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Functional Rhinoplasty: Short Review

Erdinc Cekic[1*], **Oren Friedman**[2] **and Ceren Gunel**[3]

[1]*Department of Otorhinolaryngology, Head and Neck Surgery, Lutfiye Nuri Burat State Hospital, Sultangazi, Istanbul, Turkey*

[2]*Department of Clinical Otorhinolaryngology, Head and Neck Surgery, Facial Plastic Surgery, University of Pennsylvania, Philadelphia, PA, USA*

[3]*Department of Otorhinolaryngology, Head and Neck Surgery, Faculty of Medicine, Adnan Menderes University, Aydın, Turkey*

[*]**Corresponding author:** Erdinc Cekic, MD, Department of Otorhinolaryngology–Head and Neck Surgery, Lutfiye Nuri Burat State Hospital, Sultangazi, Istanbul, Turkey, Tel: (90) 2842124128; E-mail: erdinc82@gmail.com

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Abstract

Examination of anatomical structures including the septum, internal and external nasal valve regions is essential in planning for functional rhinoplasty. In modern rhinoplasty procedures nasal functions (breathing and olfaction) beside its cosmetic role; should not be ignored for a successful operation. We should respect supportive structures of the nose in cosmetic rhinoplasty and also augment the weaker regions of the nose that are limiting nasal breathing during functional nasal surgery.

Keywords Rhinoplasty; Nasal surgery; Septum

Introduction

Aside from its cosmetic role, the nose serves a number of essential functional roles. Air passes through the nose where it is filtered, humidified, warmed and prepared for respiration. Nasal obstruction is a very common symptom reported by the general patient population. Nasal obstruction is caused by a narrowing of the nasal cavity thereby resulting in decreased nasal breathing capacity. In order to serve its primary functional roles, the nose is composed of an intricate anatomy and complex physiological capacities.

Rhinoplasty is a very popular cosmetic surgical procedure that changes both the internal and external shape of the nose and the term "functional rhinoplasty" can best be explained as changing the anatomy of the nose for the purpose of improving nasal breathing and other functions. The risks for post-rhinopasty nasal obstruction increase if a patient requests a narrowed bony and middle third, narrowed nasal tip or base, or a very reduced nasal dorsum. The surgeon must themselves understand and then explain to the patient that over-aggressive narrowing of the nose may lead to long term nasal obstructive symptoms with associated negative quality of life implications [1]. Various rates of functional problems following cosmetic rhinoplasty have been reported in the literature, ranging from 15% to 68% [2-4] and nasal airway obstruction was found to be the most common indication for secondary nasal surgery [5].

Anatomy

There are many anatomical structures, which contribute to the normal nasal function including the nasal hairs, nostrils, nasal valves, septum and inferior turbinates. It is commonly believed that internal nasal valve obstruction, external nasal valve collapse and septal deviation are the major causes of nasal airway obstruction and are the primary targets in functional rhinoplasty [6].

The internal nasal valve (INV) area is bordered by the caudal septum, caudal aspect of upper lateral cartilages (ULCs), head of the inferior turbinate and the remaining tissues of the surrounding pyriform aperture [7]. The internal nasal valve is the narrowest portion of the nasal airway and it therefore creates the greatest resistance to nasal airflow. The internal nasal valve angle should normally measure between 10° and 20° and efforts to improve breathing at the level of the INV generally do so through widening of this angle, which secondarily often enlarges the nasal valve area [8].

The external nasal valve (ENV) is the region surrounded by the caudal septum and the lateral and medial crura of the lower lateral cartilages. Obstruction at either the internal or external valve regions can be static meaning that the magnitude of obstruction is not affected by negative inspiratory forces created by inspiration. In contrast, dynamic collapse of the sidewall occurs when the sidewall of the nose collapses as a result of the negative inspiratory forces created with inspiration, resulting in obstructive nasal breathing upon inspiration [9].

