The Journal of Laryngology & Otology (2012), **126**, 525–528.

doi:10.1017/S0022215112000163

SHORT COMMUNICATION

Endoscopic, assisted, modified turbinoplasty with mucosal flap

M M PUTERMAN, N SEGAL, B-Z JOSHUA

Department of Otolaryngology – Head and Neck Surgery, Soroka University Medical Center, Ben-Gurion University of the Negev, Beer-Sheva, Israel

Abstract
A variety of surgical methods have been developed to reduce the volume of the inferior turbinates, in order to create a more patent nasal airway. We describe a technique used in our department since February 2002 for all patients undergoing inferior turbinectomy. We resect with endoscopic assistance the lateral mucosa and bony inferior turbinate. This technique can reduce a large volume of the turbinate while preserving the mucosal continuity and the submucosa by covering the raw surface with a mucosal flap. We believe our method minimises post-operative side effects and complications such as dryness, infection, bleeding and pain.

Key words: Endoscopic Surgical Procedure; Nasal Mucosa; Pedicled Flap; Nasal Concha

Introduction
Nasal obstruction due to inferior turbinate hypertrophy is a common problem. Hypertrophy of the turbinate is caused by either allergic or non-allergic chronic rhinitis, and is due to glandular submucosal hypertrophy, vascular congestion and collagen deposition. Nasal obstruction due to turbinate hypertrophy significantly impairs patients' quality of life.

Over the past century or more, a variety of surgical methods have been developed to reduce the volume of the inferior turbinates, creating a more patent nasal airway. These include 'standard' turbinectomy (excision using scissors), a variety of methods for submucosal resection of the turbinate, vidian neurectomy, electrocautery (either monopolar, using a spinal needle, or bipolar), cryotherapy, laser cautery (using several different types of laser), radiofrequency reduction (e.g. coblation) and endoscopic procedures (including the use of a debrider).

Surgical methods are associated with varying degrees of morbidity, and the outcome of the various procedures described is variable.

Material and methods
We performed an endoscopic, assisted, modified turbinoplasty technique with mucosal flaps on adult and adolescent patients who complained of nasal obstruction and were diagnosed with hypertrophied inferior turbinates. The procedure was carried out with or without other endoscopic procedures for the treatment of concomitant sino-nasal pathology, such as deviated nasal septum and chronic sinusitis. We operated only on patients who failed to respond to medical therapy. All patients underwent evaluation, including a thorough history of prior medical or surgical treatment, physical examination including anterior rhinoscopy, nasal endoscopy, and a computed tomography scan when chronic sinusitis was suspected.

Surgical technique
The procedure was performed under either local anaesthesia alone or combined local and general anaesthesia. Local anaesthesia was delivered via nasal neurosurgical cotton gauze (American Surgical company, Lynn, MA, USA) soaked with lidocaine and 2 per cent adrenaline 1:10 000 solution and packed around the inferior turbinate, the inferior meatus and the nasal cavity. After extraction of the soaked cotton gauze, the inferior turbinates were infiltrated with an intra-thecal 22 gauge needle delivering lidocaine 2 per cent and 1:100 000 adrenaline solution, for additional anaesthesia and haemostasis.

A standard 0° sinus endoscope was used in all turbinoplasty procedures.

A longitudinal incision was made running inferiorly from the caudal end of the inferior turbinate up to the anterior portion (Figure 1), using a sickle knife, and completed with micro-scissors if necessary. The medial mucoperiosteal layer of the turbinate was elevated from the bony part of the turbinate in an antero-posterior direction, and from the inferior to the superior border of the turbinate, using a Freer elevator and the tip of the suction tube. In cases in which the inferior incision failed to completely release the mucoperiosteal flap, we additionally used turbinate micro-scissors.

After elevation of the flap, the turbinate bone was denuded on its medial surface (Figure 2). Micro-scissors were introduced perpendicular to the dissected inferior turbinate and progressively excised an adequate volume of the turbinate, working in an antero-posterior direction. After partial excision of the turbinate bone with its attached lateral mucosa,

Accepted for publication 26 July 2011 First published online 2 March 2012

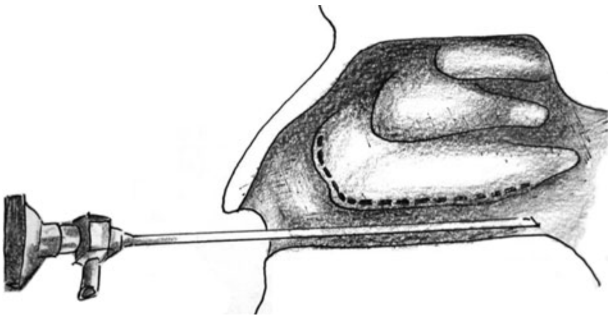

FIG. 1

Diagram showing the initial longitudinal incision (dotted line) running inferiorly from the caudal end of the inferior turbinate up to the anterior portion.

the posterior end of the turbinate was cauterised to avoid late bleeding.

