Zagazig University Medical Journal
www.zumj.journals.ekb.eg
https://doi.org/10.21608/zumj.2021.53558.2082 Volume 30, Issue 2, March 2024
Manuscript ID ZUMJ-2101-2082 (R3)
DOI 10.21608/ZUMJ.2021.53558.2082

ORIGINAL ARTICLE

Assessment of Inferior Turbinate Mucosa after Turbinate Reduction by Radiofrequency Ablation Versus Bipolar Electro Cautery: Cytological Study

Mohamed Elsayed Elshora[1], Samir Sorour Sorour[1], Naser Naguib Mohamed[1], Mahmoud Al-Mokhtar Altoumi[1]*, Ashraf Elhussiny Basha[1], Mai Mohamed Abdelwahab[2], Mohammed El Sayed Albelbary[1]
[1]Otorhinolaryngology Department, Faculty of Medicine, Zagazig University, Egypt
[2]Pathology Department, Faculty of Medicine, Zagazig University, Egypt

***Corresponding Author:**
Mahmoud Al-Mokhtar Altoumi

Email:
Mahmoudaltoumi7@gmail.com

Submit Date	**2021-03-13**
Revise Date	**2021-11-29**
Accept Date	**2021-07-11**

ABSTRACT

Background: Enlargement of inferior nasal turbinates is a common cause of nasal obstruction. There are many surgical methods used to treat hypertrophied inferior turbinates such as electrocautery, partial turbinectomy, microdebrider reduction and radiofrequency thermal ablation (RFTA). The mucosal condition after surgery is an important factor that should be considered in evaluation of different techniques.
Objective: This study aimed to examine the microstructural appearance of the ciliated epithelial tissues of inferior turbinates by light microscope. It was done by cytological examination of inferior turbinate mucosa in patients treated by radiofrequency thermal ablation (RFTA) and bipolar electro cautery (BEC) for hypertrophied inferior turbinates.
Methods: A prospective study performed on 36 patients with hypertrophied inferior turbinates causing nasal obstruction. Patients were divided into two groups: group (A) were managed with radiofrequency thermal ablation (RFTA) and group (B) were managed with bipolar electro cautery (BEC). Cytological examination of nasal mucosa was done 3 months postoperatively.
Results: by cytological microscopic examination, 88% of cases of group (A) showed no abnormalities in ciliated epithelial cells. only 12% of cases showed abnormalities in the form of damage in the ciliated cells with an architectural rearrangement. In group (B) 78% of patients showed abnormalities in cilia and epithelial cell damage and only 22% of them showed no abnormalities.
Conclusion: Radiofrequency thermal ablation (RFTA) seems to be a good modality dealing with the problem of inferior turbinate hypertrophy. It showed minimal injury to turbinate mucosal tissues with good ciliary structure, along with an intact and functioning epithelium.

Keywords: Turbinate Mucosa; Radiofrequency Thermal Ablation; Bipolar Electro Cautery; Nasal Cytology

INTRODUCTION

The inferior turbinates allow humidification of air entering the nasal cavity and functions as a barrier to different environmental allergens. It contributes to inspiratory resistance, which is mandatory for normal breathing cycle. Alteration in this physiological role of the inferior turbinates can lead to many pathological problems [1].

Radiofrequency thermal ablation (RFTA) and bipolar electro cautery (BEC) are common methods that depend on heat-controlled effect to reduce inferior turbinate size. Turbinate reduction by RFTA is superior to BEC method as it preserves nasal ciliary mucosa and hence clearance [2]. The biophysics of radiofrequency are unique and applied in a unipolar or bipolar fashion from an electrode that generates low heat energy sufficient to denature tissue proteins. A radiofrequency needle can be placed submucosally and only the tissue adjacent to the unprotected protein will undergo ablation. This fact eliminates surface destruction [3].

Nasal cytology represents a useful, cheap, and easy diagnostic method to show better details of the phenotypic characteristics of nasal mucosal tissues. It allows detection and quantification of cell populations within the nasal mucosa at a given instant and discriminates the different pathological conditions [4]. This has important clinical and pathophysiologic consequences. The decrease in the ciliated component with proportional increase in goblet cells increases the mucus production with consequent endonasal stagnation [5].

