

# Long-term Results of Bilateral Endoscopic Vidian Neurectomy in the Management of Moderate to Severe Persistent Allergic Rhinitis

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**Objective:** To evaluate the long-term efficacy of bilateral endoscopic vidian neurectomy in the management of moderate to severe persistent allergic rhinitis.

**Design:** A prospective reassessment of the postoperative long-term results of bilateral endoscopic vidian neurectomy using the Rhinoconjunctivitis Quality of Life Questionnaire and visual analog scale for patients with moderate to severe persistent allergic rhinitis.

**Setting:** University hospital.

**Patients:** A total of 236 patients with moderate to severe persistent allergic rhinitis were divided into the following 3 treatment groups: those who underwent bilateral endoscopic vidian neurectomy (group 1, n=93), those who underwent partial inferior turbinectomy and/or septoplasty (group 2, n=51), and those who received conservative therapy (controls, n=92).

**Main Outcome Measure:** The patients' quality of life was assessed at 6 months, 1 year, and 3 years after undergoing the initial selected treatments for moderate to

severe persistent allergic rhinitis. The complications were observed after treatment.

**Results:** Data from 199 of 236 patients who had complete follow-up documents were statistically analyzed. The average posttreatment bilateral endoscopic vidian neurectomy scores of the Rhinoconjunctivitis Quality of Life Questionnaire and visual analog scale were significantly improved at 6 months, 1 year, and 3 years compared with pretreatment scores for group 1 ( $P < .00$ ) and for those in groups 2 and 3 during the same period. By the patient's self-evaluation posttreatment, the percentages of much improved, improved, and not improved was 64.7% (55 cases), 24.7% (21 cases), and 10.6% (9 cases), respectively. The percentages were significantly higher for those in group 1 than for those in group 2 ( $P < .05$ ). No severe complication occurred in all 3 patient groups.

**Conclusion:** In the hands of a well-trained surgeon bilateral endoscopic vidian neurectomy is an effective and safe technique in the management of moderate to severe persistent allergic rhinitis.

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**A**LLERGIC RHINITIS IS A NON-infectious inflammation of the airway mediated by IgE when an allergen, such as pollen or dust, is inhaled by an individual with a sensitized immune system and is expressed in a series of symptoms, such as itching, sneezing, rhinorrhea, and nasal obstruction. The recommendations for allergic rhinitis and its effect on asthma have suggested a stepwise therapeutic approach depending on a new classification for allergic rhinitis.<sup>1</sup> The new classification mainly includes avoidance of the allergens and treatment with medications and specific immunotherapy. Surgical treatment was not considered by this 2008 update. The lack of evidence-based medicine might be one of the causes for this oversight.

Since Golding-Wood<sup>2</sup> reported vidian neurectomy as an operative therapy for vasomotor rhinitis in 1961, this method has been performed for allergic rhinitis since the 1970s, and dramatic clinical effects have been reported.<sup>3-5</sup> Because of irreversible complications, the original technique was abandoned in the beginning of the 1980s. Long-term results varied according to different authors.<sup>6,7</sup> However, the mechanism had not fully been elucidated.

Chen and Tan<sup>8</sup> developed an endoscopic vidian neurectomy for vasomotor rhinitis in 1996 and reported satisfactory clinical outcomes. Chen and Tan's findings were consistent with the reports by Robinson and Wormald.<sup>9</sup> Our objective was to evaluate bilateral endoscopic vidian neurectomy as a therapy for nasal allergy. Therefore, we prospectively reas-

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**Table 1. Basic Information of 199 Patients With Moderate to Severe Persistent Allergic Rhinitis**

Group <sup>a</sup>	Sex, No.		Age, Mean (SD), y	History, Mean (SD), y
	Male	Female		
1	39	47	32.2 (12.5)	8.2 (4.4)
2	21	25	34.9 (13.8)	7.2 (4.3)
3	30	38	29.8 (15.1)	6.9 (3.5)
F or $\chi^2$ value	$\chi^2=0.13$		F=2.03	F=2.50
P value	.90		.10	.07

<sup>a</sup>Group 1 indicates those who underwent bilateral endoscopic vidian neurectomy; group 2, those who underwent septal plasty and/or partial inferior turbinectomy; and group 3, those who were treated with a combination of a steroidal nasal spray and oral antihistamine for 3 months.

sessed the postoperative long-term results using the Rhinoconjunctivitis Quality of Life Questionnaire (RQLQ) and visual analog scale (VAS).

