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EFFECTIVENESS OF ENDOSCOPIC POSTERIOR NASAL NEURECTOMY FOR THE TREATMENT OF INTRACTABLE RHINITIS

By

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ABSTRACT

Background: The Posterior nasal nerve is responsible for nourishing the mucous membrane of the nose with the parasympathetic nervous system.

Objective: To evaluate the outcome of posterior nasal neurectomy in patients who have intractable chronic rhinitis by measuring subjective symptoms improvement after surgery, and assess for possible complications.

Patients and Methods: This study was conducted on 15 patients above 15 years old with two or more symptoms of rhinitis, refractory to maximum medical therapy for a period of at least 3 or more years and whose quality of life was significantly affected will be randomly selected from the outpatient clinic. Posterior nasal neurectomy was performed in those patients who were eligible for the study after applying the inclusion criteria.

Results: The mean symptoms scores for sneezing, rhinorrhea, nasal obstruction and total severity were all decreased from pre-operative levels after the third and sixth month postoperatively. We observed a significant improvement in patients' quality of life at the end of 6 months post-operatively.

Conclusion: Endoscopic resection of the posterior nasal nerve is a safe and less invasive procedure, which can provide a significant relief in of the symptoms of intractable rhinitis, particularly rhinorrhea and nasal obstruction. Fewer complications and better results make it superior over vidian neurectomy.

Keywords: Posterior Nasal Nerve, Intractable Rhinitis, Surgical Treatment of Rhinitis.

INTRODUCTION

Rhinitis is an inflammatory condition of the nasal mucosa that concerns 10 to 20% of the population and is characterized by four nasal symptoms: rhinorrhea, nasal congestion, sneezing and post-nasal discharge *(Bousquet et al., 2012)*. Depending on whether an allergic etiology is implicated, non-infectious rhinitis can be subdivided into allergic and non-allergic. With 600 million of world's population affected, allergic rhinitis is the most prevalent atopic disorder *(Chhabra et al., 2012)*.

Posterior nasal nerve (PNN) is a peripheral branch of the sphenopalatine ganglion. It enters the nasal cavity through a separate foramen, 4–5 mm below the sphenopalatine foramen. The posterior superior nasal nerves innervate the

superior and middle turbinates, and the superior and middle meatus. Other parasympathetic nerve fibres of the nose branches off and joins the greater palatine nerve and enters the nasal cavity through the canaliculi in the perpendicular plate of the palatine bone as the posterior inferior nasal nerves. These nerves innervate the inferior turbinate and the inferior meatus *(Bloom et al., 2011).*

Secretory motor fiber exits the pterygopalatine foramen in multiple branches, each of which is directed to a different target (eg, lacrimal gland and nasal mucosa). The branch originating from the pterygopalatine ganglion (PPG) is found to specifically innervate the nasal mucosa and has been called the posterior nasal nerve. Selective resection of this posterior nasal nerve removes the parasympathetic supply from the nasal cavity and provides the same benefits of vidian neurectomy, without having any of its complications *(Kobayashi et al., 2012).*

The aim of this study is to evaluate the outcome of posterior nasal neurectomy in patients who have intractable chronic rhinitis by measuring subjective symptoms improvement after surgery and assessment of possible complications.

PATIENTS AND METHODS

This prospective study was conducted in Otorhinolaryngology Head and Neck Surgery Department, Al Azhar University Hospital (Damietta) .15 patients above 15 years old with two or more symptoms of rhinitis, refractory to maximum medical therapy for a period of at least 3 or more years and whose quality of life was significantly affected will be randomly selected from the outpatient clinic. A diagnostic nasal endoscopy and C.T Scan of the nose and paranasal sinuses were performed for all patients included in the study. Posterior nasal neurectomy was performed in those patients who were eligible for the study after applying the inclusion criteria.

The procedure was done under general anesthesia. We prefer hypotensive general anesthesia (Mean Arterial Pressure – 55 to 65mmHg) in reverse Trendelenburg position. After induction of general anesthesia and oral intubation, the nasal cavity was packed with 1:1000 adrenaline patties for local vasoconstriction. All surgical procedures were performed with a 0-degree or 30-degree, 4mm Storz nasal endoscope (Karl Storz, Tuttlingen, Germany).

An incision was carried deep down to the bone is made on the lateral nasal wall, at the level of the posterior fontanelle, with a number 15 surgical blade or flag knife used in micro ear surgery. The mucosal flap was elevated posteriorly till the posterior end of the middle meatus, until the fibroneurovascular sleeve including the sphenopalatine artery and the posterior nasal nerve arising from the sphenopalatine foramen were identified. The crista ethmoidalis is a landmark for the sphenopalatine foramen.

