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SL.	CONTENTS	PAGE
1.	**Aetiology of Lymphadenopathy by Clinical and Histopathological Assessment at Tertiary Care Hospital, Bangladesh** *Md Ameer Abbas Abdullah, Md Tarequr Rahman, Mohammad Osman, Md Maksudur Rahman, Sharmin Akhter, Adnan Tarif*	130-135
2.	**Functional Outcome of Anterior Cervical Discectomy and Fusion (ACDF) Using Stand Alone Cage with Bone Graft in Degenerative Cervical Spine Disease- A Multicentric Study** *Sk Muhammad Atiqur Rahman, Md Ziaul Hasan, Golam Mahmud, Md Shamsul Alam, Md Asjadur Rahman, Dewan Afsana Shomee, Sefat-E-Rabbi Eva*	136-143
3.	**Comparison of Outcome of Inferior Turbinoplasty and Submucosal Diathermy** *Abdullah Al Marjuq, Ummul Fatema Karim Biva, Rajat kanti Sarker, Shahin Sultana Shimu, SM Shohan Reza, Md Mozammel Hossen*	144-150
4.	**Relation of Dialysis Adequacy with Nutritional Status of Adolescent on Maintenance Hemodialysis at Tertiary Care Hospitals in Dhaka City** *Md Tareq Imtiaz, Mohammed Anwar Hossain Khan, Mariam Mobasshera, Rezwana Ashraf, Md Kabir Alam, Md Reaz Uddin, Mt Anjumanara Khatun, Israt Zahan Ima, Khadiza Tul Qubra*	151-156
5.	**Pregnancy-Related Maternal Cardiac Outcomes and Predictors in Women with Heart Disease in Bangladesh: A Prospective Observational Study** *Hafiza Farzana, Tajmira Sultana, Arifa Sharmin, Sanzida Mahmud, Umme Salma, Ummae Tania Nasrin, Farhana Islam*	157-165
6.	**Atypical Morphological Patterns of Topical Steroid-Modified Dermatophytosis: A Cross-Sectional Study in South Asia** *Jannatul Sharmin Joarder, Ayesha Siddika, Fahmida Zebin*	166-171
7.	**Doppler Study of Ophthalmic Artery for Early Prediction of Preeclampsia** *Sima Basak, Pallab Kimar Das, Ishrat Sharmin, Siddika Sultana*	172-176
8.	**Clinical Profile & Outcome of Covid-19 Infection in Neonates Admitted in A Tertiary Care Hospital** *Pandora Glory, Md Al Mamun Hossain, Afroza Islam Shuma, Zannat-Ul- Sarmin, Mst Hasna Hena, Farzana Kabir, Afroza Sultana, Writtika Majumdar*	177-181
9.	**Prevalence of Allergic Rhinitis and Digital Trauma in Children with Recurrent Idiopathic Epistaxis: A Cross-Sectional Study at Laksam Upazila Health Complex, Bangladesh** *Md Delwar Hossain Munshi, Nasrin Sultana, Shaila Alam, Based Mahmud, Md Golam Sarwar Sarker*	182-187
10.	**Endogenous Ethanol Production and Its Association with Disease Activity and Fibrosis in Non-Alcoholic Fatty Liver Disease** *Md Shofequnnabi Rumi, Shirazum Monira Mili, Mohammad Majharul Haque, Md Shahinul Alam*	188-195
11.	**Clinical Predictors of Severe COVID-19 and Mortality: Insights from a Bangladeshi Cohort** *Shirazum Monira Mili, Md Shofequnnabi Rumi, Md Asaduzzaman Nur, Niraj Bidari*	196-201
12.	**Clinical Methods of Estimation of Fetal Weight is as Accurate as Ultrasound Method in Term Pregnancies** *Feroja Banu Sherin, Mst Nurunnaher Pervin Nice, Mukti Kaniz Fatema*	202-213

