

Control of Nasal Tip Position in Thick Skin Population. Columellar Graft Versus Septal Extension Grafts in Open Rhinoplasty

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Abstract

Background: Maintaining the position of the nasal tip is a crucial aspect of rhinoplasty.

Objectives: To analyze the preservation of tip projection and rotation resulting from the utilization of either a columellar strut or a septal extension graft, which are two commonly employed techniques for achieving tip control aiming to reach a more predictable pre-operative planning.

Patients and Methods: In this comparative clinical study, 40 candidates divided equally in two groups A for Columellar strut and Group B for Septal extension graft (16 women; 24 men; average age, 27 years) for primary rhinoplasty between October 2020 to October 2022 were included. Undergoing rhinoplasty computer software was used to analyze the effect columellar strut or septal extension graft on tip projection and rotation. Patients that need revision rhinoplasty or patients with congenital nasal problems were excluded.

Results: Most cases 21 (52.5%) were presented with deviated dorsum septum. Columellar strut and Septal Extension graft group, comparison between immediate post-operative and 6-month post-operative revealed significant *p*-value regarding tip projection and tip rotation.

Conclusions: From the immediate postoperative position, nasal tip projection and rotation seem to have decreased. The tip projection and rotation of patients with columellar strut and those with septal extension graft both exhibit the same changes with no significant differences between both groups when followed-up for 6 months postoperative.

Key Words: Rhinoplasty – Columellar strut – Septal extension graft-tip projection – Tip rotation.

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Introduction

One of the trickiest facial plastic surgery procedures is rhinoplasty, where the surgeon must coordinate and match the nose with the rest of the face while also enhancing the nose support and strength in addition to achieving these results over the long term [1]. The nasal tip appearance is influenced by three different factors Which are definition, projection, and rotation. Any of these measures may be aberrant in any given combination in a patient requiring nasal tip surgery [2]. Numerous cartilage grafts may successfully alter the appearance of the nasal tips, but the degree to which each of these grafts modifies nasal tip projection and rotation depends on the composition of the underlying structures and the type of effect the doctor is attempting to achieve on the nasal tip [3]. The Columellar strut and the septal extension graft are the most frequently used grafts to act as an anchor for the new nasal tip position. A floating columellar strut is a graft that is inserted into a small pocket that is dissected between the medial crura using an endonasal technique through a minor incision [4]. To stabilize the medial crura, a fixed-floating columellar strut (open method) is sutured to it. In order to prevent the graft from shifting back and forth over the nasal spine with lip movements, a 2 to 3mm pad of soft tissue is typically kept between the graft and the nasal spine [5]. In order to maintain the medial crura and modulate tip shape, various septal extension grafts have been developed, all of which rely on the presence of a stable caudal septum. septal extension grafts should reach the interdomal space extending beyond the anterior septal angle [6]. The medial crus's cephalic border, at the columellar-lobular angle, receives the graft's most inferior

and caudal portion [7]. The septal extension graft is anchored to the caudal septum and extends dorsal to the anterior septal angle [8]. Both types of graft may resorb, shrink, or move over time, changing the initial appearance [9]. Several approaches for calculating the optimum nasal tip projections and rotation have been described [10]. In the current study, the authors tried to evaluate the tip projection and rotation upon using columellar strut graft and septal extension graft using different tools in order to compare between both techniques in different timings trying to predict the amount of tip changes over time aiming to reach a more predictable pre-operative.

Patients and Methods

A comparative, double blinded clinical study where both the participants and the observers were aware of the specific type of graft used, was performed between October 2020 to October 2022. It was conducted on 40 patients (sorted in 2 groups, Group A for those submitted to Columellar strut graft and group B for those submitted to Septal extension graft) who were candidates for primary open rhinoplasty randomized by flipping a coin. Patients that need revision rhinoplasty or patients with congenital nasal problems were excluded. Detailed information about the study was discussed with all patients. Informed consent was obtained from each patient to participate in the study and photography. Faculty of Medicine, Beni-Suef University, Egypt Ethics Committee approved the study protocol. participants were photographed in standard views prior to surgery and six months after surgery.

