Posterior nasal nerve neurectomy in allergic rhinitis

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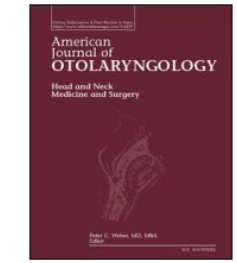

Posterior nasal nerve surgical neurectomy versus ablation for chronic rhinitis

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Q2

Background

- Chronic rhinitis (CR) affects quality of life.
- 20% of patients are refractory to medications.(intranasal corticosteroids, antihistamines, and anticholinergics)
- PNN(post nasal neurectomy) and ablation are procedural alternatives.

Introduction

- RF ablation is associated with improvement of rhinitis symptoms and quality of life at 3 months and 6 months, and a prospective study of 129 patients reports a minimal clinically important improvement of symptoms in 80.3 % of patients at 3 months at 87.7 % of patients at 6 months

Yu AJ, Tam B, Wrobel B, Hur K. Radiofrequency neurolysis of the posterior nasal nerve: a systematic review and meta-analysis. Laryngoscope 2023.

Introduction

- A pooled analysis of two randomized controlled trials found improvement with PNN ablative procedures like RF ablation or cryotherapy

Balai E, Gupta KK, Jolly K, Darr A. Posterior nasal nerve neurectomy for the
treatment of rhinitis: a systematic review and meta-analysis. Eur Ann Allergy Clin
Immunol 2023;55:101–14.

Posterior Nasal Nerve Approaches

- Ablation: In-office(LA), cryotherapy or radiofrequency.
- Neurectomy: Surgical cutting of posterior nasal nerve(GA).

Study Aim (Human Study)

- Compare clinical outcomes of:
  - In-office PNN ablation
  - Surgical PNN neurectomy

Methods - Patient Selection

- retrospective
- 55 patients (2013-2024), 28M+27F, mean age:59
- Inclusion criteria
  - Chronic rhinitis
  - Allergic rhinitis
  - Cryo or RFA or surgical neurectomy
- Exclusion criteria
  - concurrent sinus surgery
  - absence of pre and post op outcome data

Methods - Procedures

- Cryoablation (ClariFix®)
- RF Ablation (RhinAer™)
- Surgical Neurectomy under general anesthesia

cryoablation

- https://www.youtube.com/watch?v=SnIIc7K_Ybw

Technique- surgical neurectomy

1. PNN branches within both the middle meatus and inferior meatus.
2. Vertical mucosal incision was made on the palatine bone anterior to the posterior attachment of the middle turbinate
3. Submucoperiosteal elevation
4. PNN branches were then divided using both bipolar cautery and sharp dissection

Technique- surgical neurectomy

5. The submucoperiosteal elevation then continued posterior to the sphenopalatine foramen, to divide additional PNN branches.
6. submucoperiosteal elevation was then carried out posteriorly to divide any inferior PNN branches exiting from the palate and pterygoid bone into the inferior turbinate
7. The mucosal flaps were then returned to their native position.

Technique- surgical neurectomy

1. https://www.youtube.com/watch?v=R6XiUofjMuY

Methods - Outcome Measurement

- Outcome: SNOT-22 total score
- SNOT-22 rhinologic subdomain score
  - need to blow nose
  - sneezing
  - runny nose
  - nasal obstruction
  - loss of smell
  - cough
  - postnasal discharge
  - thick nasal discharge

1. 需要時常擤鼻涕	○ 沒有問題	○ 很輕微	○ 輕微	○ 中度	○ 嚴重	○非常嚴重
2. 鼻塞	○ 沒有問題	○ 很輕微	○ 輕微	○ 中度	○ 嚴重	○非常嚴重
3. 打噴嚏	○ 沒有問題	○ 很輕微	○ 輕微	○ 中度	○ 嚴重	○非常嚴重
4. 流鼻水	○ 沒有問題	○ 很輕微	○ 輕微	○ 中度	○ 嚴重	○非常嚴重
5. 咳嗽	○ 沒有問題	○ 很輕微	○ 輕微	○ 中度	○ 嚴重	○非常嚴重
6. 鼻涕倒流	○ 沒有問題	○ 很輕微	○ 輕微	○ 中度	○ 嚴重	○非常嚴重
7. 黏鼻涕	○ 沒有問題	○ 很輕微	○ 輕微	○ 中度	○ 嚴重	○非常嚴重
8. 耳鳴	○ 沒有問題	○ 很輕微	○ 輕微	○ 中度	○ 嚴重	○非常嚴重
9. 頭重	○ 沒有問題	○ 很輕微	○ 輕微	○ 中度	○ 嚴重	○非常嚴重
10. 耳部疼痛	○ 沒有問題	○ 很輕微	○ 輕微	○ 中度	○ 嚴重	○非常嚴重
11. 臉部疼痛/脹痛	○ 沒有問題	○ 很輕微	○ 輕微	○ 中度	○ 嚴重	○非常嚴重
12. 嗅覺/味覺降低	○ 沒有問題	○ 很輕微	○ 輕微	○ 中度	○ 嚴重	○非常嚴重
13. 不易入睡	○ 沒有問題	○ 很輕微	○ 輕微	○ 中度	○ 嚴重	○非常嚴重
14. 半夜醒來	○ 沒有問題	○ 很輕微	○ 輕微	○ 中度	○ 嚴重	○非常嚴重
15. 夜間睡眠品質不佳	○ 沒有問題	○ 很輕微	○ 輕微	○ 中度	○ 嚴重	○非常嚴重
16. 睡不飽	○ 沒有問題	○ 很輕微	○ 輕微	○ 中度	○ 嚴重	○非常嚴重
17. 疲累	○ 沒有問題	○ 很輕微	○ 輕微	○ 中度	○ 嚴重	○非常嚴重
18. 生產力降低	○ 沒有問題	○ 很輕微	○ 輕微	○ 中度	○ 嚴重	○非常嚴重
19. 專注力降低	○ 沒有問題	○ 很輕微	○ 輕微	○ 中度	○ 嚴重	○非常嚴重
20. 沮喪/不安/易怒	○ 沒有問題	○ 很輕微	○ 輕微	○ 中度	○ 嚴重	○非常嚴重
21. 心情沮喪	○ 沒有問題	○ 很輕微	○ 輕微	○ 中度	○ 嚴重	○非常嚴重
22. 局促不安	○ 沒有問題	○ 很輕微	○ 輕微	○ 中度	○ 嚴重	○非常嚴重

Table 1
Demographic and clinical characteristics of office ablation and neurectomy cohorts.

