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ORIGINAL ARTICLE

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Comparative study between surgical partial inferior nasal turbinectomy and coblation assisted inferior turbinate reduction in cases of inferior nasal turbinate hypertrophy

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Abstract

Background The inferior turbinate is located in the inferior part of the nose, and contribute to the nasal valve formation. Inferior turbinate hypertrophy causes chronic nasal obstruction.

Aim We aimed to assess the effectiveness of coblation-assisted reduction of the inferior turbinate hypertrophy using a specially designed coblator probe. Additionally, this study aimed to compare this technique with traditional surgical partial turbinectomy as the control arm and follow up with patients to identify potential complications.

Methods This study involved 40 patients with nasal obstruction, those patients attended the Otorhinolaryngology Department of Al Azhar University Hospital in Assiut and diagnosed with enlarged inferior turbinate that did not respond to medical treatment. Also, Pre- and post-operative CT scanning was performed to objectively evaluate the improvement.

Results Coblation group has more advantages over the traditional group like less operative time, less intraoperative blood loss, less post-op pain, less post-op nasal crusts, early return to daily activity (P value < 0.001). Significant decrease in postoperative nasal obstruction among partial inferior turbinectomy group in comparison with coblation group (P value < 0.001).

Conclusion Coblation assisted inferior turbinate reduction of the hypertrophied inferior turbinate is the technique of less complications (i.e. post-operative pain, bleeding, and nasal crust), which are commonly encountered with traditional methods. Traditional method is a bit better in patient self-satisfaction after surgery and relieving post-operative nasal obstruction.

Keywords Inferior turbinat, Coblation, CT Scan, Turbinectomy, Hypertrophy

Background

The inferior turbinate is located in the inferior part of the nose, and contribute to the nasal valve formation. The inferior turbinate substantially contributes to nasal airway resistance, as 50% of the overall airway resistance is caused by the internal nasal valve [1]. Allergic rhinitis is the main cause of inferior turbinate hypertrophy, and it is associated with nasal obstruction, rhinorrhea, and sneezing. Pale edematous mucosa is shown during nasal assessment, while eosinophilia is observed on nasal smear [2].

Turbinate-related causes of nasal obstruction typically stem from broader sinonasal conditions, necessitating treatment of the underlying pathological

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condition. Generally, the treatment strategy is usually directed toward the root cause. For instance, the treatment approach aims to control the primary inflammatory response and markers in case of allergic rhinitis [3]. Although the patients' exposure to allergens is advised to be prevented, treatments are usually provided to better control the present symptoms. These treatments include topical steroid sprays, as well as topical and systemic antihistamines [4].

Moreover, systemic decongestants are used. However, systemic steroids are often considered. In contrast, several surgical procedures are available to handle nasal obstruction in case of failure of medical treatments. However, there is ongoing debate regarding the optimal technique. The main categories of the available techniques are the conventional and latest surgical procedures [5].

This study aimed to evaluate the efficacy of coblation-assisted inferior turbinate reduction using a specially designed coblator probe. Additionally, our study aimed to compare this technique with traditional surgical partial turbinectomy as the control Arm And to follow up with patients to identify any potential complications.

Methods

This comparative prospective study was performed in the Otorhinolaryngology (ENT) Department of Al Azhar University Hospital in Assiut from June 1, 2021, to August 1, 2022. Forty patients (thirty-four females and six males) with nasal obstruction and were diagnosed with enlarged inferior turbinate that did not respond to medical treatment were enrolled in our study. We selected adult patients 18 years and above. The participants were randomly separated into two arms during the research (by Simple Randomization): Arm A involved twenty patients whom were underwent surgical partial inferior turbinectomy. Arm B included twenty patients whom were underwent coblation-assisted inferior turbinate reduction. Both arms were followed up after one week, three weeks, and three months to assess nasal symptoms.

The inclusion criteria were as follows: (1) Adult patients of different age arms. (2) Patients who had nasal obstruction and were diagnosed with enlarged inferior turbinate that did not respond to medical treatment with a duration of at least 3 months. The exclusion criteria were as follows: (1) Patients with an active nasal or sinus infection, nasal polyps, deviated nasal septum, septal perforations, or bleeding disorders; (2) Patients with sinonasal tumors or hypertrophic concha bullosa; (3) Patients who refused surgery, were unfit for surgery, or had undergone previous nasal operations.