Therefore, this study aimed to examine the microstructural appearance of the mucosal ciliated epithelial tissues obtained by nasal cytology in patients treated with RFTA and BEC for inferior turbinate hypertrophy.

METHODS

A prospective study performed on thirty-six patients recruited from the ENT outpatient clinic department in the Zagazig University hospital. Written Informed consent was taken from all patients to participate in the study. Approval for performing the study was obtained from Zagazig University Institutional Review Board (IRB). The study was done according to The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Selection criteria were based on following; All patients were complaining of nasal obstruction due to inferior turbinate hypertrophy, and all patients had persistent symptoms not relieved by medical therapy (topical corticosteroids, antihistamines, and decongestants).

Exclusion criteria: Patients with coagulation disorders, Sino nasal tumors, allergic fungal rhino sinusitis, nasal polyposis, marked nasal adhesions and sever nasal septal deviation were excluded from this study. full detailed history was taken, analysis of the chief symptoms of the patient was obtained. The main symptom was nasal obstruction. Routine physical ear,nose and throat examination, focusing on detailed nasal examination such as anterior rhinoscopy, nasal endoscopy, nasal decongestion, and CT scanning.

Surgical procedures: All procedures were done under general hypotensive anesthesia with patients in supine position and slight elevation of patient head. Nasal cavity prepared with nasal packs soaked with mixture of saline epinephrine solution concentration 1:200,000. All surgical steps were done using 0-degree endoscope in addition to set of endoscopic sinus surgery. Patients in group (A) were managed with radiofrequency thermal ablation (RTA) of the inferior turbinates. After preparation of the nasal cavity a special electrode was connected to a radiofrequency device (ENTERMED enter wave electrosurgical unite). The electrodes were inserted submucosally under endoscopic guidance. The energy generated through the procedure was 300 J at less than 75°C and energy was delivered to three different sites of each turbinate in the anterior, middle, and posterior portions. In the relatively small turbinates, two applications were done in the anterior and posterior parts only. In addition, energy delivery was stopped once whitening was noted over the applied area of mucosa during the procedure.

Patients in group (B) were managed by bipolar electro cautery (BEC) of the inferior turbinates. After preparation of nasal cavity, bipolar cautery forceps was connected to a standard surgical coagulation diathermy source under endoscopic guidance with visualization of the whole turbinate, the forceps were introduced into the nasal cavity touching both the superior and inferior surfaces of the turbinate and parallel to the floor of the nose. The diathermy circuit 20w was closed while the forceps were gradually withdrawn applying linear burn to the mucosa. Usually, 2-3 burns were needed for reduction of turbinate size. Bipolar electro cautery was controlled with foot switch.

Post-operative follows up of nasal cytology; All patients had nasal cytology biopsies from the turbinate mucosa after 3 months. A pencil shaped nasal curette with a small distal cup was used to scrap the mucosal surface of the medial aspect of the inferior turbinate figure (1). The stained sample was read at optical microscopy, at 400× and 1000× magnification with oil immersion stained with hematoxylin and eosin stain. The microscopic evaluation was targeted to detect epithelial cell abnormality and mucinous cells.

Statistical Analysis

Data were then imported into Statistical Package for the Social Sciences (SPSS version 20.0) (Statistical Package for the Social Sciences) software for analysis. According to the type of data qualitative represent as number and percentage, quantitative continues group represent by mean ± SD, the following tests were used to test differences for significance. Difference and association of qualitative variable by Chi square test (X^2) Differences between quantitative independent groups by t test, paired by paired t. P value was set at <0.05 for significant results and <0.001 for high significant result.

RESULTS

This study included 36 patients to evaluate inferior turbinate cytological mucosal state after reduction by RTA versus BEC. Patients had been enrolled in two groups each of them formed of 18 patients. Group (A) was managed by RTA and group (B)were managed by BEC.

