Video Endoscopic-Guided Nasal Valve Surgery with Spreader Graft in Snoring

AHMAD M.M. AL BASSIOUNY, M.D.
The Department of Otorhinolaryngology, Faculty of Medicine, Cairo University.

Abstract

Objective: To evaluate the effect on snoring of endoscopic nasal valve dilatation with spreader graft in patients with nasal valve insufficiency with previous history of palatal surgery.

Material and Methods: Following Institutional Review Board approval, 17 patients who were referred to our institution complaining from snoring, nasal blockage and fitting certain preoperative criteria were treated with this technique between March 2007 and November 2009, with minimum follow-up period of six months.

Results: 14 (82%) patients had significant improvement in nasal airway, 3 (18%) patients had slight improvement. Snoring was cured or improved as regards both loudness and frequency. 12 (70.5%) patients was cured, 3 (17.5%) patients were improved and failure occurred in 2 (12%) patients. 3 of the patients had significant improvement of nasal airway but had 40% improvement in their snoring were later found to have some degree of OSA. One of the patients had slight improvement in nasal airway had 50% snoring improvement. Two patients had slight improvement in nasal airway but with failure in snoring improvement.

Conclusion: Nasal valve assessment should not be overlooked as a cause of nasal blockage in all cases of snoring for better outcome results.

Key Words: Nasal valve – Snoring – Palatoplasty.

Introduction

SNORING is a common social problem that may occur alone or as a sign of a more serious condition; obstructive sleep apnea.

Although the nose is not the site of sound generation, there are several studies implicating nasal obstruction as a causative factor in breathing disturbances during sleep [1,2].

Other reports have shown that increasing nasal patency improves snoring [3,4].

The nasal valve was originally described by Mink in 1903. It is divided into external and internal portions. The external nasal valve is formed by the columella, the nasal floor, and the nasal rim (or caudal border of the lower lateral cartilage). The nasalis muscle dilates this portion during inspiration. The internal nasal valve (INV) is the better-known valve and is often referred to as the nasal valve.

The nasal valve, In the absence of other causes of nasal obstruction, is defined as the flow-limiting segment of the nasal airway. INV area is bounded superiorly by the reflection between the upper lateral cartilage (ULC) and the septum, posteriorly by the head of the inferior turbinate, inferiorly by the floor of the nose, and laterally by the bony piriform aperture and its adjacent fibrofatty tissue. The angle between the septum and the upper lateral cartilage is 10-15º [6]. The cross-sectional area of the INV is between 55 and 83mm² and is the major site of nasal resistance and regulator of airflow. Nasal airway resistance accounts for more than 50% of total airway resistance Minimal reduction in this angle can substantially restrict nasal airflow, the narrower the site, the more vulnerable it is to pathological nasal obstruction [7].

Nasal obstruction due to nasal valve abnormalities may result from either dynamic or static problems and is one of the most important and common reasons for nasal obstruction. Despite these facts, nasal valve collapse is a frequently overlooked cause of nasal obstruction [8]. 13% of the patients with chronic nasal obstruction have nasal valve collapse. Of these patients, 88% have unilateral collapse [9].

Nasal valve collapse is often related to deficiencies in the lateral nasal wall structural support.
Iatrogenic injury, as with rhinoplasty, is one of the most common causes. In addition, trauma, aging, and congenitally flaccid upper lateral cartilage may also cause nasal valve collapse. It has been shown that the mean cross-sectional area of the nasal valve decreases by 22% to 25% after reduction rhinoplasty [10].

In this study, snoring improvement with structural nasal valve dilation by using spreader graft under video-endoscopic guide have been evaluated.

**Material and Methods**

Following Institutional Review Board approval, 17 patients who were referred to our institution complaining from snoring with pervious history of palatoplasty, nasal blockage due to nasal valve insufficiency were treated with this technique between March 2007 and November 2009.

All patients completed a preoperative questionnaire (Table 1) and underwent complete ENT examination.

As part of the routine evaluation, patients should be asked to take a deep breath while observing the nasal valve. A normally functioning nasal valve widens together with the nasal alae external dilator muscles, whereas in patients with inspiratory obstruction, the nasal valve collapses during inspiration.

Cottle test was used to evaluate nasal valve stenosis. The cheek of the evaluated side is gently pulled laterally with 1-2 fingers, which opens the valve. The examiner then asks the patient to breathe and evaluates if breathing is better before or after pulling the cheek. A positive test result is when the patient feels less resistance with the valve opened.

They all had physical examination findings of visible nasal valve collapse on gentle inspiratory effort, the nasal valve collapses during inspiration, and palpably weak lateral nasal wall support.

Oral examination showed previous palatoplasty in all patients with no evidence of significant palatal scaring.