Surgical procedures

Each patient underwent the following assessments: (1) Comprehensive and detailed medical history, including personal history, duration of the complaint, and relevant past medical history; (2) General examination, which included a thorough examination of the chest, heart, and measurements of blood pressure; (3) ENT examination was performed using a nasal speculum and a rigid nasal endoscope to evaluate the size of the hypertrophied inferior turbinates before and after the operation. A comprehensive endoscopic examination of the passages in the nose was conducted for all selected cases using a nasal speculum for anterior rhinoscopy, as well as a zero- and four-mm diameter endoscope. This examination aimed to exclude any factors contributing to nasal obstruction, such as septal deviation, nasal polyps, nasal mass, and hypertrophied adenoidal tissues. Additionally, it aimed to identify any nasal pathologies that could be managed medically, allowing surgical intervention to be rescheduled until the condition was controlled. The CT scans of both nasal and paranasal sinuses, using both bone and soft tissue windows in coronal and axial views, were performed before and 3 months after the operation for all cases. Prior to the surgery, pre-operative investigations were conducted, including blood glucose level, CBC, coagulation profile, ESR, liver function tests, renal function tests, and chest x-rays, to ensure that patients were suitable candidates for surgery.

The participants were randomly separated into two arms during the research, with 20 participants per arm. Arm A underwent partial surgical inferior turbinectomy (PSIT). In this procedure, adrenaline (1: 200,000) was injected into the inferior turbinate up to the posterior end. Subsequently, a blunt freer-type turbinate elevator was used to reposition it medially. Leaving approximately one centimeter of the anterior end, the posterior end of the inferior turbinate was removed by crushing and cutting the tissue with a turbinectomy scissor. Nasal sponges or vaseline nasal packs were used to pack the area, and they were left in place for 48 h [6].

Follow up. After removal of the packs, the patients were followed up twice weekly for nasal cleaning and suction until the nasal cavity healed.

Arm B Patients underwent coblation-assisted inferior turbinate reduction. This involved using a bipolar radiation-emitting device, which was immersed in a saline gel and inserted into the submucosal layer. The device was marked at three symmetric locations, approximately one centimeter apart. Activation of the device commenced from the posterior region and progressed towards the anterior region. Typically, the device was activated for 30 s at each marked point while the patient was under general anesthesia [7].

Follow up. The patients were followed up twice weekly until the nasal cavity healed.

Data analysis

The MS Excel software (2019) was used to collect, review, and code the patients' data. The data was then transferred into SPSS. IBM SPSS version 20 was used to perform all statistical analyses. The quantitative data were recorded as mean and standard deviation (SD). The two arms were compared using the chi-square test in the case of qualitative data. However, if the expected count in any cell was found to be below five, the Fisher exact test was used instead. The two arms were compared using an independent t-test in the case of quantitative data with a parametric distribution. On the other hand, the two arms were compared using the Mann–Whitney test in the case of quantitative data with a non-parametric distribution. The significance level for the *P*-value was categorized as follows: *P*-value > 0.05 indicated non-significance, *P*-value < 0.05 revealed significance, and *P*-value < 0.01 showed high significance.

Scale used for measuring symptoms was Visual Analogue Scale (VAS) which is used frequently to measure the intensity or frequency of various symptoms. It ranges from 0 to 10 where 0 means complete absence of the symptom and 10 means presence of the symptom with very high degree up to annoying the patient and disturbing his life quality.

Results

Table 1 showed that most cases in both treatment arms were females. Furthermore, there was no statistically significant difference in terms of the participants' age between the two arms.

Table 2 revealed that there is a statistically significant decrease in operation time (minutes) in the coblation arm when compared to the arm that underwent partial inferior turbinectomy.

Table 3 reported a statistically significant increase in intraoperative blood loss (ml) in the partial inferior turbinectomy arm compared with the coblation arm. Blood loss measured in suction canisters via Visual estimation method.

