Am J Otolaryngol 40 (2019) 650–652

Contents lists available at ScienceDirect

Am J Otolaryngol

journal homepage: www.elsevier.com/locate/amjoto

New wand coblation turbinator vs coblation radiofrequency

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A B S T R A C T

Introduction: İnferior turbinate hypertrophy is a common reason of nasal obstruction. One of the most preferred surgical metod is radiofrequency tecnique. Coblation submucosal reduction turbinator (SCT);new surgical device; started to use recently. Since the method is new, very few study has been done yet. We compare coblation radiofrequency (CR) with SCT.

Material and methods: Patients with only inferior turbinate hypertrophy but no other diseases included in study. Paranasal CT was made to all patient to rule out turbinate bone hypertrophy. Group 1 32 patient; performed CR. Group 2 25 patients performed SCT. To all patients preoperative and 3 weeks later post operative mucosiliary activity test was performed. Nasal flow was measured with nasal flow meter preoperatively and 3 weeks post operatively. VAS and NOSE was measured. Results compared between two groups. SCT performed under general; CR performed under local anesthesia.

Results: There was significant nasal flow changes in CR group. ($p < 0.001$) There was no difference in pre-and-post operatively saccharin test results in CR group. ($p = 0.385$) There was slightly nasal flow gain in SCT group but this was not statistically significant. ($p < 0.192$) Also there was no statistically significant changes in pre-and-post operatively saccharin test results in SCT group. ($p = 0.167$) There was no difference between two groups in terms of post operative nasal flow values and mucociliary activity. (respectively $p = 0.562$, $p = 0.355$). (Table 2). Both two tecnique has significant increase in VAS and NOSE scores. ($p < 0.001$).

Conclusions: According to our study two tecnique is suitable and safe for nasal mucociliary activity. Tecniques has positive effect on nasal flow, VAS and NOSE scores.

1. Introduction

Inferior turbinate is a structure that has important functions in nasal physiology. It has important functions in filtering, heating, humidifying the air taken and adjusting the nasal airflow [1,2]. However, hypertrophy of the inferior turbinate decreases the nasal flow and causes nasal obstruction. Inferior turbinate hypertrophy is one of the most frequently seen reasons of nasal obstruction [3].

Medical treatment is the first-line treatment for this condition, which is frequently encountered in daily ENT practice. Saline spreys, nasal steroids, oral antihistamines, nasal antihistamines and oral montelukasts are frequently used in medical treatment. Surgical treatment comes to the fore in the cases that do not respond to medical treatment [4].

There are many surgical methods that are developed for inferior turbinate hypertrophy. Foremost among them inferior turbinate lateralization, submucosal resection, laser reduction, electrocauterization, and radiofrequency reduction take place [4,5].

Radiofrequency inferior turbinate reduction involves the direct application of a high-frequency current to the inferior turbinate, friction between inferior turbinate ions lead to submucosal damage. This thermal energy is lower than other cautery techniques but generated energy cause enough submucosal injury. Technique is popular because it can be applied by local anesthesia [6,7].

Several devices designed for radiofrequency. In our daily practice we use coblation radiofrequency (CR) device (Coblation™ Reflex). The wand is inserted in to the turbinate and activated for 10 s. Probe can be used several times during surgery to provide reduction on turbinate [4].

As the technology progresses, new devices are being used for inferior turbinate reduction. Inferior turbinate submucosal coblation turbinator (SCT) has become a new method. In this method, the turbinate incised vertically to entry and mucosa is elevated and a tunnel created. Submucosal reduction is performed in the tunnel with the help of coblation turbinator wand (Coblation™ Turbinator™). Since the method is new, very few study has been done yet [8].

Coblation Turbinator™ is the first wand designed specifically for turbinate surgery and has an actice electrode that produces the plasma field. It has intergrated irrigation, bipolar an suction connected. It was found to be a safe technique [8].

For these reason, we wanted to compare this new technology with radiofrequency that our traditional technology for reduction turbinate surgery. Thus it was aimed to determine whether this novel technology could replace the radiofrequency inferior turbinate surgery.

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https://doi.org/10.1016/j.amjoto.2019.05.019
Received 17 March 2019

2. Material and method

The study was carried out in our tertiary center and approval of the ethics committee was obtained. Written approvals of all the patients participated in were taken and the voluntary patients were included in the study. The study was performed according to Helsinki Declaration.

This study is a single-blind randomised controlled trial. Fifty-seven patients were included in the study and the patients were randomly divided two groups.

Mucociliary activity test, In-Check Nasal Inspiratory Flow Meter test NOSE and VAS were applied by blind researchers who participated in the study but do not know which surgery was applied to which patient.

