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Original article

Comparative study of microdebrider-assisted turbinoplasty and partial turbinectomy in hypertrophic rhinitis: Cohort data from Vietnamese patients

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Abstract. *Background and Aim:* Hypertrophic rhinitis of the inferior turbinate is characterized by persistent enlargement of the mucosal, submucosal, and bony components of the inferior turbinate, severely affecting the patient's quality of life. This study examines the clinical and subclinical features of patients with inferior turbinate hypertrophy requiring surgery and compares microdebrider-assisted turbinoplasty with partial turbinotomy. *Methods:* We conducted a prospective comparative cohort study with a historical control of 155 patients from April 2016 to June 2024. Patients were assigned to undergo either microdebrider-assisted turbinoplasty (MAIT group, n = 68) or partial inferior turbinotomy (PIT group, n = 87). Evaluations were conducted one week, one month, and three months after surgery. *Results:* The study included 155 patients with an average age of 34.9 ± 11.4 years and a male-to-female ratio of 2:1. At the one-week follow-up, the MAIT group showed a significantly greater reduction in Nasal Obstruction Symptom Evaluation (NOSE) scores (45.7 ± 19.2 vs. 37.1 ± 15.7, $P = 0.003$), with notable differences in nasal crusting and inferior edema. Endoscopic evaluation showed better wound healing in the MAIT group (92.6%) than in the PIT group (74.7%, $P = 0.005$). However, at the three-month follow-up, there were no significant differences in NOSE score reduction or endoscopic findings (all P-values > 0.05) between the two groups. *Conclusions:* Microdebrider-assisted inferior turbinoplasty and partial inferior turbinotomy are very effective surgical techniques for treating hypertrophy of the inferior turbinate and related problems of nasal obstruction. Microdebrider-assisted inferior turbinoplasty ensures both size reduction and maximum preservation of the inferior turbinate mucosa. (www.actabiomedica.it)

Key words: hypertrophic rhinitis, inferior turbinate hypertrophy, microdebrider-assisted turbinoplasty, partial inferior turbinotomy, surgical outcomes, cohort studies, rhinitis surgery, nasal obstruction, Vietnamese population

Introduction

Hypertrophic rhinitis is a chronic condition marked by enlargement of the mucous membrane, submucosa, and bony layers of the inferior turbinate, with severe cases extending to bone tissue. In advanced stages, the changes to the mucosa can become irreversible, requiring surgical intervention for symptom relief. Among the key symptoms of hypertrophic rhinitis, persistent nasal congestion stands out as one of

