



Resection of peripheral branches of the posterior nasal nerve compared to conventional posterior neurectomy in severe allergic rhinitis

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Abstract

Objective: Transnasal resection of the posterior nasal nerve (TRPN) is the surgical procedure for drug therapy-resistant, intractable allergic rhinitis (AR). Submucous inferior turbinectomy also improves nasal symptoms in severe AR. Surgical injury to this peripheral nerve fibre may be the major cause of the decrease in allergic symptoms. During submucous turbinectomy, we have identified the peripheral branches of the posterior nasal nerve in the inferior turbinate and resected them (SRPN). The aim of this study was to evaluate the therapeutic effects of turbinoplasty with SRPN in severe AR.

Methods: Improvements in subjective symptoms were compared between 13 patients who underwent SRPN with turbinoplasty (Group 1) and 11 who underwent TRPN combined with turbinoplasty and SRPN (Group 2) by retrospective chart review. Pre- and postoperative sneezing, rhinorrhea, and nasal obstruction were evaluated with questionnaires. Postoperative complications and drug therapy before and after surgery were investigated.

Results: All symptoms improved postoperatively in both groups, with no significant differences in the improvements in nasal symptom scores between the groups.

Conclusions: SRPN combined with submucosal turbinectomy was shown to be a safe, useful, and efficient approach to patients with AR unresponsive to medical therapy. Although this is a short-term study, the results of this study suggest that SRPN represents one of the treatment options for intractable AR.

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Keywords: Allergic rhinitis; Rhinorrhea; Submucosal turbinectomy; Endoscopic surgery; Posterior nasal neurectomy

1. Introduction

Allergic rhinitis (AR) has recently been increasing in prevalence, affecting up to 44% of the population in Japan [1]. The standard treatment strategy involves drugs including histamine H1 receptor antagonists, leukotriene receptor antagonists, Th2 cytokine suppressors, or steroids. However, these therapies sometimes show limited effec-

tiveness for patients with intractable AR. Furthermore, the cost of long-term drug therapy can be substantial.

Resection of the posterior nasal nerve is the surgical procedure for intractable AR that is resistant to drug therapy. This surgery was developed from Vidian neurectomy, which significantly decreases hypersecretion and hypersensitivity by ablation of the Vidian nerve with a transantral approach [2]. However, this surgical procedure is occasionally accompanied by irreversible complications, i.e., decreased lacrimation and numbness of the upper lip. The development of endoscopic endonasal surgery has made it possible to perform transnasal resection of the posterior nasal nerve (TRPN) [3]. This surgery overcame the complications of

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Fig. 1. Endoscopic view during submucous turbinectomy. The arrow indicates the branch of the posterior nerve, which usually runs along with vessels.

Vidian neurectomy and is minimally invasive. Today, TRPN is considered one of the most effective treatment options for severe AR.

Submucous inferior turbinectomy also improves nasal symptoms in patients with severe AR [4]. It is a turbinoplasty with submucosal reduction by removing the inferior turbinate bone, while leaving overlying mucosa intact. Recently, the submucous turbinectomy has been performed under endoscopy, which can clearly visualize the peripheral branches of the posterior nasal nerve if the periosteum is elevated carefully (Fig. 1). It has been suggested that unintended surgical resection to this peripheral nerve fibre may be the major cause of the decrease in allergic symptoms [5]. During submucous turbinectomy, we have identified the peripheral branches of the posterior nasal nerve in the inferior turbinate and resected the nerves. Our hypothesis was that this procedure's effects are equivalent to those of conventional TRPN. The aim of this study was to evaluate the effects of selective resection of peripheral branches of the posterior nasal nerve (SRPN) with submucous turbinectomy for severe AR. The improvements in subjective symptoms in patients who underwent SRPN and those who underwent TRPN combined with SRPN were compared.