	Total cohort ($N = 55$)	Ablation ($N = 34$)	Neurectomy ($N = 26$)	p-Value
Age	59.0 +/− 17.9	59.4 +/− 19.4	58.3 +/− 15.3	0.81
Sex (male, female)	28M, 27F	20M, 14F	11M, 15F	0.21
Chronic rhinitis subtype				
Allergic	18 (32.7 %)	14 (41.1 %)	7 (26.9 %)	0.25
Non-allergic	37 (67.3 %)	20 (58.8 %)	19 (73.1 %)	0.25
Co-morbidities				
GERD	25 (45.5 %)	15 (44.1 %)	14 (53.8 %)	0.46
Asthma	18 (32.7 %)	11 (32.4 %)	10 (38.5 %)	0.62
Smoking history				
Never	37 (67.3 %)	23 (67.6 %)	17 (65.4 %)	0.86
Former	17 (30.9 %)	11 (32.4 %)	8 (30.8 %)	0.90
Current	1 (1.8 %)	0 (0.0 %)	1 (3.8 %)	0.25
Past surgical history				
Turbinate reduction	16 (29.1 %)	8 (23.5 %)	8 (30.8 %)	0.53
Septoplasty	15 (26.0 %)	8 (23.5 %)	8 (30.8 %)	0.53
Sinus surgery	11 (20.0 %)	7 (20.6 %)	6 (23.1 %)	0.82
Medications				
Ipratropium spray	55 (100.0 %)	34 (100.0 %)	26 (100.0 %)	–
Corticosteroid spray	49 (89.1 %)	30 (88.2 %)	23 (88.5 %)	0.98
Corticosteroid rinse	33 (60.0 %)	21 (61.8 %)	15 (57.7 %)	0.75
Antihistamine spray	41 (74.5 %)	26 (76.5 %)	20 (76.9 %)	0.97
Antihistamine oral	27 (49.1 %)	17 (50.0 %)	13 (50.0 %)	1.00

Table 2

Changes in SNOT-22 total and rhinologic sub-domain scores (mean ± SD).

	Ablation (N = 34)			Neurectomy (N = 26)		
	Pre	Post	p-Value	Pre	Post	p-Value
Need to blow nose	2.7 ± 1.6 (N = 33)	2.7 ± 1.6 (N = 28)	0.96	3.3 ± 1.6 (N = 26)	2.7 ± 1.5 (N = 26)	0.14
Sneezing	1.5 ± 1.4 (N = 33)	2.3 ± 1.5 (N = 19)	0.04	1.8 ± 1.6 (N = 26)	1.4 ± 1.3 (N = 26)	0.34
Runny nose	3.1 ± 1.8 (N = 33)	2.9 ± 1.8 (N = 26)	0.73	3.4 ± 1.6 (N = 24)	2.4 ± 1.7 (N = 25)	0.04
Nasal obstruction	1.9 ± 1.5 (N = 31)	2.6 ± 1.1 (N = 18)	0.08	2.4 ± 1.8 (N = 25)	1.7 ± 1.8 (N = 24)	0.22
Loss of smell	1.2 ± 1.5 (N = 33)	2.5 ± 1.6 (N = 11)	0.01	0.5 ± 0.9 (N = 24)	0.4 ± 0.8 (N = 22)	0.59
Cough	2.1 ± 1.7 (N = 32)	2.7 ± 1.5 (N = 24)	0.14	1.9 ± 1.9 (N = 25)	1.6 ± 1.7 (N = 25)	0.58
Post-nasal discharge	3.6 ± 1.4 (N = 33)	3.4 ± 1.2 (N = 30)	0.59	4.0 ± 1.5 (N = 24)	2.9 ± 1.7 (N = 26)	0.03
Thick nasal discharge	2.2 ± 1.6 (N = 31)	3.0 ± 1.4 (N = 18)	0.08	2.7 ± 1.8 (N = 20)	2.5 ± 1.9 (N = 22)	0.73
Rhinologic subdomain	17.3 ± 6.2 (N = 34)	14.4 ± 8.9 (N = 34)	0.13	18.6 ± 5.5 (N = 26)	14.9 ± 5.9 (N = 26)	0.02
Total SNOT-22	35.3 ± 17.3 (N = 34)	30.4 ± 21.7 (N = 34)	0.31	43.3 ± 21.5 (N = 26)	33.3 ± 21.8 (N = 26)	0.10