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Original Research Article

Comparison of Outcome of Inferior Turbinoplasty and Submucosal Diathermy

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Abstract: ***Background*:** Nasal blockage is a prevalent concern, with turbinate hypertrophy often necessitating surgical intervention. This study aimed to compare outcomes between two common surgical techniques: inferior turbinoplasty and submucosal diathermy. ***Methods:*** This prospective analytic study was conducted at the Department of Otolaryngology and Head Neck Surgery, Dhaka Medical College and Hospital, Dhaka from July 2022 to December 2023. The study enrolled 114 patients undergoing septal surgery along with turbinate reduction surgery for nasal obstruction, selected via purposive sampling and evenly distributed between treatment groups. ***Results:*** The majority of participants (88%) were aged 16-45 years, with no significant age or gender differences between groups. Both techniques demonstrated overall improvement, with inferior turbinoplasty exhibiting a superior response. At final follow-up, more inferior turbinoplasty patients reported in grade 0 or minimal nasal obstruction and experienced a higher symptomatic improvement for sneezing. Postoperative complications occurred in 9.5% of inferior turbinoplasty patients and 15.3% of submucosal diathermy patients, with no significant difference between groups. Patient satisfaction scores were notably higher in the inferior turbinoplasty group. ***Conclusion:*** Inferior turbinoplasty demonstrated better clinical outcomes, efficacy, and mucosal preservation compared to submucosal diathermy for turbinate reduction surgery. While both techniques are effective, inferior turbinoplasty offers more predictable results, less post-operative morbidity, and higher patient satisfaction.

Keywords: Turbinate Hypertrophy, Inferior Turbinoplasty, Submucosal Diathermy.

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Introduction

Nasal obstruction is a common complaint among adults and has a substantial impact on quality of life, contributing to sleep disturbance, recurrent respiratory infections, impaired olfaction, and secondary sinonasal disease. Among its structural causes, inferior turbinate hypertrophy represents the second most common etiology after septal deviation. It may arise from allergic and non-allergic nasal hyper-reactivity, chronic use of topical decongestants, or compensatory enlargement associated with septal deviation.[1] The underlying pathophysiology is largely driven by mucosal inflammation, particularly in conditions such as allergic rhinitis and chronic rhinosinusitis. Inflammatory mediators including histamine, cytokines, and adhesion molecules induce vascular engorgement, glandular hypersecretion, and mucosal edema, leading to reduced nasal airflow and

the subjective sensation of nasal blockage.[2] While many patients respond to medical therapy, a subset continues to experience persistent symptoms, necessitating surgical intervention.[1]

The inferior turbinates play a crucial physiological role in conditioning inspired air through humidification, filtration, and temperature regulation. These functions are mediated by a highly vascular and glandular mucosa under autonomic control.[3] Moreover, the turbinates exhibit dynamic adaptability; they undergo cyclical changes in size and vascularity in response to environmental conditions and physical activity, thereby modulating nasal airflow and resistance.[4] Preservation of these physiological functions is a key consideration in surgical management [5]. Historically, radical procedures such as turbinectomy were commonly performed but have fallen out of favor due to complications including excessive bleeding, crusting, and the development of empty nose syndrome.[6, 7] Contemporary surgical strategies emphasize mucosal preservation while achieving adequate volume reduction. Techniques such as radiofrequency ablation, electrocautery, laser therapy, ultrasound-assisted reduction, and microdebrider-assisted turbinoplasty have been developed to balance efficacy with safety.[8]

Among these, inferior turbinoplasty and submucosal diathermy (SMD) are widely practiced. Inferior turbinoplasty is associated with better long-term outcomes and preservation of mucosal function, although it is technically more demanding.[9] In contrast, SMD is simpler and more accessible but carries a higher risk of thermal mucosal injury.[10] Despite their widespread use, there is no universally accepted gold standard procedure, largely due to variability in study designs and outcome measures across the literature.[11] Recently, microdebrider-assisted inferior turbinoplasty has gained attention as a precise technique that allows controlled submucosal tissue reduction with preservation of the overlying mucosa, potentially offering superior symptom relief with fewer complications compared to SMD.[9, 12] Outcomes are typically assessed using both subjective measures, such as the Visual Analog Scale (VAS) and Nasal Obstruction Symptom Evaluation (NOSE) score, and objective tools including rhinomanometry and acoustic rhinometry.[13]

In the context of Bangladesh, where environmental pollution and allergic conditions are highly prevalent, inferior turbinate hypertrophy constitutes a significant clinical burden. This study therefore aims to compare the efficacy and outcomes of inferior turbinoplasty and submucosal diathermy, with the goal of informing evidence-based surgical decision-making in routine clinical practice.