The previously elevated medial mucosal flap was then laterally rotated and repositioned to cover the remaining denuded turbinate bone and mucosal stump (Figure 3). This mucosal flap was secured in place by the introduction of a standard 8-cm nasal tampon (Merocel, Mystic, Connecticut, USA), which had previously been inserted into and sutured to a disposable glove finger, the glove finger fenestrated with scissors (Figure 4) and the whole unit smeared with synthomycin 5 per cent ophthalmic ointment. The tampon was inserted after the flap had been retracted laterally by an elongated nasal speculum. The tampon was removed after 24 hours.

This technique has been used since February 2002 for more than 400 patients undergoing inferior turbinectomy. All patients were instructed to perform nasal irrigations with saline solution for a period of up to two weeks after removal of packing. Patients were followed up for between six months and eight years, in either community or hospital-based out-patient clinics. Although we have not formally researched the effectiveness of this treatment compared with standard turbinectomy, we have observed excellent results regarding nasal obstruction, with fewer side effects and complications than the standard procedure. The great majority of our patients have reported improved nasal breathing; however, it is difficult to assess in all patients what part of their improvement is due to other concomitant procedures such as septoplasty and, occasionally, endoscopic sinus surgery.

Commonly reported complications of turbinectomy include bleeding, crusting, synechiae and empty nose symptoms.

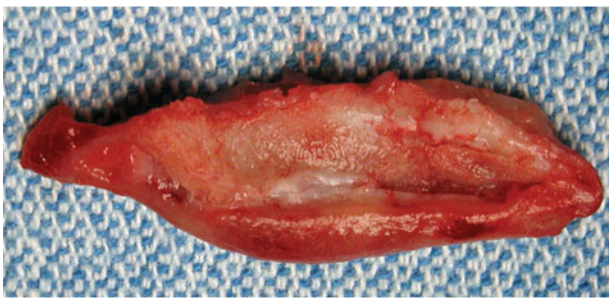

FIG. 2

Clinical photograph showing the excised portion of the inferior turbinate; note that the medial aspect of the bone is denuded.

Following the above-mentioned procedure, we did not encounter immediate post-operative bleeding requiring additional intervention. Occasionally, after tamponade removal there was a short and minimal bleeding episode, which was always controlled by local pressure. We did not encounter any late bleeding (i.e. over 24 hours after surgery), in contrast to standard inferior turbinectomy, following which there is occasionally severe bleeding from the posterior turbinate requiring haemostasis

We encountered some nasal crusting between one to two weeks after surgery. This was treated with nasal irrigation.

Rarely, small synechiae were encountered, following surgery incorporating septoplasty in addition to partial inferior turbinectomy. These synechiae were between the residual inferior turbinate and the septum. They were usually asymptomatic and easily treated.

Empty nose symptoms, such as dryness and post-nasal drip, are occasionally encountered following other turbinectomy techniques. No such symptoms were seen following our procedure.

Discussion

The primary goal of performing surgery on hypertrophied inferior nasal turbinates is to maximise the nasal airway for as extended a period as possible, while minimising complications such as excessive nasal drying, crusting, haemorrhage and pain. The advantages, disadvantages, complications and controversies of each form of treatment have been reviewed and discussed by many authors. Wight *et al.*[1] reported that anterior trimming of the inferior turbinates cannot be recommended as a form of treatment, as the initial improvement in nasal airflow does not persist in the long term. Their conclusion, together with our observation of some unsatisfactory results of the non-endoscopic technique (caused by hypertrophy of the posterior part of the inferior turbinate), led us to develop our endoscopic technique.

The technique we describe is similar to that previously reported by Kawai *et al.*[2] but uses endoscopic instrumentation, which allows an improved view, greater precision, access to the inferior turbinate tail, and accurate mucosal flap handling and positioning.

In our experience, the healing process is simpler than in cases in which bone and mucosa are left denuded, with secondary crusting and inflammation. Removal of the tampon, prepared as described, is usually painless and bloodless.

Hol and Huizing[3] reviewed 13 surgical treatments for inferior turbinate pathology, including electrocautery, chemocautery, cryosurgery, (subtotal) turbinectomy, laser surgery and radiofrequency. They concluded that these methods may have destructive effects on mucosal and submucosal physiology, and that, judging from this perspective, they should not be used.

Jackson and Koch[4] stated that although most procedures are technically easy to perform, there is variable long-term success and significant risks, including necrosis of conchal bone, eschar formation and haemorrhage.

