



Essential Role of Columellar Strut Graft on Projection and Rotation of Nasal Tip in Open Rhinoplasty

Nikita Rolekar^{1*} and Sidharth Misra²

¹Department of Plastic Surgery, Assistant Professor, Terna Speciality Hospital and Research Centre, India

²Department Of General Surgery, Extern, Terna Speciality Hospital and Research Centre, India

*Corresponding Author: Nikita Rolekar, Department of Plastic Surgery, Assistant Professor, Terna Speciality Hospital and Research Centre, India.

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Abstract

Background: The columellar strut remains a popular and effective form of an invisible graft in rhinoplasty and historically been assumed to be a technique that increases tip projection. Purpose of our study is to assess the essentiality of columellar cartilage graft in tip projection and rotation using digitized photographs.

Method: We have used photographs of 25 patients who underwent open rhinoplasty with columellar strut graft technique from January 2020 to April 2022 in Terna Multispeciality Hospital and Research Centre. Out of the 25 patients, 11 were male and 14 were female with the age group of 18-45 years. The closed rhinoplasty, secondary rhinoplasty and congenital nose deformity patients have been excluded. Standardized right profile images were taken and patient's pre and post operative photographs were compared.

Result: The average age of the patients in the study was 27.96 years ranging from 18 to 42 years with 44% were males while 56% were females. The mean preoperative nasal tip projection that is determined by the Goode's ratio Al to NTi : Na to NTi ratio was 0.566 while the mean postoperative ratio was 0.5808 after one year. The mean preoperative Nasolabial angle was found to be 95.56° while on follow up of one year was 103.28° .

Conclusion: Open rhinoplasty with a columellar strut graft increases the nasolabial angle and the nasal tip projection. It also provided stability to nasal tip by giving support to the lower lateral cartilages.

Keywords: Open Rhinoplasty; Columellar Strut Graft; Goode's Ratio; Nasolabial Angle

Introduction

Rhinoplasty is a common procedure performed by plastic surgeons for reconstructive and aesthetic purposes [1]. The common indications include functional problems like difficulty in breathing and nasal deformities due to trauma and congenital anomalies [2]. Nasal tip surgery is considered to be the most difficult step of aesthetic rhinoplasty [3,4]. The satisfactorily levels depend on symmetry, nasal tip projection and rotation [5]. The procedure of rhinoplasty can have an open or a closed approach out of which open approach is more widely used [6]. The procedure demands extensive pre-operative planning based on the face tip of the person and

the amount of reshaping that is needed [7]. Reconstructive and cosmetic surgeries have undergone a massive transformation over the years [8]. For increasing nasal tip projection, there are multiple techniques that exist [9]. Out of all the techniques, strut graft is one of the technique that is widely used to increase the nasal tip projection and rotation [10]. The other commonly used graft is a septal extension graft [11]. Columellar strut graft is used for nasal tip augmentation and has been named as such because in addition to providing better tip definition, it also resizes the columella [12]. It is placed in between the medial crura of the lower lateral cartilages. In contrast, the septal extension graft that is taken from the

thick septum, rib cartilage and double layer ear cartilages is used to lengthen the septum and the nose [13]. There is a lot of debate on the type of graft that is more suitable for nasal tip augmentation. In this study, we aim to highlight the effectiveness of the columellar strut graft by comparing the pre-operative and post-operative follow up images of the patients who had open rhinoplasty with a columellar strut graft.

Materials and Methods

The prospective study was undertaken on 25 patients who underwent open rhinoplasty with columellar strut graft from January 2020 to April 2022 at Terna Multispecialty Hospital and Research Centre. The age group that was included in our study was 18-45 years. Out of 25 patients, 11 were males and 14 were females. Closed rhinoplasty and secondary rhinoplasty and congenital nose deformity were excluded from this study. Standardized right profile photos were taken for the patients preoperatively and post-operatively follow up image were taken using Nikon DS 160, we took profile view pictures with a plane background at a fixed distance of 100 cm. The light focussing was done so, as to make sure that the photographs are shadowless. The Frankfort line was aligned within the grid of the camera.

The measurement of the nasolabial angle was done by drawing a line through the anterior and posterior ends of a nostril along with the vertical facial plane and, the results were recorded [Figure 1A].

Subsequently, the measurements were taken from the nasion to the alar-facial groove and from the nasal tip to the alar facial groove. These two measurements were used to find out the nasal tip projection by Goode's method [Figure 1B].

The measurements of before surgery and after one year follow up photographs of the patients were statistically compared using the paired t-test. A p-value of <0.05 was considered statistically significant.

Statistical analysis

For statistical analysis, we used the images of 25 patients that were taken before surgery and after one year follow up of open rhinoplasty. The paired t-test was used to compare the means of the Goode's ratio and the nasolabial angles. Significance was analysed with p value of <0.05 for interpretation of results.

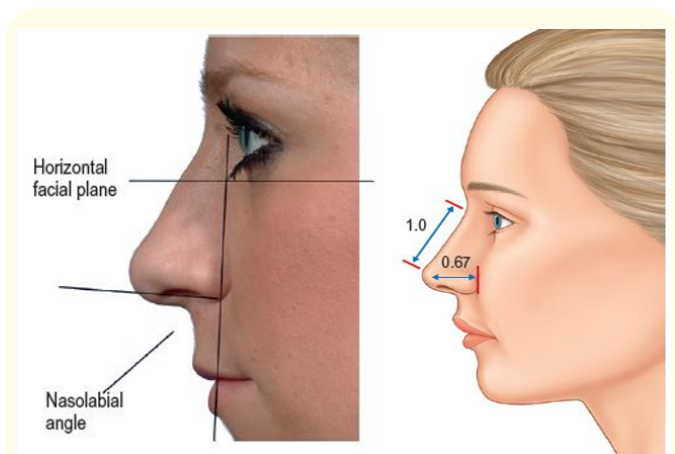


Figure 1A and 1B: Calculation of Nasolabial angle [1A], and Goode's ratio [1B].