Table 4 revealed a statistically increase in post-operative pain, nasal crusts and atrophic rhinitis among partial inferior turbinectomy group in comparison with coblation group. It also revealed increase in postoperative nasal obstruction in coblation group in comparison with traditional group. Pain and nasal obstruction assessed by using subjective Visual Analouge Score (VAS).

Table 5 revealed a statistically minimal increase in post-operative self-satisfaction levels in the partial inferior turbinectomy arm compared with the coblation arm. Self satisfaction measured subjectively via questionnaire to each patient regarding degree of improvement for each symptom and overall satisfaction from 0 to 10.

Table 1 The demographic and characteristic data of the participants of both arms

		Arm A		Arm B		Chi-square test/ Independent t-test*	
		No	%	No	%	X^2	*P*-value
Gender	Female	14	70.0	20	100	7.059	0.008
	Male	6	30.0	0	0		
Age (year)	Mean ± SD	21.00 ± 4.77		22.20 ± 4.79		0.794*	0.432

Table 2 Comparison between studied participants of the two arms regarding operation time

Operation time (minutes)	Arm A		Arm B		Independent t-test	
	Mean	SD	Mean	SD	T	*P*-value
	52.50	8.66	44.00	6.41	7.680	0.001

Table 3 Comparison between arms regarding intraoperative blood loss

Intraoperative blood loss (ml)	Arm A		Arm B		Independent t-test	
	Mean	SD	Mean	SD	T	*P*-value
	240.00	38.39	35.50	9.02	23.192	0.001

Table 4 Comparison between studied arms among post-operative complications

	Arm A		Arm B		Independent t-test	
	Mean	SD	Mean	SD	T	*P*-value
Post-operative pain (1–10)	3.60	0.82	3.0	0.47	6.146	0.022
Post-operative nasal obstruction (1–10)	3.10	0.72	5.50	1.40	3.989	0.001
Post-operative nasal crusts and atrophic rhinitis (1–10)	4.90	1.74	3.70	0.66	5.279	0.001

Table 5 Comparison between studied arms among Self-Satisfaction

Patient Self-Satisfaction (1–10)	Arm A		Arm B		Independent t-test	
	Mean	SD	Mean	SD	T	*P*-value
	7.50	1.05	7.10	0.97	1.878	0.049

Table 6 Comparison between studied arms among return to daily activities (days)

Return to daily activities (days)	Arm A		Arm B		Independent t-test	
	Mean	SD	Mean	SD	T	*P*-value
	18.30	6.04	14.10	2.69	2.842	0.007

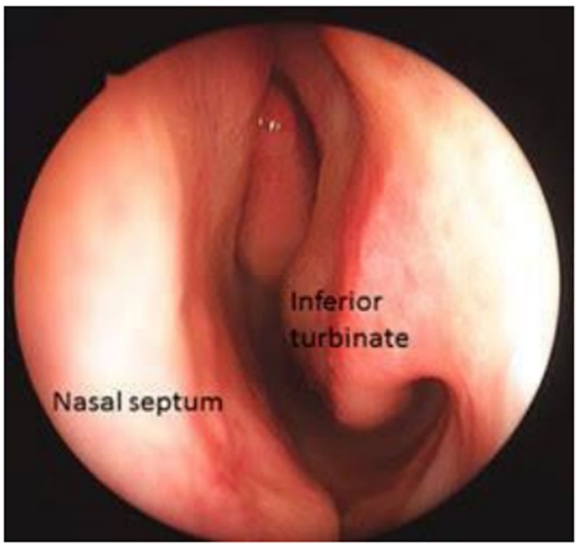

Fig. 1 Sinuscopic view of normal left inferior turbinate

Fig. 2 Sinuscopic view showing anterior end of hypertrophied left inferior turbinate

Table 6 highlighted a statistically significant decrease in the post-operative return to daily activities (days) among the coblation arm compared with the partial inferior turbinectomy arm.

Figures for pre and postoperative endoscopic and CT scan images were attached in a separate file (Figs. 1, 2, 3, 4, 5, 6, 7).