Passali *et al.*[5] reported long-term results in 382 patients randomly assigned to receive electrocautery, cryotherapy, laser cautery, submucosal resection or turbinectomy. In this study, improvement in nasal airflow following resection of the inferior turbinate was accompanied by a clinically significant loss of humidification, decreased efficiency of mucociliary transport and reduced secretory immunoglobulin A defence activities. Objective tests indicated that submucosal resection

https://doi.org/10.1017/S0022215112000163 Published online by Cambridge University Press

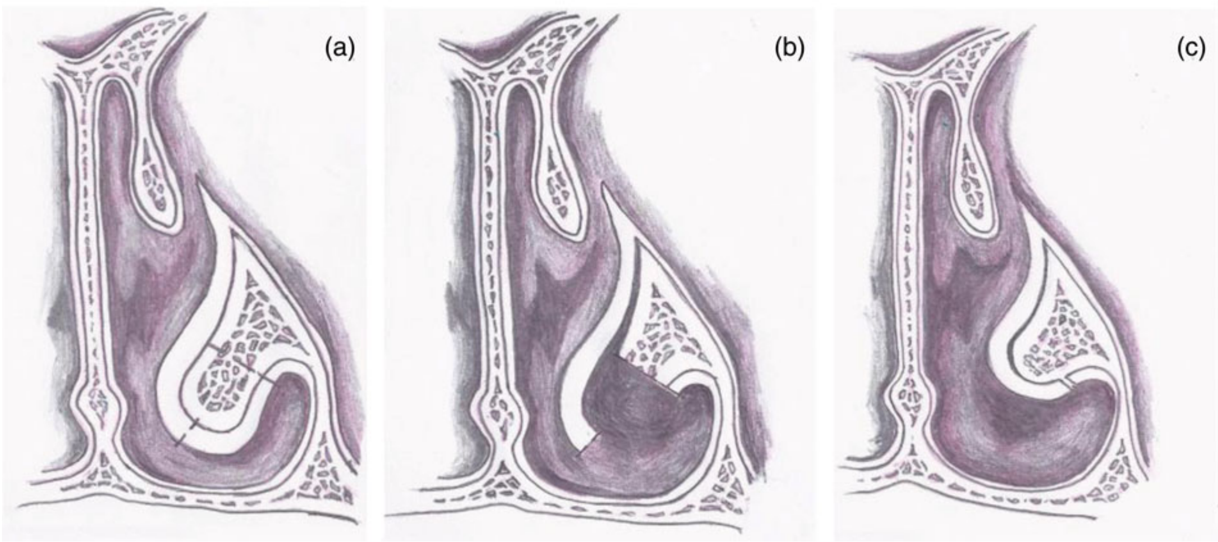

FIG. 3

Diagram of the right nose, coronal plane, showing the three consecutive surgical steps: (a) incision (dotted line); (b) mucosal flap creation and partial turbinate excision; and (c) mucosal flap repositioning over the turbinate stump.

resulted in the greatest increase in airflow and nasal respiratory function with the lowest risk of long-term complications.

Wexler *et al.*[6] studied the long-term histological effects of inferior turbinate laser surgery, and found near-total elimination of the seromucinous gland in the region of laser treatment, with a connective tissue regenerative response, together with marked reduction in venous sinusoids.

Elwany and Abdel-Moneim,[7] conducted an electron microscopy study following carbon dioxide laser turbinectomy, and observed a decreased number and activity of seromucinous glands, fibrosis of the connective tissue stroma, and a reduction in the number and congestion of cavernous blood spaces.

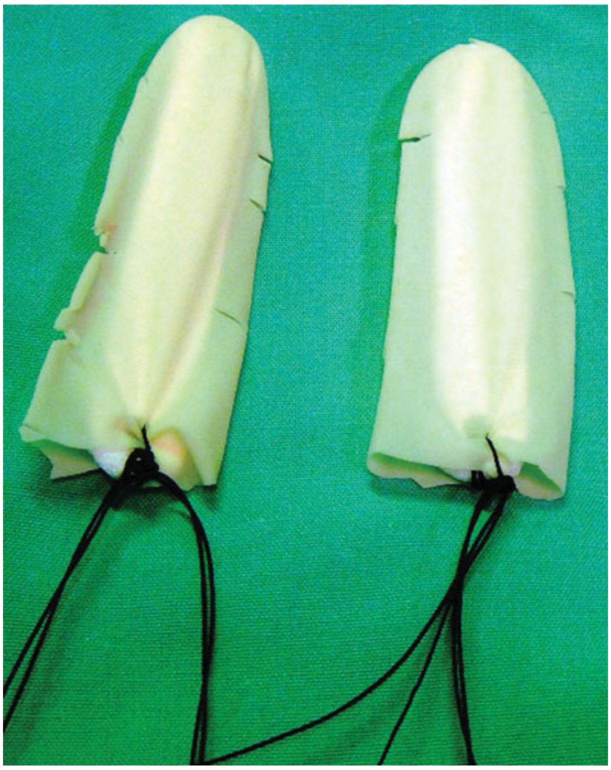

FIG. 4

Prepared nasal tampons: inserted into and sutured to a disposable glove finger which has been fenestrated with scissors.