## METHODS

### PATIENTS

A total of 236 patients with moderate to severe persistent allergic rhinitis<sup>1</sup> was selected from January 1, 2005, through January 31, 2008. The patients' ages ranged from 14 to 65 years. This study was approved by the Institutional Ethical Committee in the Third Xiangya Hospital, Central South University, Hunan, China. The skin prick test was carried out for allergen screening (ALK-Abello kit), and a positive reaction to *Dermatophagoides farinae* and *Dermatophagoides pteronyssinus* was present in all the patients. Positive test results for pollens, animal hair, fungus, and other allergens was noted for 84 patients (34.1%). All the patients were dissatisfied with a combination of steroid and antihistamine therapy for at least 2 years, and their symptoms significantly impacted their quality of life (QOL). Two hundred thirty-six eligible patients were divided into 3 treatment groups. First, physicians introduced the following 3 therapeutic methods in detail for selected patients: bilateral endoscopic vidian neurectomy (group 1), partial inferior turbinectomy and/or nasal septal plasty (group 2), and conservative treatment ([control] group 3), including oral antihistamines and local nasal steroid spray, among others. Second, the patient selected 1 of the 3 treatments. Of the 236 patients, 93 chose bilateral endoscopic vidian neurectomy, 51 patients chose partial inferior turbinectomy and/or nasal septoplasty, and 92 patients chose conservative treatment. As follow-up ended in January 2011, 199 patients were followed up for longer than 3 years (range, 3-6 years), that is, 85 patients were in group 1, 46 patients were in group 2, and 68 patients were in group 3. Thirty-seven patients were lost to follow-up because of changes in telephone numbers and residences. Basic information of all the patients is summarized in **Table 1**. No significant difference was noted in sex, age, and medical history between the 3 groups ( $P > .09$ ).

### TREATMENTS

#### Group 1: Endoscopic Vidian Neurectomy

Bilateral endoscopic vidian neurectomy was performed using general anesthesia and oral tracheal intubation. The patient was supine on the operating table with his or her head slightly lowered. The procedure was conducted using guided imaging through a wide-angle endoscope (0°, 4 mm) as previously described.<sup>8</sup> Briefly, a 2-cm curved incision was made along the posterior outer

edge of the middle turbinate attachment that reached to the sphenoid bone. The mucoperiosteal was stripped toward the outside using a periosteal dissector until the posterior margin of the sphenopalatine foramen was exposed. The pterygoid canal is located in the inferior outer edge of the sphenoid bone, and its horn-shaped opening is on the posterior edge of the sphenopalatine foramen. After exposure of the opening of the pterygoid canal, the nerve was cut with a sickle-shaped blade and electronically coagulated. The soft tissue, nerves, and vessels were coagulated and removed in front of the pterygoid canal until the opening of bone-ptyergoid canal was completely exposed. An oil gauze was packed in the nasal cavity. One week after the operation, the Shimmer test was used to determine whether the pterygoid canal nerve was cut off.<sup>8</sup> **Figure 1** A-C shows a series of computed tomographic images of the pterygoid canal. Figure 1D and E show the incision and adjacent anatomical landmarks.

