ORIGINAl ARTICLE

The broad base columellar strut for correction of retracted columella and under rotated tip

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KEYWORDS
Columellar strut; Columellar retraction; Nasolabial angle; Columellar-labial angle; Tip projection

Abstract  Objective: To describe the technique and to detect the efficacy of the broad base columellar strut in correcting retracted columella and under rotated nasal tip. Design: Retrospective chart review. Setting: University-affiliated medical center. Methods: The charts and photographs of patients suffering from columellar retraction with acute columellar-labial angle were reviewed. The columellar-labial angle and the nasal tip projection were measured and calculated from the photos and the columellar show was measured using a fine caliper. Results: The study included 17 patients, 12 females and 5 males with a mean age of 30.2 years ranging from 19 to 49 years, 14 patients had primary surgery while 3 were revision cases, Preoperative columellar-labial angle ranged from 75° to 86° with a mean 82.06 ± 4.08458 SD, while postoperatively it ranged from 92° to 105° with a mean 97.12 ° ± 3.9825 SD. Columellar show ranged preoperatively from 0.4 to 1.7 mm with a mean 0.94 mm ± 0.38739 SD while postoperatively it ranged from 2.5 to 3.5 mm with a mean of 2.65 mm ± 0.38098 SD. Nasal tip projection preoperatively ranged from 0.45 to 0.58 and postoperatively from 0.51 to 0.59. Conclusions: The broad base columellar strut technique is simple, easy, does not cause excessive tip stiffness and reduces the need to use the plumbing graft in conjunction with the columellar strut, and should help in increasing tip rotation and columellar show reliably and may add to tip projection as required.

1. Introduction

Nasal tip rotation and columellar show are among the most important factors toward a successful rhinoplasty. Tip and columellar repositioning are very challenging and many techniques were described to correct any related deformities. From the well known techniques is the columellar strut which gives good structural support to the nasal tip allowing its projection and rotation together with its effect on changing the degree of columellar show. However the columellar struts offer a less predictable nasal tip position including tip projection and rotation when compared to caudal septal extension grafts. Caudal extension graft results in stiffness in the nasal tip. It also requires a large

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amount of cartilage which is not always available especially in revision cases. In our study we described a technique that differs from the conventional columellar strut, where a modified strut design with broad base can be used to increase the columellar-labial angle and columellar show together with its additional effect on tip projection and rotation. It needs a limited amount of cartilage preserving the cartilage remnant for additional needed grafts and does not cause tip stiffness which is the case with septal extension grafts.

2. Patients and methods

This is a retrospective chart review that is approved by the Ain Shams faculty of medicine ethics committee. The charts and photographs of patients suffering from columellar retraction with acute columellar-labial angle were reviewed. Columellar retraction was considered when columellar show was less than 2 mm, acute columellar-labial angle refers to an angle <90° in males and <95° in females.

The columellar-labial angle was determined by drawing a line from the lower most part of the columella to the subnasale and from the subnasale to the labrale superiorius and measuring the angle between them in the lateral view. The columellar show was measured by measuring the vertical distance between the alar margin and the lowermost part of the columella at the mid point of the nostril using 0.1 mm graded fine caliper.

Nasal tip projection was calculated using Goode’s method. Goode’s index is the ratio of perpendicular projection of nasal tip on the nasion-alar line/a line drawn from the nasion to the nasal tip. A normal ratio is between 0.55 and 0.6, <0.55 is considered under-projected.

Pre and postoperative columellar-labial angles, tip projection and columellar show were calculated.

The results were analyzed using t test and a P-value less than 0.05 was considered statistically significant.

2.1. Surgical procedure

All surgeries were done through an open rhinoplasty approach under general anesthesia, a columellar strut was fashioned and cut where the posterior side is longer than the anterior side, resulting in a broad based columellar strut (Fig. 1), dissection extended between the medial crurae of the lower lateral cartilages, the columellar strut was placed between the medial crurae with the triangular extension of the strut placed caudal to the caudal edge of the medial crurae with its base directed posteriorly causing blunting of the columellar-labial angle and increasing the columellar show (Fig. 2), thus correcting columellar retraction. The base of the strut was placed short of the anterior nasal spine, the shorter side of the strut was directed toward the nasal tip to give the effect of rotation. In cases where projection needs to be increased, the medial crurae were pulled anteriorly and fixed to the strut in more anterior position. The strut was adjusted in place using 2 straight 31 gauge needles passing through the two medial crurae and the strut in between, then fixed using 5-0 Polydioxanone (PDS) sutures, any excess cartilage was trimmed. In all cases the strut was harvested from the central part of the septum sparing an L shaped dorsal and caudal septum strut not less than 1 cm, except in the three revision cases where costal cartilage was used in two cases and conchal cartilage was used in one and in all the revision cases septal replacement graft was used together with the broad base columellar strut to enforce the weak deformed caudal septum. Different rhinoplasty techniques in the form of median and lateral osteotomies, hump resection, dorsal grafts, cephalic trimming of lower lateral cartilage, interdomal and transdomal sutures and nasal base reduction were carried out as needed. Afterward, skin closure and septal quilting sutures were performed. Taping and an external nasal splint were fixed for a week.

