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Measuring nasal tip and lobule width; effect of transdomal and lateral crura suturing*

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SUMMARY

Statement of problem: *There is no golden standard in measuring the width of the nasal tip and lobule. In this study we tried to validate the parameters Tip Index (TI) and Lobular Index (LI) as parameters for Nasal Tip Width (NTW) and Nasal Lobule Width (NLW) respectively. Trandomal suturing and lateral crura suturing were used to alter NTW and NLW respectively.*

Methods: *Standardized digital photographs (basal view) of open approach rhinoplasty patients were analysed. Transdomal sutures and lateral crura sutures were used in 29 and 28 patients, respectively. TI and LI were determined with digital imaging software (Adobe Photoshop) pre- and postoperatively.*

Results: *Average (SD) preoperative LI changed from 0.74 (0.07) to 0.71 (0.06) postoperatively with the lateral crura suturing technique ($p = 0.045$). We were not able to measure an effect in TI with the transdomal suturing technique.*

Conclusions: *Detailed postoperative analysis with digital imaging software contributes to greater understanding of nasal tip mechanics. LI proved to be a valuable technique to describe NLW refinement.*

Key words: nasal tip, nasal lobule, transdomal suture, lateral crura suture, measurement

INTRODUCTION

The nasal lobule is the mobile lower third of the external nasal pyramid. It is composed by the tip, alae and columella as subunits. The lobular or alar cartilages are horseshoe-shaped and support the structured anatomy of the whole lobule. It is common in surgical practice to divide the alar cartilage into medial crus + intermediate crus, dome and lateral crus. The nasal tip consists of the domes (bilateral tip defining points), the transdomal connective-tissue fibres, and the overlying skin [1]. The morphology of these cartilages, their relative position to each other, and the texture of the soft tissues all contribute to the outer aspect of the nasal tip and lobule. Form and width are parameters of the nasal tip that can best be examined on an anterior and/or basal view. Additional characteristics of the tip are rotation and projection, which not only depend on the form of the cartilages, but also on the relation between the alar cartilages and the septum.

The width of the tip is mainly determined by the position of the domes. The width of the lobule is dependent of the morphology of the lateral crura. It is difficult to obtain an exact measurement of the width of the nasal tip. Several proposals have been made in the literature [1-3], but so far, there is no golden standard. On a basal view, morphology of the nasal tip and lobule can be evaluated. Because of interindividual variety, it is better to use relative measures (comparing to fixed anatomical landmarks), rather than to use absolute ones. Therefore, there is no agreement in literature which measures should be considered. For example, shall we compare the width of the tip or lobule, with the alar bases, or with the maximal width of the alar contour? Should we use the ventral ends of the nares in determining NTW and/or NLW?

Several surgical procedures have been described to alter the tip and these can roughly be divided into cartilage cutting and cartilage saving techniques. The latter involve reorienting the alar cartilages by suturing them, in an attempt to change their form [4]. Conservation and relocation, rather than reduction, have become increasingly important in modern rhinoplasty [5]. There is a large variety in nasal tip sutures, all with their special effects on width of tip + lobule, projection and rotation. Transdomal sutures are known to have a tip narrowing effect [5,6]. Lateral crura sutures narrow the tip in a lesser degree, but rather reduce the width of the lobule [6]. In this retrospective study, we analysed the results of transdomal sutures (narrowing NTW) and lateral crura sutures (reducing NLW) by determining TI and LI respectively. Digital photo-editing software is becoming increasingly popular, not only to document pre- and postoperative photographs, but also to analyze the results.

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MATERIALS AND METHODS

Patients

A retrospective study was performed on the results of rhinoplasty, in which refinement of the outer contour of the nasal tip had formed part of an external rhinoplasty procedure. All the operations were performed at the same centre by the same surgeon, between 1998 and 2002. Data were collected on 57 patients. In 28 patients, lateral crura sutures (long term resorbable PDS 5x0) had been placed as a mattress suture in the supratip region, width the knot buried in between both cephalic margins of the cartilages. In 29 patients transdomal sutures (long term resorbable PDS 5x0) have been used, as mattress sutures between the lateral and intermediate crura of the alar cartilages. Rhinoplasty was performed by an open approach. Figures 1 and 2 show the transdomal and lateral crura suturing techniques, respectively.