2. Patients and methods

2.1. Patients

Fifty-three patients underwent surgery for intractable AR between September 2002 and May 2008. Subjective symptoms before and after the surgery were investigated by retrospective chart review. Of the 53 patients, 30 whose subjective symptoms were sufficiently recorded before and at least three months after the operations were included in this study. The subjective symptoms, including sneezing, rhinorrhea, and nasal obstruction, were elicited with a

questionnaire using a numerical score based on Okuda's system [6]; each symptom was scored on a scale of 0–4 (0, none; 1, mild; 2, moderate; 3, severe; and 4, very severe). The patients filled the questionnaire between 3 and 14 months (mean 6.7 months) postoperatively. Postoperative complications and drug therapy before and after surgery were also investigated by retrospective chart review.

Preoperatively, the patients were informed about the two surgical procedures, i.e., SRPN following submucous turbinectomy under local anesthesia and TRPN with submucous turbinectomy under general anesthesia. The patients themselves selected either SRPN (Group 1; 13 patients) or TRPN (Group 2; 11 patients). All operations were performed by either of the two authors (T.K. and K.N.) who have sufficient experience doing endoscopic endonasal surgery. All patients were followed-up in our outpatient clinic for 3–80 months (mean 9.7 months) postoperatively.

2.2. Surgical technique

The operation was performed under local anesthesia in Group 1 and general anesthesia in Group 2. All surgical procedures were performed with a 0° or a 30° nasal endoscope with a diameter of 4 mm. In Group 1, 0.5% lidocaine with 1:100,000 epinephrine was infiltrated into the inferior turbinate. An incision was made from the anterior to the inferior surface of the turbinate. The periosteal plane was carefully elevated, and the turbinate bone was removed to reduce the volume of the inferior turbinate. Then, we can visualize peripheral branches of the posterior nerve beneath the periosteum usually running along with vessels (Fig. 2a). They were coagulated by bipolar cautery and resected. An additional procedure was performed in Group 2: the lateral mucosa of the middle meatus was elevated through the trans-turbinate approach following the SRPN to visualize the posterior end of the middle meatus. The neurovascular bundle including the posterior nasal nerve was subsequently identified at the spheno-palatine foramen. If the posterior

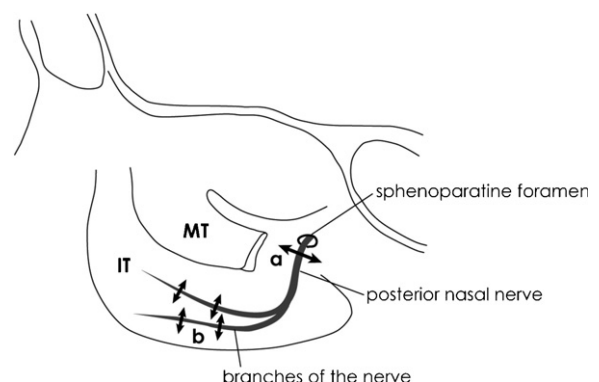


Fig. 2. Schema of the surgical procedures. The branches of the posterior nerve were resected in Group 1 (a). In addition, the main trunk of the posterior nerve was also sectioned at the spheno-palatine foramen in Group 2 (a and b). MT, middle turbinate; IT, inferior turbinate.

nasal nerve and sphenopalatine artery could be divided, only the nerve was sectioned using a high-frequency coagulator (Surgitron[®], Ellman Japan, Osaka, Japan). When they could not be divided, the bundle including the artery was sectioned (Fig. 2a and b). Sufficient coagulation was done to avoid postoperative bleeding from the sphenopalatine artery. A concomitant septoplasty was performed in 11 patients in Group 1 (84.6%) and 9 in Group 2 (81.8%). Nasal packing was carried out for 2 days.

2.3. Statistical analysis

Statistical analyses were performed using StatMateIII software (Atom, Inc.; Tokyo, Japan). The Wilcoxon signed-rank sum test was used to compare symptom scores before and after surgery. For comparison of each group, the Mann-Whitney *U* test was used to analyze preoperative symptom scores and the postoperative improvements. Postoperative drug therapy was evaluated by the Chi-square test. Differences were considered significant when the *p*-value was <0.05.