Group 1 included 32 patients and coblation radiofrequency technique was applied to this group. Group 2 consisted of 25 patients and coblation submucosal reduction turbinator technique was applied. Only the patients with turbinate hypertrophy, who did not respond to medical treatment, were included in the study. Patients with previous nasal pathologies (deviation, sinusitis, etc.), who has wide inferior turbinate bone with non hypertrophic mucosa, who had previously undergone surgery, who used cigarettes and nasal steroids in the last 3 weeks, and had known allergic rhinitis and allergy, were excluded. Allergic rhinitis patients excluded in order to evaluate new technique independently from the allergic rhinitis severity and seasonal changes.

In a study it was stated that coblation showed re-epithelialization on respiratory epithelium in fourteenth day so post operative controls was done at week three [9].

The diagnosis was made by anterior rhinoscopy, nasal endoscopy (0° 4 mm STORZ endoscope) and paranasal sinus tomography. Patients who has normal septum with no other nasal pathology, as well as those with only inferior turbinate mucosa hypertrophy and normal turbinate bone size, were included in the study.

Mucociliary activity was measured by the saccharine clearance test. Test was performed before the surgery and on the 3rd postoperative week. Test was performed as conducted by Andersen et al [10]. This method is an inexpensive, simple and effective method that is used for the measurement of mucociliary activity. A quarter of the saccharine tablet was placed about 1.5 cm behind the inferior turbinate and in the meanwhile, the patient was told to face straight, recommended normal breathing, and was told not to sniffle or breathe deeply. The period up to the taste came to the mouth was recorded. The saccharin test was performed only by blind researchers who were mentioned in the publication and who were experienced in performing this test. The results of different control periods of both groups and the patients were compared.

To evaluate nasal obstruction In-Check Nasal Inspiratory Flow Meter was used preoperative and post operative three week. Peak nasal inspiratory flow (PNIF) was measured first by each subject in a sitting position. The device was a combination of a basic peak flowmeter (PEF-meter) and rubbery anesthesia face masks of variable sizes. The mask had to be large enough not to press the nose or mouth, and small enough to prevent air leakage under the chin. Each participant was asked to take a deep breath, put the mask on to cover the nose and mouth, and to exhale sharply through the nose. The best of three results was recorded. Participants who had problems with the technique were permitted to make more attempts. After cleaning of the mask, each participant measured the PNIF with an In-check peak flow meter (In-check, Clement Clarke Int. Ltd., Essex, UK), recording the best result of three forced inspirations [10].

VAS was performed by blind researchers who participated in the study but do not know which surgery was applied to which patient. Nasal cavity crusting of the patients were evaluated. 0 means no crusting and 10 means total obstruction because of crusting.

Stewart et al. designed the nasal obstruction symptom evaluation (NOSE) in 2004. NOSE is useful and simple test to measure nasal obstruction. In 2018 Karahatay et al. validated NOSE in Turkish. We evaluated preoperative and postoperative NOSE scores of the patients [12,13].

Table 1
Characteristics of the study population.

	CR Group (n = 32)	SCT Group (n = 25)	p
Characteristics of the population			
Age (y), mean ± SD (min-max)	33.6 ± 6.37	33.18 ± 14.83	0.835★
Sex (female/male)	12/20	10/15	0.847★★
Data from clinical history			
Smoking, yes (%)	11(34.4%)	7(28%)	0.835★★
Ex-smoker	8(25%)	6(24%)	
Pre-operative Saccharin test duration (*sec*)	652.81 ± 385.52	720.0 ± 390.07	0.519★
Pre-operative inspiratory flow metry results (ml/min)	81.56 ± 24.77	95.20 ± 32.29	0.076★

SD: Standard deviation; ★Student t-test, ★★Pearson Chi-Square test.

2.1. Statistical analyses

Data was analyzed using the SPSS version 21.0 software program (Statistical Package for Social Sciences v.21, IBM, Chicago, IL). Pearson Chi-Square test was used to investigate the association between categorical sex variables. The Student *t*-test was used to compare continuous numerical variables between groups. Paired t-test was used to compare the preoperative and postoperative values in each group.

3. Results

This study included 57 subjects, including 32 in the CR group and 25 in the SCT group. There was no difference in age between groups (p: 0.835). There was no difference in the proportion of female proportion between groups (p: 0.847). Characteristics of the study population is shown in Table 1.

There was no statistically difference between the two groups about preoperatively inspiratory nasal flowmetry and saccharin tests. (Table 1).

There was significant nasal flow changes among inspiratory flowmeter results in CR group ($p < 0.001$). There was no difference in preoperatively and post operatively saccharin test results. ($p = 0.385$). (Table 2).

There was slightly nasal flow gain in SCT group but this gain was not statistically significant. ($p < 0.192$). Also there was no statistically significant changes in preoperatively and post operatively saccharin test results. ($p = 0.167$). (Table 2).

There was no difference between two groups in terms of

Table 2
Comparison of two groups results.