Materials and Methods

Study design and setting

This prospective observational analytic study was conducted in the Department of Otolaryngology and Head–Neck Surgery at Dhaka Medical College Hospital from July 2022 to December 2023.

Study population

Patients aged 16–55 years of both sex with nasal obstruction due to deviated nasal septum with hypertrophied inferior turbinate and scheduled for septal surgery with turbinate reduction were enrolled using consecutive sampling. Patients with nasal obstruction due to other causes (e.g., tumor, polyp, atrophic rhinitis), previous nasal surgery, refusal to participate, or significant psychiatric illness were excluded.

Sample size

Sample size was calculated using the standard formula for comparison of two proportions. Assuming an efficacy of 95% for inferior turbinoplasty and 78% for submucosal diathermy, with 95% confidence level and 80% power, the required sample size was 57 per group. Thus, a total of 114 participants were included. Study procedure After enrollment, all participants underwent detailed history taking, clinical examination, and diagnostic nasal endoscopy. Relevant laboratory investigations were performed preoperatively.Written informed consent was obtained from all participants or their guardians. Ethical approval was obtained from the institutional review board (Memo-ERC/DMC/ECC/2022/442, Dated-31/12/2022).

Participants (n = 114) were allocated into two groups (57 each):
Group-A (Inferior turbinoplasty group), Group-B (Submucosal Diathermy group).

Allocation was performed in an alternating sequence after the first purposive assignment. All procedures were conducted under standard surgical protocols.

Surgical techniques

In Group A, inferior turbinoplasty was performed using a microdebrider following subperiosteal dissection, preserving mucosal integrity.

In Group B, submucosal diathermy was performed using monopolar electrocautery via an insulated needle to achieve turbinate volume reduction.

Follow-up

Postoperative care was standardized. Patients were followed up at 1 week, 3 weeks, and 3 months. At each visit, crust removal, adhesion management, and clinical evaluation were performed.

Outcome measures

Primary outcomes included improvement in nasal obstruction and sneezing severity, assessed using a 4-point grading scale. A 5 (five) point Likert Scale was used to assess the patient's satisfaction. The Likert Scale is a rating scale that's often used assessing the patients/ subject/ patron regarding experiences and overall effectiveness with the sort or service. We have asked the patient 'How satisfied are you with the overall outcome of your inferior turbinoplasty and septoplasty (SMD surgery)?'Secondary outcomes included intraoperative blood loss, postoperative complications (crusting, hemorrhage, synechiae), and overall patient satisfaction.

Statistical analysis

Data were analyzed using SPSS version 20. Quantitative data were expressed as mean ± standard deviation and qualitative data as frequency and percentage. Chi-square test and unpaired t-test were applied as appropriate. A p-value < 0.05 was considered statistically significant.

Results

This prospective analytical study was carried out to investigate the compare outcome of Inferior turbinoplasty and Submucosal Diathermy. According to formula, sample size was 114. Patients were allocated in two groups, Group-A (Inferior turbinoplasty group), Group-B (Submucosal Diathermy group). All patient in both arms completed treatment and follow-up. The result and observations are given below:

Table 1: Demographic and clinical characteristics of the patients (n=114)

Attributes	Frequency (percentage)		Total (%)	P value
	Group A (n=57)	Group B (n=57)		
Age (years)				
16-25	10 (17.5%)	8 (14%)	18 (15.78%)	
26-35	29 (50.8%)	31 (54.38%)	60 (52.63%)	
36-45	12 (21.05%)	10 (17.54%)	22 (19.29%)	
46-55	6 (10.5%)	8 (14.3%)	14 (12.3%)	
Mean (±SD)	29.91±6.02	29.67±6.11		0.675
Gender				
Male	36 (63.5%)	35 (61.2%)	71 (62.4%)	0.820
Female	21 (36.5%)	22 (38.8%)	43 (37.6%)	
Residence				
Urban	40 (70%)	37 (64%)	77 (67.5%)	0.490
Rural	17 (30%)	20 (36%)	37 (32.5%)	

Group-A (Inferior turbinoplasty group), Group-B (Submucosal Diathermy group).

