

Septal extension graft use in the treatment of alar collapse

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Abstract. – OBJECTIVE: In our study, we showed that the septal extension graft (SEG) technique, which we applied for nasal projection in rhinoplasty surgery, increases the tension of the lateral cartilage (LC) and alar structures. We also demonstrated that nasal congestion could be treated by applying this technique in patients with nasal obstruction due to bilateral dynamic alar collapse.

PATIENTS AND METHODS: This study was conducted retrospectively on 23 patients with nasal obstruction due to alar collapse. Bilateral dynamic nasal collapse and (+) Cottle test was present in all patients. Nasal lateral wall tissue was also found flaccid on nasal palpation and collapsed to the extent of obstruction on deep inspiration. Standard septal extension graft (SEG) and tongue-in-groove techniques were applied to all patients.

RESULTS: Septal cartilage was used for SEG in all patients. No complaints of nasal obstruction on deep inspiration were noted by the patients at six months postoperative follow-up, and Cottle tests were negative. The patients' mean respiratory score was 152 postoperatively, compared to 66.5 preoperatively. This difference was statistically significant using the Wilcoxon signed ranks test ($p < 0.001$). In evaluating post-operative cosmetic appearance due to nasal tip projection (NTP) and cephalic rotation changes, 16 men and four women reported that it was better, while two men felt that there was no change. One woman reported that her cosmetic appearance was worse than before; a revision surgery was performed for her at seven months postoperatively.

CONCLUSIONS: This method is effective for patients with bilateral nasal collapse and thick-short columella. With the applied surgery, the caudal edge of the LC diverges from the septum, alar region tension and resistance increase, the columella increases in length, nasal projection

increases, and the vestibule cross-sectional area is enlarged. In this way, a significant increase in nasal vestibular volume was obtained.

Key Words:

Septal extension graft (SEG) technique, Tongue-in-groove technique, Alar collapse, Nasal vestibular volume.

Introduction

Nasal obstruction is an essential condition that affects 1/3rd of the population and harms the quality of life¹. Nasal valve collapse (NVC) plays a significant role in nasal congestion and is divided into two types: external nasal valve (ENV) and internal nasal valve (INV) collapse. Structures forming the external nasal valve (ENV) include the medial septum of the medial lower lateral cartilage, which forms the alar rim on the lateral side (Figure 1). The ENV is the first area of airflow resistance in the nose. The stability of the nasal alar region is conferred by the lower lateral cartilage lateral ridge (LC). Weakness and deformity of this cartilage cause ENV collapse²⁻⁶. Generally, the primary purpose of surgical treatment in ENV collapse is to support the fibro fatty tissue of the LC and alar region⁵⁻⁸.

Our study showed that the septal extension graft (SEG) technique, which we applied for nasal projection in rhinoplasty surgery, increases the tension of the LC and alar structures. We also demonstrated that nasal congestion could be treated by applying this technique in patients with nasal obstruction due to bilateral dynamic alar collapse.

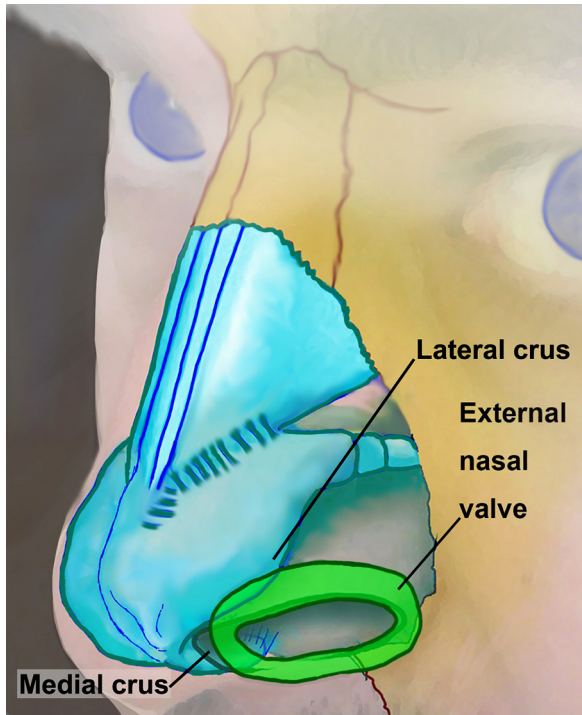


Figure 1. Appearance of the external nasal valve (ENV) and internal nasal valve (INV).

