



Manuscript ID
DOI

ZUMJ-1903-1168 (R2)
10.21608/zumj.2019.11204.1168

ORIGINAL ARTICLE

Different Techniques for Correction of Overprojected Nasal Tip

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Submit Date 2019-05-04

Revise Date 2019-11-09

Accept Date 2019-12-02

ABSTRACT

Background: The over projected nasal tip and the ptotic tip are two of the most challenging nasal deformities to correct during rhinoplasty. **Methods:** This study was done in the Department of ENT, Zagazig University Hospital from January 2018 to January 2019. It was done on 18 patients who experienced over-projected nasal tip and underwent rhinoplasty. All patients were operated by open rhinoplasty technique using general anesthesia with oral intubation. **Results:** There was no statistically significant difference between the five different groups as regard age and sex distribution. There was statistically significant reduction in radix- tip of nose postoperatively in all techniques except separation of foot plate from caudal part of septum method. There was statistically significant reduction in Alar- tip of nose postoperatively than preoperatively in all techniques except separation of foot plate from caudal part of septum method didn't show statistically significant reduction in Alar- tip of nose postoperatively. There was statistically significant reduction in Alar-tip/Radix-tip of nose postoperatively in all techniques. **Conclusions:** We concluded that in cases needed deprojection with rotation, it is better to perform lateral crural over lay technique, while in cases needed deprojection with derotation it is better to perform medial crural overlay technique. In cases needed deprojection with maintain rotation it is better to perform medial and lateral overlay techniques, and in cases suffered from mild over-projected nasal tip it is better to perform separation of foot plate from caudal part of septum only.

Keywords: Over projected nasal tip, Rhinoplasty, Medial Crural Overlay



INTRODUCTION

The expression "Pinocchio" refer to over-projected tip. Both over-projected and ptotic tips are two of the mainly difficult nasal deformities to acceptable during rhinoplasty. A careful preoperative consideration for understanding of tip dynamics, though, one can attain a pleasant-sounding facial aesthetic⁽¹⁾.

The structure of nasal tip has a complex tri-dimensional anatomy; and the relationship between these structures internally determines the definitive function and form of the nasal tip. So, any change of one in the tip structure may lead to alternation in other the nasal tip portions ⁽²⁾.

The nasal tip over-projection can be a primary over projection due to over developed alar cartilages or a secondary over projection due to over developed septal cartilage and anterior nasal spine, which is commonly referred to as a tension

nose. In cases of primary over projection, where the alar cartilages are overdeveloped with long medial and lateral crura, adequate tip de-projection is realistically impossible without diminishing the length of the medial and/or lateral crura⁽³⁾.

Moreover, Joseph and Safian in 1930s who illustrated a shortening of crura medially and laterally to remove projection of the nasal tip. After that, Lipsett who established in 1959, a crural shortening medially. Many modifications of crural shortening laterally have been depicted to conserve vestibular skin during suture or overlap the separated segments⁽⁴⁾.

A suture of crural septal medially could be carried out in all aged patients go through aesthetic rhinoplasty, this occur to prevent additional exaggeration of acute nasolabial angle which already existed and for maintaining the projection rotation and projection of nasal tip ⁽⁵⁾.

The aim of this work is to illustrate different procedures used to generate a refined aesthetic and agreeable nasal tip in patients with over-projected nasal tip.

PATIENTS AND METHODS

This study was done in the Department of ENT, Zagazig University Hospital from January 2018 to January 2019. It was done on 18 patients who experienced overprojected nasal tip and underwent rhinoplasty; they were 12 males and 6 females, their ages ranging from 18 to 40 years old. All patients were operated by open rhinoplasty technique using general anesthesia with oral intubation.

Written informed consent was obtained from all participants and the study was approved by the research ethical committee of Faculty of Medicine, Zagazig University. The work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Types of techniques used in the study for nasal tip modifications:

1. Medial Crural Overlay (MCO):

An inverted V columellar incision is used to expose the alar cartilages and nasal dorsum. After that, alar cartilages are divided at the midline. The measurement of deprojection is determined by using a caliper from the posterior dome in each medial crus. These measurements must be similar in both sides even one crus is longer than the other medially then incise along the previously drawn lines. A drawn line should be corresponding to the dome slope for allowing the cut ends of the medial crura at the posterior portions to fit accurately into the domes niche upon the tuck-up completion.