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Loss of smell	1.2 ± 1.5 (N = 33)	2.5 ± 1.6 (N = 11)	0.01	0.5 ± 0.9 (N = 24)	0.4 ± 0.8 (N = 22)	0.59
Cough	2.1 ± 1.7 (N = 32)	2.7 ± 1.5 (N = 24)	0.14	1.9 ± 1.9 (N = 25)	1.6 ± 1.7 (N = 25)	0.58
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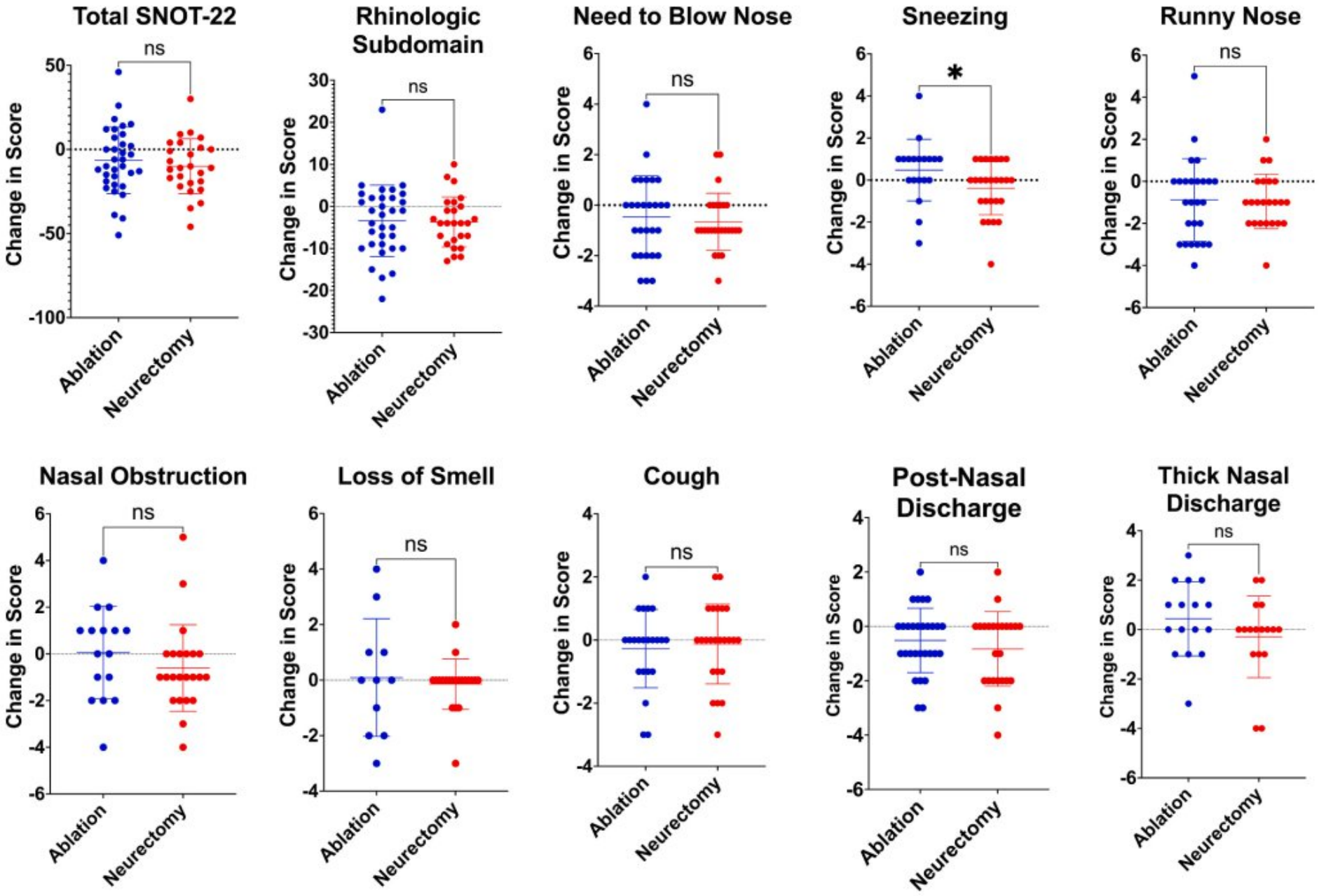


Fig. 1. Magnitude changes in SNOT-22 scores for office ablation and PNN neurectomy cohorts. ns = not significant, * = $p < 0.05$.