#### Group 2: Septal Plasty and/or Partial Inferior Turbinectomy

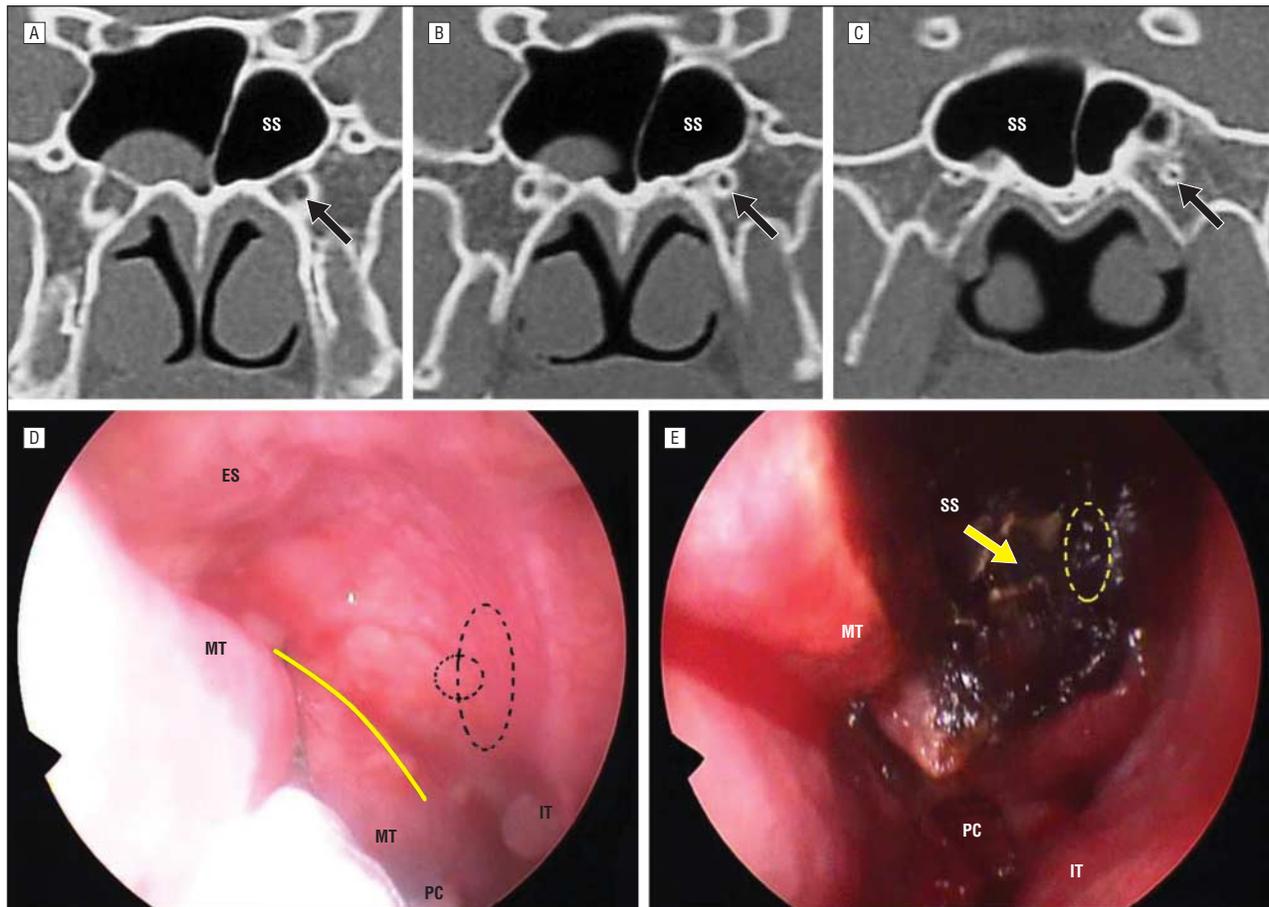
The procedure was also conducted using guided imaging through a wide-angle endoscope. An incision was made on the left side of the septum, and the mucoperichondrium was separated on both sides. The anterior, inferior, and posterior edges of the cartilage were cut and pushed to the right side using a septum distraction device. The bony deviation of the premaxilla and/or the vomer (crista and/or spine) was carefully separated and removed. The septal cartilage and the mucoperiosteal flap were replaced. Finally, the posterior of the inferior turbinate was resected. A steroidal nasal spray was routinely used for 1 month by these patients.

#### Group 3: Conservation (Control)

These patients were treated with a combination of a steroidal nasal spray and oral antihistamine for 3 months.