Subsequently, the vestibular skin is disconnected from the incised medial crus at the anterior side which contacts to the undersurface of the dome. The posterior portion of crus medially that is left attached to vestibular skin is then tucked into the correct undersurface of the dome. This allows the upper portion of the crus for overlapping the lower portion on its medial aspect. The overlapped parts are sutured with two horizontal mattress sutures of 5-0 polydioxanone (PDS) together. The same procedure is repeated on the contralateral side as shown in figure 1.

2. Lateral Crural Overlay (LCO):

An incision is made over lower part of cartilage laterally. Sharp dissection proceeds anteriorly; the lower lateral cartilage is then transposed over the posterior limb and sutured in place. Additional bulk in this area also supplies to reinforce the nasal valve externally. The identified posterior portion of the lateral crus by the same measurement is used

here. A drawn line is anteriorly at this level. A second drawn line is anteriorly from the first one and using the same measurement as the medial crural tuck-up as shown in figure 2.

3. Combining MCO and LCO:

The amount of lateral crural overlay will be equivalent to the amount of medial crural overlay as shown in figure 3.

4. Separation of footplate from caudal part of septum:

Separation of the attachment of footplate of lower lateral cartilage from septum, then posterior reattachment of the footplate to the septum to deprojected tip as shown in figure 4.

5. Post-operative follow up:

This was ranging from 6 to 12 months including postoperative examination, patient satisfaction, complications and postoperative photographs.

Statistical analysis

Data were checked, entered and analyzed by using SPSS (Statistical Product and Service Solutions) version 19. Data were expressed as number and percentage for qualitative variable while they were expressed as mean \pm SD for quantitative variables. Chi-square (χ^2) test was used to compare the proportions. While student's t-test and F test were used for comparison of quantitative variables. $P < 0.05$ was considered statistically significant.

RESULTS

This study included 18 participants divided into 5 groups according to their surgical needs: each one had a different technique for overprojected nasal tip correction which is suitable for the patient condition, 1st group was corrected by lateral crural overlay only method and consisted of 5 participants, 2nd group was corrected by medial crural overlay with separation of foot plate from caudal part of septum method and consisted of 3 participants, 3rd group was corrected separation of foot plate from caudal part of septum method and consisted of 2 participants, 4th group was corrected by medial and lateral crural overlay with separation of foot plate from caudal part of septum and consisted of 3 participants and the last 5th group was corrected by lateral crural overlay with separation of foot plate from caudal part of septum method and consisted of 5 participants.

There was no statistically significant difference between the five different groups as regard age and sex distribution.

Table (1) shows that there was no statistically significant difference between the different groups as regard preoperative radix-tip distance of the nose. Table (2) shows that there was no statistically significant difference between the

different groups as regard preoperative alar-tip distance of the nose. Table (3) shows that there was no statistically significant difference between the different groups as regard preoperative alar-tip/radix-tip of nose. Table (4) shows that there was statistically significant reduction in radix-tip of nose postoperatively than preoperatively in all techniques except separation of foot plate from caudal part of septum method didn't show statistically significant reduction in radix- tip of nose postoperatively. Table (5) shows that there was statistically significant reduction in Alar-tip of nose postoperatively than preoperatively in all techniques except separation of foot plate from caudal part of septum method didn't show statistically significant reduction in Alar- tip of nose postoperatively. Table (6) shows that there was statistically significant reduction in Alar-tip/Radix-tip of nose postoperatively than

preoperatively in all techniques but separation of foot plate from caudal part of septum method showed the least statistically significant reduction in Alar- tip/Radix-tip of nose postoperatively. Table (7) shows that the highest percent of improvement (16.6%) was in the 4thgroup which was corrected by medial and lateral crural overlay with separation of foot plate from caudal part of septum followed by the 5th group which was corrected by lateral crural overlay with separation of foot plate from caudal part of septum method(16.3%) and the least percent of improvement(15.1%) was in the 3rd group which was corrected by separation of foot plate from caudal part of septum method. Results also sowed that there was no major complications happened in the collumellar skin incision or the nasal rim infra cartilaginous incisions, no tip necrosis, bleeding, or infection was encountered in this series of patients