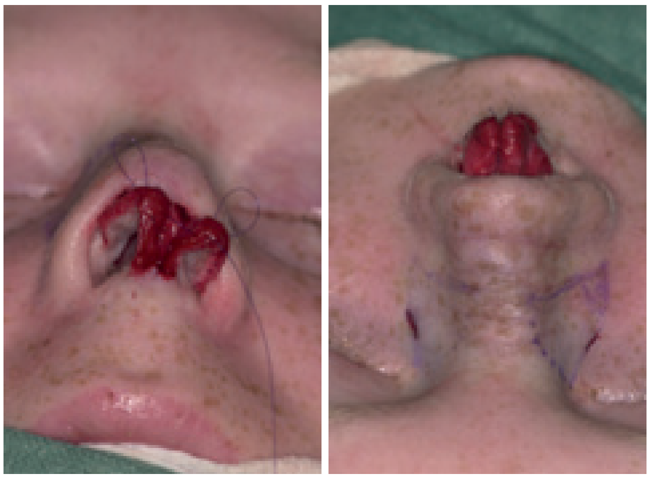

Figure 1. a) Transdomal suture PDS 5x0 running from the left intermediate crus through the left lateral crus, where it is coming back in, continuing its path to contralateral. b) Bird view of the tightened knot of a transdomal suture, buried between the two intermediate crura.

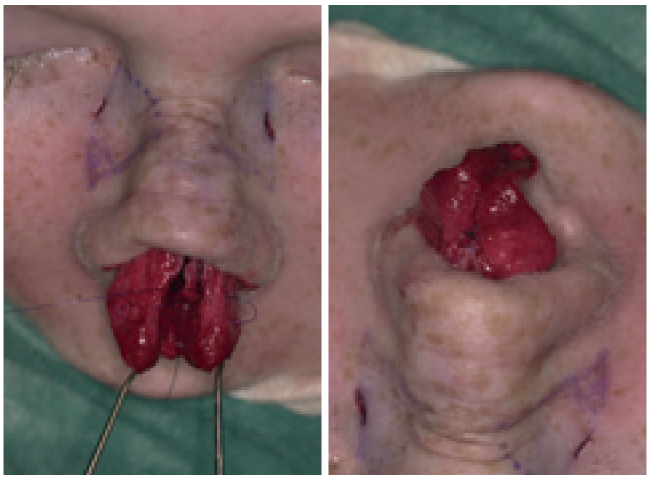

Figure 2. a) Lateral crura suture PDS 5x0 running from medial cefalic margin of right lateral crus, with a loop coming in more cranial on the cephalic margin, continuing its path to contralateral. b) Bird view of the tightened knot of a lateral crura suture, buried between the two cefalic margins of the lateral crura.

Digital photographical analysis

A standard series of digital photographs were taken before surgery and 12 months later. Pre- and postoperative photographs were taken with a 35 mm Nikon FM2 camera and a studio-grade electronic flash unit. We used a 105 mm macro portrait lens with a focal length of 1:2.8, and an aperture number of 16 (F-stop). In the lateral view, the viewfinder was focused on the Frankfort line at the lateral canthus at a fixed distance of 1.3 m. To ensure proper and uniform photographic size, focusing is thus achieved by moving the camera, not by adjusting the lens [7]. Despite this professional equipment, neglectable variances may occur from picture to picture. To rule out these deviations, we did not measure absolute millimetres, but only used relative measures of TI and LI.

The pre- and postoperative basal views were used for further analysis. The width of the nasal tip and lobule was measured with commercially available photo-editing software (Adobe Photoshop; version 5, for Windows PC and Macintosh; Adobe systems Incorporated, San Jose, California, US) using two different methods:

1) Tip Index (TI) expressed as the ratio of

$$\frac{\textbf{Width of tip at ventral border of nares}}{\textbf{Maximum width of lobule}} \ \mathbf{x\ 100 = TI} \ \text{(Figure 3)}$$

Figure 3. Measurement of nasal Tip Index in patient with transdomal suturing. a) preoperative (a/b)x100= 36.2. b) postoperative (a/b)x100= 34.7.

This measure is proposed by Huizing and de Groot as Lobular (tip) index [1]. Because it says more about the width of the tip rather than the lobule, and in order to avoid confusion with the following parameter LI, we abbreviate it here as TI.

2) Lobular Index (LI) expressed as the ratio of

$$\frac{\textbf{Width of lobule outer contours at ventral end of the nostrils}}{\textbf{Width between nasal alar roots}} \times 100 = L1$$

(Figure 4)