Cytological microscopic examination of ciliated epithelial cells was performed 3 months postoperatively for all cases. In group (A)16 patients (89%) had no abnormalities in the ciliated epithelial cells figure 3 (a). only two patients (11%) had abnormal ciliated epithelial cells. Mucinous cells were not observed in 12 patients (66.6%). 5 patients (27.8%) had moderate mucinous cells and only one patient (5.6%) had large mucinous cells in the cytological sample.

In group (B), 14 patients (88%) had abnormal ciliated epithelial cells and 4 patients (12%) showed no abnormalities. Mucinous cells were not observed in 5 patients (27.8%). 9 patients (50%) had moderate mucinous cells and 4 patients (22.2%) showed large mucinous cells in their samples. There was no significant difference between the two groups table 2.

Table 1: Epithelial cells abnormalities between studied groups

			Group		X^2	P
			Radiofrequency Group	Diathermy Group		
Epithelial ciliated cells abnormality	**No**	**N**	16	4		
		%	89%	12%		
	Yes	**N**	2	14	9.02	0.003*
		%	11%	88%		
Total		**N**	18	18		
		%	100.0%	100.0%		

Table 2: Mucinous cells distribution between studied groups at 3-month postoperatively:

			G	roup	t/ X^2	P
			Radiofrequency Group	Diathermy Group		
Mucinous cells	**Mean ± SD**		16.212±49.38	19.5±57.38	1.718	0.078
	Non	**N**	12	5		
		%	66.6%	%27.8		
	Moderate	**N**	5	9		
		%	27.8%	%50.0	5.82	0.054
	Large	**N**	1	4		
		%	%5.6	%22.2		
Total		**N**	18	18		
		%	%100.0	%100.0		

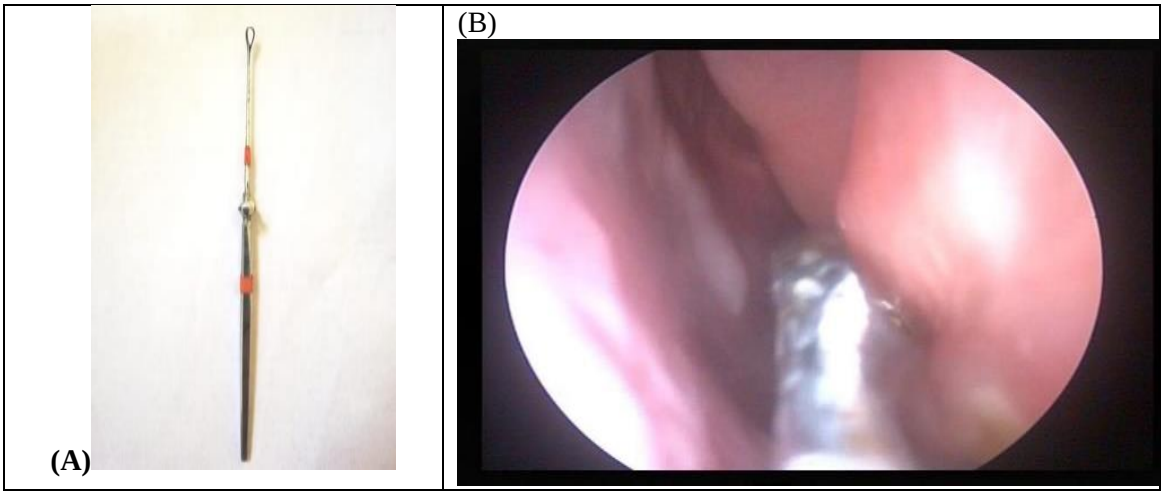

Figure 1: (A) Rhino nasal curette for cytology sample (B) Endoscopic sampling by scraping mucosal epithelium of left inferior turbinate for cytology.