Table (1): Comparing preoperative radix-tip distance of nose between the studied groups

Groups	Number of participants (18)	Preoperative radix-tip distance of nose mean ± SD (Range)	F-Test	p-value
<i>1st group</i>	5	5.9±0.5 (5.5-6.5)	0.08	0.9
<i>2nd group</i>	3	6.1±0.5 (5.5-6.5)		
<i>3rd group</i>	2	6.05±0.6 (5.5-6.5)		
<i>4th group</i>	3	6.0±0.5 (5.5-6.3)		
<i>5th group</i>	5	6.02±0.38 (5.6-6.5)		

Table (2): Comparing preoperative alar-tip distance of nose between the studied groups

Groups	Number of participants (18)	Preoperative Alar-tip distance of nose mean ± SD (Range)	F-Test	p-value
<i>1st group</i>	5	4.2±0.2 (4-4.5)	0.3	0.8
<i>2nd group</i>	3	4.3±0.2 (4.0-4.5)		
<i>3rd group</i>	2	4.20±0.3 (4.0-4.5)		
<i>4th group</i>	3	4.03±0.4 (3.6-4.5)		
<i>5th group</i>	5	4.22±0.19 (4.0-4.5)		

Table (3): Comparing preoperative Alar-tip/Radix-tip of nose between the studied groups

Groups	Number of participants (18)	Preoperative Alar –tip/Radix- tip of nose mean ± SD (Range)	F-Test	p-value
<i>1st group</i>	5	0.70±0.01 (0.69-0.72)	0.07	0.9
<i>2nd group</i>	3	0.70±0.01 (0.69-0.72)		
<i>3rd group</i>	2	0.71±0.02 (0.69-0.72)		
<i>4th group</i>	3	0.7±0.01 (0.69-0.71)		
<i>5th group</i>	5	0.7±0.01 (0.69-0.71)		

Table (4): Comparing pre and postoperative radix-tip of nose in each of the studied groups

Variable	Preoperative Radix- tip of nose mean ± SD (Range)	Postoperative radix -tip of nose mean ± SD (Range)	Wilcoxon signed rank- Test	p-value
<i>1st group</i>	5.9±0.5 (5.5-6.5)	5.4±0.5 (5.0-6.0)	11	0.03*
<i>2nd group</i>	6.1±0.5 (5.5-6.5)	5.6±0.5 (5.0-6.0)	14	0.005*
<i>3rd group</i>	6.05±0.6 (5.5-6.5)	5.6±0.5 (5.2-6.0)	5.3	0.07
<i>4th group</i>	6.0±0.5 (5.5-6.3)	5.5±0.5 (5.0-6.0)	6.5	0.02*
<i>5th group</i>	6.02±0.38 (5.6-6.5)	5.5±0.36 (5.1-6.0)	26	0.001**

Table (5): Comparing pre and postoperative alar-tip of nose in each of the studied groups

Variable	Preoperative Alar- tip of nose mean ± SD (Range)	Postoperative Alar- tip of nose mean ± SD (Range)	Wilcoxon signed rank- Test	p-value
<i>1st group</i>	4.2±0.2 (4-4.5)	3.2±0.2 (3-3.5)	49	0.001**
<i>2nd group</i>	4.3±0.2 (4.0-4.5)	3.26±0.2 (3.0-3.4)	31	0.001**
<i>3rd group</i>	4.20±0.3 (4.0-4.5)	3.25±0.2 (3.1-3.4)	10	0.06
<i>4th group</i>	4.03±0.4 (3.6-4.5)	3.3±0.2 (3.1-3.5)	4.5	0.04*
<i>5th group</i>	4.22±0.19 (4.0-4.5)	3.5±0.3 (3.0-3.9)	4	0.01*

Table (6): Comparing pre and postoperative alar-tip/radix-tip of nose in each of the studied groups