The mean age was 29.91 ± 6.02 years in Group A and 29.67 ± 6.11 years in Group B, with no significant mean difference (p = 0.675). Overall, males constituted 71 (62.4%) and females 43 (37.6%) of the cohort. There was no significant difference in gender distribution between the groups (p = 0.82).

Table 2: Distribution of respondents by clinical presentation's (n=114)

Clinical presentation's	Frequency	Percentage (%)
Nasal blockage	114	100.0
Sneezing	98	85.9

Table shows the distribution of respondents by clinical presentations. Above table shows that most common symptom was Nasal blockage (100%) and Sneezing (85.9%).

Table 3: Assessment of major symptomatic improvement/ deterioration of nasal obstruction and sneezing (n=114)

Follow up time		Frequency (Percentage)		p-value
		Group-A (n=57)	Group-B (n=57)	
Grades of nasal obstruction				
Baseline	Grade 0	7 (11.8%)	5 (7.1%)	0.207
	Grade 1	17 (30.6%)	25 (44.7%)	
	Grade 2	20 (35.3%)	11 (20.0%)	
	Grade 3	13 (22.4%)	16 (28.2%)	
	Mean value	1.73	1.91	
1st follow-up	Grade 0	18 (30.6%)	12 (20%)	0.319
	Grade 1	24 (42.4%)	19 (34.1%)	
	Grade 2	10 (17.6%)	17 (29.4%)	
	Grade 3	5 (9.4%)	9 (16.5%)	
	Mean value	1.47	1.40	
Final follow-up	Grade 0	30 (51.8%)	24 (40.0%)	<0.001
	Grade 1	19 (34.1%)	15 (27.1%)	
	Grade 2	6 (10.6%)	14 (25.9%)	
	Grade 3	2 (3.5%)	4 (7.1%)	
	Mean value	0.36	1.03	
Grades of sneezing				
Baseline	Grade 0	2 (3.53%)	0 (0.0%)	1.000
	Grade 1	6 (10.59%)	3 (5.88%)	
	Grade 2	19 (34.12%)	17 (30.59%)	
	Grade 3	30 (51.76%)	37 (63.53%)	
	Mean value	1.27	1.49	
1st follow-up	Grade 0	12 (21.18%)	9 (16.47%)	0.004
	Grade 1	16 (28.24%)	11 (20%)	
	Grade 2	15 (27.06%)	19 (34.12%)	
	Grade 3	14 (23.53%)	18 (29.41%)	
	Mean value	1.12	2.2	
Final follow-up	Grade 0	21 (36.5%)	15 (25.9%)	<0.001
	Grade 1	20 (35.3%)	16 (28.2%)	
	Grade 2	13 (22.4%)	21 (36.5%)	
	Grade 3	3 (5.9%)	5 (9.4%)	
	Mean value	0.98	1.78	

Group-A (Inferior turbinoplasty group), Group-B (Submucosal Diathermy group).

In nasal obstruction, most participants initially had Grade 2 severity, with mean scores of 1.73 (Group A) and 1.91 (Group B). At first follow-up, both groups improved (1.47 vs 1.40; $p = 0.319$). By final follow-up, Group A showed significantly greater improvement (0.36 vs 1.03; $p < 0.001$). For sneezing severity, baseline scores were comparable (1.27 vs 1.49; $p = 1.000$). At first follow-up, Group A improved (1.12) while Group B worsened (2.20), showing a significant difference ($p = 0.004$). At final follow-up, Group A improved (0.98) compared to Group B (1.78), with a highly significant difference ($p < 0.001$), indicating superior effectiveness of Group A.