### FOLLOW-UP

All the patients were asked for clinic review at 6 months, 1 year, and 3 years after undergoing the initial selected treatment. To improve patient follow-up rates, specialty nurses regularly conducted telephone interviews with all the patients. During each clinic review, in addition to conventional examination of the nasal cavity, each patient was required to complete the Rhinoconjunctivitis Quality of Life Questionnaire (RQLQ) and visual analog scale (VAS) to evaluate his or her QOL.<sup>10</sup> The use of antiallergic medicine was recorded. At the end of follow up in January 2011, patients were required to subjectively assess the degree of symptom improvement 3 to approximately 6 years after the initial treatment. The degree of long-term improvement in symptoms was subdivided into the following 3 cat-



**Figure 1.** Representative computed tomographic view of the pterygoid canal and operative schematic diagram. A-C, A computed tomographic series of the pterygoid canal from the anterior to posterior positions showing the relation between the pterygoid canal, sphenoid sinus (SS), and round canal. Black arrows indicate the pterygoid canal. D, Incision and anatomical surroundings. Yellow curved line indicates an incision; the oval, the location of sphenopalatine foramen; and the circle, the location of pterygoid canal. ES indicates ethmoid sinus; IT, inferior turbinate; MT, middle turbinate; and PC, posterior choana. E, The yellow arrow indicates the horn-shaped pterygoid canal; IT, inferior turbinate; MT, middle turbinate; SS, sphenoid sinus; and PC, posterior choana.

egories: much improved, improved, and not improved. Those in the much improved group included patients who had been asymptomatic or had mild symptoms after treatment with no impact on QOL. Those in the improved group included patients whose symptoms were significantly improved, but QOL was still affected. Those in the not improved group included patients whose symptoms were slightly improved or worsen, and QOL was seriously affected.

### STATISTICAL ANALYSIS

Data were analyzed using the SPSS, version 13.0, statistical package (SPSS Inc). One-way analysis of variance and the Mann-Whitney test were used for comparative analysis of the QOL scores and the overall degree of symptom improvement. Statistical significance was set at  $P < .05$ .

## RESULTS

### COMPARISON OF THE RQLQ AND VAS SCORES IN THE 3 GROUPS

A total of 199 of 236 patients have been followed up for 3 to approximately 6 years and completed the RQLQ and VAS at each follow-up visit at 6 months, 1 year, and 3 years.

**Table 2** summarizes the average RQLQ and VAS scores

for each group before the initial treatment. No significant difference was noted between groups ( $P > .05$ ). Among the subitems of the RQLQ, only the score for non-hay-fever symptoms in group 3 was significantly lower than those for the other 2 groups ( $P < .05$ ). No significant difference was noted in 6 of 7 subitems between the 3 groups ( $P > .05$ ). The QOL scores showed dynamic changes occurred in patients with moderate to severe allergic rhinitis after undergoing the 3 different treatments.

Compared with the preoperative scores, the RQLQ and VAS scores in patients with severe to moderate allergic rhinitis were significantly lower at 6 months, 1 year, and 3 years after undergoing bilateral endoscopic vidian neurectomy (group 1,  $P < .05$ ) or septoplasty and/or partial inferior turbinectomy (group 2,  $P < .05$ ). Both RQLQ and VAS scores of group 3 controls were not significantly changed in the follow-up period (**Table 3**).

The RQLQ and VAS scores at 6 months, 1 year, and 3 years after treatments in groups 1 and 2 were significantly lower than those for group 3. This finding indicated that the surgical treatments could significantly improve the symptoms and QOL for patients with moderate to severe persistent allergic rhinitis.