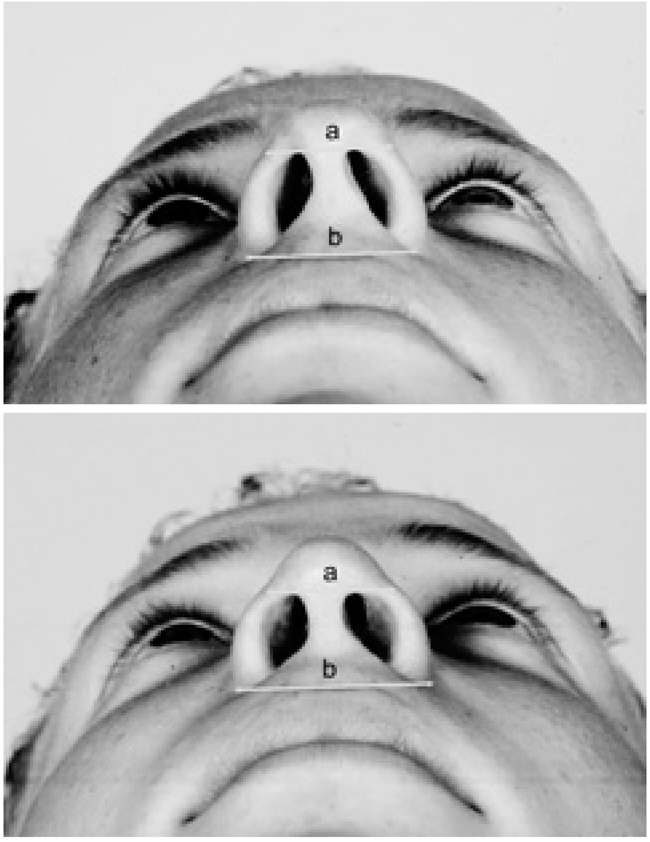

Figure 4. Measurement of nasal Lobular Index in patient with lateral crura suturing. a) preoperative (a/b)x100= 74.2. b) postoperative (a/b)x100= 68.3.

Measurements were performed by an independent researcher who was not aware of the pre- or postoperative situation.

Statistical analysis

Wilcoxon Signed Ranks test was applied for statistical analysis of the results, using SPSS.

RESULTS

Nasal tip width

In the group of patients with transdomal suturing (n = 29), pre- and postoperative average TI (SD) was 34.58 (5.24) and 34.53 (6.39) respectively, which was statistically not significant (p = 0.940). In the group with lateral crura suturing (n = 28), pre- and postoperative TI (SD) was 35.11 (4.98) and 33.96 (3.30) respectively, which was not significant either (p = 0.649).

Nasal lobule width

In the group of patients with lateral crura suturing (n = 28), pre- and postoperative average LI (SD) was 74.62 (7.43) and 71.05 (5.89) respectively, which was statistically significant (p = 0.045). In the group with transdomal suturing (n = 29), pre- and postoperative average LI (SD) was 71.48 (11.79) and 71.34 (5.77) which was not significant (p = 0.294).

DISCUSSION

Nasal tip surgery is one of the most challenging parts of rhinoplasty. Several techniques have been described to reduce the width of the tip and lobule, based on different theories of tip support structures and recoil mechanisms. There are also various approaches that can be used to apply each technique. The most widely-accepted surgical approaches for the nasal tip include cartilage delivery and open rhinoplasty [8]. Without doubt, the open rhinoplasty approach gives the best overview and makes manipulation of the lower lateral cartilages less complicated. In the past decade, it has become clear that cartilage relocation is preferable to removing parts of the alar cartilages [4]. However, it is difficult to describe and compare different surgical techniques because internationally accepted standards for measuring techniques are lacking.

A variety of suturing techniques is known in the literature [5,6], but it is difficult to quantify their results. Without any doubt a transdomal suture achieves tip refinement (Figures 1 and 3). The question stays, however, how to measure the result? In this retrospective study, TI was not able to quantify the effect of transdomal suturing. Although the concept seemed right, we could not demonstrate a significant tip refinement, which might rather be due to the limited sensitivity of the measuring method. Apart from this explanation, in our technique we did not lift any vestibular skin from the cartilage under the domes, which might have prevented medialisation of the lateral crus in the dome area. "Pushing down" the vestibular skin can be expected to have a more pronounced effect on reducing the width of the tip. Kridel [9] used this technique in a "lateral-steal method" to increase tip projection, but did not mention any effect on the width. There was no effect of lateral crura suturing on TI, but this was hardly to be expected, because this suture rather influences NLW.

Our retrospective study was able to demonstrate a significant reduction in lobule width measured with LI, using lateral crura sutures. In order to avoid changes in the referral maximal width of lobule, influencing the measuring outcome, we chose as a referral the width between the nasal alar roots, which stays fairly constant in straight forward rhinoplasties. According to Guyuron (6) the lateral crura sutures reduce NLW, but they also have an effect on the transdomal distance. Therefore they also have a tip refining effect, but not as pronounced as the transdomal sutures.

In conclusion, the nasal lobule is a three-dimensional structure in which any kind of tip suture exerts an effect in different directions. Our retrospective results showed that LI is able to measure the effect of lateral crura suturing. In order to demonstrate the effect of transdomal sutures, we need more sensitive techniques than TI. In the near future we will examine three-dimensional volumetry as a method to analyze tip and lobule refinements more precisely. In our results no effect could be demonstrated of transdomal suturing on NLW, measured by LI.

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