the most challenging to treat (1–3). While nasal congestion is not life threatening, it significantly impacts nasal-sinus function and greatly reduces a patient's quality of life (4–5). Medical therapy is the first-line approach for treating turbinate dysfunction and typically includes nasal decongestants (in both topical and oral forms), antihistamines, intranasal steroid sprays, leukotriene receptor antagonists such as montelukast, and desensitization techniques (6–7). However, these treatments often offer only short-term symptom relief. For patients with inferior turbinate hypertrophy who do not respond to medical treatments, surgical intervention becomes necessary. The aim of surgery is to reduce nasal symptoms while preserving the mucosa and effectively reducing the volume of the inferior turbinate (8). At least 13 surgical techniques have been used over the past 130 years to treat hypertrophy of the inferior turbinate (9). Over time, a variety of surgical techniques have been developed to reduce the size of the inferior turbinate. Some of these methods include conventional turbinectomy, laser turbinectomy, cryoturbinectomy, electrocautery turbinectomy, conventional turbinoplasty, microdebrider-assisted turbinoplasty, coblation turbinoplasty, radiofrequency turbinoplasty, and ultrasound turbinoplasty. These techniques can generally be classified into two main categories: mucosal-sparing and non-mucosal-sparing procedures, based on whether the medial mucosa of the inferior turbinate is preserved (10). Surgical intervention is usually considered after the failure of medical treatments for three months in cases of nasal obstruction due to inferior turbinate hypertrophy (11). However, if rhinosinusitis is also present, medical treatment may be extended for up to six months (10). Studies on surgical outcomes for the treatment of inferior turbinate hypertrophy have been conducted in many parts of the world, but data specific to the Vietnamese population remain limited. Additionally, Nguyen et al. found that the nasal structure of Vietnamese individuals differs from that of Caucasians. Therefore, evaluating surgical outcomes in the Vietnamese population is essential (12). In Vietnam, various surgical methods for inferior turbinate hypertrophy are employed, with most achieving success rates of over 90% (13–14). However, most published studies have focused on individual surgical methods without directly comparing them. This lack of comparison makes it difficult to determine the most effective approach. In 2022, Ta et al. conducted a meta-analysis of 12 studies on non-mucosal-sparing surgeries, 14 studies on mucosal-sparing surgeries, and 17 studies combining different methods, involving 3,810 patients. Despite the lack of universal consensus on the ideal surgical method, recent research suggests that microdebrider-assisted turbinoplasty may offer superior outcomes (15–16). Similarly, a study by Karamatzanis found that the microdebrider-assisted approach resulted in the lowest complication rates when compared to other methods (7). Furthermore, the study by Maniaci demonstrated that microdebrider-assisted turbinoplasty is highly effective in controlling clinical symptoms, with all evaluated factors showing statistically significant improvement ($P < 0.001$ in all cases) (17). In addition to the microdebrider-assisted technique, partial inferior turbinotomy remains a widely used approach due to its simplicity and the fact that it uses basic tools available in all operating rooms. The partial inferior turbinate resection method leads to good postoperative nasal airflow as it removes both the hypertrophic mucosa and bony portions of the inferior turbinate (18). Each surgical method has its strengths and weaknesses, and the choice of technique often depends on the equipment available at a given facility and the surgeon's experience. This variability in approach has contributed to the lack of a clear consensus or guideline regarding the most appropriate surgical method for specific cases (19). Given the variety of techniques available, we sought to compare two commonly used surgical methods for inferior turbinate hypertrophy: mucosal-sparing microdebrider-assisted inferior turbinoplasty (MAIT) and non-mucosal-sparing partial inferior turbinectomy (PIT). Our findings provide valuable insight into the effectiveness of each method, their complication rates, and their impact on patients' quality of life post-surgery. Continued research, including direct comparisons between different surgical methods, is essential to establish more definitive guidelines for treating this condition. Our study aims to fill this gap and provide evidence to guide clinicians in selecting the most appropriate surgical technique for their patients.

Materials and Methods

Study design and settings

A prospective comparative cohort study with a historical control was conducted at Can Tho ENT Hospital. The study included both a historical control group and a prospective cohort. Patients aged ≥ 18 years with persistent nasal congestion lasting ≥ 12 weeks that was refractory to medical treatment were included. Patients who had incomplete follow-up after surgery, severe systemic diseases (e.g., cardiovascular, respiratory, or metabolic disorders), coagulation disorders, a history of prior nasal surgery, nasal polyps, or other sinonasal pathologies, or who did not consent to participate in the study were excluded. Data for partial inferior turbinectomy (PIT) were collected retrospectively from April 2016 to April 2018, while data for microdebrider-assisted inferior turbinoplasty (MAIT) were collected prospectively from June 2022 to June 2024. All eligible cases that met the diagnostic criteria and had no exclusion criteria during the study period were included. A total of 89 patients participated in the PIT group (retrospective cohort) and 68 patients in the MAIT group (prospective cohort), all of whom met the inclusion criteria with no exclusions.

Surgery methods

PIT method: A Kelly clamp was used along the inferior turbinate to create a groove on the superior surface of the inferior turbinate. Scissors were used to cut the turbinate along the line created by the Kelly clamp. Electrocautery was applied to the cut surface using an electrocautery probe, moving from posterior to anterior. MAIT method: A No. 15 blade was used to make an incision at the anterior aspect of the inferior turbinate, approximately 3–4 mm. The microdebrider unit was set to an oscillating mode at 3,000 rpm using a 2.9 mm inferior turbinate blade. Under endoscopic guidance, the hypertrophic submucosal tissue was precisely trimmed.