The dynamic QOL changes demonstrated that both RQLQ and VAS scores were increased slightly in group 1

**Table 2. The RQLQ and VAS Scores Before the Initial Treatment in the 3 Groups**

Subitems	Group <sup>a</sup>			P Value
	1 (n=85)	2 (n=46)	3 (n=68)	
RQLQ				
Nasal symptom	4.06 (1.11)	3.89 (1.23)	3.91 (1.05)	.66
Eye symptom	0.89 (0.77)	0.84 (0.76)	0.96 (0.85)	.66
Non-hay-fever symptom	1.78 (1.45)	1.87 (1.34)	1.26 (1.03)	.03 <sup>b</sup>
Activities	3.21 (0.98)	3.43 (0.79)	2.98 (1.51)	.06
Sleep	0.86 (0.81)	0.75 (0.64)	0.96 (0.83)	.50
Practical problems	4.08 (0.89)	3.87 (1.25)	3.91 (1.11)	.54
Emotional function	1.61 (0.72)	1.52 (0.79)	1.73 (0.51)	.12
Total score	2.27 (0.52)	2.34 (0.61)	2.23 (0.69)	.70
VAS score	7.41 (1.19)	6.98 (1.26)	7.12 (1.28)	.30

Abbreviations: RQLQ, rhinoconjunctivitis quality of life questionnaire; VAS, visual analog scale.

<sup>a</sup>Group 1 indicates those who underwent bilateral endoscopic vidian neurectomy; group 2, those who underwent septoplasty and/or partial inferior turbinectomy; and group 3, those who were treated with a combination of a steroidal nasal spray and oral antihistamine for 3 months. Data are given as mean (SD).

<sup>b</sup> $P < .05$ .

**Table 3. Dynamic Changes in the RQLQ and VAS Scores in Patients With Allergic Rhinitis Treated With Surgery or Medications<sup>a</sup>**

Group <sup>b</sup>	Baseline	Length of Follow-up		
		6 mo	1 y	3 y
		<b>RQLQ</b>		
1 (n=85)	2.27 (0.52)	0.83 (0.42) <sup>c,d</sup>	0.95 (0.36) <sup>c,d</sup>	1.08 (0.49) <sup>c,d</sup>
2 (n=46)	2.34 (0.61)	1.21 (0.51) <sup>c</sup>	1.71 (0.51) <sup>c</sup>	1.79 (0.58) <sup>c</sup>
3 (n=68)	2.23 (0.69)	1.96 (0.62)	2.05 (0.49)	2.06 (0.61)
F value	0.35	70.42	73.67	58.14
P value	.71	<.001	<.001	<.001
		<b>VAS</b>		
1 (n=58)	7.41 (1.19)	2.47 (1.51) <sup>c,d</sup>	2.59 (1.71) <sup>c,d</sup>	2.83 (1.67) <sup>c,d</sup>
2 (n=35)	6.98 (1.26)	4.23 (1.82) <sup>c</sup>	5.45 (2.58) <sup>c</sup>	5.98 (2.19) <sup>c</sup>
3 (n=52)	7.12 (1.28)	6.65 (1.75)	6.69 (1.81)	6.91 (1.79)
F value	1.19	84.30	64.53	68.62
P value	.31	<.001	<.001	<.001

Abbreviations: RQLQ, Rhinoconjunctivitis Quality of Life Questionnaire; VAS, visual analog scale.

<sup>a</sup>Data are given as mean (SD) unless otherwise indicated.

<sup>b</sup>Group 1 indicates those who underwent endoscopic vidian neurectomy; group 2, those who underwent septoplasty and/or partial inferior turbinectomy; and group 3, those who were treated with a combination steroidal nasal spray and oral antihistamine for 3 months.

<sup>c</sup>Compared with baseline,  $P < .05$ .

<sup>d</sup>Compared with group 2,  $P < .001$ .

( $P > .05$ , Table 3) and significantly increased in group 2 ( $P < .001$ , Table 3) at 1 and 3 years, respectively, when compared with the 6-month postoperative scores. This finding indicated that bilateral endoscopic vidian neurectomy has a long-term efficacy for allergic rhinitis, whereas, septoplasty and/or partial turbinectomy has only short-term efficacy for allergic rhinitis.

