

## Original Research

# The Effectiveness of Inferior Turbinoplasty in Children with Nasal Obstruction

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## ABSTRACT

### Objective

To evaluate the effectiveness of medial flap inferior turbinoplasty for the treatment of nasal obstruction in children.

### Patients and Methods

This study was conducted at the ear nose throat (ENT) Department at Minia University Hospital, Minia, Egypt which include 40 children with bilateral nasal obstruction due to bilateral hypertrophied inferior turbinates that did not respond to medical treatment for 3 successive months in the form of (systemic antihistamines, systemic and local decongestant drugs and local corticosteroid spray) who attended the ENT outpatient clinic. All patients were subjected to turbinate reduction through medial flap inferior turbinoplasty.

### Results

Forty patients with bilateral hypertrophied inferior turbinates were assessed. Ninety days after surgery, 90% of patients transformed from severe or moderate degrees of nasal obstruction “pre-operatively” to mild degree or completely with no nasal obstruction; 80% of patients had grade I improvement in nasal obstruction and 14 patients had only grade II improvement; only 10% of patients had crustation.

### Conclusion

Medial flap inferior turbinoplasty is safe and effective in the treatment of nasal obstruction in children with almost no complications was recorded.

### Keywords

Inferior turbinate hypertrophy; Inferior turbinoplasty; Nasal obstruction; Children.

## INTRODUCTION

Nasal obstruction caused by inferior turbinate hypertrophy is a common complaint among the pediatric population. Symptoms include mouth breathing, snoring or obstructive sleep apnea, and nasal drainage.<sup>1,2</sup>

Medical treatments include inhaled nasal corticosteroids, nasal irrigation, systemic medications (eg, leukotriene receptor antagonists, second-generation antihistamines), and immunotherapy. When medical therapy has failed, surgical reduction of the inferior turbinates has become a popular option.<sup>3,4</sup>

Goals for the ideal inferior turbinoplasty (IT) include maximizing nasal airflow while limiting crusting and synechiae formation by preserving the turbinate mucosa.<sup>2,4</sup>

Current surgical techniques for IT include radiofrequency ablation (RFA), microdebridement, and partial turbinectomy, although no consensus on a superior method or device has been established.<sup>3</sup>

In our study, all children patients underwent medial flap inferior turbinoplasty to explore the success and failure of rates of this procedure in the treatment of nasal obstruction in children.

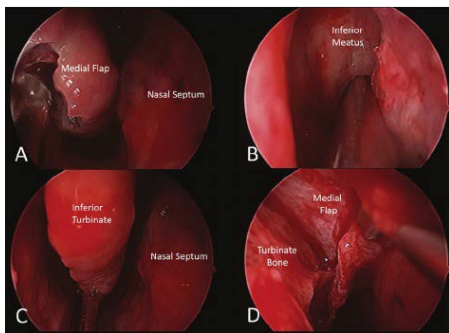
## PATIENTS AND METHODS

This study was conducted at the ear nose throat (ENT) department at Minia University Hospital, Minia, Egypt which include 40 children with bilateral nasal obstruction due to bilateral hypertrophied inferior turbinates that did not respond to medical treatment for 3 successive months in the form of (systemic antihistamines, systemic and local decongestant drugs and local corticosteroid spray) who attended the ENT outpatient clinic. All patients were subjected to turbinate reduction through medial flap inferior turbinoplasty.