Data collection

Patients meeting the inclusion criteria were enrolled in the study, with baseline characteristics including gender and age. The data for the two groups, MAIT and PIT, were collected homogeneously, with all information fully recorded at the time points before surgery and one week, one month, and three months after surgery. The comparison was conducted by evaluating the changes in patient characteristics over these time points. Inferior turbinate hypertrophy was graded according to Friedman's classification. The Friedman grading system classifies inferior turbinate hypertrophy into three grades. Grade I refers to mild enlargement of the turbinate without any obvious obstruction. Grade II represents an intermediate stage between Grades I and III. In Grade III, the turbinate is significantly enlarged, completely occluding the nasal cavity (20). Preoperative assessments included nasal obstruction severity using the Nasal Obstruction Symptom Evaluation (NOSE) score and Glatzel mirror evaluation. The Glatzel mirror test is used to assess nasal airflow by measuring condensation rings formed on a cold mirror placed close to the nose while the patient breathes normally through their nostrils with their mouth closed. The moisture in the exhaled air condenses on the mirror, creating oval rings in front of each nostril, with larger rings indicating greater airflow. This method only evaluates exhalation. All measurements were conducted by the same individual at the same site, maintaining consistent testing conditions, including a temperature range of 22 to 24°C and a relative humidity of 50 to 65%. The degree of nasal airflow was assessed before and 15 minutes after administering a decongestant spray, Rhinex® 0.05% (Naphazoline nitrate 7.5 mg), based on the following levels: normal airflow (> 6 cm of mirror fog), mild reduction (5–6 m), moderate reduction (4–5 cm), and severe reduction (< 3 cm) (21). The NOSE score was used to assess the impact of nasal congestion on the patient's quality of life. Patients were asked to rate the severity of five nasal obstruction-related symptoms: nasal congestion or stuffiness, nasal blockage or obstruction, trouble breathing through the nose, trouble sleeping, and difficulty getting enough air through the nose during exercise or exertion. Each symptom was scored on a five-point Likert scale, where 0 = not a problem, 1 = very mild problem, 2 = moderate problem, 3 = fairly bad problem, and 4 = severe problem. The total score

was calculated by summing the individual scores for all five symptoms and multiplying the sum by five, resulting in a final NOSE score ranging from 0 to 100, with higher scores indicating more severe nasal obstruction. Based on the final NOSE score, nasal obstruction severity was classified into four categories: mild (5–25), moderate (30–50), severe (55–75), and extreme (80–100) (22). Postoperatively, these patients were followed up and reassessed at one week, one month, and three months. Changes in NOSE score (Δ NOSE) and nasal airflow were recorded. Endoscopic examinations were performed to evaluate crusting, healing status, and the condition of the inferior turbinate.

Statistical analysis

Descriptive data were presented as frequencies and percentages for categorical variables, while continuous variables were reported as mean ± standard deviation (SD) for normally distributed data and median (interquartile range) for non-normally distributed data. The chi-square test or Fisher's exact test was used to compare categorical variables between the two groups, while the t-test or Wilcoxon test was used for continuous variables, depending on data distribution. The Friedman test was applied to assess changes in characteristics over time at preoperative and one-week, one-month, and three-month postoperative follow-ups. A two-tailed *P*-value < 0.05 was considered statistically significant. Data analysis was performed using R software version 4.4.2 (R Foundation for Statistical Computing, Vienna, Austria).

Results

General characteristics of patients before surgery

We enrolled 155 patients with hypertrophic inferior turbinate rhinitis who were scheduled for surgery. Among these, 68 patients were assigned to microdebrider-assisted inferior turbinoplasty (MAIT) and 87 patients to partial inferior turbinectomy (PIT). The average age of the 155 patients was 34.9 ± 11.4 years, with a male-to-female ratio of 2:1. There was no difference in age or sex between the two surgical method groups. Patients were preoperatively evaluated using the NOSE score, the degree of inferior turbinate hypertrophy, and nasal airflow obstruction level assessment using a Glatzel mirror. Before using the decongestion spray, we found that the MAIT group had a mean NOSE score of 71.84 ± 17.19, with the majority of patients having grade II and III inferior turbinate hypertrophy. Nasal airflow was assessed as moderate. In contrast, the PIT group had a mean NOSE score of 66.03 ± 18.4, with the majority of patients (89.7%) having grade III inferior turbinate hypertrophy, as shown in Table 1.

Postoperative outcomes at one week, one month, and three months

All patients were followed up and evaluated at one week, one month, and three months postoperatively. In the MAIT group, we observed a significant decrease in the mean NOSE score from 71.8 to 26.2, 12.8, and 7.3 at one week, one month, and three months post-surgery, respectively ($P < 0.001$). Concurrently, nasal airflow, as assessed by the Glatzel mirror, showed a progressive increase at each evaluation time point ($P < 0.001$), as presented in Figure 1. For the PIT group, the mean NOSE score significantly decreased from 66.03 to 29.0, 12.9, and 5.2 at one week, one month, and three months post-surgery, respectively ($P < 0.001$). Nasal airflow, evaluated using the Glatzel mirror, also demonstrated a gradual improvement across the assessment time points ($P < 0.001$), as shown in Figure 2.

