate to severe allergic rhinitis may not respond and patient compliance also may be poor.

In 1979, Konno reported long-term relief in allergic rhinitis symptoms after vidian neurectomy. This however, was associated with complications like dryness of eyes, numbness in the cheek due to the antrostomy and kerato-conjunctivitis sicca. [8]

More selective procedures like cryodestruction of 6 mm area of vidian nerve branches using a cryoprobe also resulted in significant reduction of rhinorrhea. LASER ablation of the same nerve branches was introduced in 2019 in New York as an office procedure. Ablation of posterior nasal nerve is more physiological and reduces the sequelae encountered in Vidian neurectomy thereby bringing elimination of parasympathetic supply to inferior turbinates reducing nasal obstruction and rhinorrhoea. 60–65% reduction in TNSS was observed as early as two weeks following LASER ablation and consistent reduction in scores were observed 90 days post-procedure. [9]

Toru described Endoscopic approach to expose the posterior superior nasal nerve at the spheno palatine

Table 3 Comparison of difference in mean total nasal symptom score between groups

	TNSS	Mean	SD	*P* value
Difference between first evaluation and 1st month evaluation	Surgical	8.20	2.708	0.002
	Medical	5.80	2.398	
Difference between first evaluation and 6th month evaluation	Surgical	9.76	2.603	0.001
	Medical	7.40	2.217	

There was a statistically significant difference between groups with respect to difference in mean TNSS between first evaluation and 1st month evaluation. There was a statistically significant difference between groups with respect to difference in mean TNSS between first evaluation and 6th month evaluation

Table 4 Comparison of improvement according to total nasal symptom score between two groups

Percentage improvement in symptoms	Surgical		Medical		*P* value
	N	%	N	%	
< 50% improvement	5	20.0%	11	44.0%	0.069
> 50% improvement	20	80.0%	14	56.0%	
< 80% improvement	18	72.0%	22	88.0%	0.153
> 80% improvement	7	28.0%	3	12.0%	

80 percent patients in surgery group had more than 50% improvement in symptoms whereas in medical management group, only56% patients had more than 50% improvement symptoms as per the total nasal symptom scores

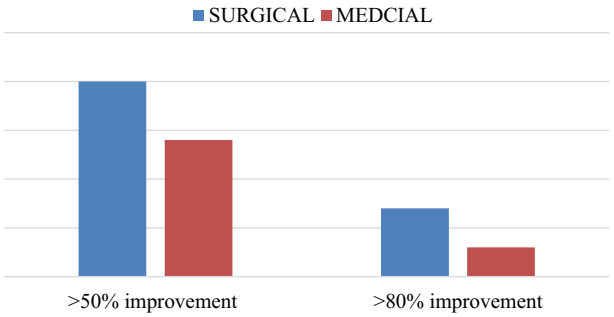

Fig. 7 Graph showing comparison of improvement according to total nasal symptom score between two groups

foramen in 2007. Branches identified after elevating periosteum and was were ablated with LASER or bipolar cautery along with tissues around to resect all posterior nasal nerve branches. [10].

Technique of selective resection of branches of posterior nasal nerve in the inferior turbinate was introduced in 2019.This procedure reduced sneezing and nasal obstruction, however rhinorrhea persisted. The better outcome in posterior nasal neurectomy involving main trunk of posterior nasal nerve could have been due to resection of peripheral branches supplying middle turbinate also. [11] In our study also we performed transnasal endoscopic transection of the main posterior lateral nasal nerve branches at the sphenopalatine foramen which are 3–4 in number close to the sphenopalatine foramen.

Retrospective study in 212 allergic and vasomotor rhinitis patients who underwent endoscopic posterior nasal neurectomy showed significant reduction in Sino nasal outcome test-22 (SNOT-22) scores. [12].

Cassano et al. attributes the reduction in sneezing and nasal pruritis following posterior nasal nerve transection to the resection of posterior inferior nasal nerve fibres. [13] In our study, there was substantial reduction in TNSS which continued to reduce 6 months following surgery, showing significant reduction in parasympathetic supply. A smaller study in Kerala also showed relief from sneezing, however required continued medical treatment after surgery. [14].

In our study, among the patients who underwent posterior lateral nasal neurectomy, 80% of patients had more than 50% improvement in TNSS and 92% patients had more than 50% improvement in MRQLQ. 28% patients had more than 80 percent improvement in TNSS and 40 percent patients had more than 80 percent improvement in MQRLQ scores. (Tables 4 and 5) This indicates a substantial improvement in bothersome symptoms of allergic rhinitis and better quality of life in many allergic rhinitis patients after posterior lateral nasal neurectomy. All patients reported significant improvement in all four typical symptoms of allergic rhinitis including rhinorrhea, sneezing, nasal pruritis and nasal obstruction. No complications were observed.

In our study, only 5 patients showed less than 50% improvement in symptoms following surgery. These patients required continued medical management after surgery. Anatomical variation, incomplete resection of nerve branches, co-existing rhinosinusitis would have contributed to this result. According to Bleier, small, accessory posterolateral nerve fascicles can be transmitted through multiple small fissures and foramina in the palatine bone carrying parasympathetic supply. [15] Few branches from the rami orbitales also innervates nasal mucosa in some patients. Since these branches were not addressed in our study, some patients might have had symptoms of allergic rhinitis following surgery. Owing to bleeding from sphenopalatine foramen area, some tiny branches posterior to sphenopalatine artery in the foramen could have been missed which resulted in persistence of symptoms.However, larger studies with longer follow-up may be required to accurately assess the effectiveness of surgery and the cause of inadequate response and long-term recurrences.

The relief observed in our patients was consistent over a period of 6 months after surgery and hence definitely better than the use of topical steroid sprays and leukotriene antagonists for Perennial allergic rhinitis.

We recommend endoscope assisted bilateral posterior lateral nasal neurectomy as a treatment option in patients with intractable moderate to severe allergic rhinitis.

Table 5 Comparison of improvement in quality of life according to Mini RQLQbetween two groups

Improvement in quality of life as per the mini RQLQ scores	Surgical		Medical		*P* value
	N	%	N	%	
< 50% improvement	2	8.0%	4	16.0%	0.384
> 50% improvement	23	92.0%	21	84.0%	
< 80% improvement	15	60.0%	12	48.0%	0.395
> 80% improvement	10	40.0%	13	52.0%	

Patients who do not have adequate symptom relief with medical management can benefit from posterior lateral nasal nerve transection. Since most of the patients in surgery group did not require any medical management after surgery, we can conclude that this surgery is beneficial as we can avoid subjecting the patients to medical treatment and its side effects. Surgery may also be a cost-effective option in allergic rhinitis patients as they do not have to use long term medical management with intranasal corticosteroids and oral leukotriene antagonists which may be expensive in the long run. Surgery also solves the problem of low compliance to long-term medical treatment and significantly improves the quality of life in allergic rhinitis patients. In view of nil to very low rate of complications, this surgery may be safely performed in allergic rhinitis patients.

Conclusion

Posterior lateral nasal nerve transection is a selective surgical treatment for perennial allergic rhinitis. It gives significant reduction in nasal symptoms like nasal obstruction, sneezing and rhinorrhea and has a long term effect. It is physiological and selective by reducing parasympathetic supply to nose without any reduction in lacrimation. In patients not responding or fail to comply to medical treatment, endoscopic posterior lateral nasal nerve transection is a suitable option.

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Declarations

Conflict of interest The author declare that they have no conflict of interest.

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