Anterior Rhinomanometry done for all patients’ pre and post operatively, with and without decongestion and total resistance is calculated. Resistance above 0.3Pa/mL/s is usually symptomatic. The 2 major types of obstruction are mucosal hypertrophy and structural deformity. Decongestion is used to determine a mucosal cause of nasal resistance. Marked reduction in resistance with decongestion suggests mucosal disease. Decongestion causing less than a 35% decrease in resistance suggests a structural cause of nasal obstruction rather than a mucosal cause [11].

The surgery was not primarily aimed to correct obstructive sleep apnea; therefore polysomnography was not part of the evaluation process.

Patients were included in this study when they met with the following criteria:

1- Snoring with prior history of palatoplasty, at least 6 months after surgery.
2- Primary complaint of nasal blockage that was relieved with the Cottle maneuver.
3- Significant Anterior Rhinomanometery measurements.
4- No previous history of nasal surgeries.
5- No septal deviation or inferior turbinate hypertrophy.
6- Non obstructing tonsils.
7- Negative tongue test for enlarged base of tongue.

Table (1): Questionnaire used in the study.

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Did you snore before surgery?</td>
<td>- Improved percentage. - Remain the same. - Get worse.</td>
</tr>
<tr>
<td>2- If &quot;yes&quot;:</td>
<td></td>
</tr>
<tr>
<td>3- Have you tried nostril expanders before surgery?</td>
<td></td>
</tr>
<tr>
<td>4- If &quot;yes&quot; was it helpful?</td>
<td></td>
</tr>
<tr>
<td>5- Have you often feel tired after your sleep?</td>
<td></td>
</tr>
</tbody>
</table>

**Surgical Procedure:**

- **Anesthesia:** General with oro-tracheal tube.
- **Incision:** A small mucosal incision near the anterior septal angle, on both sides (Fig. 1).
- The 4mm, 0 degree Endoscope with a video attachment introduced in the nasal cavity. Freer elevator is used to elevate the mucoperichondrium to develop a precise subperichondrial dissection along the length of the cartilaginous dorsum near the junction of the dorsal septum and upper lateral cartilage. The skin over the upper lateral cartilage is dissected on both sides.

- Endoscopic septoplasty is done and Fashion rectangular spreader grafts are obtained. A bridge of mucoperichondrium should be left attached to the septum at the inferior edge of the spreader pocket. It is preferred that the septoplasty dissection and the spreader graft pocket remain unconnected.
The graft will extend from the osseocartilaginous junction to the internal nasal valve where the upper lateral cartilage meets the dorsal septum. The thickness can be determined to achieve the desired functional effect without causing excessive widening, usually 1mm to 3mm in thickness. A typical graft extends from the osseocartilaginous junction to the anterior septal angle. They were usually contoured to 5-6mm in height, 2-3mm in thickness and 20-23mm in length.

- Division of the upper lateral cartilages from their attachment to the dorsal septum is undertaken in the submucoperichondrial plane.
- The grafts inserted into the subperi-chondrial plane (Fig. 2).
- The spreader grafts are secured with absorbable suture.

A small injection needle is inserted from outside through the skin of one side to pass through the upper lateral cartilages and the grafts to the skin of the other side in the middle of the length of the upper lateral cartilages to fix grafts in place. 2 Small straight needle with PDS 5/0 suture is passed in the same way like the injection needle anterior and posterior to it. Cut The 2 straight needles to be disconnected from the suture material. On both sides, through the endoscope the PDS suture is picked to be under the skin and the both ends of sutures on each side is tied together to fix the grafts in place. The skin needle is then removed.

- The mucosal incision is the closed with 5/0 absorbable suture.
- Light nasal pack is inserted for one day.

All patients followed up for 6 months postoperatively.

Improvement of nasal breathing was evaluated subjectively and objectively with pre and post operative anterior rhinomanometry.

Improvement of snoring was classified into three categories as described by Walker, et al. in 1995:

1- Cured: Complete elimination or significant reduction by more than 70%.
2- Improved: Reduction to an acceptable level of 30% to 70%.
3- Failure: No change or reduction less than 30%.

The questionnaire asked patients to indicate their level of snoring before and after their surgery as perceived by their partner, family and colleagues.

Results

From March 2007 and November 2009, 17 patients have been treated with this technique. They were 10 (59%) male and 7 (41%) females. The mean age was 38.3 (age range between 32 and 44 years). Mean weight (kg) 85.5; the mean body mass index was 27.2.

Table (2) shows patient’s data.

Nasal airway improvement:

14 (82%) patient had significant improvement in nasal airway, 3 (18%) patient had slight improvement. (Table 3).