3. Results

The characteristics of the patients in each group are shown in Table 1. There were no significant differences in symptom scores before the operation between the two groups. Nasal symptom scores before and after surgery in each group are shown in Table 2. All three symptoms (sneezing, rhinorrhea, and nasal obstruction) improved significantly in both groups ($p < 0.01$ except “rhinorrhea” in Group 1 of which *p* value was 0.030) postoperatively. The improvements in nasal symptom scores postoperatively are shown in Fig. 3. There were no significant differences between Group 1 and Group 2. Postoperative drug therapy was not needed in 6 of 12 patients in Group 1 (50%) and 7 of 11 in Group 2 (64%), although there was no significant difference (Fig. 4).

There were no major complications in both groups. One patient in Group 2 had a postoperative nasal hemorrhage 14 days after the operation, which was successfully treated with nasal packing. Two patients in Group 2 complained of

Table 1
Characteristics of the patients in each group.

	Group 1	Group 2	<i>p</i> -Value
Number of patients	13	11	
Sex (male:female)	7:6	5:6	0.71
Age (years)	30.4	30.3	0.93
Scores before operation			
Sneezing	1.8	1.9	0.66
Rhinorrhea	2.5	2.8	0.38
Nasal obstruction	2.5	3.0	0.37
Follow-up period ^a (months)	6.8	6.7	1.0

^a Interval between the operation and filling the questionnaire.

Table 2
Nasal symptom scores before and after operations.

	Before op. (SD)	After op. (SD)	<i>p</i> -Value
Group 1			
Sneezing	1.8 (1.1)	1.0 (0.6)	0.007
Rhinorrhea	2.4 (1.1)	1.8 (0.9)	0.030
Nasal obstruction	2.5 (1.3)	0.5 (0.5)	0.001
Group 2			
Sneezing	1.9 (0.8)	0.8 (0.6)	0.007
Rhinorrhea	2.8 (0.9)	1.6 (0.9)	0.003
Nasal obstruction	3.0 (0.9)	0.6 (0.7)	0.002

transient numbness of the upper teeth. In Group 1, no complications were noted.

4. Discussion

Transnasal resection of the posterior nasal nerve (TRPN) is known to be an effective procedure to treat intractable AR unresponsive to medical therapy. It is especially effective for patients with severe rhinorrhea because the interruption of parasympathetic nerve fibers suppresses nasal secretion. Since the posterior nasal nerve also contains afferent sensory fiber supplying the posterior half of the mucosa in the nasal cavity, sneezing can be reduced. Recently, TRPN has been being carried out by a trans-turbinate approach combined with inferior turbinoplasty. Ikeda et al. called it “functional inferior turbinoplasty” and showed satisfactory results in patients with intractable AR [7].

Submucous turbinectomy reduces the volume of the congested inferior turbinate, resulting in improvement of nasal obstruction. It preserves epithelium and ciliary function with scar formation in the lamina propria. The scar formation decreases the number of nasal glands and vessels, resulting in a decrease in rhinorrhea. Therefore, turbinoplasty has also been thought to be effective for rhinorrhea and sneezing [5].

In the last two decades, endoscopy has been widely used in sinonasal surgeries, and turbinoplasty with submucosal reduction has been performed endoscopically. This procedure

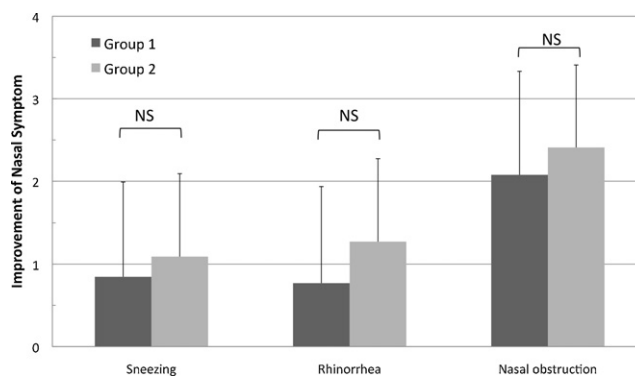


Fig. 3. Improvement in nasal symptom scores after surgery. NS, not significant.