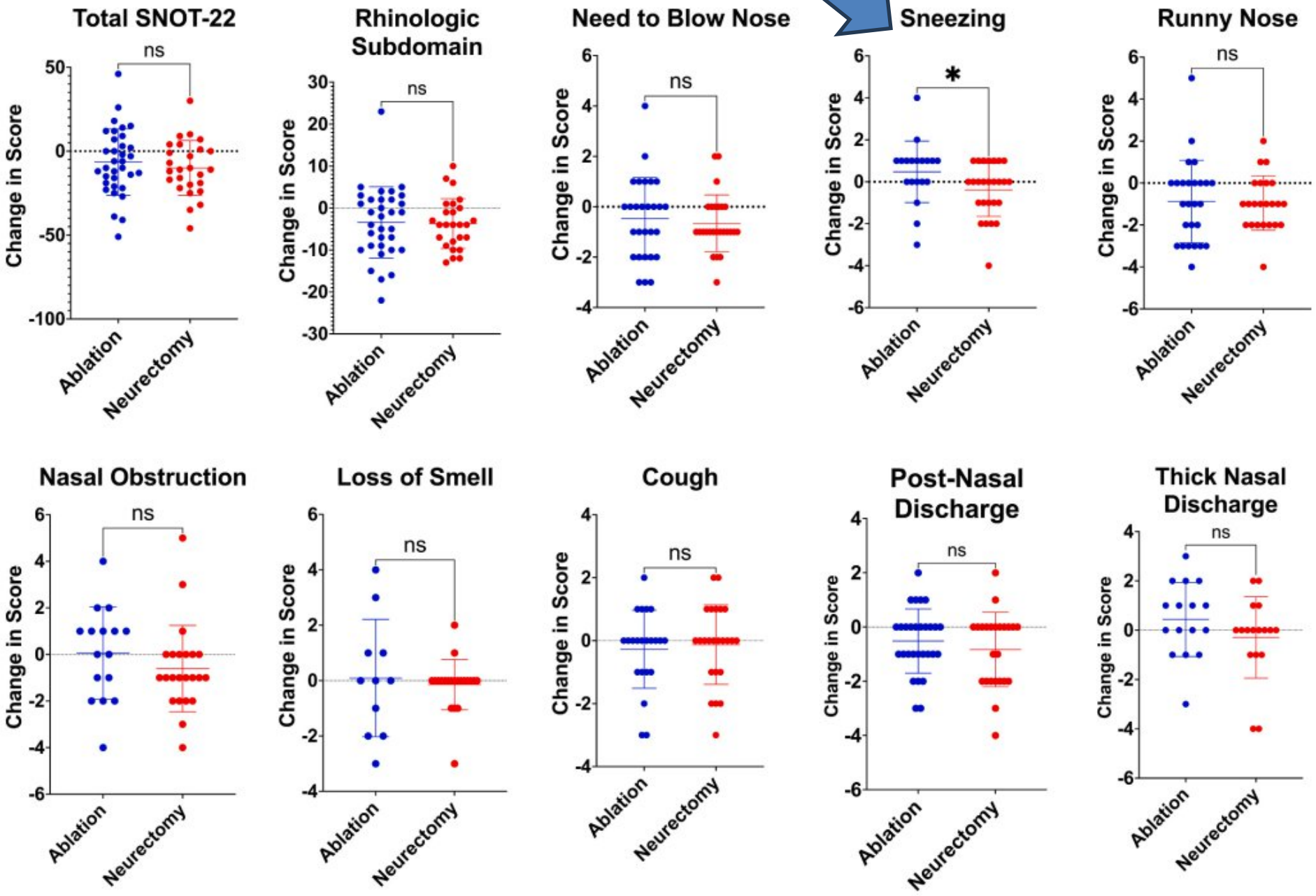


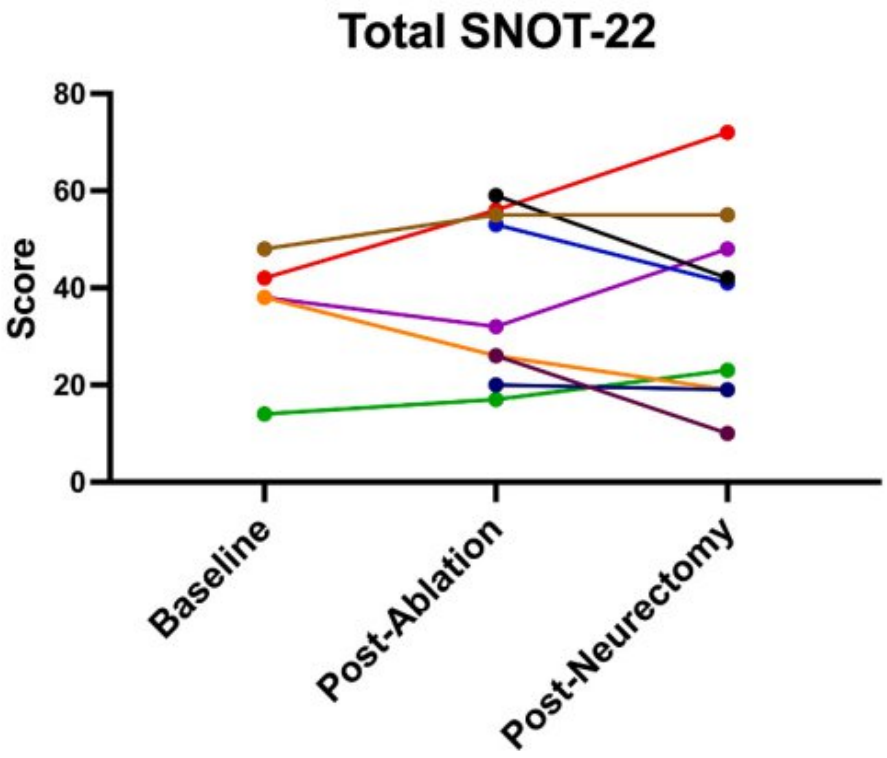
Fig. 1. Magnitude changes in SNOT-22 scores for office ablation and PNN neurectomy cohorts. ns = not significant, * = $p < 0.05$.

Comparison Summary

- Overall improvement similar
- Neurectomy better for specific symptoms(Rhinologic Subdomain, Sneezing, , post nasal drip, rhinorrhea)

Secondary Procedures

- Limited additional improvement after secondary neurectomy



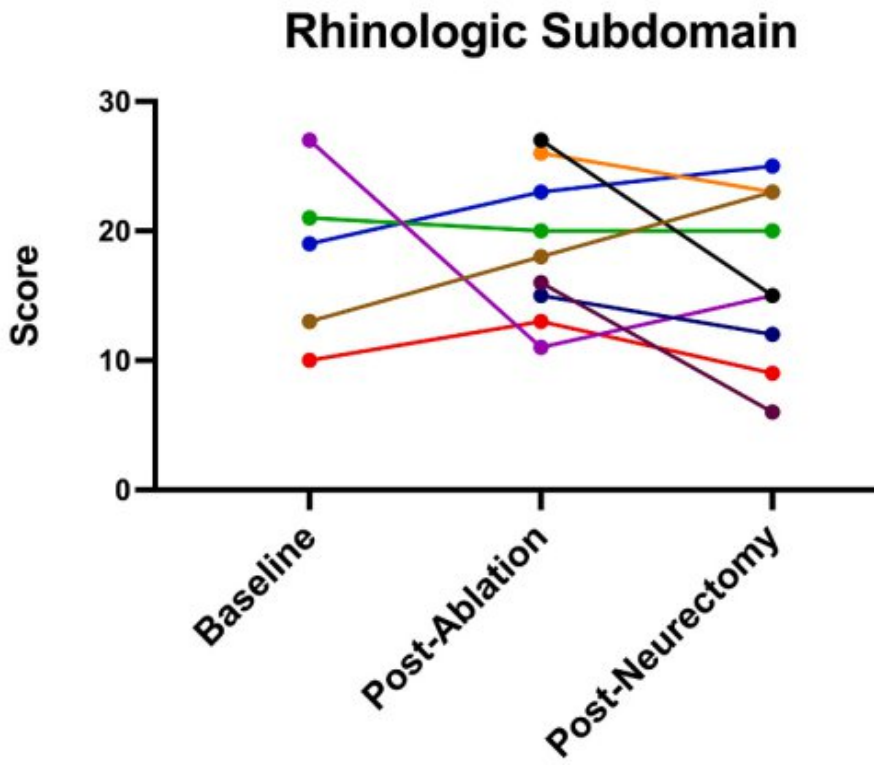


Fig. 2. Evolution of SNOT-22 scores in sub-cohort of patients receiving cryotherapy followed by PNN neurectomy.

Multivariable Analysis

- No predictive factors identified
  - allergic versus nonallergic rhinitis
  - co-morbidities like GERD and asthma
  - smoking history
  - prior sinonasal surgical history
  - medications for rhinitis.

Discussion

- One prospective study of 15 patients with allergic rhinitis who failed medical therapy showed improvement in symptoms after neurectomy, as measured by TNSS(total nasal symptoms score) at 6 months

Trivedi B, Vyas P, Soni NK, Gupta P, Dabaria RK. Is posterior nasal nerve
neurectomy really a ray of hope for the patients of allergic rhinitis. Indian J Otolaryngol Head Neck Surg 2022;74:4713–7

- Ogi et al. showed in 31 patients undergoing inferior turbinectomy and PNN neurectomy that symptom scores for sneezing, rhinorrhea, and nasal obstruction were significantly lower at 1 year compared to preoperatively using a 4-point numerical scoring system

Ogi K, Manabe Y, Mori S, Kimura Y, Tokunaga T, Kato Y, et al. Long-term effects of
combined submucous turbinectomy and posterior nasal neurectomy in patients with allergic rhinitis. SN Compr Clin Med 2019;1:540–6

Cassano et al. found that 30 patients with sphenopalatine artery ligation (including PNN neurectomy) with functional endoscopic sinus surgery (FESS) had significant improvement in rhinorrhea, sneezing, and itching at 1 and 3 years compared to FESS alone using a 4- point scoring system

Cassano M, Marioni G, Russo L, Cassano P. Sphenopalatine artery ligation with
nerve resection in patients with vasomotor rhinitis and polyposis: a prospective,
randomized, double-blind investigation. Acta Otolaryngol 2012;132:525–32.