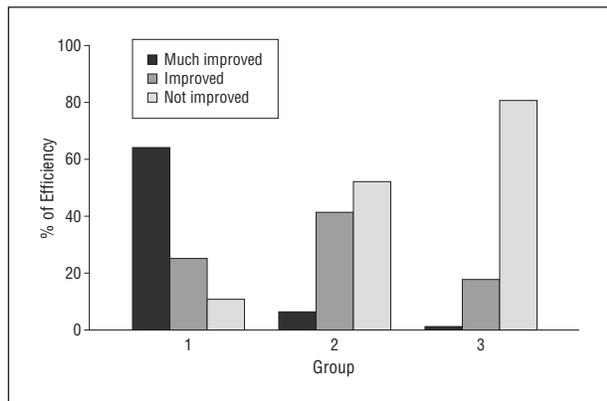
#### THE OVERALL EFFICACY OF TREATMENTS BY PATIENTS' SELF-EVALUATION

At the end of the follow-up period, all the patients were required to make subjective judgments on the efficacy of their chosen treatment for moderate to severe persistent allergic rhinitis. The results showed that the rates of much improved and improved were 64.7% (55 of 85) and 24.7% (21 of 85) in group 1, 6.5% (3 of 46) and 41.3% (19 of 46) in group 2, and 1.5% (1 of 68) and 17.6% (12

of 68) in group 3, respectively. However, the rate of not improved was 10.6% (9 of 85), 52.2% (24 of 46), and 80.9% (55 of 68) in groups 1 through 3, respectively. The Mann-Whitney test was used for comparison analysis. The results demonstrated that the efficacy of both surgical treatment groups (groups 1 and 2) was better than for the control group (group 3) ( $P < .05$ , **Figure 2**), whereas the efficacy of the bilateral endoscopic vidian neurectomy (group 1) was significantly higher than the efficacy of the septoplasty and/or partial inferior turbinate surgery (group 2) ( $P < .05$ , **Figure 2**).

#### SURGICAL COMPLICATIONS

Twenty-six of 85 patients (30.6%) who underwent bilateral endoscopic vidian neurectomy experienced dry eye shortly after being operated on, and this symptom resolved after 1 month of treatment with sodium hyaluro-



**Figure 2.** The overall efficacy rate of the 3 patient groups by self-evaluation for moderate to severe persistent allergic rhinitis. At the end of follow up in January 2011, all the patients were required to self-evaluate the overall efficacy into the following 3 categories: much improved (that the patient had been asymptomatic or had mild symptoms after treatment and there was no impact on the quality of life), improved (that the patient's symptoms were significantly improved but still affected his or her quality of life), or not improved (that the symptoms were improved slightly or worsened, and the symptoms seriously affected his or her quality of life).

nate eye drops. Seven female patients (8.2%) reported that they had no tears while crying or in times of postoperative sadness. Numbness in the upper lip/palate occurred in 8 patients (9.4%), and it resolved within 1 postoperative year with no special treatment. Thirteen patients (15.3%) had mild nasal dryness. No postoperative bleeding, oculomotor, abducens nerve damage, or other severe complications were noted. Of 46 patients who underwent septal plasty and/or partial inferior turbinectomy, 2 patients (4.3%) reported having dry eyes; 5 patients (10.9%) reported having nasal dryness.

#### COMMENT

Allergic rhinitis, a systemic disease, is an IgE-mediated inflammation of the nasal mucosa. However, the 4 main symptoms that distress the patient who has persistent allergic rhinitis are associated with dysfunction of the autonomic and sensory nerve imbalance in nasal mucosa. Parasympathetic nervous excitement may cause nasal vasodilation and glandular secretion of mucosa and is expressed as nasal obstruction and watery rhinorrhea. Trigeminal nerve endings may be stimulated by the release of histamine or allergens and may cause nasal itching, sneezing, and other related symptoms. Studies have found that increases of some neuropeptides in nasal mucosa were correlated with symptoms of allergic rhinitis,<sup>11</sup> such as substance p, calcitonin gene-related peptide, vasoactive intestinal peptide, and the neuropeptide acid network. In the present study, data of the RQLQ survey showed that symptoms of watery discharge and nasal obstruction were significantly improved in patients with moderate to severe persistent allergic rhinitis after undergoing bilateral endoscopic vidian neurectomy. Concurrently, sensory nerve-related symptoms, such as nasal itching and sneezing, were also significantly improved. Improvement of sensory nerve-related symptoms may be caused by severing the trigeminal nervous branches around the pterygoid canal during the operation.