Figure 1 shows differences in mean operation times and MAT took averages 42 minutes compared to SMD's 34 minutes.

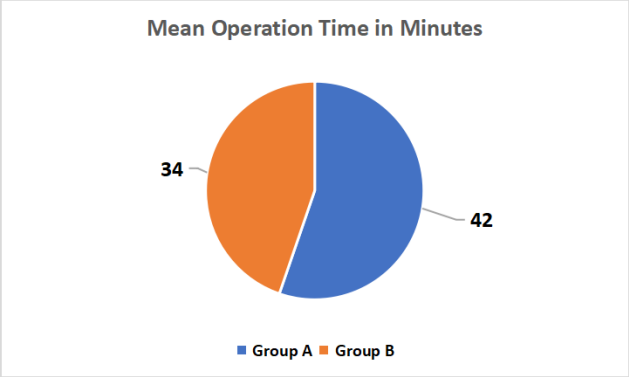


Figure 1: Distribution of cases according to intraoperative events (mean operation time) (n=114)

Bleeding during turbinate surgery was unavoidable in both groups. The amount of blood loss varied between the two groups and ranged between few cubic centimeters that could not be measured (lost in the suction circuit tubes) to 50 ml in maximum patients. The difference was non-significant. Only 11 patients in group-A and 6 patients in group-B had blood loss between 50-100 ml (Figure 2).

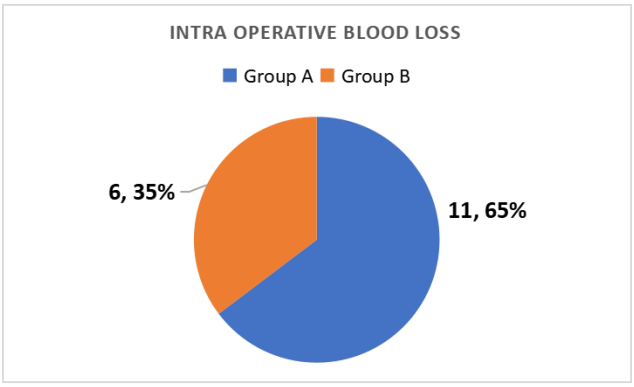


Figure 2: Distribution of cases according to intraoperative events (intra operative blood loss) (n=114)

Table 4: Distribution of the study subjects according to overall outcome and postopeartive complications (n=114)

Outcome	Frequency (Percentage)		p-value
	Group-A (n=57)	Group-B (n=57)	
Improved without complication	51 (90.5%)	48 (84.7%)	0.205
Complications	6 (9.5%)	9 (15.3%)	
Crust formation	4 (67%)	7 (78%)	0.608
Postoperative haemorrhage	2 (33%)	1 (11%)	0.392
Synechiae	0 (0%)	1 (11%)	0.298

Group-A (Inferior turbinoplasty group), Group-B (Submucosal Diathermy group).

Complications occurred in 9.5% of Group A and 15.3% of Group B, with no significant intergroup difference. Crust formation was observed early in both groups (67% in Group A, 78% in Group B) but resolved completely by the final follow-up. Postoperative hemorrhage was noted in 33% of Group A and 11% of Group B, while synechiae occurred only in 11% of Group B; all were managed successfully.

Table 5: Patients satisfaction Following treatment (n=114)

Impression	Satisfaction grade (Likert Scale)	Number of patients		P value
		Group-A (n=57)	Group-B (n=57)	
Very satisfied	5	19	13	<0.001
Somewhat satisfied	4	21	17	
Undecided/ neutral	3	12	16	
Somewhat dissatisfied	2	4	9	
Very dissatisfied	1	1	2	
Mean ± SD		3.98 ± 0.93	2.87 ± 1.17	

Group-A (Inferior turbinoplasty group), Group-B (Submucosal Diathermy group).

During the analysis, a total of 70 (53.14%) patients from both group A & B experienced/ satisfaction of grades 4 and 5 after treatment. The mean±SD of score was 3.98 ± 0.93 in group-A and 2.87 ± 1.17 in group-B. The difference was statistically significant ($p<0.05$) between two groups.

