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Impact of dome splitting on the nasal airflow efficacy of external airway

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ABSTRACT

Dome splitting is effective technique in the nasal tip surgery indicated for the reduction of tip projection, increasing tip rotation, domal arch narrowing and correction of the lobule asymmetry. However, there are concerns regarding its negative effects on nasal airflow. The present study compared the effect of rhinoplasty with the dome splitting on the efficacy of external nasal airflow. In a prospective before and after clinical trial, 46 eligible patients (39 females, 6 males) were selected and standardized images of their nasal bases were obtained during normal and deep breathes before and 3 months after the surgery. Patients were subjected to rhinoplasty with open technique and dome splitting was done in the nasal lower cartilage between lateral and medial crura. The area of the nasal external airway was measured during normal and deep breathes before and 3 months after the surgery. The percent of nasal airflow efficacy was determined qualitatively and quantitatively in the patients' left and right nostrils using McNemar and Wilcoxon Signed Ranks tests. In the left and right nostrils, 67.4% (31) of the patients, the airflow efficacy was decreased and in 32.6% (15) patients, the airflow efficacy increased. Dome splitting significantly decreased the airflow efficacy of the patients ($P<0.05$). Airflow efficacy decreased (-7.19 ± 23.7) in the left nostrils than right nostrils (-7.28 ± 14.7). Airflow efficacy of the patients significantly decreased ($P<0.05$).These results suggested rhinoplasty surgery using dome splitting decreased the nasal airflow efficacy after the surgery, hence care must be exercised for alterations in nasal air flow resistance when manipulating the nasal framework is done.

KEY WORDS: RHINOPLASTY, DOME SPLITTING, NASAL AIRFLOW EFFICACY

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INTRODUCTION

The surgery of the tip is the most difficult and challenging part of any rhinoplastic surgery and difficulties arise due to surgical problems and healing process. The narrowing and reshaping of the tip is considered as an integral part of the rhinoplastic operation rather than ignoring it or considering it as a separate surgical procedure. In a routine rhinoplasty, whenever the nose is narrowed, the tip will appear broad and rounded requiring it's remodeling in majority of the cases (Foda et al. 2013).

Nasal tip repositioning methods are used to adjust the existing alar cartilages and to augment the nasal lobule with grafts or implants (Kridel and Konior, 1990). Vertical dome division of the alar cartilage is mostly used for modification of the nasal tip projection in cosmetic and reconstructive rhinoplasty. It is a valuable adjunctive procedure for nasal tip refinement (Chang et al. 2008). The Goldman first described Vertical dome which gives rise to tip irregularities such as lower nasal third pinching and alar notching (Chang et al. 2008). Vertical dome technique modified to create an approach with minimal tissue excision that is focused on the incision and mobilization of the lower lateral cartilages (Foda, 2001). Although vertical dome division can be considered a conservative, cartilagesparing approach to nasal tip surgery, concerns about postoperative asymmetry and cartilage visibility remain, especially in thin-skinned patients (Lavinsky-Wolff et al. 2013).

It is suggest vertical dome technique is an effective method for nasal tip deprojection and narrowing via an open approach (Gandomi et al. 2011). Also, little effort has been made to study patients' satisfaction and quality-of-life outcomes after vertical dome surgery using validated scales (Lavinsky-Wolff et al. 2013). Maintenance of the structural integrity after nasal surgery is important in preventing nasal airway stenosis (Yoo et al. 2011). However, adverse effects reported for the vertical dome surgery on airflow where in patients postoperativertical dome surgery failed to normalize airflow (Conrad et al. 2000). Also, clinically asymptomatic were reported in patients after surgery (Conrad et al. 2000). So, the aim of the current study was to determine effect of rhinoplasty with the dome splitting on the efficacy of external nasal airflow.

MATERIAL AND METHODS

SAMPLE SELECTION

The present study compared the effect of rhinoplasty with the dome splitting on the efficacy of external nasal airflow in patients referred to a private clinic and Bu Ali hospital at 2016-2017. In a prospective before and after clinical trial, 46 eligible patients (39 females, 6 males with the mean age of 36.4 years old) were selected and standardized images of their nasal bases were obtained during normal and deep breathes before and 3 months after the surgery.