Comparison of treatment outcomes between the MAIT and PIT groups

At the one-week follow-up, we observed a significantly greater reduction in NOSE scores in the MAIT group compared to the PIT group (45.7 ± 19.2 vs. 37.1 ± 15.7, $P = 0.003$). Regarding changes in nasal airflow obstruction, the majority of patients in the MAIT group experienced a one-grade reduction (50%), with 33.8% experiencing a two-grade reduction. Similarly, in the PIT group, 47.1% of patients had a one-grade reduction, and 23.0% had a two-grade reduction. Notably, 24.1% of cases in the PIT group showed no change. However, there was no statistically significant difference in the change in nasal airflow obstruction grades between the two surgical techniques at one week ($P = 0.171$). When assessing objective

Table 1. Clinical and paraclinical features of patients before surgery

	MAIT group (n = 68)	PIT group (n = 87)	*P*
Age (years), mean ± SD	36.1 ± 11.47	34.0 ± 11.28	0.262
• 18–30 (years), n (%)	• 24 (35.3%)	• 37 (42.5%)	0.728
• 31–45 (years), n (%)	• 34 (50%)	• 36 (41.4%)	
• 45–60 (years), n (%)	• 8 (11.8%)	• 12 (13.8%)	
• > 60 (years), n (%)	• 2 (2.9%)	• 2 (2.3%)	
Gender			
• Male, n (%)	• 43 (63.2%)	• 61 (70.1%)	0.393
• Female, n (%)	• 25 (36.8%)	• 26 (29.9%)	
NOSE score	71.84 ± 17.19	66.03±18.40	0.044
Grading of inferior turbinate hypertrophy (before decongestion spray)			
• Grade I, n (%)	• 0 (0%)	• 0 (0%)	< 0.001*
• Grade II, n (%)	• 25 (36.8%)	• 9 (10.3%)	
• Grade III, n (%)	• 43 (63.2%)	• 78 (89.7%)	
Grading of inferior turbinate hypertrophy (after decongestion spray)			
• Grade I, n (%)	• 0 (%)	• 0 (0%)	< 0.001*
• Grade II, n (%)	• 33 (48.5%)	• 15 (17.2%)	
• Grade III, n (%)	• 35 (51.5%)	• 72 (82.8%)	
Nasal airflow obstruction (before decongestion spray)			
• None, n (%)	• 0 (0%)	• 0 (0%)	< 0.001*
• Mild, n (%)	• 6 (8.8%)	• 1 (1.2%)	
• Moderate, n (%)	• 25 (36.8%)	• 15 (17.2%)	
• Severe, n (%)	• 37 (54.4%)	• 71 (81.6%)	
Nasal airflow obstruction (after decongestion spray)			
• None, n (%)	• 0 (0%)	• 0 (0%)	< 0.001*
• Mild, n (%)	• 7 (10.3%)	• 1 (1.2%)	
• Moderate, n (%)	• 36 (52.9%)	• 15 (17.2%)	
• Severe, n (%)	• 25 (36.8%)	• 71 (81.6%)	

Note. *P-value < 0.05 was considered significant; *Abbreviations:* n: number; MAIT: microdebrider-assisted inferior turbinoplasty; PIT: partial inferior turbinectomy