Figure 2A and 2B: Comparison of nasolabial angle before surgery and after one year follow up.



Figure 3A and 3B: Comparison of the Goode's ratio.

Results

In our study 25 patients underwent open rhinoplasty with a columellar strut graft over a period of 2 year, there were 11 males (44%) and 14 females (56%). The average age of the patients in the study was 27.96 years.

The results were analysed statistically and the paired t-test was used to detect significant difference between the groups. After comparing before surgery and after one year value of nasolabial angle and Goode’s ratio, the difference was statistically significant with a p value of 0.004 and 0.001 respectively.

The mean preoperative nasolabial angle was 95.56° while the mean of nasolabial angle measured after one year was 103.28°.

	N	MIN value	MAX value	RANGE	Mean	Standard Deviation
Age	25	18	42	18-42	27.96	5.9546
Al to NTi						
Preoperative		0.55	0.8	0.55-0.80	0.67	0.0926
Postoperative		0.55	0.8	0.55-0.80	0.668	0.0888
Na to NTi						
Preoperative		1	1.5	1-1.5	1.1856	0.1526
Postoperative		1	1.5	1-1.5	1.1528	0.1349
Al to NTi:Na to NTi						
Preoperative		0.5	0.73	0.5-0.73	0.566	0.0514
Postoperative		0.52	0.73	0.52-0.73	0.5808	0.0453
Nasolabial Angle						
Preoperative		80	126	80-126	95.56	12.0488
Postoperative		95	112	95-112	103.28	5.8774

Table 1: Descriptive analysis.

Paired differences for Al to Nti: Na-Nti					T	df
Mean	SD	Std. Error mean	95% Confidence interval of the differences			
			Lower	Upper		
-0.0148	0.0202	0.0040	-0.0232	-0.0064	-3.6576	24
		p value: 0.00124				

Table 2: Paired sample test for Goode’s ratio.

Paired differences for NLA					T	df
Mean	SD	Std. Error mean	95% Confidence interval of the differences			
			LOWER	UPPER		
-7.7200	12.3204	2.4641	-12.8056	-2.6344	-3.1330	24
		p value: 0.00451				

Table 3: Paired sample test for Nasolabial angle.

Discussion

Open rhinoplasty is an evolving procedure that has seen multiple modifications since its inception. The aim of rhinoplasty is to improve the appearance of the nose or improve function like breathing, or both. Multiple grafts and suture techniques can be used for nasal tip augmentation. Some of the tip grafts used include columellar strut graft, lateral crura strut grafts, alar rim grafts, alar batten on-lay grafts, shield grafts and caudal septal extension grafts [14,15]. The columellar strut graft technique is a widely used in open rhinoplasty to obtain the nasal tip stability and a desired nasal tip angle.

Some of the objective parameters that aid in understanding the nasal tip rotation and nasal tip projection are nasolabial angle and Goode's ratio, respectively. The nasal tip rotation that is measured by the nasolabial angle differs in both women and men [16]. In women, the ideal angle ranges from 95° to 110° while in men, the ideal angle should be closer to 90° [17]. A normal nasal tip projection is determined by a Goode's ratio of 0.55 to 0.60 [18].

The study conducted by Alghonaim Y., *et al.* included 25 patients; all of them were females with an average age of 29 years old ranging from 21 to 46 years old [8]. In our study, we included 25 patients, out of which 11 were males and 14 were females with an average age of 27.96 years ranging from 18 to 42 years.

According to Alghonaim Y., *et al.* the mean NLA increased from 91.44° preoperatively to 97.2° three months postoperatively [8]. The study conducted by Atighechi S., *et al.* found that the patients who underwent a columellar strut graft had an increase in the mean NLA from 97.01° to 112.78° postoperatively [19]. In our study, the mean NLA increased from 95.56° to 103.28° after one year postoperatively.

The study conducted by Altinel D., *et al.* suggested that there was an increase in nasal tip projection from 0.605 to 0.636 one year postoperatively in patients who received a columellar strut graft for nasal tip augmentation [2]. In our study, there was an increase in the nasal tip projection from a preoperative Goode's ratio of 0.566 to a Goode's ratio of 0.5808 one year postoperatively. It is evident that there was an increase in the nasal tip projection determined by the Goode's ratio and the nasolabial angle after an open rhinoplasty that was done with a columellar strut graft.

Conclusion

Open rhinoplasty with a columellar strut graft is a technique that has led to an increase in the nasolabial angle and the nasal tip projection. It also provided stability to nasal tip by giving support to the lower lateral cartilages.

Declaration of Patient Consent

The authors certify that they have obtained all appropriate patient consent forms. Consent for providing the images and other clinical information in the journal was also included. The patients have been explained that their initials would not be mentioned, and their identity would be concealed although, complete anonymity cannot be guaranteed.

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Nil

Conflicts of Interest

There are no conflicts of interest.

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