3. Results

The study included 17 patients, 12 females and 5 males with a mean age of 30.2 years ranging from 19 to 49 years, 14 patients had primary surgery done while 3 were revision cases, the three
revision cases had large anterior septal perforation causing further fibrosis and posterior traction on the columella aggraving the columellar retraction, two of them had saddle nose. All cases had retracted columella, acute columellar-labial angle and 9 had decreased nasal tip projection. The mean follow up time was 12.5 months ranging from 10 to 15 months. Fig. 3 shows the preparative and post operative Lateral and oblique views of one of the patients of the study.

Table 1 shows the details of the preoperative and postoperative columellar show, columellar-labial angle and projection according to Goode’s method. Preoperative columellar-labial angle ranged from 75° to 86° with a mean 82.06 ± 4.08458 SD, while postoperatively it ranged from 92° to 105° with a mean of 97.12° ± 3.9825 SD (Fig. 4). Columellar show ranged preoperatively from 0.4 to 1.7 mm with a mean of 0.94 mm ± 0.38739 SD while postoperatively it ranged from 2.5 to 3.5 mm with a mean of 2.65 mm ± 0.38098 SD (Fig. 5). Nasal tip projection preoperatively ranged from 0.45 to 0.58 and postoperatively from 0.51 to 0.59.

4. Discussion and conclusion

For a columella to be esthetically pleasing it should have a balanced position in relation to the adjacent alar rim, the change in the columellar normal position in case of retraction or too much show gives an unpleasant esthetic appearance. A retracted columella is one of the challenging deformities and becomes more challenging when the case is a revision case where fibrosis causes further retraction. The columellar-labial angle establishment is one of the most important criteria for achieving a good esthetic outcome in rhinoplasty surgery, as the ability to achieve an obtuse columellar-labial angle usually results in a satisfied patient.

Different techniques have been used for repositioning of the nasal tip and columella among them is the columellar strut, not only does it provide structural support to the tip allowing for tip projection and rotation, but it is also used as a way to change the degree of columellar show, equalizing the medial crura and maintaining their shape. It can also be used as a scaffold upon which tip correction as tip grafts and suture techniques can be used. In general it provides good integrity to the structure of the lower third of the nose. However columellar struts have some limitations, they are subject to both resorption and displacement, and as they are not attached to the caudal septum post operative tip drooping may occur.

In their study to know the effect of columellar strut on final tip position Rhorich et al. analyzed the tip projection, columellar-labial angle and nasofrontal angle in 100 rhinoplasty patients, the columellar-labial angle was increased in only 46% and unchanged in 20%, while it decreased in 34%. They also found that tip projection decreased in 65%, increased in 27%, and was unchanged in 8% of subjects. We found that tip projection increased in 12 cases, decreased in 2 cases and was unchanged in 3 cases, however it is impossible to conclude the effect of the columellar strut on tip projection.

Figure 3  Left lateral (A and B) and oblique (C and D) views of pre-operative and postoperative photos of a patient with retracted columella and acute columellar-labial angle that was managed with the broad base columellar strut, cephalic trim of the lower lateral cartilages, interdomal and transdomal sutures, medial and lateral osteotomies, alar base and alar flare reduction.
from our study as other techniques were used to enhance tip projection in our cases.

Dhong et al.2 considered columellar struts inadequate for rotating the tip or improving the columellar-labial angle, so they used an L shaped columellar strut attached to the caudal septum to increase nasal tip projection and tip rotation, they placed the vertical portion of the strut between the LLCs while the horizontal portion was fixed posteriorly to the caudal end of the nasal septum, and as their L-shaped strut was secured to the columellar base, columellar base retraction could also be concomitantly corrected together with tip projection. Their technique achieves comparable results to our technique however it is more complex and results in a stiff unnatural nasal base.