The fundamental idea here is that if the pole of the tent is extended, the side walls of the tent will be tensioned (Figure 2A-B). The tent's height will increase, and the collapsing side walls will be

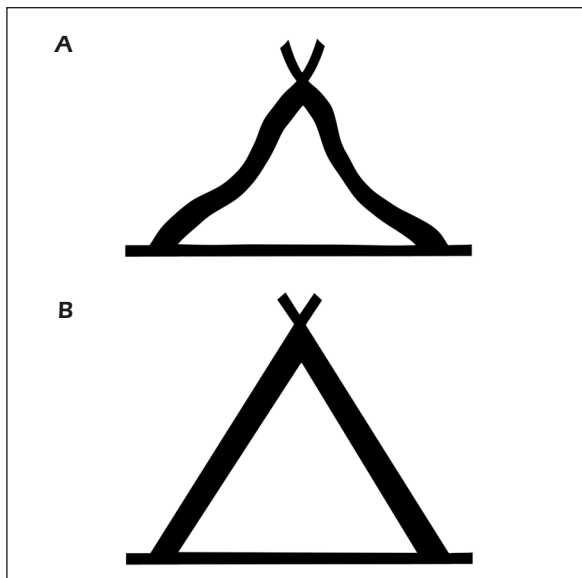


Figure 2. A-B, If the pole of the tent is extended, the side walls of the tent will be tensioned.

tightened, expanding the surface. Suppose we apply this theory to a collapsing nostril. In that case, we can interpret it as extending the nasal septum to increase the projection of the nose, eliminating nasal collapse and expanding the airway.

Patients and Methods

This study was conducted retrospectively at the Istanbul Yeni Yüzyıl University, Faculty of Medicine, ENT Department, according to the rules outlined in the Declaration of Helsinki. Ethics Committee approval of the Istanbul Yeni Yüzyıl University Ethics Committee for Non-Invasive Health Sciences Research (Date: 01.06.2022, decision No.:2022/05-554) was obtained for this study. Patients' consent was obtained before the operations.

Subjects

This study was conducted retrospectively on 23 patients with nasal obstruction due to alar collapse at the Istanbul Yeni Yüzyıl University, Faculty of Medicine, ENT Department, between March 2019 and May 2022. Bilateral dynamic nasal collapse and (+) Cottle test was present in all patients. Nasal lateral wall tissue was also found flaccid on nasal palpation and collapsed to the extent of obstruction on deep inspiration. No pathology causing a nasal obstruction (such as septal deviation, allergic rhinitis, turbinate hypertrophy, acute and/or chronic sinusitis, and nasal polyp) was observed in any of the patients, and facial nerve examinations were normal.

Operation Technique

Standard septal extension graft (SEG) and tongue-in-groove techniques were applied to all patients. The standard septal extension graft technique was explained to patients in detail (particularly the changes in nasal projection and rotation that would result from the operation), and their consent was obtained.

Facial photographs of the patients were taken at a standard distance, focusing on the alar base. The columella and nostrils were enlarged in the computer environment to the exact scale. Eliminating collapse can be achieved by providing sufficient alar and lateral crural tension. The minimum alteration required to raise the nasal tip projection (NTP) – in effect, the necessary length of the SEG – was formulated as follows (Figure 3).