Discussion

Nasal obstruction is considered a prevalent complaint among patients visiting ENT clinics. Enlargement of the inferior turbinate is a prevalent factor that contributes to nasal obstruction. Turbinate hypertrophy can occur in various conditions, such as vasomotor rhinitis, infectious rhinitis, and allergic rhinitis**.** In this study, a comparison was conducted between two techniques: surgical

Fig. 3 Anterior Rhinoscopy of both nasal cavities showing hypertrophied inferior turbinates

partial inferior turbinectomy and coblation-assisted inferior turbinate reduction. Forty participants were randomly assigned to two equal arms, with 20 participants in each arm. Because there is no agreement on the most effective treatment method among the different available approaches, the objective of this study was to evaluate and compare the efficacy and safety of surgical partial inferior turbinectomy and coblation-assisted inferior turbinate reduction among individuals who have enlarged inferior turbinates.

This prospective randomized controlled trial involved 40 patients with nasal obstruction who were diagnosed with enlarged inferior turbinate that did not respond to medical treatment. Our study showed that most cases in both treatment arms were females (34 [85%]). Many theories were introduced to explain this feminine predominance, including hormonal theory and much exposure to dust and domestic mites. No statistically significant difference was recorded between the coblation Arm And the partial inferior turbinectomy arm regarding age (mean age 22.20 ± 4.79 vs. 21.00 ± 4.77, respectively) (*P*-value > 0.05). Similarly, Jabr et al. [8] conducted a prospective observational study that involved 100 participants who were diagnosed with hypertrophy of the inferior turbinate. The study findings indicated that the majority of the participants were females (55 [55%]), with an average age of 31.40 years. Additionally, Gomaa et al. performed a study [6] that compared the outcomes of sub-mucosal diathermy and partial surgical inferior turbinectomy to treat inferior turbinate hypertrophy. The study, involving 50 patients, showed that a majority of

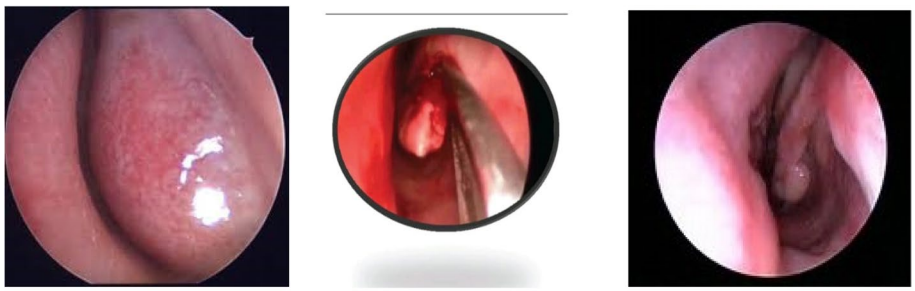

Fig. 4 Endoscopic views of left nasal cavity in traditional surgery. **a** Pre-operative hypertrophied left inferior turbinate. **b** Intraoperative scissor cutting of left inferior turbinate. **c** Postoperative picture of inferior turbinate after 3 months of traditional surgery

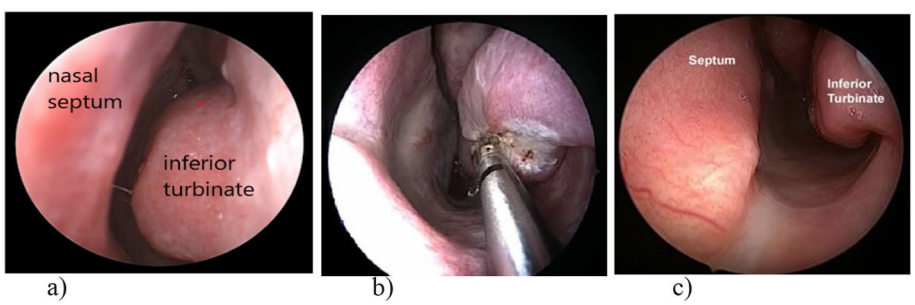

Fig. 5 Endoscopic views of left nasal cavity in coblation surgery. **a** Pre-operative hypertrophied left inferior turbinate. **b** Intraoperative coblation blade inside left inferior turbinate. **c** Postoperative picture of left inferior turbinate after 3 months of removal of its submucosal layer by coblation