Variable	Preoperative Alar- tip/Radix-tip of nose mean ± SD (Range)	Postoperative Alar- tip/Radix-tip of nose mean ± SD (Range)	Wilcoxon signed rank- Test	p-value
<i>1st group</i>	0.70±0.01 (0.69-0.72)	0.59±0.01 (0.58-0.60)	22	0.001**
<i>2nd group</i>	0.70±0.01 (0.69-0.72)	0.59±0.01 (0.58-0.60)	34	0.001**
<i>3rd group</i>	0.71±0.02 (0.69-0.72)	0.59±0.01 (0.58-0.60)	23	0.02*
<i>4th group</i>	0.7±0.01 (0.69-0.71)	0.58±0.005 (0.58-0.59)	35	0.001**
<i>5th group</i>	0.7±0.01 (0.69-0.71)	0.59±0.008 (0.58-0.60)	43	0.001**

Table (7): Percent of improvement in each technique in the studied groups (each patient must fulfill all criteria needed for successfulness of the specific technique which is suitable for his conditions)

Groups	Number of participants (18)	Percent of improvement Mean (Range)
<i>1st group</i>	5	15.3% (13.04% - 16.67%)
<i>2nd group</i>	3	16.1% (15.7% - 16.67%)
<i>3rd group</i>	2	15.1% (14.2% - 15.9%)
<i>4th group</i>	3	16.6% (15.9% - 17.1%)
<i>5th group</i>	5	16.3% (15.9% - 16.7%)



Figure (1): Medial Crural Overlay (MCO)



Figure (2): Lateral Crural Overlay (LCO)



Figure (3): Combining MCO and LCO



Figure (4): Separation of footplate from caudal part of septum

DISCUSSION

The over projected nasal tip is a facial characteristic in which a disharmony exists in the anterior projection of the nose from the facial plane. Fundamentally, the diagnosis of over projection can be made using one of several methods when analyzing the lateral view ⁽⁶⁾.

According to **Goode** ⁽⁷⁾, a line to the nasal tip drawn perpendicular to a line from the nasion

through the alar-facial junction should be 55% to 60% of the dorsal nasal length from the nasion to the tip. **Crumely and Lanser** ⁽⁸⁾ described the ideal nose as one in which the length of a line from the nasion to the vermilion cutaneous junction of the upper lip compares with the length of a perpendicular from this line to the tip-defining point with a ratio of 0.2833. In a simplification of these mathematical techniques, **Simons** relates the

length of the upper lip (from the subnasale to the labrale superius) as ideally equivalent to the length from the subnasale to the tip⁽⁹⁾.

In this study, 5 types of techniques for nasal tip modifications were evaluated namely: lateral crural overlay only, medial crural overlay with separation of foat plate from caudal part of septum, separation of foat plate from caudal part of septum only, medial and lateral crural overlay with separation of foat plate from caudal part of septum and lateral crural overlay with separation of foat plate from caudal part of septum.

As regard lateral crural overlay only technique in our study (group 1), there was statistically significant reduction in Radix-tip of nose postoperatively (mean+ SD; 5.4±0.5) than preoperatively (mean+ SD; 5.9±0.5), (P value 0.03) and there was highly statistically significant reduction in Alar- tip of nose postoperatively (mean+ SD; 3.2±0.2) than preoperatively (mean+ SD; 4.2±0.2), (P value 0.001). Also there was highly statistically significant reduction in Alar-tip/Radix-tip of nose postoperatively (mean+ SD; 0.59±0.01) than preoperatively (mean+ SD; 0.70±0.01), (P value 0.001). Percent of improvement in group 1 was 15.3% (13.04% - 16.67%).

Kridel and Konior⁽¹⁰⁾ described the lateral crural overlay technique for shortening the lateral crus. This technique describes the placement of a vertical incision in the middle segment of the crus, followed by overlapping of the separated ends to effectively shorten the length of the crus. However, shortening of the lateral crus can induce tip rotation⁽¹¹⁾. **Webster**⁽¹²⁾ described a lateral crural technique that aimed to control retrodisplacement by preserving a portion of the cephalic aspect, which was delineated by a rim strip incision, to provide better stability. **Wise et al.**⁽¹³⁾ described the intermediate crural overlay technique, which also achieved nasal deprojection but specifically maintained the curvature of the nose.