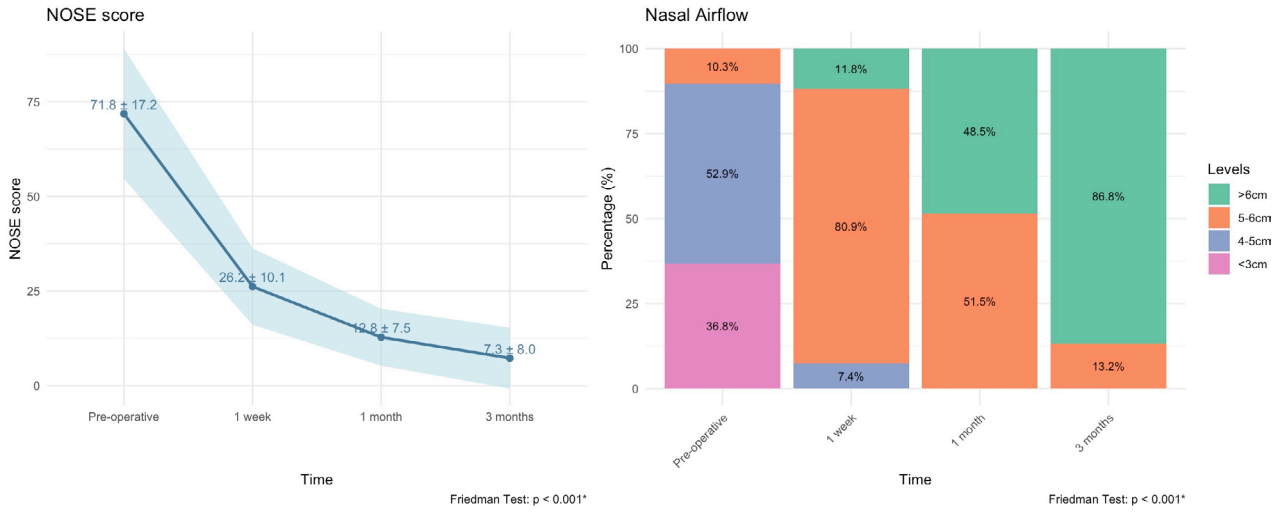

Figure 1. Nasal airflow and NOSE score across time points in the MAIT group

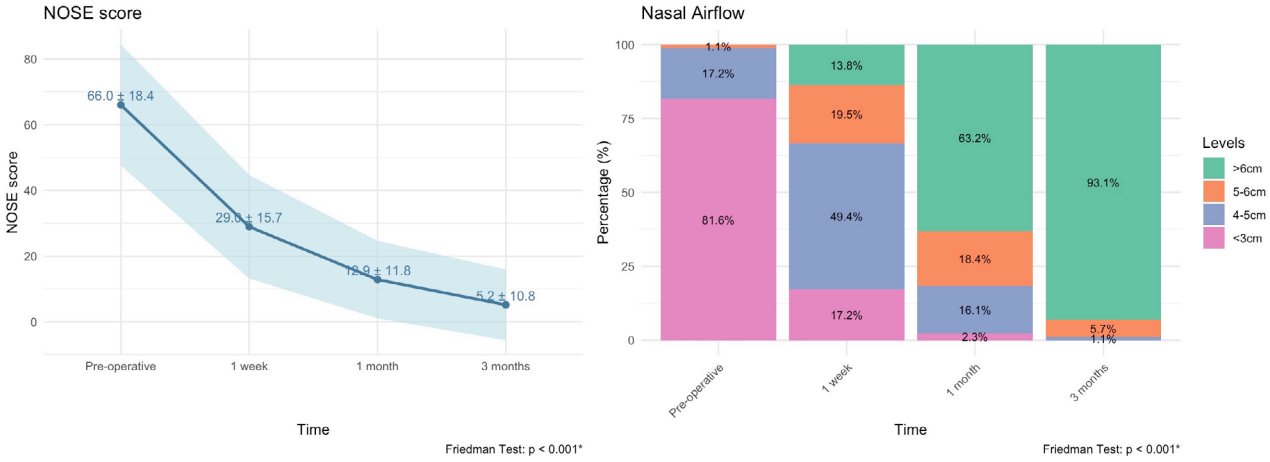

Figure 2. Nasal airflow and NOSE score across time points in the PIT group

Table 2. Clinical and paraclinical features of patients after one week

	Group A (MAIT) (n = 68)	**Group B (PIT) (n = 87)**	***P***
Δ NOSE score	45.7 ± 19.2	37.1 ± 15.7	0.003*
Nasal airflow obstruction • Unchanged • Decreased by 1 degree • Decreased by 2 degrees • Decreased by 3 degrees	 • 8 (11.8%) • 34 (50.0%) • 23 (33.8%) • 3 (4.4%)	 • 21 (24.1%) • 41 (47.1%) • 20 (23.0%) • 5 (5.8%)	0.171
Crusting • None • Mild • Moderate • Severe	 • 0 (0.0%) • 53 (77.9%) • 15 (22.1%) • 0 (0.0%)	 • 23 (26.4%) • 51 (58.6%) • 13 (15.0%) • 0 (0.0%)	< 0.001*
Inferior • Reduction • Edema • Atrophic inflammation	 • 14 (20.6%) • 54 (79.4%) • 0 (0.0%)	 • 71 (81.6%) • 16 (18.4%) • 0 (0.0%)	< 0.001*
Healing • Good • Moderate • Poor	 • 63 (92.6%) • 5 (7.4%) • 0 (0.0%)	 • 65 (74.7%) • 22 (25.3%) • 0 (0.0%)	0.005*