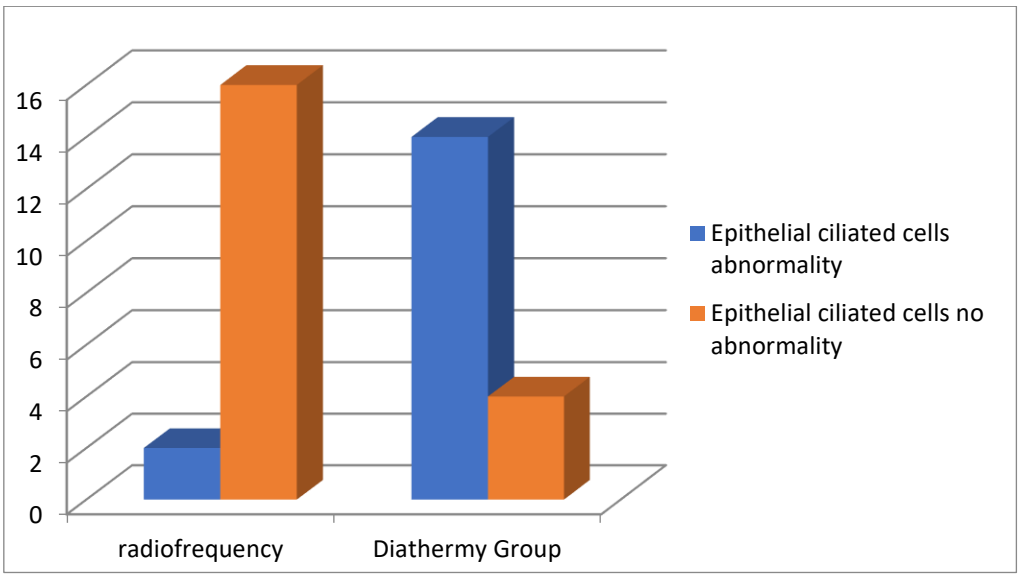

Figure (2): Epithelial cells abnormality distribution between studied groups.

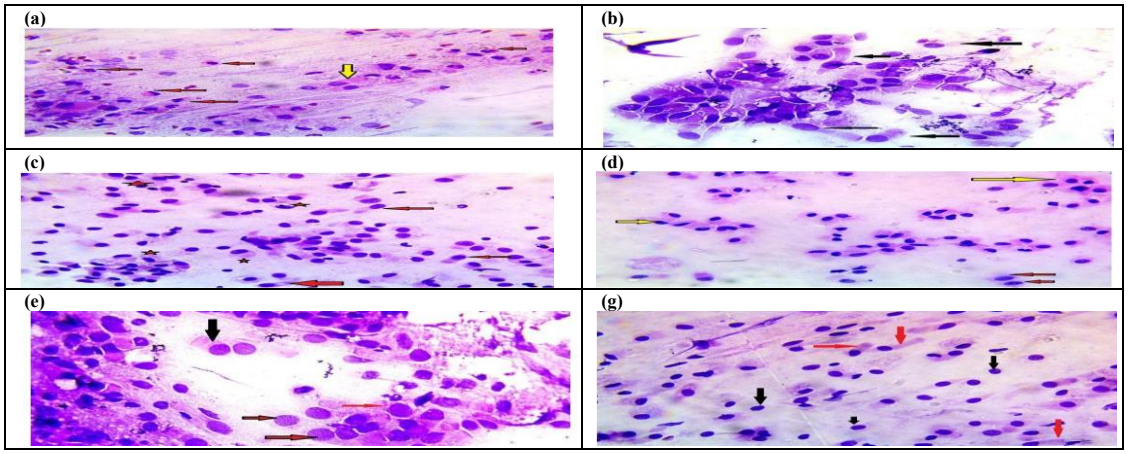

Figure (3): Nasal cytology from a case of group (A) showing: (a) Ciliated cells (yellow arrow) and inflammatory cells (red arrows) in a mucinous background. (b): Ciliated cells (arrows) in addition to normal basal cells and striated cells. (c): ciliated cells (arrows) and mucinous cells (Asterix). (d): Basal epithelial cells (red arrows) and striated cells (yellow arrows) with paucity of ciliated cells. (e): Abnormal ciliated cell (black arrow) with many basophiles (red arrows). (g): Ciliated cells (red arrows and basal cells (black arrows), (H&E x400).

