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Klinik Çalışma - Araştırma / *Original Article*

Powered Submucous Resection of the Inferior Turbinate

Güçlendirilmiş Submüköz İnferior Konka Rezeksiyonu

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Objectives: The objectivesof the present our experience with endoscopic powered modification of the submucous resection in inferior turbinate hypertrophy and to underline the morphological and functional results of the treatment.

Patients and Methods: Sixty-five patients with inferior turbinate hypertrophy were treated by bilateral turbinoplasty with microdebriders for a period of 2 years. All patients underwent nasal endoscopy, Cottle's test, visual analogue (VAS) scale assessment and objective functional evaluation of nasal patency by acoustic rhinometry and rhinomanometry before and after decongestion before the operation. The patients were followed up to 1 year postoperatively.

Results: VAS showed marked improvement in nasal breathing – increased by 2.12 points (60%). Total Minimal Crossectional Area (TMCA) –increased by 0.42 cm^2 (36%) and the Total Nasal Volume (TNV) increased by 3.82 cm^3 (32%). The Total Nasal Resistance (TNR) – decreased by 0.34 $Pa/cm^3/sec$ (47%). All postoperative data for the functional assessment of the nasal breathing were collected without decongestion.

Conclusion: Powered submucous turbinoplasty with microdebriders allows precisely controlled resection of submucosa and bone with mucosal preservation, making this technique, the method of choice enabling optimal volume reduction with preservation of function of the inferior turbinate.

Key Words: Nasal cavity/physiopathology; turbinates/pathology/surgery.

Amaç: Bu çalışmada, alt konka hipertrofisinde endoskop ile güçlendirilmiş görüş altında submüköz rezeksiyon deneyimlerimizin sunulması ve tedavinin morfolojik ve fonksiyonel sonuçlarınının vurgulanması amaçlandı.

Hastalar ve Yöntemler: Alt konka hipertrofili 64 hastaya iki yıllık bir süre içersinde mikrodebrider ile bilateral turbinoplasti uygulandı. Bütün hastalara dekonjesyon öncesi ve sonrası, ayrıca ameliyat öncesi ve sonrası nazal endoskopi, Cottle testi, görsel analog skala (VAS) değerlendirmesi ve nazal pasajın akustik rinometri ve rinomanometri ile objektif değerlendirmesi yapıldı. Hastalar ameliyat sonrası bir yıl takip edildi.

Bulgular: Görsel analog skala değerlendirmesine göre nazal solumada belirgin düzelme görüldü (2.12 puan artış, %60). Toplam en küçük krosseksiyonel alanda 0.42 cm^2 (%36) ve toplam nazal hacimde 3.82 cm^3 artış görüldü (%32). Toplam nazal direnç 0.34 $Pa/cm^3/dk$ azaldı (%47). Nazal solumanın bütün fonksiyonel postoperatif verileri dekonjestansız halde iken toplandı.

Sonuç: Mikroderbiderle güçlendirilmiş submüköz tubinoplasti, mukozanın korunarak mukoza altı ve kemiğin hassas rezeksiyonunu sağlar. Bu teknik, alt konkaların fonksiyonunu koruyarak optimal hacim küçültülmesine olanak tanıması nedeniyle tercih edilir.

Anahtar Sözcükler: Nazal kavite/fizyopatoloji; konka/patoloji/cerrahi.

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Pathology of the inferior turbinate is one of the major causes of nasal obstruction but its ideal treatment still remains an open question. Medical therapy is generally a treatment of choice in mild and moderate turbinate hypertrophy caused by allergic rhinitis, chronic rhinosinusitis or rhinitis medicamentosa. Surgery of the turbinate is reserved for patients with severe hypertrophy and for those who do not respond to the pharmacological treatment. Many different surgical methods have been introduced during the last 150 years but there is still considerable controversy over the merits of the various techniques.[1] Irreversible destruction of the mucosa of the turbinate and impairment of its function are the main disadvantages of most of the surgical procedures. In searching of the best compromise between turbinate reduction and preservation of its function in 1994 surgery with microdebriders has been introduced by Setcliff and Parsons.[2] In Bulgaria this method is used since 2002.[3,4] The aim of the present report is to share our experience with endoscopic powered modification of the submucous resection /turbinoplasty/ in inferior turbinate hypertrophy and to present subjective and functional results of the treatment.

