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Conchal contractility after inferior turbinate hypertrophy treatment: A prospective, randomized clinical trial☆,☆☆

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ABSTRACT

Objective: The aim of this study is to evaluate the effects of these two methods (Nasal corticosteroids (NCS) and radiofrequency (RF) application) on conchal contractility utilizing objective rhinologic measurement parameters.
Methods: 82 patients were presented with the complaint of nasal obstruction and diagnosed with inferior turbinate hypertrophy and were included in the study. Patients in Group 1 received NCS for 12 weeks. Patients in Group 2 were administered RF to their inferior turbinates. Acoustic rhinometry and rhinomanometry tests with and without decongestant were performed.
Results: In the evaluation of the contractility difference of rhinometry parameters, there was not a significant difference among pre and postoperative acoustic rhinometric parameters in Group 1. Whereas in Group 2, postoperative contractility difference was significantly decreased compared to preoperative values.
In the evaluation of the contractility difference of rhinomanometric parameters, no significant difference was found between pre and postoperative values in Group 1. However, postoperative contractility difference was significantly decreased compared to preoperative values in Group 2 in terms.
Conclusion: Because the RF procedure produces fibrosis in the vascular tissues, inferior turbinates do not have a shrinking response to decongestant administration. Administration of NCS administration maintains the contractility function compared to RF application.

1. Introduction

The nasal mucosa can perform many sinonasal functions with its complex nature. Primary functions of the nasal mucosa include humidification, cleansing from harmful particles, filtering and providing heat regulation of inspiratory air [1,2].

The inferior turbinate has a wide surface area within the nasal mucosa. With its localization and wide surface area, it provides a significant contribution to the nasal mucosa to perform nasal functions. Inferior turbinate hypertrophy is among the most common causes of nasal obstruction, leading to a wide range of additional pathologies [3]. Airway resistance may not severely interfere with inhalation, but nasal airway narrowing may create inadequate climatization of the inhaled air. Abnormally low airway resistance leads to too much air ingressing to the nasal passage which in turn shortens the contact time between air and the mucosa, hindering sufficient climatization [1].

Numerous methods are used in the treatment of inferior turbinate hypertrophy. These modalities are divided into two as medical and surgical methods. Medical methods include topical antihistamines, topical and systemic decongestants and, topical and systemic corticosteroids. Whereas surgical methods include electrocauterization, radiofrequency application, laser, argon plasma, lateralization, segmental resection and total resection [4]. Although these methods are primarily applied in order to expand nasal airway, contact of the nasal mucosa with air and its functionality are crucial in order to make this expansion valuable. The mucosa which has a high vascularity is the most dominant portion of the climatization of inhaled air [5]. Therefore, every treatment method influencing the contractility feature of the conchal mucosa may affect the mucosal structure and thus nasal functions.

In the literature, nasal corticosteroid sprays and/or radiofrequency applications are commonly used for the reduction of the inferior turbinate hypertrophy. However, information about the condition of mucosal contractility of the inferior concha following these methods is limited. The objective of this study is to evaluate the effects of the

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most commonly used two methods comparatively on mucosal contractility of the inferior concha through objective rhinologic methods.

2. Materials and method

2.1. Study design

Approval was obtained from the ethics committee of clinical trials of the university. Patients who presented to the otorhinolaryngology department with the complaint of chronic nasal obstruction between December 2013 and February 2015 were included in the study. Patients with isolated inferior turbinate hypertrophy in the ethiopathogenesis of chronic nasal obstruction were included. The exclusion criteria are the patients with allergic rhinitis (prick test was applied in order to rule out allergic rhinitis), those aged under 18 or over 65 years, having nasal pathologies other than inferior turbinate hypertrophy (deviated nasal septum, nasal polyps, acute sinusitis), patients with systemic diseases, mental retardation or difficulty to cooperate, those who will not able to visit for routine control, those with craniofacial anomalies, previous concha surgery or nasal surgery and who were actively using nasal corticosteroids. Patients who were also excluded were those with conchal hypertrophy due to an osseous component only by baseline decongestion test. All the participants were informed about the study and given written consents.

A total of 82 patients who presented with the complaints of nasal obstruction and diagnosed with inferior turbinate hypertrophy were included in the study. Patients were randomized into two groups according to the order of admission. Patients in Group 1 (Nasal Corticosteroids = NCS) (n = 41) received 200 mcg Mometasone furoate as two puffs through each nostril twice a day for 12 weeks. Patients in Group 2 (Radiofrequency = RF) (n = 41) were administered radiofrequency (radioSURGE 2200, Meyer HAAKE Gmbh Medical Innovations, Ober-Moerlen, Germany) from 3 separate points in the inferior turbinate 3 min after superficial anesthesia (nasal packing soaked in 10% lodocaine) with the patient in half sitting position. Local anesthesia of 1 to 2 mL of lidocaine HCl (40 mg/mL) was infiltrated into the inferior concha. A conchal probe was submucosally applied. RF energy was transmitted to the anterior, middle and posterior parts of the inferior turbinate.