Note. *P-value < 0.05 was considered significant; *Abbreviations:* n: number; MAIT: microdebrider-assisted inferior turbinoplasty; PIT: partial inferior turbinectomy; ΔNOSE score: Preoperative NOSE score NOSE score at one week

improvement via nasal endoscopy, the MAIT group primarily presented with mild and moderate crusting (77.9% and 22.1%, respectively). In contrast, 26.4% of the PIT group showed no nasal crusting. Regarding the inferior turbinate, we noted that 20.6% of cases in the MAIT group showed size reduction, while 79.4% remained edematous. This was significantly higher than the PIT group, where 18.4% of cases exhibited edema at the one-week time point (P < 0.001). However, endoscopic assessment of wound healing revealed that 92.6% of cases in the MAIT group demonstrated good wound healing, which was significantly higher than the 74.7% observed in the PIT group (P = 0.005), as presented in Table 2.

At the one-month follow-up, we observed a significantly greater reduction in NOSE scores in the MAIT group compared to the PIT group (59.04 ± 18.7 vs. 53.2 ± 15.8, $P = 0.035$). The MAIT group showed a predominant reduction of two grades in nasal airflow obstruction, significantly higher than the PIT group (44.1% vs. 33.3%, $P < 0.001$). However, the PIT group exhibited a predominantly and significantly greater proportion of three-grade reductions compared to the MAIT group (46% vs. 17.7%, $P = 0.001$). Endoscopic examination revealed that the majority of cases had either no crusting or only mild crusting. However, the PIT group had a significantly higher proportion of cases with no crusting compared to the MAIT group (96.6% vs. 61.8%, $P < 0.001$). Overall, both groups predominantly demonstrated good wound healing at the one-month time point, with no statistically significant difference between the groups ($P = 0.082$), as detailed in Table 3.

Finally, at the three-month follow-up, we observed no statistically significant difference in the reduction of NOSE scores between the two groups ($P = 0.230$). Endoscopic examination revealed no significant differences in the incidence of nasal crusting, appearance of the inferior turbinate, or degree of wound healing between the two surgical techniques (all P-values > 0.05), as detailed in Table 4.

Discussion

Although turbinoplasty is one of the most commonly performed ENT surgeries in Vietnam and globally, there is still no widely accepted consensus on which surgical technique should be used for specific cases (10). In our study, we employed two methods, MAIT and PIT, which differ completely in the surgical techniques used in the treatment of inferior turbinate hypertrophy that is unresponsive to medical management (23). The primary goal of inferior turbinate reduction surgery is to alleviate nasal obstruction while preserving nasal function (24). Our study evaluated the clinical and paraclinical characteristics, as well as the treatment outcomes, of patients preand postoperatively for both surgical methods.

Table 3. Clinical and paraclinical features of patients after one month

	MAIT group (n = 68)	**PIT group (n = 87)**	***P***
Δ NOSE score	59.04 ± 18.7	53.2 ± 15.8	0.035*
Nasal airflow obstruction			0.001*
• Unchanged	• 3 (4.4%)	• 2 (2.3%)	
• Decreased by 1 degree	• 23 (33.8%)	• 16 (18.4%)	
• Decreased by 2 degrees	• 30 (44.1%)	• 29 (33.3%)	
• Decreased by 3 degrees	• 12 (17.7%)	• 40 (46.0%)	
Crusting			< 0.001*
• None	• 42 (61.8%)	• 84 (96.6%)	
• Mild	• 26 (38.2%)	• 3 (3.4%)	
• Moderate	• 0 (0.0%)	• 0 (0.0%)	
• Severe	• 0 (0.0%)	• 0 (0.0%)	
Inferior			< 0.001*
• Reduction	• 51 (75.0%)	• 85 (97.7%)	
• Edema	• 17 (25%)	• 2 (2.3%)	
• Atrophic inflammation	• 0 (0.0%)	• 0 (0.0%)	
Healing			0.082
• Good	• 65 (95.6%)	• 87 (100%)	
• Moderate	• 3 (4.4%)	• 0 (0.0%)	
• Poor	• 0 (0.0%)	• 0 (0.0%)	

Note. *P-value < 0.05 was considered significant; *Abbreviations:* n: number; MAIT: microdebrider-assisted inferior turbinoplasty; PIT: partial inferior turbinectomy; ΔNOSE score: Preoperative NOSE score NOSE score at one month