Discussion

This prospective analytical study was conducted in the Department of Otolaryngology and Head Neck Surgery, Dhaka Medical College and Hospital, Dhaka, to compare the outcomes of inferior turbinoplasty and submucosal diathermy in patients with inferior turbinate hypertrophy presenting with nasal obstruction. Inferior turbinate surgery has evolved considerably over recent decades, with the primary goal of improving nasal airflow and patient quality of life. Despite the availability of multiple surgical techniques, no universally accepted gold standard exists, largely due to variability in study designs and outcome measures.[14] In the present study, microdebrider-assisted turbinoplasty (MAT) demonstrated superior improvement in nasal obstruction compared to submucosal diathermy (SMD). A greater proportion of patients in the MAT group achieved minimal or no obstruction at final follow-up, indicating better long-term airway patency. This finding is consistent with previous systematic reviews reporting significant improvement in patient-reported nasal obstruction scores with microdebrider-assisted techniques compared to thermal methods.[11]

Operative duration was longer in the MAT group (mean 42 minutes) compared to the SMD group (34 minutes), which aligns with previous findings that highlight the technically demanding nature of microdebrider-assisted procedures.[15] The increased duration reflects the need for meticulous submucosal dissection and preservation of mucosal integrity, which contributes to improved long-term outcomes.[14] Patient satisfaction was significantly higher in the MAT group, indicating superior subjective outcomes and overall symptom relief. This is supported by recent evidence demonstrating improved quality-of-life scores following microdebrider-assisted turbinoplasty.[16] These findings reinforce the clinical advantage of mucosal-preserving techniques in achieving better patient-centered outcomes.

Intraoperative bleeding was more frequent in the MAT group, likely due to increased tissue manipulation during the procedure. However, similar findings have been reported in the literature, where although bleeding risk is slightly higher with MAT, it is generally not clinically significant.[11] Inferior turbinate hypertrophy remains a major cause of chronic nasal obstruction requiring surgical intervention in refractory cases. A recent randomized clinical trial demonstrated that both microdebrider-assisted and submucosal techniques significantly improve nasal airflow, although outcomes vary depending on surgical technique and patient selection.[17] In the present study, postoperative nasal patency was higher in the MAT group, suggesting superior functional restoration. Postoperative complications were minimal in both groups. Crust formation was more frequently observed in the SMD group, likely due to greater thermal mucosal injury. This observation is consistent with recent comparative studies showing higher crusting rates following diathermy-based procedures compared to mucosal-sparing techniques.[16] Postoperative hemorrhage was slightly higher in the MAT group; however, the difference was not statistically significant, supporting comparable safety profiles between the two techniques.[14] The present study also demonstrated greater improvement in sneezing scores in the MAT group, consistent with previous findings showing significant reduction in nasal symptoms following microdebrider-assisted procedures compared to SMD.[9]

Overall, the findings of this study indicate that MAT provides superior functional outcomes, improved symptom control, and higher patient satisfaction compared to SMD, despite longer operative time and slightly increased intraoperative bleeding. Recent literature supports this trend, emphasizing the growing preference for mucosal-preserving techniques due to their enhanced long-term efficacy and quality-of-life outcomes.[17] These results highlight the importance of selecting surgical techniques that balance efficacy, safety, and patient satisfaction in the management of inferior turbinate hypertrophy, particularly in resource-limited settings where environmental and allergic factors contribute significantly to disease burden.

Limitations

It was a single centre study with small sample size. Only patients admitted in Dhaka Medical College Hospital were taken for the study. So this may not reflect the overall picture of the country. A large scale study needs to be conducted to reach a definitive conclusion.

Conclusion

Present study shows that both of the used surgical techniques were found to be effective in reducing nasal obstruction but inferior turbinoplasty was more effective in reducing nasal obstruction and sneezing. Patients satisfaction also found to be significantly better following inferior turbinoplasty when compared to submucosal diathermy procedures among the two groups of patients.

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