A separate group of surgical techniques exist that collectively attempt to “borrow” cartilage from the lateral crus and add it to the medial crus. These are often described as “vertical dome division” techniques. The Goldman technique, described in 1954, is one such technique and requires separation of the lateral crus from the medial crus by complete transection lateral to the dome, after which it is mobilized medially and sutured to the medial crura⁽¹⁴⁾. Often considered a destructive technique in that the integrity of the lateral crus is interrupted, it has been associated with tip asymmetry, affording a pinched tip appearance to the tip. Modifications of this technique by **Simons**⁽¹⁵⁾ and **Adamson et al.**⁽¹⁶⁾ have focused on

improving the stability of the tripod through the use of suture stabilization, cartilage incision, incomplete excision and overlapping as well as moving away from excision of vestibular skin as was originally described.

As regard lateral crural overlay with separation of foat plate from caudal part of septum technique in our study (group 5), there was highly statistically significant reduction in Radix- tip of nose postoperatively (mean+ SD; 5.5±0.36) than preoperatively (mean+ SD; 6.02±0.38), (P value 0.001) and there was highly statistically significant reduction in Alar-tip of nose postoperatively (mean+ SD; 3.5±0.3) than preoperatively (mean+ SD; 4.22±0.19), (P value 0.01). Also there was highly statistically significant reduction in Alar- tip / Radix tip of nose postoperatively (mean+ SD; 0.59±0.008) than preoperatively (mean+ SD; 0.7±0.01), (P value 0.001). Percent of improvement in group 5 was 16.3% (15.9% - 16.7%).

In a prospective study by **Abdilkarim**⁽¹⁷⁾, 64 patients were included for primary, and secondary, open rhinoplasty, with nasal droopy tip and nasal tip true overprojection problems. They have been treated in Sulaimaniyah Hospital for Burn and Plastic Surgery and from Private Hospitals in Sulaimaniyah city. The age range was 18-34 years. Forty nine patients were female, the rest of the patients were male. They have been treated primarily, for the tip drooping and to a lesser extent for nasal tip overprojection, by the senior author, with Lateral Crural Cartilages Overlay. The study conducted from April 2012 to January 2016. The patients, postoperatively, were followed up for up to one year. Goode ratio and Nasofacial angle deducted from real time photographs have been used to evaluate the amount of rotation and deprojection of the nasal tip.

No major complications happened in the collumellar skin incision or the nasal rim infracartilagenous incisions skin separated from the undersurface of the LLCs. Minor step off in the collumellar incision in 3 cases (4.6%) and scarring in the infra cartilaginous incision sites in 2 cases (3.1%). No projection changes noticed in 6 cases (9.3%) although the rotation is satisfactory in the latter cases. Patients (more than 90 %) were satisfied with the net result of the tip plasties except for 6 (9.3%) cases. Only five cases (7.8%) were revised by alar base excision for the reason of alar base flaring. No tip necrosis, bleeding, or infection was encountered in this series of patients⁽¹⁷⁾.

In a study by **Foda and Kridel**⁽¹¹⁾, they compared two techniques for correction of nasal tip overprojection namely lateral crural steal (LCS)

versus lateral crural overlay (LCO). They selected series of 30 patients seeking rhinoplasty mainly for nasal tip repositioning. Only patients with no history of previous nasal operations were included. Main outcome measures were the nasofacial angle and the Goode ratio were used to assess tip projection, and the nasolabial angle and rotation angle were used to assess tip rotation. They found that the use of the LCS technique resulted in an increase in both nasal tip projection and rotation, but the use of the LCO technique resulted in an increase in tip rotation and a decrease in tip projection ($P < .001$). Additionally, the LCO technique resulted in significantly higher degrees of rotation than the LCS technique ($P < .001$). They concluded that the LCS procedure is indicated when a moderate increase in nasal tip projection and rotation is desired. The LCO technique is useful in patients where severe under rotation is associated with overprojection.

As regard medial crural overlay with separation of foot plate from caudal part of septum technique in our study (group 2), there was highly statistically significant reduction in radix-tip of nose postoperatively (mean+ SD; 5.6 ± 0.5) than preoperatively (mean+ SD; 6.1 ± 0.5), (P value 0.005) and there was highly statistically significant reduction in Alar-tip of nose postoperatively (mean+ SD; 3.26 ± 0.2) than preoperatively (mean+ SD; 4.3 ± 0.2), (P value 0.001). Also, there was highly statistically significant reduction in Alar-tip/Radix-tip of nose postoperatively (mean+ SD; 0.59 ± 0.01) than preoperatively (mean+ SD; 0.70 ± 0.01), (P value 0.001). Percent of improvement in group 2 was 16.1% (15.7% - 16.67%).