Bilateral endoscopic vidian neurectomy displayed a marked short-term effect for symptoms of allergic rhinitis in 100% of cases,<sup>12</sup> while the long-term efficacy varied according to various study findings.<sup>2,13-15</sup> Golding-Wood<sup>2</sup> and Fernandes<sup>13</sup> have reported that the long-term efficacy rate of vidian neurectomy through a maxillary sinus approach was as high as 95.8% and 88%, respectively. Electrocautery of the vidian nerve also showed a long-term efficacy rate of 59% in the treatment of allergic rhinitis.<sup>14</sup> However, Yin<sup>15</sup> reported that the 1-year recurrence rate of symptoms in allergic rhinitis was 66.7% after vidian neurectomy, and the 5-year recurrence rate reached 85.7%. The difference between authors' findings might be caused by different surgical techniques or evaluation tools. Herein, we demonstrated the result of a prospective case-control study in which the long-term efficacy of bilateral endoscopic vidian neurectomy was evaluated using the RQLQ and VAS scores in patients with moderate to severe persistent allergic rhinitis. Compared with the control group or the group who underwent septal plasty and/or partial inferior turbinectomy, both QOL and symptoms of allergic rhinitis were significantly improved after 3 to 6 years of follow-up after undergoing bilateral endoscopic vidian neurectomy. The long-term overall efficacy of patients who underwent bilateral endoscopic vidian neurectomy showed that the much improved rate was 64.7%, the improved rate was 24.7%, and the not improved rate was 10.6%. Efficacy was significantly better for those who underwent bilateral endoscopic vidian neurectomy. These results further confirmed that bilateral endoscopic vidian neurectomy is an effective method for improving the QOL for patients with moderate to severe persistent allergic rhinitis. The focus of clinical research should further improve the surgical technique, increase the success rate of surgery, and reduce trauma and complications.

Since vidian neurectomy has been reported by Golding-Wood<sup>2</sup> to treat rhinitis, several different approaches to pterygoid canal nerve were introduced, for example, transmaxillary sinus, transeptum, and transpalatine among other options. Although these surgical procedures demonstrated a significant therapeutic effect, some serious complications (eg, severe dry eye, facial numbness, permanent blindness, and abducens nerve palsy) have been reported in some patients.<sup>16,17</sup> Therefore, this technique was not recommended for the management of allergic rhinitis. The introduction of nasal endoscopic surgery resulted in more accurate endoscopic recognition of sphenopalatine foramen, pterygoid canal, and the surrounding vital anatomical structures. In most cases, not only both the pterygoid canal nerve stump and surrounding soft tissue were precisely removed under direct guided imaging, but also damage to the neighboring vital structures, such as the sphenopalatine artery, sphenopalatine ganglion, orbital structures, and the optic nerve, was avoided.<sup>8,9,18</sup> To avoid severe complications, (eg, damages to the sphenopalatine artery), it is important to spare the mucoperiosteum of the sphenoid bone. Complications reported herein demonstrated that 26 of 85 patients (30.6%) experienced mild dry eye shortly after surgery; however, their dry eye resolved 2 months after surgery. Seven female patients (8.2%) reported that there

were no tears when they cried or while they were sad after surgery. Numbness in the upper lip/palate occurred in 8 patients (9.4%); within 1-year postsurgery, the numbness resolved with no special treatment. Thirteen patients (15.3%) had mild nasal dryness. No serious complication occurred in these patients. In conclusion, we suggest that bilateral endoscopic vidian neurectomy could be a safe procedure if the surgeon were well trained.

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**Author Contributions:** Dr Tan had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. *Study concept and design:* Tan. *Acquisition of data:* Ma, H. Li, and W. Li. *Analysis and interpretation of data:* Tan and Wang. *Drafting of the manuscript:* Tan, Ma, H. Li, W. Li, and Wang. *Critical revision of the manuscript for important intellectual content:* Tan. *Statistical analysis:* Wang. *Administrative, technical, and material support:* Tan, Ma, H. Li, and W. Li. *Study supervision:* Tan.

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