PATIENTS AND METHODS

From 2002 to 2004 sixty five patients with turbinate hypertrophy were treated with bilateral endoscopic powered submucous resection. The patients were followed postoperatively for at least 1 year. The following examination methods were used before and after decongestion pre- and postoperatively.

Clinical examination included rhinoscopy, nasal endoscopy, a four-grade visual analog scale for assessment of nasal breathing (normal breathing - 1 point, light obstruction - 2 points, moderate obstruction - 3 points, severe obstruction - 4 points, and the Cottle's test.

For functional examination, acoustic rhinometry (Rhino 2000, Rhinometrics, Denmark) and anterior rhinomanometry (Flowscreen/ Rhino, Jaeger Version 6, Germany) were used.

The indications for surgery of the turbinate were permanent hypertrophy, resistance to medical treatment, static nasal obstruction, hyposmia and rhinorhea. Cottle's test, data from acoustic rhinometry and anterior rhinomanometry before and after decongestion were very helpful in taking the decision for surgery. Decongestion eliminates the nasal cycle and shows the mucosal component of the turbinate hypertrophy and if the obstruction is static (submucosal or bony hypertrophy) or dynamic (mucosal hypertrophy). For statistical analysis, the program Statistica for Windows Version 4.3, t-test and Wilcoxon matched paired test were used.

The aims of the surgical treatment were: to decrease nasal obstruction by reducing the volume of the inferior turbinate with preservation of the mucosa; to decrease nasal secretion by destroying the erectile tissue and glands in the submucosa; and to improve olfaction.

Surgical technique in powered submucous resection

Powered system with microdebriders PSU-2 by Olympus was used. The hand piece of the system is connected to a suction pump with sufficient suction pressure (Fig. 1).

The microdebrider consists of fixed outer canula with rotating cutting inner part (Fig. 2 a, b).

Most of the cutting surface of the blade is covered by the outer canula, thus preserving the adjacent tissues from injury. As the inner part rotates, the tissues are drawn into the lumen, sheared off and suctioned out through the outer canula. Soft tissues and bone are resected, depending on the type of the microdebrider. Oscillating mode and low speed of rotation is

Fig. 1. *Hand piece with microdebrider.*

used for soft tissue resection and high speed rotation mode is used for bone resection.

In most of the cases local anesthesia with 2% lidocain and epinephrin 1/100000 were used. Visualization of the procedure was accomplished using surgical microscope or 4 mm 0 degree endoscope.

The technique of partial submucous resection of the inferior turbinate consists of several steps:

- Medialization of the inferior turbinate;

- Incision along the anterior portion of the turbinate;

- Submucous dissection of the turbinate, creating an intraturbinal pocket;

- Insertion of 3.5 mm microdebrider with serrated blade into the submucosal pocket, facing the submucosa. Back and forth movements of the microdebrider, cutting the hypertrophic part and removing the redundant erectile tissue inside the pocket;

- Thinning of the bony part of the turbinate along its entire length with aggressive microdebrider, without resection of the turbinal bone;

- Lateralization of the turbinate;

- Light nasal dressing.

The surgical technique is similar to the classic inferior turbinoplasty described by Mabry.[5,6] The difference is the use of powered equipment for shaving the submucosa and bone instead of using forceps and scissors. The thinning of the bony part of the turbinate is our modification and its aim is to reduce the volume of the bone without its removal. Thus, the morphological and physiological characteristics of the inferior turbinate are preserved better. At the same time, the preservation of the anterior part of the bone does not require adaptation of the mucosa over the resected bone and use of nasal dressing to stent the mucosal flap for several days.