DOME SPLITTING SURGICAL PROCEDURE

The area of the nostril before and after the study determined before and after the study. In this regard, photography obtained from each patient based on their gender during the normal and deep breathes as $S_{N1}0$**.** The rhinoplasty was done in patients under general anesthesia. The incisions were highlighted using methylene blue (Hamilton and Grant, 2014; Pi et al. 2016). For dome splitting, no other techniques such as alar contour graft and alar base resection applied. If in patients other techniques applied, they dropped from the study. Lateral crura and medial crura cartilages were used for dome splitting. Three months after rhinoplasty, the nostril area was determined as $S_{N0}1$. All measurements were done using caliper and photographs based on standard scale (1:1). All photographs were done under the same condition by an expert operator using a digital camera (Cannon D7, Tele 18-125) at a distance of the 120 cm. The standard slides from the frontal, lateral and overhead of the patients were done (Ettorre et al. 2006; Duron et al. 2014). The area of the nasal external airway was measured during normal and deep breathes before and 3 months after the surgery on the images by Adobe Photoshop Ver. 12.0 software.

PERCENT OF NASAL AIRFLOW EFFICACY

The percent of nasal airflow efficacy before the surgery determined as

$$RE0 = S_{N1}0 \div S_{N0}0 \times 100:$$

Where $S_{N0}0$ stands for normal and $S_{N1}0$ deep breaths. Also, after 3 months airflow efficacy determined as:

$$RE1 = S_{N1}1 \div S_{N0}1 \times 100$$

Where $S_{N0}0$ stands for normal and $S_{N1}0$ deep breaths.

STATISTICAL ANALYSIS

Data were analyzed by repeated measure two-way analysis of variance (ANOVA) using SPSS 16.0 for Windows (SPSS, Inc., Chicago, IL, USA). The percent of nasal airflow efficacy was determined qualitatively and quantitatively in the patients' left and right nostrils and subjected to McNemar and Wilcoxon Signed Ranks tests

respectively. P<0.05 was considered as significant difference.

RESULTS

The dome splitting surgery is shown in figure 1.

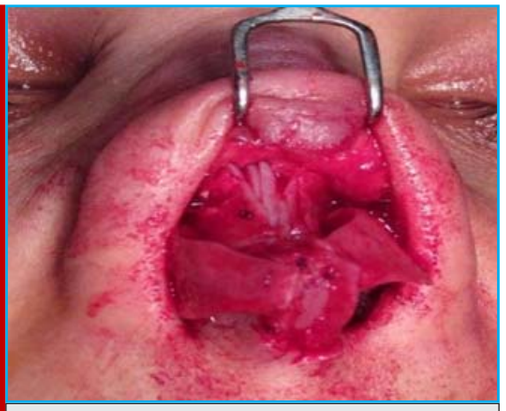

FIGURE 1. The dome splitting surgery

The nasal airflow efficacy following dome splitting is shown in table 1. In the left and right nostrils, 67.4% (31) of the patients, the airflow efficacy was decreased and in 32.6% (15) patients, the airflow efficacy increased. Dome splitting significantly decreased the airflow efficacy of the patients (P<0.05). Airflow efficacy decreased (-7.19±23.7) in the left nostrils than right nostrils (-7.28±14.7). Airflow efficacy of the patients significantly decreased (P<0.05).

The result of the dome splitting in one patient is presented in figure 2.