The posterior nasal nerve identified as follow the proximal portion or the main trunk of the nerve lies anterior to the sphenopalatine artery at the sphenopalatine foramen level. The nerve is carefully delineated and resected with micro scissors then cauterized using a bipolar diathermy. The nerve was resected at its main trunk, in order to avoid missing of its peripheral branches.

All patients were reviewed postoperatively after the first week, second week, first month, third month and sixth month. Patient feedbacks were collected during the first-month, third-month and sixth-month visits. No medical treatments for rhinitis were given during the follow-up periods.

Statistical analysis:

All data were collected, tabulated and statistically analyzed using SPSS 22.0 for windows (SPSS Inc., Chicago, IL, USA).

RESULTS

The current study was conducted from march 2020 to November 2020 , 15 patients were enrolled for this study. There were 8 male patients (53.3%) and 7 female patients (46.7%) **(Figure 1)**, age range of 25 to 50 (36.33 ± 6.62).

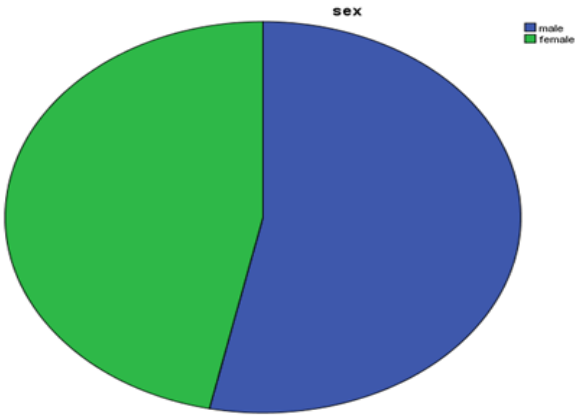

Figure (1): Sex distribution in the study population

Subjective nasal symptoms of all 15 patients improved over a period of 6 months *(Table 1, Figure 2)*. The p-values for these were statistically significant (<0.05).

Table (1): Subjective nasal symptom scores evaluation with Okuda's score before and after surgery (Mean±SD)

	Rhinorrhea	Sneezing	Nasal Obstruction	Total severity
pre-operative	3.0000±.75593	3.4667±.51640	2.5333±.51640	3.6667±.48795
1 month	1.3333±.89974	2.1333±.83381	1.6000±.50709	1.6667±.48795
3 month	.6667±.61721	1.7333±.59362	.7333±.45774	.7333±.45774
6 month	.4000±.50709	1.6000±.63246	.4667±.51640	.5333±.51640
	0.001	**0.015**	**0.016**	**0.001**

This table shows that The mean symptom scores for sneezing, rhinorrhea, nasal obstruction and total severity were all decreased from pre-operative levels after the third and sixth month postoperatively and show highly statistical significant difference (p-value < 0.05) between pre-operative & 6th month assessment as regard rhinorrhea, sneezing, nasal obstruction & total severity.

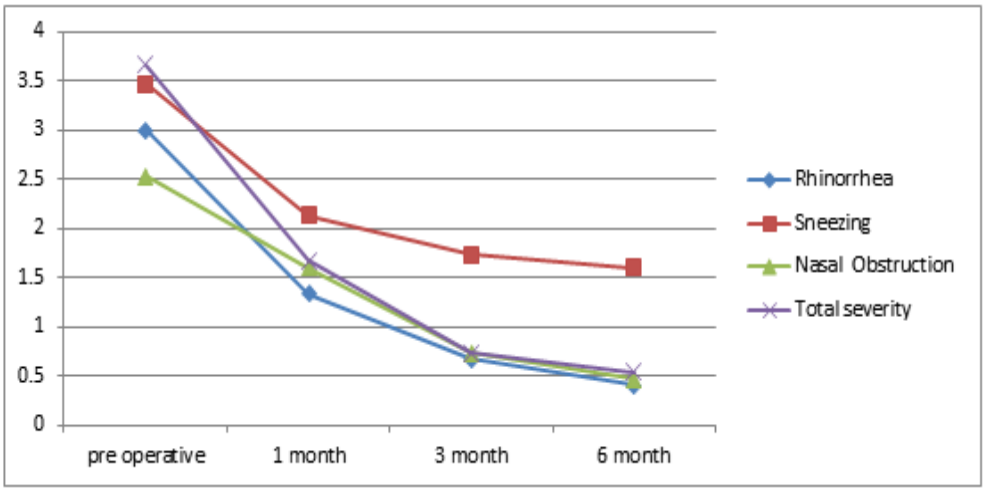

Figure (2): Mean time-dependent subjective symptom score

We observed a significant improvement in patients' quality of life at the end of 6 months post-operatively **(Table 2, Figure 3)**.