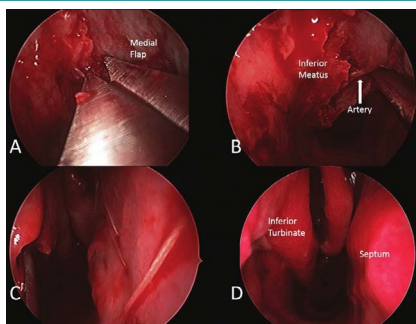
### Technique

**Medial flap turbinoplasty:** The procedure commences with the creation of a window to the inferior meatus, at the anterior inferior turbinate in the axilla between the inferior turbinate medially and the pyriform aperture laterally. The posterior soft tissue tail is removed with the microdebrider, and a medial flap is created by removal of the inferior border. The remaining mucosal flap is elevated in a subperiosteal plane using a cottle dissector as shown in Figure 1. The turbinate bone and lateral mucosa are then removed along the vertex of the inferior meatus. The arterial supply, the medial and lateral branches of the inferior turbinate artery, is then identified and cautery is applied using a bayonet bipolar forceps. Attention is then directed at sculpting the anterior head, undermining the soft tissue with microdebrider or ensuring bone removal is flush to the pyriform. The medial flap is then rotated laterally onto itself and surgical dressing is placed to support the flap as shown in Figure 2.

**Figure 1:** Right Nasal Cavity: (A) Creation of Window, (B) Inferior Meatus, (C) Medial Flap Creation, and (D) Elevation of Medial Flap



**Figure 2:** Right Nasal Cavity: (A) Bone Removal Along Vertex Of Inferior Meatus, (B) Inferior Turbinate Artery, (C) MFinal Positioning Of Medial Flap, and (D) 10-Day Post Operative Appearance



The patients were given oral antibiotics, local nasal decongestant for 1 week and nasal douche with sodium bicarbonate for 2 weeks post-operatively.

In all patients follow-up was carried-out on two weeks, one month and three months post-operatively to assess the previous parameters.

### Statistical Analysis

Categorical data were presented as counts and proportions (percentages). Normal distribution of continuous data was tested using a Kolmogorov-Smirnov test. Continuous and normally distributed data are presented as mean  $\pm$  1 standard deviation and were compared by two-tailed unpaired *t*-test. Student *t*-test and one-way ANOVA were used to compare continuous variables. statistical significance was defined if  $p < 0.05$ . All analyses were performed with SPSS version 24.0 statistical software (SPSS, Inc., Chicago, Illinois, USA).

## RESULTS

The study was done on 40 patients, 17 (42.5%) were females and 23 (57.5%) were males. Patients were in the age range of 6-16 years (mean  $12.1 \pm 2.6$ ) with no significant difference regarding the age and sex distribution (Table 1).

	Number	Percentage
<b>Sex:</b>		
Males	23	57.5%
Females	17	42.5%
	Mean	SD
Age (years)	12.1	2.6

### Degree of Nasal Obstruction

In our study, all the 40 patients (100%) had some degrees of nasal obstruction pre-operatively, it was severe in 12 (30%) cases, moderate in 28 (70%) cases.

In 2<sup>nd</sup> week following the surgery, there is mild improvement in nasal obstruction as it became no obstruction in 7 (17.5%), mild in 11 (27.5%), moderate in 17 (42.5%), severe in 5 (12.5%).

After the 2<sup>nd</sup> week there was gradual & statistically significant ( $p$ -value  $< 0.001$ ) improvement in nasal obstruction started mostly at 1 month and persisted for 3 months where in the 1<sup>st</sup> month post-operative visit, only 2 patients (5%) have severe obstruction & on the 3<sup>rd</sup> month post-operative visit 29 patients (72.5%) had subjectively no nasal obstruction, 7 patients (17.5%) had mild obstruction, 3 patients (7.5%) had moderate obstruction and 1 patient (2.5%) had severe obstruction (Table 2).

**Table 2.** Degree of Nasal Obstruction Pre and Post-Operative (At 2 weeks, 1 Month and 3 Months)

Parameter	Pre-operative	2 <sup>nd</sup> Week	1 <sup>st</sup> Month	3 <sup>rd</sup> Month	p value
No	0(0%)	7(17.5%)	20(5%)	29(72.5%)	<0.01
Mild	0(0%)	11(27.5%)	9(22.5%)	7(17.5%)	
Moderate	28(70%)	17(42.5%)	9(22.5%)	3(7.5%)	
Severe	12(30%)	5(12.5%)	2(5%)	1(2.5%)	

### Endoscopic Grading of Inferior Turbinate Hypertrophy (ITH)

In our study, we used a freidman grading system for scoring turbinat hypertrophy and all the patients were in grade 2 and 3 pre-operatively, grade 2 in 23 (57.5%) and grade 3 in 17 (42.5%).