Table 4. Clinical and paraclinical features of patients after three months

	MAIT group (n = 68)	**PIT group (n = 87)**	***P***
Δ NOSE score	64.56 ± 19.12	60.86 ± 18.82	0.230
Nasal airflow obstruction • Unchanged • Decreased by 1 degree • Decreased by 2 degrees • Decreased by 3 degrees	 • 0 (0.0%) • 13 (19.1%) • 33 (48.5%) • 22 (32.4%)	 • 0 (0.0%) • 3 (3.5%) • 18 (20.7%) • 66 (75.8%)	< 0.001*
Crusting • None • Mild • Moderate • Severe	 • 68 (100%) • 0 (0.0%) • 0 (0.0%) • 0 (0.0%)	 • 87 (100%) • 0 (0.0%) • 0 (0.0%) • 0 (0.0%)	0.999
Inferior • Reduction • Edema • Atrophic inflammation	 • 66 (97.1%) • 2 (2.9%) • 0 (0.0%)	 • 86 (98.9%) • 1 (1.1%) • 0 (0.0%)	0.582
Healing • Good • Moderate • Poor	 • 67 (98.5%) • 1 (1.5%) • 0 (0.0%)	 • 87 (100%) • 0 (0.0%) • 0 (0.0%)	0.999

Note. *P-value < 0.05 was considered significant; *Abbreviations:* n: number; MAIT: microdebrider-assisted inferior turbinoplasty; PIT: partial inferior turbinectomy; ΔNOSE score: Preoperative NOSE score NOSE score at three months

The MAIT method preserves the entire mucosal layer and the turbinate bone while removing the entire submucosal layer of the inferior turbinate (25). The resection area is limited to the tip of the inferior turbinate, approximately 3–4 mm, with the lowest rate of postoperative bleeding and the need for intervention (26). Our study observed the effectiveness of the MAIT method in treating associated conditions, including allergic rhinitis and medicamentous rhinitis, similar to the study by Ivanovich and others (27–30). In contrast, the PIT method involves partial resection of the inferior turbinate, including the mucosa, submucosa, and hypertrophic bone of the inferior turbinate, resulting in a wide resection area (25). Our study recorded the effectiveness of this method in addressing hypertrophic bone turbinate pathology, as well as other chronic rhinitis conditions (31).

Baseline characteristics of study participants before surgery

We observed a mean patient age of 34.9 ± 11.4 years, with most patients aged between 18 and 35 years – the working-age group. Males were predominant in our study. Similarly, Rehman et al.'s study on inferior turbinate hypertrophy reported a mean age of 33.47 ± 9.57 years, with a male-to-female ratio of 1.2:1 (32). Studies by Bhagat and El-Magd also found this age group to be the most prevalent (6, 18). From this, we observed that hypertrophic rhinitis can occur across various age groups but is most prevalent in the working-age population. This may be attributed to a higher risk of exposure to environmental pollution and toxic chemicals, increasing the likelihood of developing conditions such as allergic rhinitis and rhinosinusitis, leading to a higher incidence of inferior turbinate hypertrophy. Additionally, societal norms, in which men are more frequently engaged in outdoor work and exposed to environmental hazards, could contribute to the observed male predominance in the studies (32). At the preoperative time point, we observed that most patients had high NOSE scores, inferior turbinate hypertrophy of grades II and III, and moderate to severe nasal airflow obstruction. There was no significant improvement in the degree of nasal airflow obstruction or

the Friedman classification of inferior turbinate hypertrophy before and 15 minutes after nasal decongestant spray administration, indicating severe patient conditions and a lack of response to medical treatment (33). According to a study by Bonnecaze, the 3D morphology of the inferior turbinate shows very little variation with age and gender. Changes were only noted in relation to advanced age, such as a decrease in curvature, a wider angle between the inferior turbinate and the lateral nasal wall, and a relatively smaller size of the entire turbinate, possibly due to reduced bone density (34).