Table (2): Changes in RQLQ scores before and after treatment or surgery (Mean±SD)

Activities	3.2667±1.09978	1.2±.86189	0.001
Sleep	2.9333±1.03280	0.5333±.63994	0.003
Non-hay fever symptoms	2.5333±.91548	1.3333±.81650	0.017
Practical problems	3.0667±1.16292	0.7333±.79881	0.011
Nasal symptoms	4.4±.50709	1.4±.50709	0.002
Eye symptoms	3.2667±1.03280	1.2±.86189	0.002
Emotions	3.6±.91026	1.6667±.81650	0.001
Overall	4.1333±.91548	1.6±.98561	0.004

This table shows that the changes in all 7 domains of RQLQ were statistically significant. The p-values for these were statistically significant (<0.05).

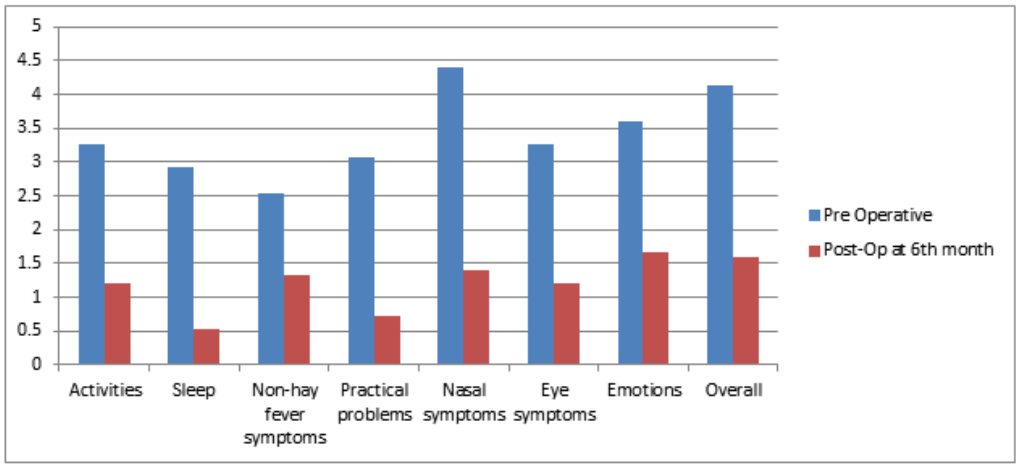

Figure (3): Mean Pre-Operative and Post-Operative scores with RQLQ

DISCUSSION

Rhinitis is an inflammatory condition of the nasal mucosa that concerns 10 to 20% of the population and is characterized by four nasal symptoms: rhinorrhea, nasal congestion, sneezing and post-nasal discharge *(Bousquet et al., 2012).*

Depending on whether an allergic etiology is implicated, non-infectious rhinitis can be subdivided into allergic and non-allergic. With 600 million of world's population affected, allergic rhinitis is the most prevalent atopic disorder *(Chhabra et al., 2012).*

Surgical treatment for AR patients has been considered as a successful alternative strategy when the patients are resistant to standard combinations of medical treatment. According to the Japanese guidelines for AR, the objectives of surgical treatment for AR include modulation of the nasal mucosa, correction of the nasal cavity to improve nasal ventilation, and improvement of hyper reactivity with rhinorrhea.

The results of current study demonstrated that cutting the para sympathetic supply to the nasal mucosa decrease symptoms of rhinitis like sneezing and rhinorrhea and nasal obstruction.

These finding agreed with the results of *Konno et al., (2010)* who reviewed that the vidian nerve (or nerve of the pterygoid canal) provides the main postganglionic parasympathetic supply to the nasal mucosa, palate, and lacrimal gland. Stimulation of the vidian nerve can cause secretory and vasodilatory effects in both humans and animals. Resection of the vidian nerve can reduce the overactive nasal reflex, which relieves sneezing and nasal hypersecretion. Also described techniques for endoscopic vidian neurectomy and reported that rhinorrhea and nasal obstruction improved significantly after endoscopic vidian neurectomy. They also described histological changes after vidian neurectomy, significant reduction of stromal edema and eosinophilic infiltration, reduction of mast cells and histamine, and reduction of mucous acinar gland cells. This is likely to have been caused by the disruption of the cholinergic innervations of the nasal mucosa after the efferent pathway of the parasympathetic reflex has been transeccted.

Also in this study we showed that endoscopic posterior nasal neurectomy give the same benefits of vidian neurectomy without having its complication.