Many surgeons prefer the septal extension grafts than the columellar struts to achieve the desired tip projection and

Table 1  Showing the pre and postoperative columellar-labial angle preoperative (in degrees), columellar show (in mm), and nasal tip projection calculated by Goode’s method.

<table>
<thead>
<tr>
<th>Sex</th>
<th>Age</th>
<th>Columellar-labial angle preoperative (in degrees)</th>
<th>Columellar-labial angle post-operative (in degrees)</th>
<th>Columellar show preoperative (in mm)</th>
<th>Columellar show post-operative (in mm)</th>
<th>Nasal tip projection (Goode’s method) pre-operative</th>
<th>Nasal tip projection (Goode’s method) postoperative</th>
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<tr>
<td>m</td>
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Figure 4  Graph showing the pre and postoperative columellar-labial angle.
rotation as the nasal tip position is less predictable with the use of struts, however, this often results in nasal tip stiffness. Furthermore, the septal extension grafts need a relatively large amount of harvested cartilage which is not always available, also, a part of the harvested cartilage should be spared for other grafts in the majority of cases especially if it was previously used in revision cases.

Atighechi et al. compared between the use of caudal extension graft and columellar strut with plumping grafts of fragments of cartilage introduced into the columellar base for correction of tip ptosis. They found that both methods were properly correct for the columellar-labial angle and columellar retraction, however, the caudal extension graft showed to be a more stable method in long-term follow-up. The use of the broad base columellar strut obviates the need to use plumping grafts with struts and we believe it is more stable and predictable.

While, Akkus et al. showed that both caudal extension grafts and columellar struts are effective to improve projection in short and long-term results and they reported no significant difference between their two study groups, however, they illustrated that the stability of tip position would be more in case of use of caudal extension grafts when compared to columellar struts.

As a method to control tip projection Byrd et al. introduced 3 types of septal extension grafts, they described them as paired spreader grafts, paired batten grafts, and direct extension grafts, according to the position of the nasal tip. Although they provided more support and prevented deviation as they are overlapping grafts, nasal stiffness and thickened nasal membranous septum were their main drawbacks.

Kim et al. applied three different types of septal extension grafts based on the type of deformity to be corrected (upturned tip correction or tip lengthening, simultaneous tip lengthening and nasal tip projection, or retracted columella correction) all grafts were reinforced by small batten grafts on the opposite side to support and centralize the septal extension grafts and prevent its gradual deviation. In the third type used to correct columellar retraction they located the relatively thicker part of the graft forward allowing it to be located properly downward toward the base of the columella hence blunting the columellar-labial angle and correcting the columellar retraction.

Toriumi et al. used a caudal extension graft with more length along its inferior margin, blunting the columellar-labial angle and increasing the tip rotation, and used a graft longer at its superior margin causing counter-rotation of the nasal tip by pushing it downward. However, these techniques need a large amount of cartilage, and as the grafts extend downward and are fixed to the anterior nasal spine, they also cause the tip to be stiff instead of being mobile.

Kim and Kim used rib cartilage for septal extension grafts in cases where the septal cartilage wasn't possible to be used due to trauma or in revision cases, but it carried the risk of cartilage warping and the potential of morbidity at the donor site. In this study, the columellar-labial angle and the columellar show increased in all the cases as it is a direct effect of the broad base columellar strut that can be fashioned according to the need. The broad base columellar strut differs from the septal extension graft and the conventional columellar strut, our technique involved the use of a columellar strut with its base extending caudally toward the columellar base allowing for the increase of the columellar show and blunting of the acute columellar-labial angle hence proper correction of the columellar retraction, together with its additional effect on increasing tip rotation and projection. It is not fixed to the anterior nasal spine so it preserves the normal tip mobility and prevents tip stiffness on holding the nose or on laughing, which are present in the septal extension grafts. It only needs a small amount of cartilage which allows the preservation of the

Figure 5  Graph showing the pre and postoperative columellar show.
remnant septal cartilage for additional needed grafts, and is specifically suitable for revision cases where the amount of cartilage to be harvested from the septum is minimal.

The small sample size and being a retrospective study are of our study limitations so a larger sample size and a prospective study should follow.

We believe the broad base columellar strut technique is simple, easy to perform and does not cause excessive tip stiffness unlike the septal extension graft and the L shaped columellar strut, and reduces the need to use the plumbing graft in conjunction with the columellar strut, and should help in increasing columellar-labial angle and columellar show reliably and may add to tip projection as required.

References