There was significant improvement ( $p < 0.001$ ) in turbinat hypertrophy grades (inferior turbinate size) in different periods after the procedure where in the 3<sup>rd</sup> month most of patients (32/80%) had grade I inferior turbinate hypertrophy, only (8/20%) of patients had grade II and no patient had grade III (Table 3).

**Table 3.** Inferior Turbinate Hypertrophy Grading Pre and Post-Operative (at 2 Weeks, 1 Month and 3 Months)

Parameter	Pre-operative	2 <sup>nd</sup> Week	1 <sup>st</sup> Month	3 <sup>rd</sup> Month	p value
Grade I	0(0%)	3(7.5%)	20(50%)	32(80%)	<0.01
Grade II	23(57.5%)	25(62.5%)	16(40%)	8(20%)	
Grade III	17(42.5%)	12(30%)	4(10%)	0(0%)	

### Complications After Surgery

In our study, the surgery was well tolerated by most of patients with low rate of minor complications & no major or significant complications like severe epistaxis or intranasal adhesion were reported during or after the operation.

At the 2<sup>nd</sup> week following surgery, we observed crustations in all of patients which was mild crustations in 27 (67.5%), severe in 13 (32.5%) & then gradually reduced with time where present in only 17 (42.5%) at 1<sup>st</sup> post-operative month and after 3 months only 4 patients (10%) had mild crustations (Table 4).

**Table 4.** Degree of Crustations Post-Operative (At 2 weeks, 1 Month and 3 Months)

Parameter	2 <sup>nd</sup> Week	1 <sup>st</sup> Month	3 <sup>rd</sup> Month	p value	
Crustation	No	0(0%)	23(57.5%)	36(90%)	<0.01
	Mild	27(67.5%)	12(30%)	4(10%)	
	Severe	13(32.5%)	5(12.5%)	0(0%)	

## DISCUSSION

Nasal obstruction is a common complaint in children and it can impair normal breathing, forcing patients to breathe through the mouth and often affects their daily activities, it is often caused by

inferior turbinate enlargement or hypertrophy.<sup>5</sup>

Inferior turbinoplasty (IT) in pediatric patients is a common procedure used to treat childhood nasal obstruction, the goals for the ideal inferior turbinoplasty include maximizing nasal airflow while limiting crusting and synechiae formation by preserving the turbinate mucosa.<sup>6</sup>

This is a prospective study included a total of 40 children patients with bilateral nasal obstruction due to bilateral hypertrophied inferior turbinates. Patients did not respond to medical treatment for 3 successive months and all these patients were subjected to turbinate reduction through inferior turbinoplasty.

### Post-operative Follow-up (Outcomes)

**Degree of nasal obstruction:** The present results revealed that there was a significant improvement in the degree of nasal obstruction at 1 and 3 months post-operatively, this was evidenced by that the majority of patients transformed from severe or moderate degrees of nasal obstruction “pre-operatively” to mild degree or completely with no nasal obstruction ( $p < 0.001$ ). These results are in agreement with one study who assessed the efficacy of inferior turbinoplasty in patients with nasal obstruction. They found that after 3 months post-operative, 94.7% of patients had good improvement in breathing, either grades IV or V.<sup>7</sup>

One study studied the long-term outcomes in medial flap inferior turbinoplasty in patients with nasal obstruction. They found that the procedure improved obviously nasal obstruction degree (the outcome was 90.2%) and they concluded that medial flap inferior turbinoplasty provided consistent, robust results. Long-term relief of obstructive symptoms without additional risk of complication.<sup>8</sup>