These finding go in hand with *Greiner et al., (2011)* who showed that a secretory motor fiber exits the pterygopalatine foramen in multiple branches, each of which is directed to a different target (eg, lacrimal gland and nasal mucosa). The branch originating from the pterygopalatine ganglion (PPG) is found to specifically innervate the nasal mucosa and has been called the posterior nasal nerve. Selective resection of this posterior nasal nerve removes the parasympathetic supply from the nasal cavity and provides the same benefits of vidian neurectomy, without having any of its complications.

Also *Lee et al., (2012)* stated that the vidian neurectomy procedure was almost abandoned due to technical difficulties in approaching the pterygopalatine region,

important associated complications such as severe bleeding from the sphenopalatine artery and its branches, dry eyes due to decreased lacrimation, ophthalmoplegia, and even blindness.

In support of the effectiveness of posterior nasal neurectomy *May et al., (2017)* observed that posterior nasal neurectomy causes reduction of the secretagogue motor and inhibition of the neurogenic inflammation induced by the parasympathetic and sensory denervation.

Also *Eren et al., (2015)* demonstrate that the posterior nasal nerve emerges from the SPF and is distributed to the inferior turbinate mucosa following the branches of the sphenopalatine vessels. Innervation of the parasympathetic component increases the secretomotor function, and innervation of the sensory component that regulates the sensitivity of the nasal.

Kobayashi et al., (2012) also reported similar benefits for the patient after posterior nasal neurectomy. They concluded that selective resection of peripheral branches of the posterior nerve could reduce allergic symptoms.

CONCLUSION

Endoscopic resection of the posterior nasal nerve is a safe and less invasive procedure, which can provide a significant relief in symptoms of intractable rhinitis, particularly rhinorrhea and nasal obstruction. Fewer complications and better results make it superior over vidian neurectomy.

Limitations of our study: This was a short-term study of a limited number of cases. Studies with longer follow up periods and a large number of patients are suggested to validate our results.

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فعالية إستئصال العصب الأنفي الخلفي بالمنظار لعلاج إلتهاب الأنف المستعصي

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خلفية البحث: إلتهابات الأنف المستعصية هي حالة إلتهابية تصيب الغشاء المخاطي للأنف و في حين أن العلاج الطبي الحالي قد يكون مفيدًا لمعظم المرضى، إلا أنه في الحالات المستعصية يعتبر التدخل الجراحي أفضل وهناك العديد من التدخلات الجراحية بما في ذلك إستئصال العصب فيديان وتصغير القرينة السفلية للأنف وإستئصال العصب الأنفي الخلفي.

الهدف من البحث: هو تقييم نتائج إستئصال العصب الأنفي الخلفي بالمنظار في المرضى الذين يعانون من إلتهاب الأنف المزمن المستعصي عن طريق قياس التحسن الذاتي للأعراض بعد الجراحة، وتقييم المضاعفات المحتملة.

المرضى وطرق البحث: أجريت هذه الدراسة على 15 مريضا تتراوح أعمارهم من 25 الى 50 عام منهم 8 رجال و 7 نساء وتم أخذ التاريخ المرضي لكل واحد منهم وشكوى كل مريض. وتم عمل منظار الأنف التشخيصي و أشعة مقطعية على الأنف والجيوب الأنفية لجميع المرضى المشمولين في هذة الدراسة قبل العملية ثم تم إجراء عملية إستئصال العصب الأنفي الخلفي بالمنظار في المرضى الذين كانوا مؤهلين للدراسة بعد تطبيق معايير الإشتمال و تمت متابعت جميع المرضى بعد العملية في الأسبوع الأول والأسبوع الثاني والشهر الأول والشهر الثالث والشهر السادس ثم تم جمع ملاحظات المرضى خلال زيارات الشهر الأول والشهر الثالث والشهر السادس.

نتائج البحث: لوحظ بعد العملية تحسن الأعراض الأنفية لجميع المرضى الخمسة عشر على مدى ستة أشهر كما لوحظ إنخفاض متوسط درجات أعراض العطس وسيلان الأنف إنسداد الأنف والأعراض الكلية من مستويات ما قبل الجراحة

خصوصا في الشهر الثالث والسادس بعد الجراحة وإجمالا فهناك تحسنًا كبيرًا في جودة حياة المرضى في نهاية الشهر السادس بعد الجراحة.

الإستنتاج: إستئصال العصب الأنفي الخلفي بالمنظار لعلاج إلتهابات الأنف المستعصية إجراء آمن ويعتبرأقل تدخل جراحي يمكن أن يوفر راحة كبيرة في علاج أعراض إلتهاب الأنف المستعصي.

وتوصي هذه الدراسة بإجراء البحث على فترة أطول للحصول على نتائج أدق و أفضل.

الكلمات الدالة: عصب الأنف الخلفي، إلتهابات الأنف المستعصية، علاج إلتهاب الأنف جراحيا.