Conclusion

- Both alleviate rhinologic symptoms of CR. Neurectomy offers benefits over in-office ablation for specific symptoms, such as sneezing.
- Did not find any clear benefit in performing a secondary neurectomy after an initial office ablation.

- Thanks for your attention

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ORIGINAL ARTICLE

The long-term outcomes of posterior nasal neurectomy with or without pharyngeal neurectomy in patients with allergic rhinitis: a randomized controlled trial

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Posterior Nasal Neurectomy With or Without Pharyngeal Neurectomy

Introduction to Allergic Rhinitis

- Allergic Rhinitis (AR) is a chronic inflammatory condition of the nasal mucosa caused by IgE-mediated response to allergens.
- by limiting nasal mucosal hypersensitivity and suppressing associated secretory activity.
- Symptoms: itching, nasal congestion, rhinorrhea, sneezing
- Often associated with asthma and chronic cough

Conventional Treatments for AR

- AR is typically managed through:
  - Second-generation antihistamines
  - Intranasal corticosteroids
  - Allergen-specific immunotherapy

Surgical Options for Refractory AR

- When conservative treatments fail, surgical interventions are considered.
  - Vidian neurectomy
  - Posterior nasal neurectomy (PNN) as a selective alternative

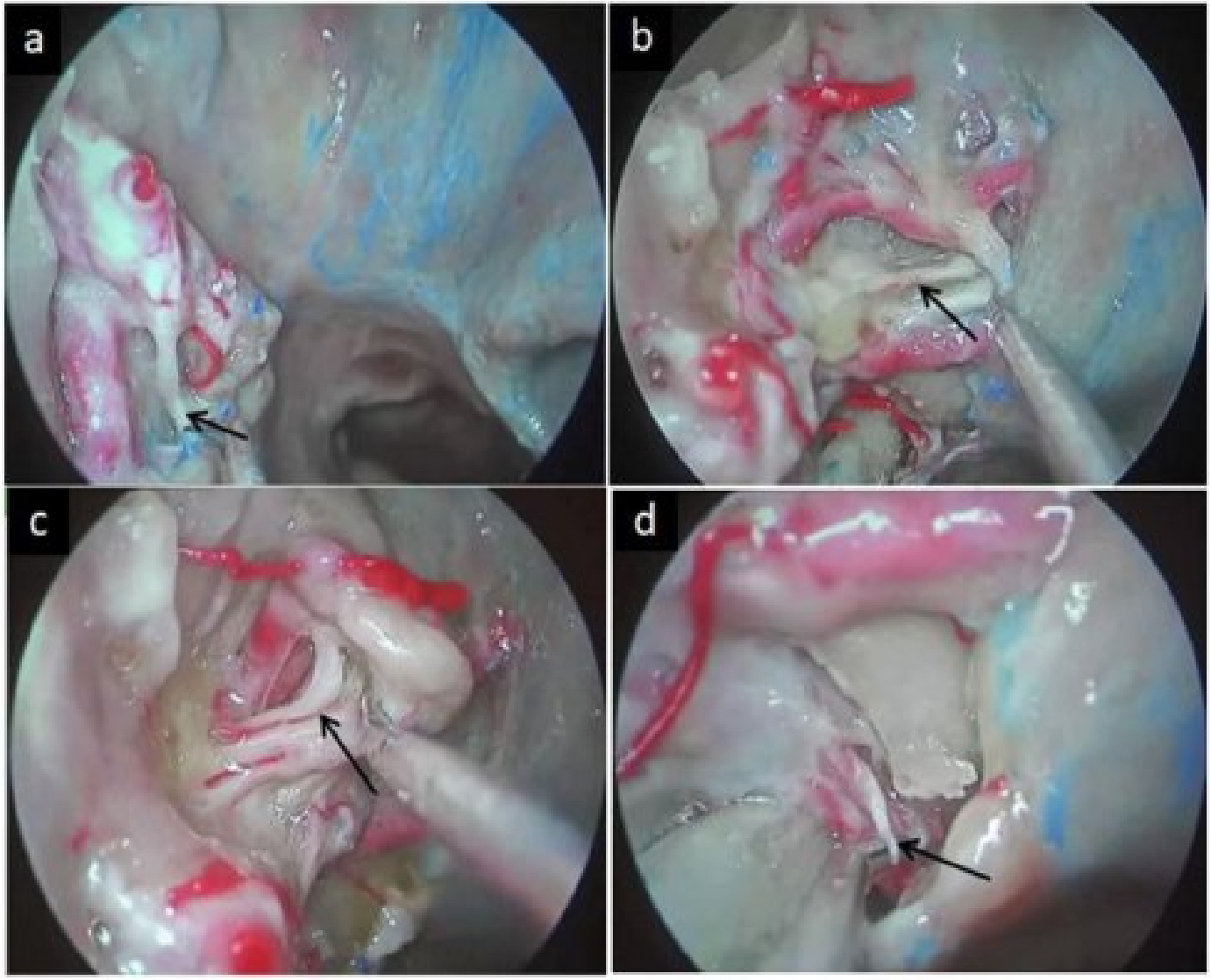


Figure 1 The posterior nasal nerve emerges from the sphenopalatine foramen and is distributed to the nasal mucosa following the branches of the sphenopalatine vessels. (a) The anteroinferior branch of the posterior nasal nerve toward the inferior turbinate. (b) The branch of the posterior nasal nerve toward the nasal septum. (c) The posterosuperior branch of the posterior nasal nerve toward the superior turbinate. (d) The pharyngeal nerve transmitted by the palatovaginal canal (PVC).

Study Objective

- To evaluate the long-term efficacy of PNN with or without pharyngeal neurectomy (PN) in treating moderate-to-severe allergic rhinitis.
- Compare symptom relief and quality of life
- Assess impact on comorbid chronic cough and asthma

Study Design

- 2016/2 ~ 2019/2
- A randomized controlled trial including 52 patients with perennial allergic rhinitis.
- Control group: PNN only
- Experimental group: PNN + PN
- Follow-up: 6, 12, and 24 months