Snoring improvement:

Snoring was cured or improved as regards both loudness and frequency. 12 patients (70.5%) was cured 3 patients (17.5%) were improved and failure occurred in 2 (12%) cases (Table 4).
Relation between nasal breathing and snoring improvement:

The relation of nasal airway improvement after surgery and snoring improvement is outlined in table 5. 3 of the patients who had significant improvement of nasal airway but had 40% improvement in their snoring were later found to have some degree of OSA. 1 of the patients who had slight improvement in nasal airway had 50% snoring improvement. 2 of the patients who had slight improvement in nasal airway but with failure in snoring improvement.

Table (2): Patients’ data.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (range) age (years)</td>
<td>38.3</td>
</tr>
<tr>
<td>Mean (range) weight (kg)</td>
<td>85.5</td>
</tr>
<tr>
<td>Body mass index</td>
<td>27.2</td>
</tr>
</tbody>
</table>

Table (3): Airway improvement.

<table>
<thead>
<tr>
<th>Airway improvement</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant</td>
<td>14 (82%)</td>
</tr>
<tr>
<td>Slight</td>
<td>3 (18%)</td>
</tr>
<tr>
<td>No change</td>
<td>0</td>
</tr>
</tbody>
</table>

Table (4): Snoring improvement.

<table>
<thead>
<tr>
<th>Snoring improvement</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cured</td>
<td>12 (70.5%)</td>
</tr>
<tr>
<td>Improved</td>
<td>3 (17.5%)</td>
</tr>
<tr>
<td>Failed</td>
<td>2 (12%)</td>
</tr>
</tbody>
</table>

Table (5): Relation between airway and snoring improvement.

<table>
<thead>
<tr>
<th>Nasal airway improvement</th>
<th>Snoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
</tr>
<tr>
<td>Significant</td>
<td>14</td>
</tr>
<tr>
<td>Slight</td>
<td>3</td>
</tr>
<tr>
<td>No change</td>
<td>0</td>
</tr>
</tbody>
</table>

Discussion

The management of snoring depends mainly on the careful preoperative assessment of upper airway obstruction. Although nasal obstruction is one of the contributing factors of snoring, nasal valve insufficiency is frequently overlooked as a cause of nasal obstruction and also overlooked as a contributor to snoring.

Poiseuille’s law describes airflow through a passageway such as the nose. Airflow is proportional to the radius of the nasal passages, raised to the fourth Power. Thus, changes as small as 1mm of the INV will have exponential effect on airflow and resistance through the nasal cavity [13]. Additionally, irregular tubes as found in the nose cause turbulent flow [14].

The treatment methods for nasal valve dysfunction aim to either repositioning of the upper lateral cartilages or strengthening them.

A number of surgical techniques have been described for the nasal valve area. Sheen, 1984, have been described the of spreader grafts in treatment of nasal valve dysfunction following rhinoplasty. The technique aims to widening of the nasal valve angle by inserting a cartilaginous graft between the nasal septum and the upper lateral cartilage.

Butterfly graft had been used in treatment of nasal valve collapse in functional secondary rhinoplasty [9] and in treatment of snoring [8]. Park, 1998, have been described the flaring suture technique to increase the nasal valve area by using a mattress sutures. Other varieties suture techniques have been used successfully in the nasal valve area [17,18].

In this study, improvement of snoring in simple snorers with previous history of palatoplasty after correction of nasal valve insufficiency has been addressed.

In this study the nasal valve dilation with the use of spreader grafts results in significant improvement of nasal breathing was 82%. This results matches with the results of Allison and Edwin, 2005 who obtained successful results with the spreader graft in rhinoplasty. Ragab A. and Khodair F., 2005 obtained 83% improvement in nasal blockage with the use of spreader graft in comparison to 8.3% improvement without its use.

The relation of nasal valve and nasal resistance and sleep disordered breathing has been studied in several studies. Vikkula et al, 2003, showed that nasal resistance is known to be an independent predictor of the apnea-hypopnea index in nonobese patients.

In this study, all patients whose snoring improved after surgery also had a significant improvement in their nasal airway breathing. These results are matching with the findings of Metes, el al. 1991, that stated that the nasal resistance has a significant correlation with the snoring index. Bertrand, et al. 2002, suggested that the observed decrease in snoring after nasal valve surgery may
be induced by changes in the direction of the nasal airflow against the nasal mucosa which may produce by a reflex between mecanoreceptors of the nasal mucosa and muscles of the pharynx, an increased tonus of the muscles of the pharynx.

The use of the nasal endoscopy was of value in precise dissection of the mucosa at the nasal valve area to avoid mucosal tear and postoperative fibrosis which will add more to the problem. also, to assess in the way of graft stabilization with sutures.

**Conclusion:**

Preoperative assessment in cases of snoring is the key of success for patients. Nasal valve assessment should not be overlooked as a cause of nasal blockage in all cases of snoring for better outcome results.

**References**