All study patients were assessed pre-operative through proper history review by examining the patient's conditions that may influence his ability to endure general anesthesia and reviewing the medical history of the nose in relation to persistent or episodic obstruction, nasal pain, allergies. Full Physical examination through following the 10-7-5 method was performed [11]. A speculum was used to perform an intra nasal examination to check for synechiae, webs, lesions, discharge, internal nasal valve issues, septal deviations, mucosal scars, and septal perforations. The medial cheek at the level of the internal valve was subjected to lateral traction in order to perform the Cottle test [12]. Nasal obstruction at the internal valve may be indicated by a subjective improvement in nasal airflow on the tested side. CT paranasal sinuses to assess bony and cartilaginous nasal parts was done. Evaluation of tip projection and rotation was done in 4 timings: Pre-operative, intra operative, 3 months and 6-month post-operative using Rhinobase (Inprise Corp., Scotts Valley, California, United States) which is a computer software that provides quick links to clinical history, physical examination, photographic analysis, and surgical plan (Figs. 1,2). Photographs were calibrated to facilitate detailed

measurements. When taking the frontal and lateral views of the image, a consistent scale (Ruler) was held against the patient's face for calibration. We used the Goode approach to measure tip projection, as it is the most often used method, and the nasolabial angle to analyze tip rotation.



Fig. (1): Pre-operative lateral calibrated view with resultant analysis.

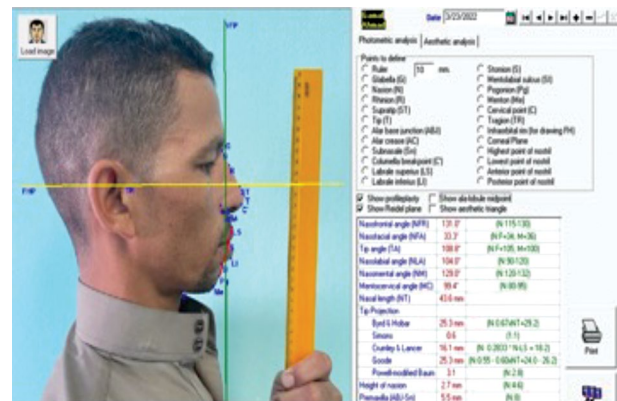


Fig. (2): 6-month post-operative calibrated lateral view analysis in Rhinobase.

Rhinobase displayed patient data alongside the expected normal range for each component. Post-operative patient satisfaction was measured by Rhinoplasty Outcomes Evaluation (ROE) [13]. Validated questionnaire was modified for the nasal-tip surgery and translated into Arabic which consists of six questions each with five possible responses graded from 0 to 4. Therefore, the possible range for the questionnaire score is between 0 and 24. To facilitate comprehension, the score must be divided by 24 and multiplied by 100, resulting in a number ranging from 0 to 100; the higher the score, the greater the patient's satisfaction.

Surgical technique: An open approach was used with separation of components. Dorsal reduction and mucoperichondrial flaps were elevated to allow for septal harvest, which was used as the

source of cartilage graft. Cases in which columellar strut grafts were used (Group A): A strut graft about 20mm long and about 4 mm wide was placed into a web created between the two medial crura, secured in a pocket inferiorly toward the anterior nasal spine, and affixed to the medial crus of the lower lateral cartilages using 5-0 polypropylene sutures on a septal needle through vestibular skin, both medial crura, and columella strut. Cases involving the use of septal extension grafts (Group B): The graft was usually 15mm by 15mm in shape. It spanned 5-8 mm over the caudal septum for maximum support (Fig. 3). The graft was secured by horizontal mattress sutures made from 5-0 polypropylene at the anterior septal angle, the caudal septum, and the medial crura of the caudal edge of the graft (Fig. 4). Using slight cartilage curvatures, the caudal border of the graft was positioned in the midline. The most caudal and inferior section of the graft was put at the columellar-lobar angle on the cephalic border of the medial crus. The most significant location of fixation was situated where the cephalic borders of the middle crura meet, beneath the middle crura's divergence. The graft had the proper columellar-lobular angle at this point.



Fig. (3): Septal extension graft before suturing overlapping the caudal septum by roughly 5-8mm.



Fig. (4): Septal extension graft as shown with the blue arrow, overlapped the caudal septum (white arrow) extending to the tip.

Results

A total of 40 patients were recruited: 20 patients at each group. The mean age (years) was 26.55 ± 5.708 for CS group and 27.45 ± 7.674 for SEG group; 16 female patients, 9 for CS group and 7 for SEG group and 24 male patients 11 for CS group and 13 for SEG group.