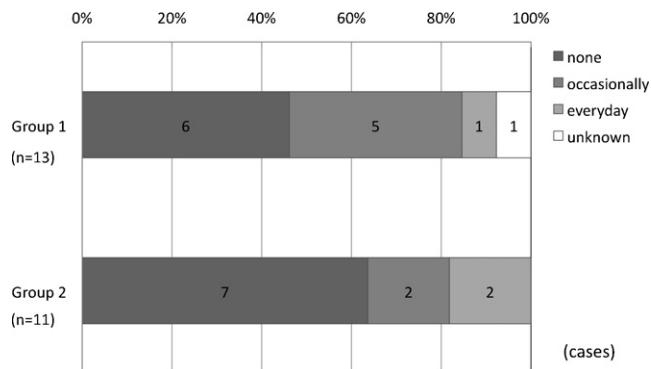


Fig. 4. Drug therapy after surgery. The percentages of medication-free patients are 50% in Group 1 and 64% in Group 2, respectively; the difference is not significant.

clearly identifies the peripheral branches of the posterior nasal nerve, which are usually running along with vessels in the inferior turbinate bone. Mori et al. mentioned that surgically induced damage to this peripheral nerve fiber during removal of the turbinate bone might be a major factor in improving allergic symptoms after submucous turbinectomy [5]. Therefore, we postulated that selective resection of peripheral branches of the posterior nasal nerve (SRPN) could reduce allergic symptoms as well as TRPN.

In this study, SRPN was performed through the inferior turbinate (Group 1). In Group 2, TRPN was performed in combination with SRPN. Both groups had significant improvement in symptoms including sneezing and rhinorrhea without major complications. Comparing the groups, there was no significant difference in the improvement in symptom scores. The results suggest that SRPN represents a treatment option for intractable AR. SRPN has some advantages: it is technically easier and less invasive, and it can therefore be performed under local anesthesia. Furthermore, postoperative hemorrhage occurred rarely. On the other hand, TRPN sometimes causes postoperative hemorrhage, especially from the sectioned sphenopalatine artery.

The mean improvements of three nasal symptoms in Group 2 were higher than those in Group 1, although there was no significant difference (Fig. 3). The posterior half of the middle turbinate is supplied by the posterior nasal nerve. Since the middle turbinate also harbors abundant submucosal glands [8], SRPN cannot reduce the hypersecretion from the posterior part of the middle turbinate. On the other hand, resection of the posterior nasal nerve trunk at the sphenopalatine foramen results in denervation of the branches to the middle turbinate and nasal septum. This may be one of the reasons why the patients who underwent SRPN combined with TRPN (Group 2) had higher average in improvement of three symptoms, especially of rhinorrhea. However, the middle turbinate has a much smaller surface area than the inferior turbinate. This might explain why there was no significant difference between the two groups.

Since this was a short-term study and the number of the cases was limited, further study is necessary to evaluate the

effects of SRPN with turbinoplasty. Nevertheless, it did show that less invasive SRPN with turbinoplasty is as effective as TRPN, and it should be considered as a treatment option for severe allergic rhinitis.

5. Conclusions

In inferior turbinoplasty, we can visualize peripheral branches of the posterior nasal nerve if the periosteum is elevated carefully under endoscopic surgery. In this study, resection of the branches (SRPN) with submucous turbinectomy was shown to be a safe, useful, and efficient approach to patients with AR unresponsive to medical therapy. It is less invasive and an easier procedure, which can reduce not only nasal obstruction but also sneezing and rhinorrhea. Although this is a short-term study, the results of this study suggest that SRPN represents one of the treatment options for intractable AR.

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