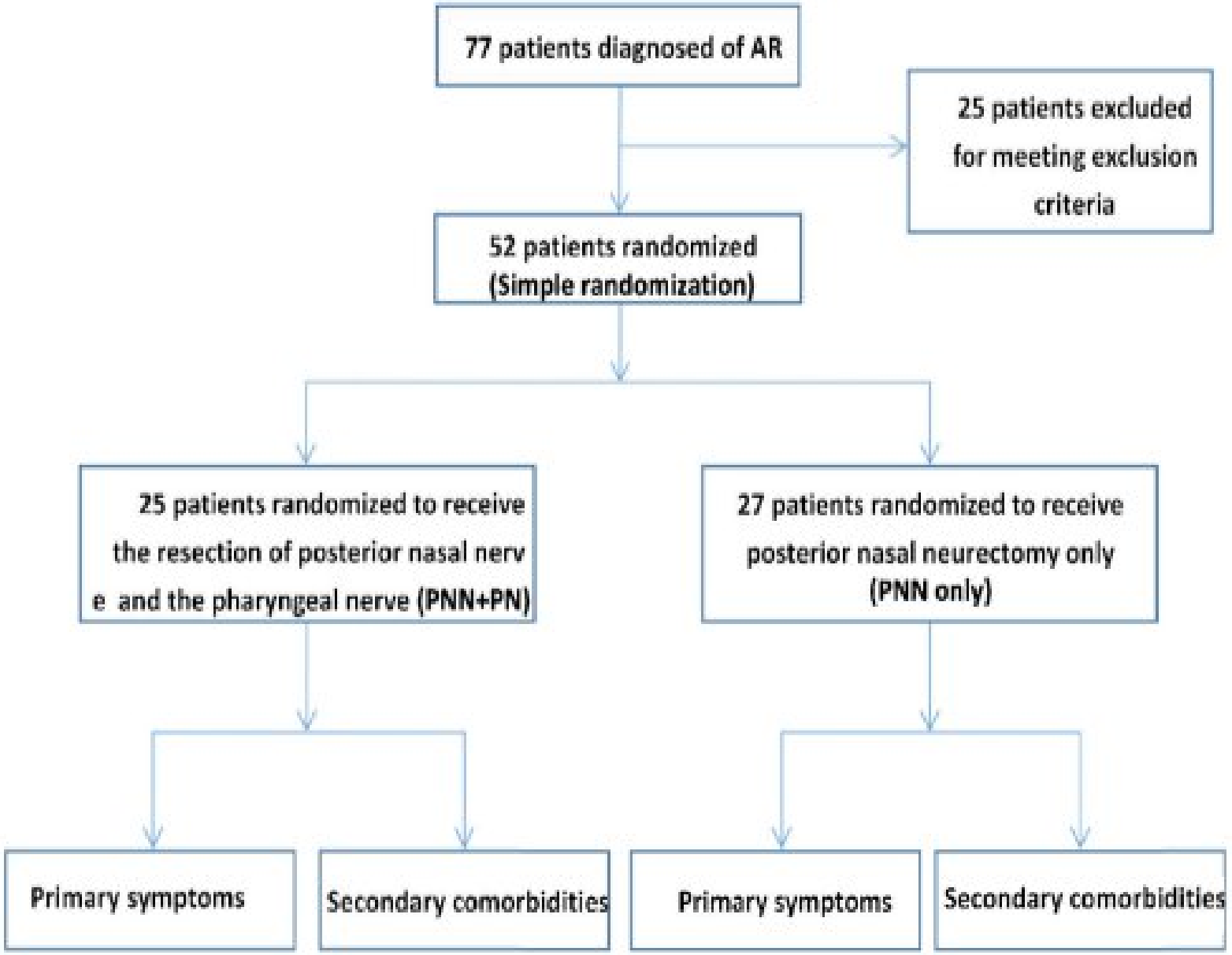


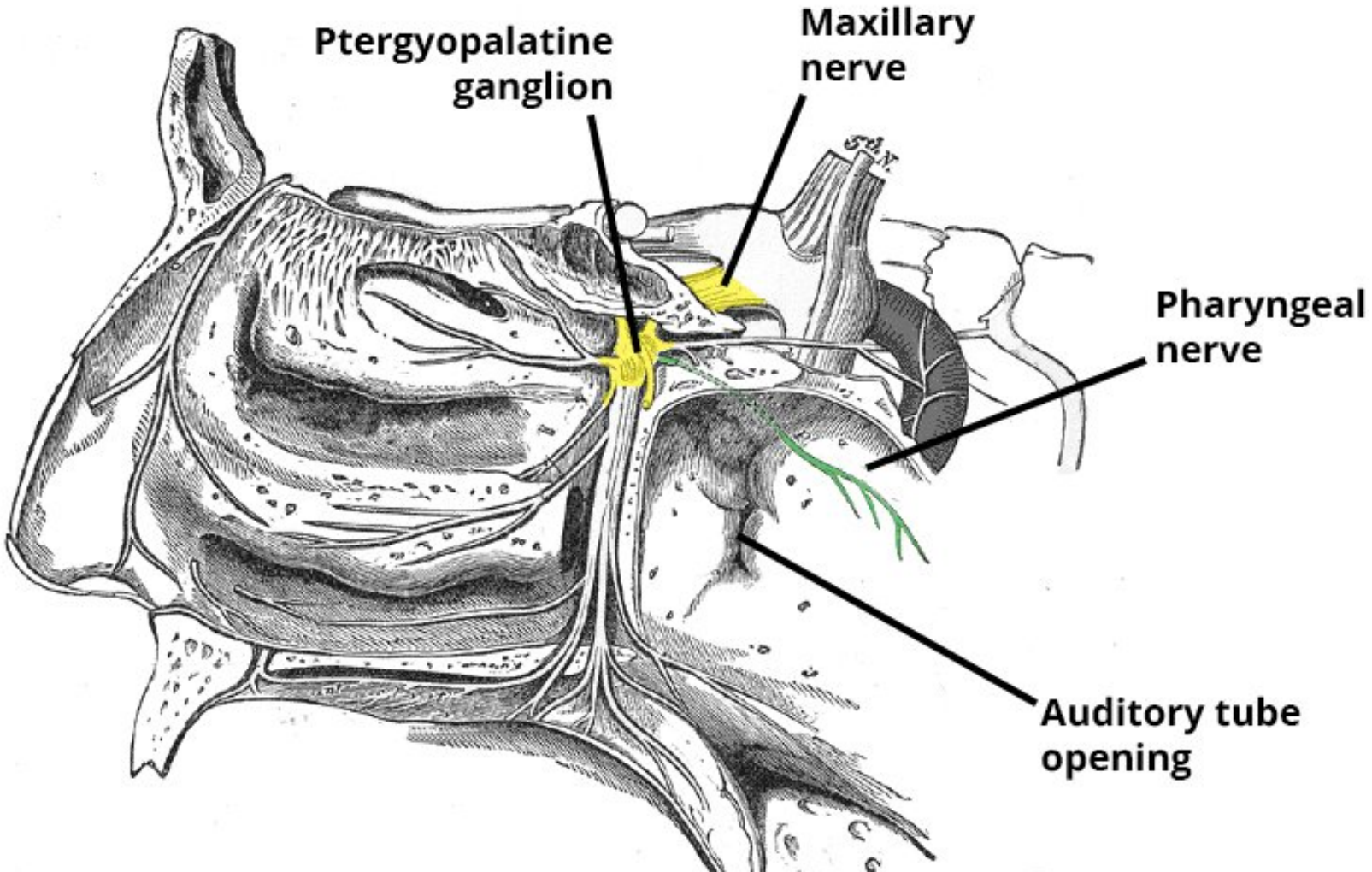
Figure 2 Study flowchart.