Preoperative and postoperative clinical and paraclinical changes

Our study recorded that the average NOSE score before surgery was 71.84 ± 17.19 for the MAIT group and 66.03 ± 18.40 for the PIT group. After one week, there was a significantly greater reduction in NOSE scores in the MAIT group compared to the PIT group (P = 0.003). We observed that in the MAIT group, all cases exhibited crusting, ranging from mild to moderate (77.9% and 22.1%, respectively), with inferior turbinate edema present in 79.4% of cases. This indicates that with the MAIT method, as the entire mucosal layer is preserved, there is an inflammatory response post-surgery, leading to mucosal edema. Additionally, the blood accumulated in the submucosal space is gradually pushed out through the incision at the tip of the turbinate, resulting in a higher rate of nasal crusting. Nasal crusting does not cause significant discomfort for patients, as it is concentrated at the incision site at the tip of the turbinate and only adheres to the surface of the mucosa, making it easy to remove during postoperative care. Our results are consistent with those of Bhagat (6). In the PIT group, there was less crusting compared to the MAIT group, with 26.4% of cases showing no crusting. After one month, 96.6% of the PIT group had no nasal crusting, while 61.8% of the MAIT group had no crusting, indicating that nasal crusting cleared more quickly in the PIT group than in the MAIT group. After three months, we observed no statistically significant difference in the reduction in NOSE scores between the two groups (P = 0.230). Endoscopic examination revealed no significant differences in the incidence of nasal crusting, appearance of the inferior turbinate, or degree of wound healing between the two surgical techniques (all P-values > 0.05). Contrary to the results of the study by Ali et al., at one and three months postoperatively, the sides with MAIT had significantly fewer crustations (P = 0.040 and 0.032, respectively) and better tissue healing (P = 0.010 and 0.010, respectively) than the sides with PIT; however, there were no statistically significant differences in nasal obstruction relief (19). In Khan's study, based on one-month postoperative visits, there was no case of nasal crusting in the MAIT group in contrast with the PIT group (P = 0,012) (35). In our study, the PIT method involved using Kelly forceps to clamp before resection, creating a more limited resection area. This smaller resection site results in a lower need for postoperative cauterization to control bleeding and, consequently, a lower rate of nasal crusting. Additionally, with less mucosal tissue remaining, there is less edema.

Evaluation of treatment outcomes in the two methods

Due to the difference in symptoms between the two groups before surgery, we assessed the changes in symptoms both before and after surgery to clearly observe the differences in the degree of patient improvement between the two surgical methods. This study demonstrates that both methods provide excellent treatment results in improving nasal congestion, laying the foundation for the widespread implementation of these methods in healthcare facilities nationwide.

Strengths and limitations

Our study comprehensively evaluated the clinical and paraclinical characteristics of two surgical techniques and monitored patient progress over time to record improvements. However, certain limitations of the study should be acknowledged. First, as the study was conducted at a single hospital, its findings may not be generalizable to Vietnam, where there are significant disparities in medical infrastructure and varying levels of technical expertise. Additionally, inconsistent data storage and medical record keeping made it difficult to retrieve all necessary supplementary information for the study retrospectively. Moreover,

the three-month follow-up period was insufficient to capture potential long-term effects or histopathological changes after surgery. Extending the duration of follow-up periods would provide valuable insight into the long-term effectiveness and potential complications of the surgeries, allowing for a more comprehensive evaluation of their benefits and risks. This could help in understanding how the procedures perform over time and whether the results are sustained in the long run. Therefore, further studies involving different age groups and longer follow-up periods are needed to provide a more comprehensive evaluation of these surgical techniques.

Conclusion

Our study shows that the treatment effectiveness of both methods is similar in improving the nasal congestion symptoms of inferior turbinate hypertrophy. The MAIT method has the advantage of maximizing mucosal preservation and controlling turbinate volume reduction with minimal trauma. A unique benefit of the PIT method is that it simultaneously addresses the hypertrophic bone, mucosal, and submucosal tissue without altering the shape of the nasal cavity, thus preserving the nasal passages. However, the PIT method showed less nasal crusting and edema postoperatively compared to the MAIT method during the short-term follow-up period.

Ethic Approval: The study was approved by the Ethics Committee in Biomedical Research at Can Tho University of Medicine and Pharmacy (No. 22.115.HV/PCT-HĐĐĐ for the MAIT study and No. 310/QĐ-DHYDCT for the PIT study). The study protocol ensured compliance with standard ethical declarations. Written informed consent was obtained from the enrolled patients prior to their inclusion in the study.

Conflict of Interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

Authors Contribution: HCC, CQDN, NHD (concept and design); GHN, CTP, HCC (acquisition, analysis, and interpretation of data); CTP, GHN, HCC (drafting of the manuscript); HCC, CQDN, NHD (critical review of the manuscript for important intellectual content). All authors approved the final version to be published and agreed to be accountable for all aspects of the work, ensuring that any questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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