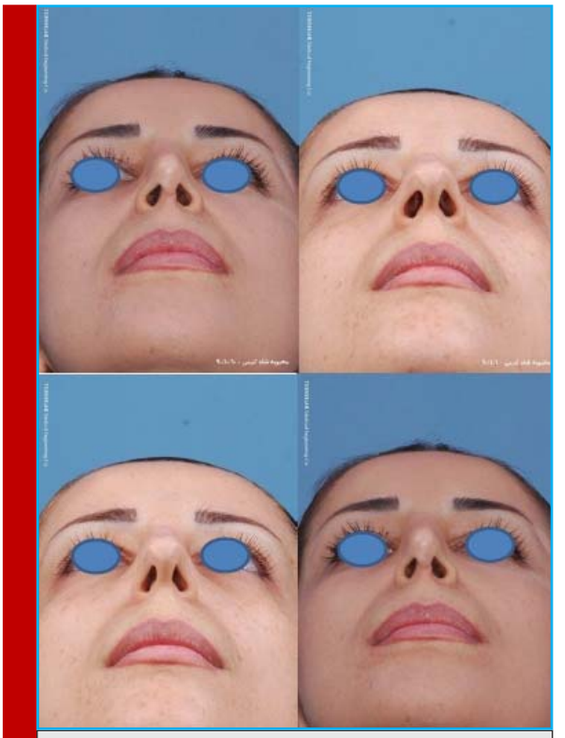

FIGURE 2. The photography of the of the dome splitting in one patient

DISCUSSION

Since introduce of the dome division, numerous researches was done on its accuracy. Surgical changes created in the nasal tip represent an integral part of every aesthetic rhinoplasty; accomplished surgeons worldwide differ significantly in their personal preferences for tip refinement approaches and techniques (Simons and Fine, 1977). Most surgeons agree that preservation of the integrity of the alar cartilage is desirable during tip sculpture, while some surgeons imply numerous forms of vertical division of the residual complete strip to accomplish tip narrowing. Scarce of consensus about the appropriate surgical approach utilized to gain access to the tip structures continues to exist and is further underscored by surgeons who practice an exclusively open approach to every rhinoplasty problem (Funk et al. 2009).

It is reported vertical dome division improves the nasal airway by improve the nasal valve aperture (Richard et al. 1998). In the current study, the left and right nostrils, 67.4% (31) of the patients, the airflow efficacy was decreased and in 32.6% (15) patients, the airflow efficacy increased. Dome splitting significantly decreased the airflow efficacy of the patients. Airflow efficacy decreased (-7.19±23.7) in the left nostrils than right nostrils (-7.28±14.7). Airflow efficacy of the patients significantly decreased. Vertical dome division should replace horizontal trimming of the lower lateral cartilage in rhinoplasty (Adamson et al. 1990). One must consider involved in the nasal tip is decrease nasal air flow (Richard et al. 1998). The lower lateral cartilage is

Table 1. nasal airflow efficacy following dome splitting

	Air flow		
Nostril	Decrease (n, %)	Increase (n, %)	Total (n, %)
Left	31(67.4%)	15 (32.6%)	46 (100%)
Right	31(67.4%)	15 (32.6%)	46 (100%)

fixed medially at the collumella and at the lateral border of the alar. Lower lateral cartilage holds up the soft tissue of the nasal tip (Constantinides et al. 1996). If the cartilage get weaker, is was not able to maintain support of the soft tissue which horizontal excision will contribute to collapse and compromise at the nasal valve (Richard et al. 1998). In a study on impact of vertical dome division on nasal airflow, Conrad et al. (2000) reported the airflow was negatively affected in 37.5% and improved postoperatively in 25% of patients. The protocol which they applied in their research was differ from ours.

Recently Gandomi et al. (2011) reported the modified vertical dome technique is an effective method for nasal tip de-projection and narrowing via an open approach. Despite several research efforts, studies evaluating quality-of-life outcomes after nasal tip surgery with dome division surgery remain scarce in the facial plastic surgery literature. In the current study, we used dome division technique to determine its effects on nasal air flow. We think obtained results of the current study can use as base information for accuracy of this technique on patients breathing. It is reported dome division technique improved the life quality of the patients during a short period (Lavinsky-Wolff et al. 2013) which the protocol applied in our study was different from incoming research.

In a study on comparison of suture and vertical dome division techniques of bulbous nose refinement, Ghazipour et al. (2011) was reported among the 35 patients with transdomal and interdomal technique, 2 patients (7.5%) had a previous bulbous nose deformity remained stable of whom one patient resulted in revision surgery. The overall satisfaction rate in these patients was approximately 92%. Also, in 35 patients with who underwent surgery using vertical dome division method, in 3 patients (6.8%) complication as over narrowing nasal tip was observed which in one case this led to revision surgery and in one case (2.8%) collapse of lower lateral cartilage occurred. Base on their report it seems vertical dome division is effective for life quality of the patients while in the current study obtained results revealed vertical dome division leads to nasal obstruction. Despite these limitations, our results add relevant quality-of-life data to the rhinoplasty literature, including specific information about the outcomes of vertical dome division surgery in patients. In conclusion results suggested rhinoplasty surgery using dome splitting decreased the nasal airflow efficacy after the surgery. So care must be exercised for alterations in nasal air flow resistance when manipulating the nasal framework is done.

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