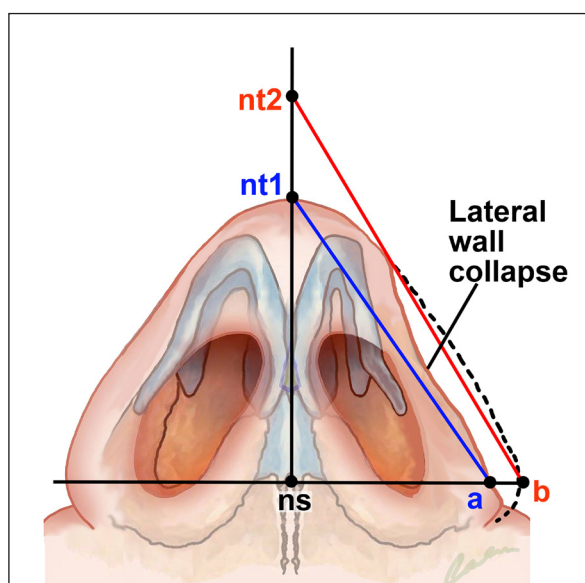


Figure 3. Measuring of the minimum alteration required to raise the nasal tip. (ns: the midpoint of the nasal cusp and the columella base. a, the highest point of the collapsed lobule. b, The highest point of the lobule, which should typically be. nt1: preoperative nasal tip. nt2: postoperative nasal tip).

The line drawn parallel to the a-nt1 line from point b intersects the line passing through the vertical plane at point nt2. nt2 is the new type of notation. The distance between nt1 and nt2 represents the length of the SEG that should be placed [ns: the middle of the line connecting the two points where the alar lobules are most raised (midpoint of the nasal cusp and the base of the columella); a: the highest point of the collapsed lobule; b: the highest point of the lobule, which should typically be; nt1: a preoperative nasal tip; nt2: postoperative nasal tip].

The nasal respiratory assessment of patients was measured using an analog scale from 1 to 10, where 1 is complete nasal obstruction, and 10 is whole nasal opening.

Evaluation of postoperative cosmetic appearance was rated as better, the same, or worse.

Statistical Analysis

The data obtained in the study were analyzed using SPSS for Windows 16.0 software (SPSS Inc., Chicago, IL, USA). The Wilcoxon signed-rank test was used.

A value of $p < 0.05$ was considered statistically significant.

Results

Eighteen patients (78%) were male and five female (22%), with mean ages of 45.5 and 39.7 years, respectively. A history of heavy eyeglass use was present in 15 males and three females. All postoperative patients were instructed to use lenses.

Septal cartilage was used for SEG in all patients. No complaints of nasal obstruction on deep inspiration were noted by the patients at the six months postoperative follow-up, and Cottle tests were negative.

The mean respiratory score of the patients increased from 66.5 to 152 postoperatively. This difference was statistically significant using the Wilcoxon signed ranks test ($p < 0.001$).

In evaluating postoperative cosmetic appearance due to NTP and cephalic rotation changes, 16 men and four women reported that it was better, while two men felt that there was no change. One woman reported that her cosmetic appearance was worse than before; a revision surgery was performed for her at seven months postoperatively (Figure 4A-B).

Discussion

In literature, nostril patency has been shown to affect directly clinical ENV patency, as the volume of the area formed by the nostril patency is the ENV. The borders of this area form the nostril opening in the caudal, septum, and medial crural in the medial aspect, the alar cartilage in the anterolateral aspect, and the fibro-fatty tissue in the posterior aspect of the INV. All of these structures have a direct and/or indirect effect on the ENV; however, the most important structure is the lateral crus. ENV problems can be static, dynamic, or both⁹⁻¹². Dynamic collapse is due to insufficient resistance of the LC, which is responsible for lateral nasal wall resistance.