As regard medial and lateral crural overlay with separation of foot plate from caudal part of septum technique in our study (group 4), there was statistically significant reduction in radix-tip of nose postoperatively (mean+ SD; 5.5 ± 0.5) than preoperatively (mean+ SD; 6.0 ± 0.5), (P value 0.02) and there was statistically significant reduction in Alar-tip of nose postoperatively As regard Separation of foot plate from caudal part of septum only (mean+ SD; 3.3 ± 0.2) than preoperatively (mean+ SD; 4.03 ± 0.4), (P value 0.04). Also there was highly statistically significant reduction in Alar-tip/ Radix-tip of nose postoperatively (mean+ SD; 0.58 ± 0.005) than preoperatively (mean+ SD; 0.7 ± 0.01), (P value 0.001). Percent of improvement in group 4 was the best among all groups 16.6% (15.9% - 17.1%).

To create deprojection of the nasal tip without altering tip rotation, the lateral and medial crura need to be equally shortened. **Joseph⁽¹⁸⁾ and Safian⁽¹⁹⁾** described achieving deprojection by

excising lateral and medial crura elements. This would be later modified to accommodate an external rhinoplasty technique. **Close et al.⁽²⁰⁾** removed uncalculated length of the medial and lateral crura. The remnants would be sutured together end to end. Later, **Foda⁽²¹⁾ and Soliemanzadeh and Kridel⁽²²⁾** combined medial and lateral crura overlay and suturing techniques to effect deprojection.

In a study by **Foda⁽⁴⁾**, he reviewed 480 patients with primary overprojected nasal tips, the deformity was corrected using lateral crural overlay (LCO) in 298 (62.1%), medial crural overlay (MCO) in 71 (14.8%), and both LCO and MCO in 111 (23.1%). All patients were followed for a mean period of 18 months (range 6–120 months). He concluded that LCO and MCO both resulted in effective deprojection of the nasal tip, while retaining a strong and stable alar cartilage complex that maintained its new position over the long follow-up period. The technique requires an external rhinoplasty approach in order to be executed precisely, under direct vision, and with the alar cartilages in their normal resting position. No cases of infection or suture extrusion were encountered; however, a simultaneous alar base reduction was required in 30% of cases.

As regard separation of foot plate from caudal part of septum technique in our study (group 3), there was no statistically significant reduction in radix-tip of nose postoperatively (mean+ SD; 5.6 ± 0.5) than preoperatively (mean+ SD; 6.05 ± 0.6), (P value 0.07) and there was no statistically significant reduction in Alar-tip of nose postoperatively (mean+ SD; 3.25 ± 0.2) than preoperatively (mean+ SD; 4.20 ± 0.3), (P value 0.06). Also there was statistically significant reduction in Alar-tip/Radix-tip of nose postoperatively (mean+ SD; 0.59 ± 0.01) than preoperatively (mean+ SD; 0.71 ± 0.02), (P value 0.02). Percent of improvement in group 3 was the least percentage of improvement among all groups 15.1% (14.2% - 15.9%).

CONCLUSION

We concluded that in cases needed deprojection with rotation, it is better to perform lateral crural overlay technique, while in cases needed deprojection with derotation it is better to perform medial crural overlay technique. In cases needed deprojection with maintain rotation it is better to perform medial and lateral overlay techniques, and in cases suffered from mild overprojected nasal tip it is better to perform separation of foot plate from caudal part of septum only.

Informed consent and ethics committee/IRB approval

An informed written consent was obtained from all patients and the responsible ethics committee (institutional review board, Zagazig faculty of medicine) has given approval.

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To Cite:

Altaeb, A., El-Bahrawy, A., abd el fattah, M., Elsayed, A. Different techniques for correction of overprojected nasal tip. *Zagazig University Medical Journal*, 2022; (1454-1462): -. doi: 10.21608/zumj.2019.11204.1168