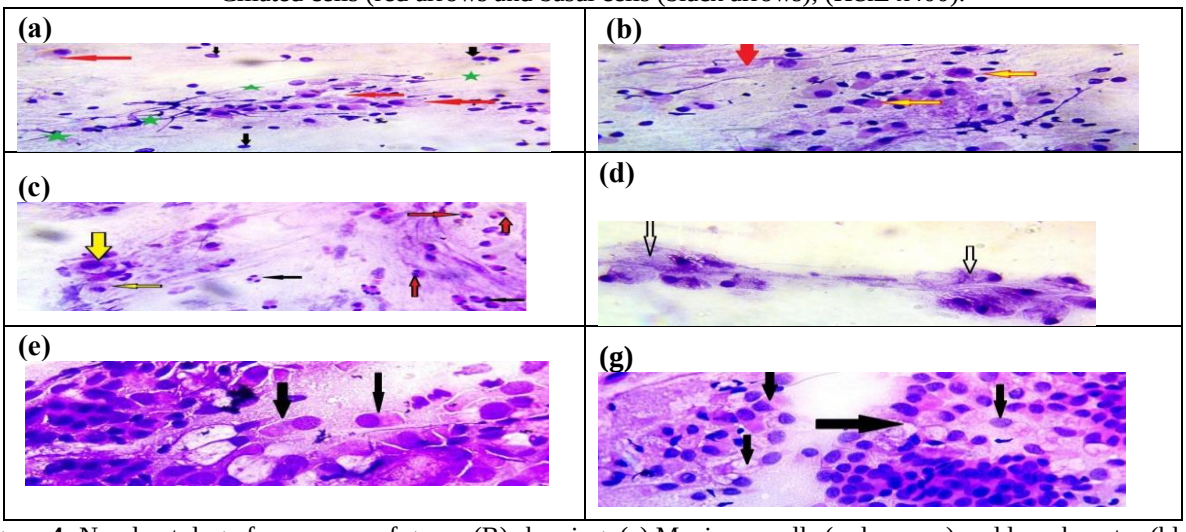

Figure 4: Nasal cytology from a case of group (B) showing: (a) Mucinous cells (red arrows) and lymphocytes (black arrows) with mucin threads (astrix). (b): Abnormal ciliated cell (red arrow), and numerous striated cells (yellow arrows). (c): Oesinophils (red arrows), P.N.L.s (black arrows) and mucinous cells (yellow arrows). (d): Groups of crushed mucinous cells (arrows). (e): Abnormal ciliated cells (black arrows). (g): Large number of mucinous cells (black arrows) (H&E x400).

DISCUSSION

The present study was conducted to compare RFTA and BEC as treatment modalities of hypertrophied inferior turbinates with regards to objective method to assess nasal ciliary mucosa preservation. Also, compare the microscopic effects of radiofrequency and electrocautery therapies for inferior turbinate reduction for patients with inferior turbinate hypertrophy.

Post-operative Nasal cytology provides a useful diagnostic tool to assist in evaluating nasal mucosa alterations after inferior turbinate surgery and progress toward restoration of nasal mucosa function over time. Nasal cytology is being increasingly used to differentiate between different types of rhinopathies, to manage rhinitis, and to monitor the efficiency of medical and surgical treatments Cassano et al. [6] In the present study, cytological microscopic examination of ciliated epithelial cells performed. In group A treated with RFTA, 88% of patients had no abnormality in ciliated epithelial cell and only two patients had abnormal ciliated epithelial cell. In group B treated with BEC showed abnormal ciliated epithelial cells in 77%. Also, goblet cell ratio was more evident in group B Epithelial ciliated cells abnormality was significantly associated with diathermy Group. This result was harmony with Harju et al. [7] who evaluated the effects of radiofrequency ablation, diode laser, and microdebrider-assisted inferior turbinoplasty techniques on ciliated epithelium and mucociliary function. They concluded that radiofrequency ablation is more mucosal preserving techniques, which was found to increase the amount of squamous metaplasia at the 3-month follow-up. The number of cilia seemed to increase even after radiofrequency ablation. But in Gindro's et al. [8], based on the evaluation of nasal mucosa after, radiofrequency and ultrasounds reduction, have not confirmed the regeneration of cilia and restoration of normal structure of the epithelium. Which seems to be due to different types of devices and amount of energy used.