Treatment

Deviated nasal septum

A deviated septum can be traumatic or congenital. There are also different types of surgical techniques for these different types of deviations (e.g. Submucous resection, scoring, wedge resection etc.). In cases of severe deformities involving critical regions of the septum, more aggressive techniques may be required (C-shaped or S-shaped) including extracorporeal septal reconstruction. This technique involves the total or near total removal of the septal cartilage, reshaping and reinforcing a new and strong septal cartilage L-strut and finally, replacing the removed cartilage into the septal space and fixing it in position.

Chronic turbinate hypertrophy

Lateral out-fracture, submucosal diathermy, electro cautery and turbinectomy are the most frequent surgical methods, but we try to avoid the removal or destruction of any tissue in the vast majority of patients. Destruction, injury, or excessive removal of respiratory

mucosa may cause atrophic rhinitis and subsequent empty nose syndrome.

Internal nasal valve collapse

In most patients, the middle nasal vault is the critical region for nasal breathing. The relationship between the upper lateral cartilages and the septum may be altered from birth, aging, trauma, or from prior rhinoplasty that causes middle third narrowing [10]. Spreader grafts are often used to reconstruct the middle vault of the nose. Placement of spreader grafts under an intact connection between the ULCs and the septum can significantly widen the INV angle more than when spreader grafts are placed after division of the ULCs from the septum as often occurs with dorsal nasal hump resection [11]. Autospreader flaps, using the upper lateral cartilages to act as spacer and supportive grafts between the ULC and septum, are a nice alternative to middle vault reconstruction with septal cartilage spreader grafts [12].

Another technique to reconstruct the middle vault is described by Guyuron as a splay graft. The graft is harvested from conchal cartilage and is placed on the under surface of the upper lateral cartilages and over the dorsum of the septum to reconstruct and widen the middle vault [11].

The butterfly graft is highly effective in correcting INV obstruction, including both static and dynamic collapse of the sidewall [13]. It widens the internal nasal valve angle by flaring the upper lateral cartilages. Conchal cartilage is harvested and the graft is then carved and secured to the superficial surface of the native upper lateral cartilage with a single stitch on each side. The butterfly graft can be placed through an endonasal or external approach. The dorsal septum can be slightly reduced to create space for the graft in order to avoid a post-operative polly-beak deformity. One of the concerns with the butterfly graft is the negative cosmetic changes that can occur with the application of a cartilage onlay graft along the dorsum and sidewalls of the nose but it can most commonly be applied in a very satisfactory cosmetic way and in cases of pinched alar creases the appearance of the nose following butterfly graft application is actually much improved.

External nasal valve collapse

Various cartilage grafts may be used to strengthen ENV stability. The most common technique is the alar batten graft which may support the weakest points along the nasal sidewall or the alar rim. Alar batten grafts and lateral crural strut grafts provide support and strength to the lateral nasal walls to prevent static and dynamic collapse. These grafts may be placed via an intercartilagenous, marginal, or external incision including the alar-facial stab approach [14,15]. Septal, auricular, or rib cartilage graft materials may be used. The location of graft placement is determined on examining the patient in the office and it is placed at the points of greatest sidewall collapse.

Understanding nasal anatomy and how to preserve good solid structural support, even while reducing the size of the nose as we do in cosmetic rhinoplasty, allows us to maintain excellent nasal function during cosmetic rhinoplasty. Understanding the root causes and specific anatomical sites of nasal obstruction is the key to successful surgical planning and outcomes for functional rhinoplasty. Anatomical structures playing major roles in nasal breathing functions include the septum and the internal and external nasal valves, so physical examination of these regions is essential. Planning for functional rhinoplasty involves the identification of the sites of nasal airway obstruction or old trauma and addressing those regions during the operation with a number of different techniques. Modern rhinoplasty requires that we respect supportive structures of the nose in cosmetic rhinoplasty and that we augment weaker regions of the nose that are limiting nasal breathing during functional nasal surgery.

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