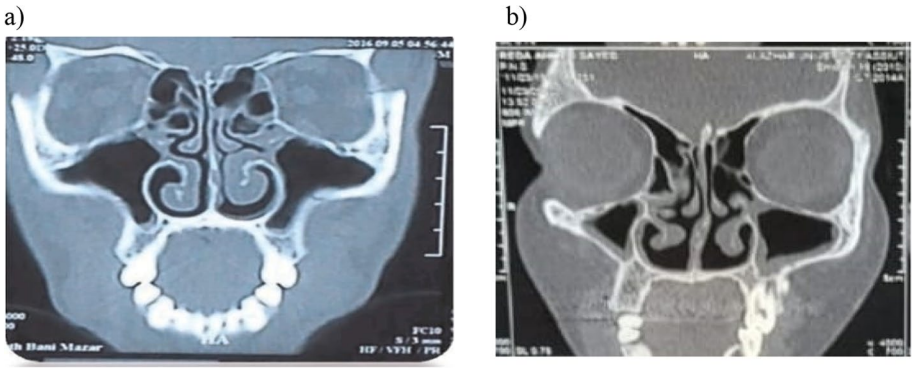

Fig. 6 Computed tomographic scan of bilateral nasal cavities. **a** preoperative view of hypertrophied inferior turbinate, **b**) three months postoperative view of operated inferior turbinate by traditional partial inferior turbinectomy surgery

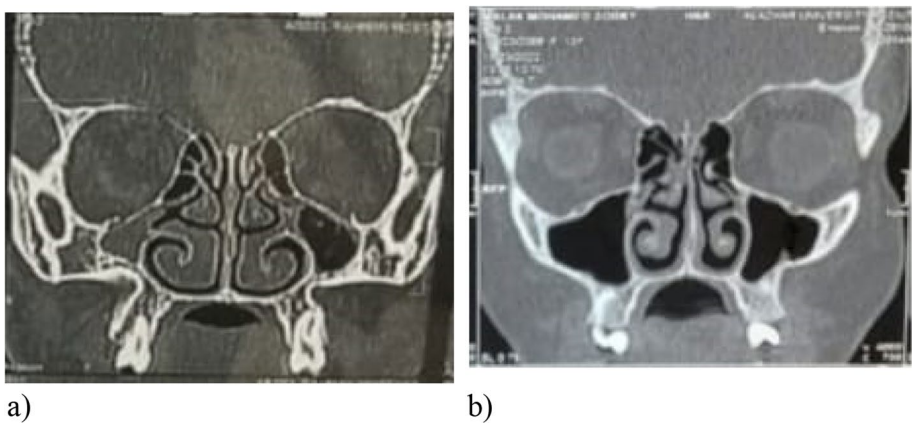

Fig. 7 Computed tomographic scan of bilateral nasal cavities. **a** preoperative view of hypertrophied inferior turbinate, **b**) three months postoperative view of operated inferior turbinate by coblation assisted inferior turbinate reduction

the participants were female (68%), with an average age of 26.1 ± 6.6 years.

Regarding duration of operation, our study revealed a statistically significant decrease in operation time (minutes) among the coblation arm compared with the partial inferior turbinectomy arm (44.00 ± 6.41 vs. 52.50 ± 8.66, respectively) (*P*-value < 0.001). Therefore, the coblation-assisted procedure has the potential to be utilized in outpatient clinics, where it can be administered with local anesthesia and completed within a matter of minutes. These findings are consistent with the results obtained from a prospective comparative study carried out by Aref et al. [9]. The study compared the effectiveness of the coblation and partial turbinectomy procedures in reducing inferior turbinate hypertrophy. It revealed that the partial turbinectomy arm required a longer operation time compared to the coblation arm (30 versus 15 min, respectively).