Inclusion & Exclusion Criteria

- Inclusion: Diagnosed AR, refractory to standard therapy
- Exclusion:
  - uncontrolled asthma
  - prior nasal surgery, sinus diseases
  - poor compliance
  - acute infection
  - smoking

Surgical Techniques

- General anesthesia.
- PNN: Selective resection of posterior nasal nerve
- PN: Additional resection of pharyngeal nerve


Ptergyopalatine ganglion
Maxillary nerve
Pharyngeal nerve
Auditory tube opening

Evaluation Metrics

- Symptom severity and comorbidities were assessed using:
  - Visual Analog Scale (VAS)
  - Rhinoconjunctivitis Quality of Life Questionnaire (RQLQ)
  - Asthma Control Test (ACT)

Rhinoconjunctivitis Quality of Life Questionnaire (RQLQ)

Scoring:

0 = Not troubled

1 = Hardly troubled

2 = Mildly troubled

3 = Moderately troubled

4 = Quite a bit troubled

5 = Very troubled

6 = Extremely troubled

7 part, total 28 questions

RQLQ-Activity

1. How much have you been troubled by your nose or eye symptoms when performing outdoor activities?

1. How much have you been troubled by your nose or eye symptoms when performing social activities?

1. How much have you been troubled by your nose or eye symptoms in your work or at school?

RQLQ-Sleep

1. How much have you been troubled by your nose or eye symptoms preventing you from getting to sleep?

1. How much have you been troubled by your nose or eye symptoms waking you up at night?

1. How much have you been troubled by your nose or eye symptoms waking you up early?

RQLQ-Nasal Symptoms

1. How troubled have you been by a blocked nose?
2. How troubled have you been by a runny nose?
3. How troubled have you been by sneezing?
4. How troubled have you been by an itchy nose?

RQLQ-Eye Symptoms

1. How troubled have you been by itchy eyes?
2. How troubled have you been by sore eyes?
3. How troubled have you been by watery eyes?
4. How troubled have you been by red eyes?

RQLQ-Non-nose/eye Symptoms

1. How troubled have you been by feeling tired?
2. How troubled have you been by headaches?
3. How troubled have you been by feeling irritable?
4. How troubled have you been by poor concentration?
5. How troubled have you been by feeling unwell?
6. How troubled have you been by feeling depressed?
7. How troubled have you been by feeling frustrated?

RQLQ-Emotional Function

1. How much have you felt troubled or embarrassed by your nose or eye symptoms?
2. How much have you felt upset because of your nose or eye symptoms?
3. How much have you felt frustrated because of your nose or eye symptoms?

RQLQ- Exposure to Environmental Stimuli

1. How troubled have you been by cigarette smoke, exhaust fumes, or strong smells?
2. How troubled have you been by dust or mold?
3. How troubled have you been by pollens?
4. How troubled have you been by cold air or weather changes?

Asthma control test

Questions	Score
1. In the past 4 weeks, how much of the time did your asthma keep you from getting as much done at work, school or at home?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
2. During the past 4 weeks, how often have you had shortness of breath?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
3. During the past 4 weeks, how often did your asthma symptoms wake you up at night or earlier than usual in the morning?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
4. During the past 4 weeks, how often have you used your rescue inhaler or nebulizer medication (such as albuterol)?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5
5. How would you rate your asthma control during the past 4 weeks?	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

- 20–25: Well controlled asthma
- 16–19: Not well controlled
- ≤15: Poorly controlled – consider reevaluation

Timeline of Follow-up

- Patients were evaluated preoperatively and postoperatively at:
  - 6 months
  - 12 months
  - 24 months

Table 1 Baseline demographic characteristics and clinical findings in study patients.

Variables	PNN + PN	PNN	*p*-Value
Number of patients	25	27	–
Gender (male/female)	16/9	15/12	0.535
Age (years, mean ± SD)	37.04 ± 8.41	36.44 ± 7.71	0.791
Duration of AR (years, mean ± SD)	5.76 ± 2.47	6.56 ± 1.89	0.196
VAS (mean ± SD)			
Rhinorrhea	7.24 ± 1.20	7.07 ± 1.33	0.693
Nasal obstruction	6.52 ± 1.48	6.70 ± 1.38	0.645
Sneezing	7.00 ± 1.26	6.96 ± 1.26	0.916
Nasal itching	6.28 ± 1.75	6.41 ± 1.42	0.773
RQLQ (mean ± SD)			
NES	20.48 ± 3.16	20.30 ± 3.60	0.846
NNES	14.68 ± 3.40	15.30 ± 4.24	0.568
Sleep disorders	7.08 ± 2.20	7.63 ± 2.59	0.415
Others	24.88 ± 5.05	24.26 ± 5.16	0.663
Comorbidity			
Cough (VAS score, mean ± SD)	3.68 ± 1.77	3.81 ± 1.59	0.774
Asthma (number of patients)	9	10	0.938
Asthma (ACT score, mean ± SD)	16.11 ± 1.90	16.60 ± 2.22	0.615
Deviated nasal septum (number of patients)	12	16	0.416
Hypertrophy of inferior turbinate (number of patients)	6	7	0.873

PNN, posterior nasal neurectomy; PN, pharyngeal neurectomy; AR, allergic rrhinitis; SD, standard deviation; VAS, visual analog scale; RQLQ, rhinoconjunctivitis quality of life questionnaire; NES, nasal/eye symptoms; NNES, non-nasal/eye symptoms; ACT, asthma control test.

Baseline Characteristics

- No significant differences between groups at baseline.
- Similar age, gender, AR duration
- Comparable preoperative VAS and RQLQ scores

Table 2 Mean VAS scores in the experimental and control groups.