Berger, Ophir [9] showed that Diathermy-treated group showed a significant difference in ciliary loss, goblet cell loss, epithelial damage. The changes in the inferior turbinate caused by radiofrequency and laser have been compared by Zborayova et al. [10], they found an intact surface epithelium cell radiofrequency- treated group. Similarly, in our study no major epithelial injury was visible in group A while it was moderate or severe in group B because of high temperature insult to epithelium.

CONCLUSION

Radiofrequency tissue reduction has an edge over bipolar diathermy, keeping earlier postoperative healing and lesser incidence of complications. At present, this study prefers Radiofrequency tissue reduction as a first line treatment modality in patients with chronic nasal obstruction due to inferior turbinate hypertrophy unresponsive to medical treatment. Radiofrequency showed minimal injury to tissues that result in good ciliary structure and healthy goblet cells, along with an intact and functioning epithelium.

Limitations of this study few numbers of patients, COVID 19 precaution, short period of the study.

Conflict of interest: The authors report no conflicts of interest. The authors along are responsible for the content and writing of the paper.

Financial Disclosures: This study was not supported by any source of funding

REFERENCES

1. Daniel C, Utainrat W, Setabutr D. Surgical management of inferior turbinate hypertrophy. Oper Tech Otolayngol Head Neck Surg. 2018; 29(2): 83-8.
2. Rosato C, Pagliuca G, Martellucci S, de Vincentiis M, Greco A, Fusconi M, et al. Effect of Radiofrequency Thermal Ablation Treatment on Nasal Ciliary Motility: A Study with Phase-Contrast Microscopy. Otolaryngol Head Neck Surg. 2016; 154(4): 754-8.
3. Pang KP, Rotenberg BW, Woodson BT. Advanced surgical techniques in snoring and obstructive sleep apnea: Plural Publishing; 2013.
4. Toppila-Salmi S, van Drunen CM, Fokkens WJ, Golebski K, Mattila P, Joenvaara S, et al. Molecular mechanisms of nasal epithelium in rhinitis and rhinosinusitis. Curr Allergy Asthma Rep. 2015; 15(2): 495.
5. Heffler E, Landi M, Caruso C, Fichera S, Gani F, Guida G, et al. Nasal cytology: Methodology with application to clinical practice and research. Clin Exp Allergy. 2018; 48(9): 1092-106.
6. Cassano M, Granieri C, Del Giudice AM, Mora F, Fiocca-Matthews E, Cassano P. Restoration of nasal cytology after endoscopic turbinoplasty versus laser-assisted turbinoplasty. Am J Rhinol Allergy. 2010; 24(4): 310-4.
7. Harju T, Honkanen M, Vippola M, Kivekas I, Rautiainen M. The effect of inferior turbinate surgery on ciliated epithelium: A randomized, blinded study. Laryngoscope. 2019; 129(1): 18-24.
8. Gindros G, Kantas I, Balatsouras DG, Kandiloros D, Manthos AK, Kaidoglou A. Mucosal changes in chronic hypertrophic rhinitis

after surgical turbinate reduction. Eur Arch Otorhinolaryngol. 2009; 266(9): 1409-16.
9. Berger G, Ophir D, Pitaro K, Landsberg R. Histopathological changes after coblation inferior turbinate reduction. Arch o Otolary Head Neck Sur. 2008; 134(8): 819-23.
10. Zborayová K, Ryška A, Lánsky M, Čelakovský P, Janušková V, Vokurka J. Histomorphologic study of nasal turbinates after surgical treatment: a comparison of laser surgery and radiofrequency-induced thermotherapy effects in animals. .Acta Otolaryngol 2009; 129(5): 550-5.

To cite:

Altoumi, M., Shora, M., Sorour, S., Mohamed, N., Basha, A., Abdelwahab, M., Albelbary, M. Objective Evaluation of Turbinate Mucosa after Reduction by Radiofrequency Ablation versus Diathermy. *Zagazig University Medical Journal*, 2024; (394-399): -. doi: 10.21608/zumj.2021.53558.2082