Regarding intraoperative blood loss, the present study revealed a statistically significant increase in intraoperative blood loss (ml) among the partial inferior turbinectomy arm in comparison with the coblation arm (240.00 ± 38.39 vs. 35.50 ± 9.02, respectively) (*P*-value < 0.001). The results of this study align with the research conducted by Aref et al. [9], who observed that patients undergoing partial inferior turbinectomy experienced various levels of blood loss ranging between 150–250 ml. On the contrary, the coblation arm experienced minimal blood loss, typically not exceeding a few milliliters. Moreover, Aref et al. [9] reported that the mean intraoperative bleeding (ml) among patients who underwent coblation turbinoplasty was 45.63 ± 12.6 ml.

Regarding post-operative complications, our study revealed a statistical increase in post-operative pain among the partial inferior turbinectomy arm compared with the coblation arm (3.60 ± 0.82 Vs. 3.0 ± 0.47, respectively) (*P*-value < 0.001). These findings align with the study conducted by Aref et al. [9], which reported that the partial turbinectomy arm had higher pain levels compared with the coblation arm. Furthermore, a

prior study conducted by Salem et al. [10] examined the effectiveness of coblation and submucosal diathermy procedures in managing inferior turbinate hypertrophy. The findings of this study revealed that the coblation arm was associated with lower levels of pain both throughout the procedure and in the recovery period afterward compared to submucosal diathermy. The arm that underwent partial inferior turbinectomy had a significant reduction in post-operative nasal obstruction when compared to the arm treated with the coblation procedure (3.10 ± 0.72 vs. 5.50 ± 1.40, respectively) (P-value < 0.001). These findings agreed with the research conducted by Aref et al. [9], which compared the effectiveness of the coblation and partial turbinectomy procedures in reducing inferior turbinate hypertrophy. The research demonstrated that both techniques led to an observable improvement in nasal obstruction in all patients compared to their pre-operative condition. However, the degree of improvement in nasal obstruction was more observed in the arm that underwent partial turbinectomy compared with those treated with the coblation technique. Similarly, the current results were in line with the research conducted by Gomaa et al. [6], which reported that one month after surgery, conventional partial inferior turbinectomy resulted in an 88% improvement in the relief of nasal blockage.

Our study findings revealed a statistically significant increase in post-operative nasal crusts among the partial inferior turbinectomy arm in comparison with the coblation arm (4.90 ± 1.74 vs. 3.70 ± 0.66 respectively) (P-value < 0.001).

Personal communication with Sabry et al. [11] showed a decrease in nasal crusting, atrophic rhinitis, and empty nose syndrome (P-value < 0.05) in the microdebrider method more than in the traditional method. The comparison between studied arms regarding self-satisfaction revealed a statistically significant increase in post-operative self-satisfaction among the partial inferior turbinectomy arm in comparison with the coblation arm (7.50 ± 1.05 vs. 6.90 ± 0.97, respectively) (P-value $= 0.048$). Our study found a significant statistical decrease in the number of days required for post-operative return to daily activities in the arm treated with the coblation procedure compared to those who underwent partial inferior turbinectomy procedure (14.10 ± 2.69 vs. 18.30 ± 6.04, respectively) (P-value < 0.001). Salzano et al. [12] reported that after only 1 week, patients who underwent surgical partial inferior turbinectomy had a significant improvement in symptoms, which surpassed the maximum level of improvement reported by patients who received the coblation technique.

Conclusion

Coblation assisted inferior turbinate reduction of the hypertrophied inferior turbinate is the technique of higher efficacy and less complications (i.e. post-operative pain, bleeding, and nasal crust), which are commonly encountered with traditional methods. Traditional method is abit better in patient self-satisfaction after surgery and relieving post-operative nasal obstruction.

Abbreviations

CBC Complete Blood Count
CT Computed Tomography
IT Inferior Turbinate
PSIT Partial Surgical Inferior Turbinectomy

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Authors' contributions

AR and GI designed the research study. MA and MI performed the research. GI and MA provided help and advice on the patient selection. AR and GI analyzed the data. AR and MI wrote the manuscript.

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Availability of data and materials

The data is available upon request of editorial board.

Declarations

Ethics approval and consent to participate

An approval of Al-Azhar Assuit faculty of medicine ethical committee, was obtained before the start of this study. The aim of the study was explained to each participator before collection of data. Verbal and written consent was obtained from those who agree to participate in the study. Privacy of the data was assured.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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