2.2. Evaluation

Objective rhinologic measurements were performed before and 3 months after treatment in both groups. Patients were taken to the rhinology testing room and rested for 15 min. The measurements were taken first without decongestant and after with decongestant. For the measurement with decongestant, patients received two puffs of a topical decongestant (Otrivine spray, 0.1%, 10 mL) into each nostril and waited for 15 min before testing.

2.2.1. Acoustic rhinometry (AR)

Acoustic rhinometry (Acoustic Rhinometer A1; GM Instruments Ltd., Kilwinning, Scotland) was performed in accordance with the standards described and recommended by the standardization committee [6].

The anatomic nasal adaptor for AR was then applied to the patient's nose. When necessary, an ultrasound gel was also applied to prevent leakage. The patients were asked to hold their breath during the measurements. The mean value of three measurement curves was calculated.

The minimum cross-sectional area (MCA1) was measured in the first 2 cm and the minimum cross-sectional area (MCA2) in the first 5 cm from the nostril. Unilateral nasal cavity volume (VOL) was measured at a distance of 0–7 cm from the nostril.

2.2.2. Rhinomanometry (RMM)

This measurement was carried out immediately following the AR measurement. While one nostril was being measured, the other nostril was kept closed. Nasal airway resistance (NAR) levels were measured during inspiration, according to Broms algorithm (6), using an active anterior RMM (Rhinomanometer NR6; GM Instruments Ltd.).

2.2.3. Contractility capacity of the mucosa

Nasal mucosal contractility capacity is the measurement of the change between before and after decongestant administration. In our study, formulas were created in order to evaluate the contractility capacity through objective rhinologic measurements. This measurement was based on the percentage changes of the parameters evaluated in these formulas before and after decongestant administration. These percentage changes differ depending on the measurement parameters in AR and RMM. Acoustic rhinometric parameters (MCA, VOLUME) are expected to increase after decongestants. However, RMM parameter (NAR) is expected to decrease following decongestant. Therefore, two separate contractility index formulas were developed for these two different evaluation methods. Contractility index has not been mentioned in the literature before.

$$\text{ACOUSTIC RHINOMETRY}\quad \text{Contractility Index}(\%) = \left\{\frac{\text{Value-Dec}(+)}{\text{Value-Dec}(-)} \times 100\right\} - 100$$

$$\text{RHINOMANOMETRY}\quad \text{Contractility Index}(\%) = 100 - \left\{\frac{\text{Value-Dec}(-)}{\text{Value-Dec}(+)} \times 100\right\}$$

3. Statistics

Statistical analysis was carried out using the Statistical Package for the Social Sciences version 13.0 software for Windows (SPSS Inc., Chicago, Illinois, USA). All quantitative variables were estimated using measurements of central location (i.e., mean and median) and measurements of dispersion (i.e., standard deviation (SD)). Data normality was assessed using the Kolmogorov-Smirnov test of normality.

Paired *t*-test was used in intra-group objective rhinologic evaluation (AR, RMM) for pre and postoperative comparison, while independent *t*-test was used for intergroup comparisons ($p < 0.05$ was considered statistically significant).

4. Results

Both groups were comparable in age (Group 1: 27.4 ± 6.1, Group 2: 23.5 ± 4.8) and gender (Group 1: 28 male, 13 female, Group 2: 25 male, 16 female).

4.1. Acoustic rhinometry (AR)

No statistically significant differences were found in baseline AR evaluation parameters (MCA-1, MCA-2, VOLUME) between the groups before and after decongestant ($p > 0.05$). Similarly, there were not significant differences between groups in terms of the AR evaluation parameters (MCA-1, MCA-2, VOLUME) measured before decongestant at postoperative month 3 ($p > 0.05$) (Table 1). However, AR evaluation parameters (MCA-1, MCA-2, VOLUME) measured after decongestant were significantly higher in Group 1 (NCS) compared to those in Group 2 (RF) at postoperative month 3 ($p < 0.05$) (Table 1).

As for intragroup comparisons, AR parameters (MCA-1, MCA-2, VOLUME) were significantly increased before decongestant at postoperative 3rd month compared to baseline values in the groups ($p < 0.05$) (Table 2). However no significant difference was found between preoperative and postoperative values after decongestant in Group 2 (RF) ($p > 0.05$) (Table 2).