According to the Bernoulli principle, the flow velocity through a pipe is inversely proportional to the intraluminal pressure. As Knowlton and Starling¹³ revealed, rapid flow through a rigid pipe caused collapses in soft sections due to negative intraluminal pressure¹⁴. In line with this principle, dynamic collapse on profound inspiration results from insufficient resistance of the LC, which creates lateral nasal wall resistance.

As the caudal edge of the LC is closer to the nasal septum, the nasal vestibular volume de-



Figure 4. A, Preoperative view. B, Postoperative view.

creases. This distance is further reduced by deep inspiration and nasal obstruction¹⁵. In our study, the distance from the LC to the nasal septum increased following surgery. The tensions of the LC and alar fibro-fatty tissues also increased, and inspiratory collapse was not observed.

The caudal septum is located between the two medial crura in the midsagittal plane and affects the nostril opening. The nostril aperture is adversely affected in noses with the short and thick columella¹⁶. The SEG technique applied in our study to alar collapse decreases the width of the columella, which has an indirect positive effect on nasal volume.

SEG is widely used in rhinoplasty procedures to increase nasal tip projection and control rotation. During SEG application, the graft is fixed to the dorsal or caudal part of the septum. In the tongue-in-groove technique, the medial crura are sutured directly to the SEG. This grafting technique is used in short noses with poor support, a malpositioned LC, or a thick columella^{17,18}. SEG applications are performed end-to-end or side-by-side. They are effective for improving nasal tip rotation and projection and positively affect nostril volume¹⁹.

SEG does, however, have some disadvantages and may be contraindicated in patients with nasal

projection and/or excessive cranial rotation. It is therefore recommended that it is applied mainly in patients with nasal collapse and a low nasolabial angle. Other techniques should also be considered; for example, a batten graft can be easily applied in cases of nasal collapse during inspiration. However, graft displacement is risky, and it should be remembered that it is co-trained in patients with narrow vestibules²⁰. Lateral crus modification techniques involve changing the LC's position and/or shape. Cephalic malpositioning of the LC is a problem involving the long axis, and repositioning may be achieved by using a lateral crural strut graft. In contrast, sagittal malpositioning of the LC is a problem involving the short axis. It can be resolved using the domal suture technique, with the short axis of the LC positioned perpendicularly to the septum^{15,21,22}. In our study, the LC short axis was placed perpendicularly to the septal cartilage using domal sutures. In the suspension suture techniques imitating the Cottle maneuver, the LC piriform aperture²³, inferior orbital rim²⁴, or malar eminence²⁵ are sutured with permanent materials. The disadvantage of these techniques is the necessity for an extra surgical procedure. Ointments are used during follow-up period²⁶.

Patient preoperative and postoperative NTP changes should be analyzed using facial analysis

methods and applied simultaneously to higher patient series to improve the methodology used in our study. Our preoperative and postoperative functional comparison was based on objective tests like rhinomanometry.

Conclusions

In conclusion, this method is effective for patients with bilateral nasal collapse and thick-short columella. With the applied surgery:

- The caudal edge of the LC diverges from the septum
- Alar region tension and resistance increase
- The columella increases in length
- Nasal projection increases
- The vestibule cross-sectional area is enlarged
- In this way, a significant increase in nasal vestibular volume is obtained.

Conflict of Interest

The Authors declare that they have no conflict of interests.

Ethics Approval

Ethics Committee approval of the Istanbul Yeni Yüzyıl University Ethics Committee for Non-Invasive Health Sciences Research (date: 01.06.2022 and decision No.: 2022/05-554) was obtained for this study.

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Authors' Contribution

Ali Seyed Resuli: Planning, designing, literature survey, data collection, interpretation of the results, active intellectual support. Muhammet Dilber: Planning, designing, literature survey, interpretation of the results, active intellectual support. Nuray Bayar Muluk: Planning, designing, literature survey, interpretation of the results, active intellectual support, writing, submission. Cemal Cingi: Planning, designing, literature survey, interpretation of the results, active intellectual support, English editing.

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