Sapci *et al.*[8] concluded that although laser ablation of the turbinate was effective in improving nasal obstruction, it significantly disturbed mucociliary function.

Berger *et al.*[9] studied histopathological changes after coblation of the inferior turbinates, and found significant fibrosis, glandular and venous sinusoid depletion, and partial epithelial shedding.

Our technique combines the advantages of the submucosal and standard resection techniques. It consists of removal of hypertrophied bone and mucosa, while avoiding the undesirable depletion of important submucosal histological structures, and the harmful effects of leaving raw surfaces, by using the mucosal flap to cover the stump.

Our method usually enables resection of approximately half the turbinate volume, including both mucosa and bone. Performing this procedure endoscopically enables improved precision, better visualisation during mucosal flap incision and dissection, and precise placement of the mucosal flap and tampon. It also allows bipolar cauterisation of the inferior turbinate tail, as it enables the surgeon to approach the remote area of the tail, which often constitutes both the last obstacle to air passage and a source of secondary failure (in cases in which non-endoscopic surgery is used). Our method can reduce a large volume of the turbinate while preserving the mucosal continuity and submucosa by covering the raw surface with a mucosal flap. We believe that our method is rarely associated with post-operative side effects and complications such as dryness, infection, bleeding and pain.

Conclusion

Every reported surgical treatment for hypertrophied inferior turbinates has been noted to have advantages and drawbacks.

We believe that our endoscopic, assisted, modified turbinoplasty technique provides effective control of airway obstruction without overly interfering with the physiology of the turbinates. Furthermore, by leaving the mucosal lining continuity and submucosa intact, our technique reduces the incidence of undesirable side effects and complications associated with alternative procedures. We recommend this technique in view of its described hypothetical advantages, although we acknowledge the greater surgical skill and instrumentation required.

Additional studies are required in order to compare this technique to previously described procedures with regards to operating time, adverse effects and post-operative surgical success.

References

1 Wight RG, Jones AS, Beckingham E. Trimming of the inferior turbinates: a prospective long-term study. *Clin Otolaryngol Allied Sci* 1990;**15**:347–50
2 Kawai M, Kim Y, Okuyama T, Yoshida M. Modified method of submucosal turbinectomy: mucosal flap method. *Acta Otolaryngol Suppl* 1994;**511**:228–32
3 Hol MK, Huizing EH. Treatment of inferior turbinate pathology: a review and critical evaluation of the different techniques. *Rhinology* 2000;**38**:157–66
4 Jackson LE, Koch RJ. Controversies in the management of inferior turbinate hypertrophy: a comprehensive review. *Plast Reconstr Surg* 1999;**103**:300–12
5 Passali D, Passali FM, Damiani V, Passali GC, Bellussi L. Treatment of inferior turbinate hypertrophy: a randomized clinical trial. *Ann Otol Rhinol Laryngol* 2003;**112**:683–8
6 Wexler DB, Berger G, Derowe A, Ophir D. Long-term histologic effects of inferior turbinate laser surgery. *Otolaryngol Head Neck Surg* 2001;**124**:459–63
7 Elwany S, Abdel-Moneim MH. Carbon dioxide laser turbinectomy. An electron microscopic study. *J Laryngol Otol* 1997;**111**:931–4
8 Sapci T, Sahin B, Karavus A, Akbulut UG. Comparison of the effects of radiofrequency tissue ablation, CO2 laser ablation, and partial turbinectomy applications on nasal mucociliary functions. *Laryngoscope* 2003;**113**:514–19
9 Berger G, Ophir D, Pitaro K, Landsberg R. Histopathological changes after coblation inferior turbinate reduction. *Arch Otolaryngol Head Neck Surg* 2008;**134**:819–23

Address for correspondence:
Dr Marc Puterman,
Department of Otolaryngology – Head and Neck Surgery,
Soroka University Medical Center,
Box 151,
Beer-Sheva 84101, Israel

Fax: +972 8 640 3037
E-mail: puterman@netvision.net.il

Dr M Puterman takes responsibility for the integrity of the content of the paper
Competing interests: None declared