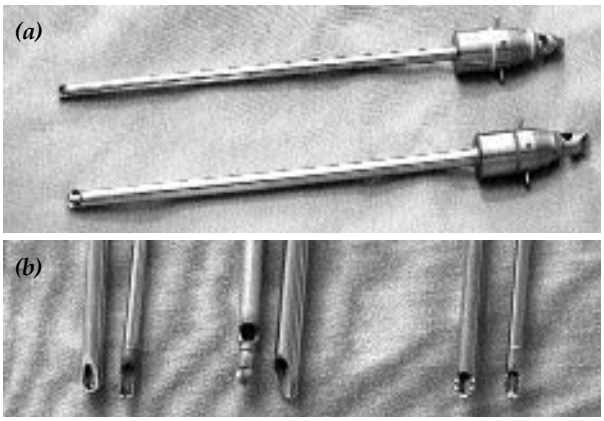

Fig. 2. (a, b) *Microdebriders.*

RESULTS

The treatment was considered successful when the difference between the preoperative and postoperative assessment, without decongestion, by visual analogue scale (VAS) was 50% or more and the difference between the preoperative and postoperative values of the parameters measured by acoustic rhinometry were rhinomanometry are statistically significant ($p<0.05$). We compared the preoperative and postoperative data without decongestion because decongestion is not a normal state of the nasal mucosa. Thus the results were closer to the natural conditions in the nose. Decongestion was used only preoperatively in order to differentiate the kind of nasal obstruction /dynamic or static.

Visual analogue scale

All the 65 patients were assessed by visual analogue scale preoperatively. One year after the surgery 54 (83%) were followed by the same scale (Fig. 3).

The difference between the preoperative and postoperative assessment by visual analogue scale was 2.12 points (60%). An improvement

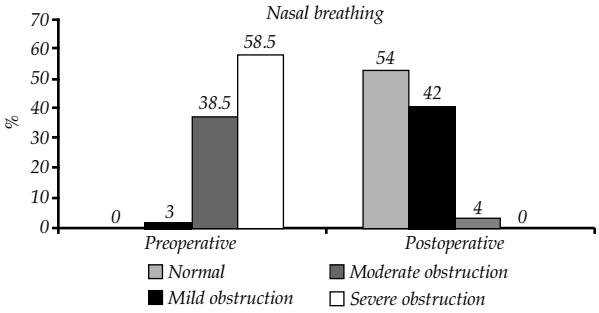

Fig. 3. *Pre- and postoperative subjective assessment of the nasal obstruction.*

Table 1. Results of the pre- and postoperative evaluation of nasal breathing by acoustic rhinometry and anterior rhinomanometry

Parameters	Preoperative	Postoperative	Difference	*p*
TMCA	1.01 cm^2 (SD 0.6)	1.43 cm^2 (SD 0.11)	0.42 cm^2 (36%)	p<0.01
TNV	8.2 cm^3 (SD 1.31)	12.02 cm^3 (SD 1.9)	3.82 cm^3 (32%)	p<0.01
TNR	0.72 $Pa/cm^3/sec$±(SD 0.13)	0.38 $Pa/cm^3/sec$±(SD 1.14)	0.34 $Pa/cm^3/sec$ (47%)	p<0.01

TMCA: Total minimal crossectional area; TNV: Total nasal volume; TNR: Total nasal resistance.

over 50% between pre- and postoperative values was found in 79% of the patients.

Functional assessment

The results of the functional assessment are presented in Table 1 and Fig 4 and are based on 54 patients evaluated pre- and postoperatively.

The mean increase of total minimal cross sectional area - TMCA was 0.42 cm^2 (41.5%); with p<0.01 in 84% of the patients.

The mean increase of the total nasal volume - TNV was 3.83 cm^3; with p<0.01 in 79% of the patients.

The mean decrease of the total nasal resistance - TNR is 0.34 $Pa/cm^3/sec$ (47%); with p<0.01 in 87% of the cases.

DISCUSSION

Submucous resection of the inferior turbinate was introduced first by Low (1906), but it was Freer (1911) who made it popular in Europe.[1] Despite its good functional results, this surgical method was not widely used because of its relatively difficult technique. It became popular in the eighties of the previous century by Mabry's modification[5,6] which he called "inferior turbinoplasty". Since then, many modifications of Mabry's technique were introduced - Grymer at al.[7] Hol and Huizing[1] Passali et al.[8-10] Some of the authors[8-10] continue to use the term submucous resection, which better describes the nature of the method.