Another study studied the clinical outcomes of inferior turbinoplasty in the management of inferior turbinate hypertrophy. They assessed pre-operatively and 1<sup>st</sup> week, 1<sup>st</sup> month and 3<sup>rd</sup> month post-operatively depending on subjective visual analogue scale scores for nasal obstruction. They found that there was significant improvement in nasal obstruction. Pre-operatively, nasal obstruction was moderate to severe in all patients, at the first post-operative week 18 patients (60.0%) had no obstruction, and 12 (40.0%) had mild obstruction, on the 1<sup>st</sup> post-operative month 23 (76.7%) patients had no obstruction and 7 patients still had mild nasal obstruction while on the 3<sup>rd</sup> post-operative month the total number of patients with no obstruction was 26 (86.7%) and only 4 patients remained with mild one.<sup>9</sup>

**Turbinate hypertrophy grades:** The present results demonstrated that there was a significant improvement ( $p < 0.001$ ) in turbinate hypertrophy grades at different follow up periods post-operatively (at 2<sup>nd</sup> week post-operative, 3 patients (7.5%) had grade I, 25 patients (62.5%) had grade II and 12 patients (30%) had grade III. However, after 1 month, 20 patients (50%) had grade I, 16 patients (40%) had grade II and 4 patients (10%) had grade III. After 3 months, 32 patients (80%) had grade I and 8 patients (20%) had grade II. one study who studied the clinical outcomes of inferior turbinoplasty

in the management of inferior turbinate hypertrophy agreed with our results. They found that regarding the grading of turbinate hypertrophy, pre-operatively, 11 patients (36.7%) had grade 2 and the remaining 19 patients (63.3%) had grade 3 while none had grade 1, post-operatively all the patients had grade 1. This improvement was statistically significant.<sup>9</sup>

Another study who studied inferior turbinoplasty technique for the treatment of nasal obstruction. They found that this procedure affected significantly the degree of turbinate hypertrophy and is effective in the improvement of the complaint of nasal obstruction post-operative.<sup>10</sup>

**Post-operative complications:** Regarding degree of crustations, the present results showed that degree of crustations was significantly improved ( $p < 0.001$ ) at 3 months post-operatively (at the 2<sup>nd</sup> week following surgery, all of patients had crustations, however, only 4 patients (10%) had mild crustations). However, the results showed that there were no intranasal adhesions or bleeding at 2<sup>nd</sup> weeks, 1 month, 3 months after surgery.

Similar to our findings, one study found that more than 85% of patients who usually had itching, sneezing, and rhinorrhea achieved moderate or complete recovery 3 months after the surgery and the degree of crustations was significantly improved.<sup>8</sup> Also another study, found that medial flap inferior turbinoplasty resulted in long-term relief of obstructive symptoms without additional risk of complication (The technique was associated with low rates of nasal crusting and troublesome primary hemorrhage or intranasal adhesions.<sup>8</sup>

Also, our results are confirmed by another study who studied the clinical outcomes of inferior turbinoplasty in the management of inferior turbinate hypertrophy. They found that crusting was reported in 26 (86.7%) patients at the first post-operative week and the number changed to 5 (16.7%) patients at the first month while at the end of follow-up period, (3<sup>rd</sup> month) no patient had crusting. Also, bleeding occurred post-operatively where only 2 (6.7%) patients developed bleeding at the first post-operative week and none at the next follow up periods. In the present study, the gradual decrement in crusting might be due to mucosal preservation of the medial surface of IT and meticulous treatment that was given to the patients during the post-operative period.<sup>9</sup>

## CONCLUSION

Medial flap inferior turbinoplasty is safe and effective in the treatment of nasal obstruction in children with almost no complications was recorded. The removal of both the lateral mucosa and the bone, as well as a controlled reduction of the medial mucosa, is less likely to lead re-expansion of the turbinate with the passage of time.

## FUNDING SOURCES

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## ETHICAL APPROVAL

All procedures performed in this study followed the 1964 Helsinki declaration and its later amendments and was approved by the local research ethics committee at Minia Faculty of Medicine. Informed consent was obtained from all the study participants.

## CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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