	PNN + PN	PNN	*p*-Value
Rhinorrhea (mean ± SD)			
Preoperative	7.24 ± 1.20	7.07 ± 1.33	0.639
0.5 year	2.16 ± 1.14[a]	2.48 ± 1.58[a]	0.402
1 year	2.17 ± 1.11[a]	2.64 ± 1.35[a]	0.201
2 years	2.45 ± 1.15[a]	2.62 ± 1.40[a]	0.675
Nasal obstruction (mean ± SD)			
Preoperative	6.52 ± 1.48	6.70 ± 1.38	0.645
0.5 year	2.00 ± 1.23[a]	2.41 ± 1.55[a]	0.301
1 year	1.96 ± 1.87[a]	2.52 ± 1.65[a]	0.149
2 years	2.05 ± 1.23[a]	2.52 ± 1.57[a]	0.291
Sneezing (mean ± SD)			
Preoperative	7.00 ± 1.26	6.96 ± 1.26	0.916
0.5 year	2.76 ± 1.27[a]	2.59 ± 1.31[a]	0.642
1 year	2.83 ± 1.23[a]	2.72 ± 1.28[a]	0.771
2 years	2.90 ± 1.07[a]	2.81 ± 1.29[a]	0.809
Nasal itching (mean ± SD)			
Preoperative	6.28 ± 1.75	6.41 ± 1.42	0.773
0.5 year	1.92 ± 1.29[a]	2.44 ± 1.50[a]	0.184
1 year	2.09 ± 1.28[a]	2.68 ± 1.46[a]	0.143
2 years	2.30 ± 1.22[a]	2.67 ± 1.43[a]	0.383

VAS, visual analog scale; SD, standard deviation; PNN, posterior nasal neurectomy; PN, pharyngeal neurectomy.
The student's *t*-test was used for statistical analysis.
[a] $p < 0.05$ vs. preoperative.

VAS Score Improvements

- Both groups showed significant reductions in VAS scores at all follow-up points.
- No significant difference between groups
- Symptoms: rhinorrhea, obstruction, sneezing, itching

Table 3 Mean RQLQ scores in the experimental and control groups.

	PNN + PN	PNN	*p*-Value
NES (mean ± SD)			
Preoperative	20.48 ± 3.16	20.30 ± 3.60	0.846
0.5 year	9.64 ± 1.98[a]	8.93 ± 2.87[a]	0.298
1 year	9.39 ± 1.85[a]	9.08 ± 2.91[a]	0.658
2 years	9.45 ± 1.96[a]	8.90 ± 2.70[a]	0.466
NNES (mean ± SD)			
Preoperative	14.68 ± 3.40	15.30 ± 4.24	0.568
0.5 year	8.24 ± 2.19[a]	7.93 ± 2.30[a]	0.617
1 year	8.17 ± 2.1[a]	8.40 ± 2.75[a]	0.756
2 years	9.30 ± 2.30[a]	8.67 ± 2.90[a]	0.445
Sleeping (mean ± SD)			
Preoperative	7.08 ± 2.20	7.63 ± 2.59	0.415
0.5 year	3.36 ± 1.73[a]	3.85 ± 2.01[a]	0.351
1 year	3.61 ± 1.56[a]	4.12 ± 1.83[a]	0.305
2 years	3.55 ± 1.03[a]	4.33 ± 1.85[a]	0.139
Others (mean ± SD)			
Preoperative	24.88 ± 5.05	24.26 ± 5.16	0.663
0.5 year	10.84 ± 3.99[a]	11.04 ± 4.33[a]	0.865
1 year	11.61 ± 4.18[a]	11.64 ± 4.38[a]	0.980
2 years	12.25 ± 4.56[a]	12.14 ± 4.23[a]	0.938

RQLQ, rhinoconjunctivitis quality of life questionnaire; SD, standard deviation; PNN, posterior nasal neurectomy; PN, pharyngeal neurectomy; NES, nasal/eye symptoms; NNES, non-nasal/eye symptoms.
The student's *t*-test was also used for statistical analysis.
[a] $p < 0.05$ vs. preoperative.

RQLQ Improvements

- Quality of life improved significantly in both groups postoperatively.
- Improvement sustained at 6, 12, and 24 months
- No significant intergroup difference

Chronic Cough Outcome

- Cough severity reduced in both groups, with greater improvement in PNN+PN group.
- Statistically significant difference ($p < 0.05$) favoring combined surgery

Table 4 Comparisons of comorbidities in the experimental and control groups.

	Chronic cough (mean ± SD)			ACT (mean ± SD)		
	PNN + PN	PNN	*p*-value	PNN + PN	PNN	*p*-value
Preoperative	3.68 ± 1.77	3.81 ± 1.59	0.774	16.11 ± 1.90[a]	16.60 ± 2.22[a]	0.615
0.5 year	1.76 ± 1.05[a]	2.52 ± 1.50[a]	0.042[b]	19.89 ± 1.45[a]	20.10 ± 1.66[a]	0.773
1 year	1.74 ± 1.03[a]	2.60 ± 1.53[a]	0.033[b]	19.33 ± 0.71[a]	19.30 ± 0.40[a]	0.968
2 years	1.65 ± 1.09[a]	2.62 ± 1.66[a]	0.033[b]	19.22 ± 1.39[a]	19.60 ± 2.07[a]	0.650

ACT, asthma control test; SD, standard deviation; PNN, posterior nasal neurectomy; PN, pharyngeal neurectomy.
The student's *t*-test was used for statistical analysis again.

[a] $p < 0.05$ vs. preoperative.

[b] $p < 0.05$ between PNN + PN group and PNN group.

Asthma Control Results

- ACT scores improved significantly postoperatively in both groups.
- No significant difference between PNN and PNN+PN groups

Postoperative Complications

- No major complications observed.
- One minor nasal bleed resolved endoscopically
- No dry eye, palatal numbness, or synechiae

Discussion: Key Findings

- Both surgical approaches are effective and safe.
- PNN + PN is especially beneficial for patients with chronic cough

Clinical Implications

- Surgical neurectomy can be considered in refractory AR patients.
- Combined surgery recommended in presence of chronic cough
- PNN alone sufficient for typical AR cases

Study Limitations

- Single-center, small sample size
- Subjective scoring systems
- No etiological analysis of cough

Conclusion

- PNN with or without PN is effective for AR symptom relief.
- Combined approach better for cough
- Recommend tailored approach based on comorbidities

Thank You / Questions

- Thank you for your attention!