With the introduction of microdebriders in rhinosurgery by Setcliff and Parsons,[2] many surgeons started to perform submucous resection or powered inferior turbinoplasty using the advantages of the powered systems. The endoscopic approach which they use in addition provides great precision of the surgical intervention.[11-14]

The grounds for the submucous resection are in the anatomy of the inferior turbinate, which consists of two mucosal layers and bone between them. The medial mucosal layer is thicker with well developed submucosa and its hypertrophy is frequent cause for nasal obstruction.[15] The use of microdebriders allows removal of the submucous hypertrophy, thus reducing the volume of the turbinate without impairment of its mucosal lining.

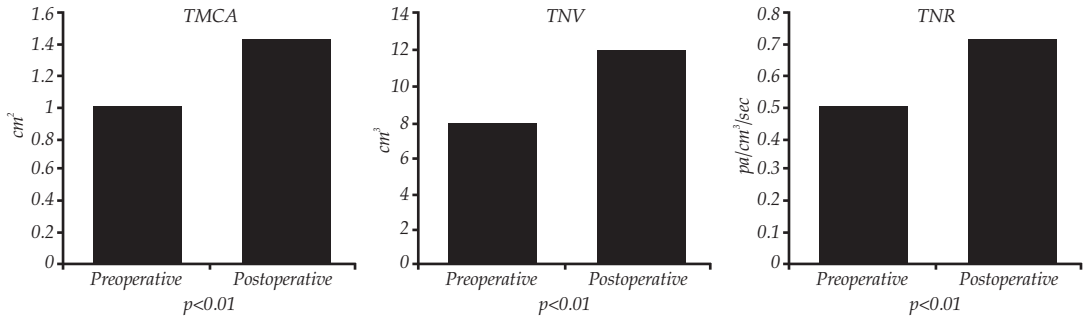

Fig. 4. *Functional results of the main nasal parameters as assessed byacoustic rhinometry and anterior rhinomanometry.* *TMCA: Total minimal crossectional area; TNV: Total nasal volume; TNR: Total nasal resistance.*

The efficacy of the surgical techniques in treating turbinate pathology should be judged by two basic criteria: to diminish the complaints and to preserve the function of the turbinates (the ability of reducing nasal obstruction, hypersecretion, sneesing without functional side effects occurring in short and long term). It would be a mistake to focus exclusively on the degree of widening of nasal passages for wider nasal cavity do not always mean that the nose functions better.[1] In that aspect, the submucous resection offers optimal volume reduction and preservation of function with long lasting surgical effect.[8-10] The powered microdebrider assisted submucous resection of the turbinate as a modification of the classic technique is thus quite acceptable from morphological and physiological points of view.

Our experience with the powered microdebrider assisted submucous resection of the turbinate convinced us that the method is easy to perform and well tolerated by the patients. Because of the reduced bleeding and less trauma, the technique could be applied in an outpatient way. Our modification with thinning of the turbinal bone instead of resection, preserves the natural anatomy and function which makes the operation very acceptable from physiological point of view. The volume reduction of the turbinate is quite enough for improvement and even for normalization of nasal breathing, which can be seen from the results of the objective assessment of nasal breathing. The assessment of the nasal breathing by acoustic rhinometry and rhinomanometry showed statistically significant improvement of nasal patency in more than 80% of the cases. The subjective assessment of nasal breathing also showed marked improvement - in 79% of the patients. An additional effect from the submucous resection of the inferior turbinate is the functional condition of the mucosa. It is proved by the lack of crusts and dryness in the postoperative period.

The advantages of the powered submucous resection with microdebriders are in the preservation of the mucosal lining and the bone together with substantial volume reduction. Minimal trauma, reduced bleeding, and the enhanced precision achieved by the use of surgical microscope and endoscopes make the method a part of the minimally invasive surgery of the nose.

CONCLUSIONS

Powered submucous turbinoplasty with microdebriders allows precisely controlled resection of submucosa and bone with mucosal preservation, making the technique the method of choice enabling optimal volume reduction with preservation of function of the inferior turbinate. The advantages of the method are the preservation of the anatomy and the physiology of the turbinate, which lead to very short postoperative period with reduced crust formation and long lasting effect.

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