	CR group (n = 32) mean ± SD	SCT group (n = 25) mean ± SD	p
Pre-operative saccharin test duration (sec)	652.81 ± 385.52	720.0 ± 390.07	0.519★
Pre- operative inspiratory flow metry results (ml/min)	81.56 ± 24.77	95.20 ± 32.29	0.076★
Pre-operative NOSE	15.25 ± 1.56	15.16 ± 1.46	0.825★
Post-operative saccharin test duration (sec)	705.62 ± 423.04	604.78 ± 352.80	0.355★
Post- operative inspiratory flow metry results (ml/min)	103.75 ± 32.79	98.69 ± 30.04	0.562★
Post-operative NOSE	7.34 ± 1.77	7.76 ± 1.23	0.322★
VAS	3.78 ± 1.15	3.08 ± 0.95	0.018★

SD: Standard deviation; ★Student t-test.

postoperative nasal flow values and mucociliary activity. (respectively $p = 0.562$, $p = 0.355$). (Table 2).

Both two technique improve VAS scores significantly. ($p < 0.001$) VAS scores of SCT group was higher then the CR group but compare the two technique there was no significant difference. ($p = 0.018$) Postoperative NOSE scores of the both groups was significantly better than the preoperative NOSE scores. ($p < 0.001$) Compare the groups there was no significant difference. ($p = 0.322$).

4. Discussion

Inferior turbinate is an anatomical structure that plays an important role in nasal physiology. It is not a part of the ethmoid bone like other turbinates, but it is a separate bone structure. The narrowest part of the nasal cavity reflecting the area of highest resistance is the anterior nasal valve or the isthmus; thus inferior turbinate stands there. Hypertrophy of inferior turbinate lead to severe nasal obstruction and failure of medical treatment; patients are referred for surgery. There is no consensus on selection of turbinate surgery and many techniques has been using [4,6,14,15].

Non-thermal tissue reduction; cold ablation; where radiofrequency power is delivered through a conductive solution break the molecular bonds by releasing charged plasma particles cause fibrosis with reduction in submucosal glands and venous sinusoids but with intact basement membrane. İnferior turbinate reduction by coblation could be done by using the Ultra Reflex™ wand [16,17].

The Coblation™ Turbinator™ turbinate reduction wand differs significantly from the Coblation™ Reflex wand. The Turbinator™ wand incorporates a broader 2.9 mm shaft with an active electrode at the tip which generates the plasma field common to other Coblation™ instruments. In addition, there is suction and saline irrigation ports on the reverse side of the tip. The wand is connected to the standard Coblation™ power unit which will default to the manufacturer's recommended settings (Ablate 7 and Coag 3) [8].

Unlike the Ultra Reflex wand; Coblation™, the Turbinator™ is the first wand designed specifically for turbinate reduction surgery that incorporates the active electrode that produces the plasma field unique to Coblation™ technology. Ultra-Reflex wand works as standard bipolar, albeit on a low thermal energy setting [8].

Coblation turbinator wand is a new technique in turbinate surgery. This technique starts with vertical incision to turbinate then mucosa and soft tissues elevated from the bone of the turbinate and a tunnel created. Then wand is inserted in the tunnel and ablation is applied by moving the wand to reduce the soft tissues. This technique need more instruments than CR technique. Because of the incision need bleeding is more than the CR technique.

CR technique is easy to perform via local anesthesia; less blood loss, less surgical instruments needed and easy to perform. SCT compare to CR is perform via general anesthesia, more blood loss because of the incision need, more surgical instrument needed and more complicated to perform.

Both techniques has no negative effect on the mucociliary activity. Although the turbinator technique causes less trauma to the inferior turbinate mucosa, mucociliary activity is not affected in two tecnique.

PNIF is a reliable method for objectively evaluating nasal obstruction. Low cost, easy application and the reliability makes the PNIF favorable compared to the other tests [11,18–20].

Both techniques increase the nasal flow and affect breathing in a positive way but SCT technique' increase was not statistically significant and CR technique provided statistically more nasal flow gain.

Considered in terms of VAS, turbinator technique have provided more positive results in terms of crusting but there was no statistically difference. NOSE scores made progress in both technique but there was no difference according the two groups.

5. Conclusion

During the present study, no major complication was developed, and the technique was safely applied in all the patients who underwent the coblation turbinator technique. According to our study, turbinator technique is a technique that can be safely used, has a positive effect on nasal physiology, and can be used effectively in order to reduce nasal obstruction. However, when compared to the CR technique, it was observed that the increase in nasal flow was less but there was no difference in NOSE scores. Therefore, it is suggested that the device and the technique are needed to be improved. Development of the application characteristics of wand without incision via a lancet and easy tunnel creation attribute may cause the mucociliary activity and nasal flow to be positively affected after the surgery and need of more instruments decreases.

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