Table (1): Measuring tip projection in millimeters by Rhinobase software.

Timing	CS		SEG		P-value
	Mean	Std. deviation	Mean	Std. deviation	
T0	29.35	3.34	29.92	4.55	NS
T2	28.73	2.57	29.39	3.2	NS
T3	28.12	2.48	28.99	3.15	NS
Percent of change between T3 vs T2	-2.11		-1.34		0.12 (NS)

The table revealed a non-significant (NS) p-value between both groups in pre and postoperative timings. The percentage of change between T3 vs T2 was also not significant which means that both grafts can maintain postoperative values at 3 months until 6 months.

Among all studied cases, the majority of cases 21 (52.5%) were presented with deviated dorsum septum followed by 7 (17.5%) cases presented by over projecting tip as presented at (Fig. 5).

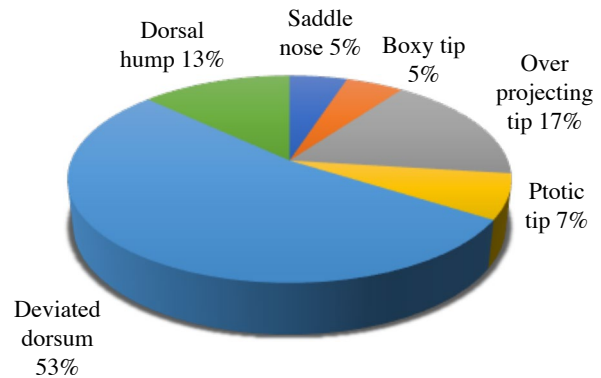


Fig. (5): Pie chart showing distribution of Cases regarding main problem.

Operative outcome According to the measuring method and timing, the results were stratified. Data evaluated over time included from preoperatively (T0), immediate postoperatively (T1 on operating table), early postoperatively (T2 at 3 months), and late postoperatively (T3 at 6 months).

Tip projection: For the columellar strut group, tip projection was 29.35 ± 3.34 mm at T 0, 29.14 ± 2.7 mm at T1, 28.73 ± 2.57 mm at T2, and

29.39±3.2mm at T3. While for Septal extension group, tip projection was 29.92±4.55mm at T0, 29.64±3.22mm at T1, 29.39±3.2mm at T2, and 28.99±3.15mm at T3.

Table (2): Measuring tip rotation in degrees revealed using Rhinobase software.

Timing	CS		SEG		p-value
	Mean	Std. deviation	Mean	Std. deviation	
T0	94.5	5.24	93.8	6.34	0.7 NS
T2	98.85	5.18	97.45	4.37	0.23 NS
T3	98.54	5.37	97.24	4.29	0.4 NS
Change % T3 vs T2	-0.33		-0.21		0.39 (NS)

The table revealed a non-significant (NS) p-value between both groups in pre and postoperative timings. The percentage of change between T3 vs T2 was also not significant which means that both grafts can maintain postoperative values at 3 months until 6 months.

Tip rotation: Defined by the nasolabial angle, Preoperatively and at the three specified postoperative time points, tip rotation was assessed. The columellar strut group had an average nasolabial angle of 94.5±5.24° at T0, 99.29±5.08° at T1, 98.85±5.18° at T2 and 98.54±5.37° at T3. While in Septal extension graft group, the mean nasolabial angle was 93.80±6.34° at T0, 97.9±4.55° at T1, 97.45±4.374° at T2 and 97.24±4.29 degrees at T3. A non-significant p-value was noted comparing tip rotation changes between both groups.

Table (3): Showing the mean value of breathing in Rhinoplasty Outcome Evaluation (ROE).

Timing	CS	SEG
	Mean	Mean
T0	3	3
T3	4	4
p-value	0.017	0.047

4 is the maximum score and 0 is the lowest score, both groups show a significant p-value between pre and postoperative results which was concordant with the relevant improvement in nasal obstruction.

We couldn't relate that change in breathing to a specific technique since they both showed significant improvement but may be due to partial turbinectomy done in 3 cases in each group in addition to the almost routine osteotomies done in all cases.

Cases:

Case (1): 34 years old male patient, history of blunt trauma 4 years ago, mainly complained of aesthetic look. Rhinoplasty was done and CS was used. Preoperative Rhinobase measuring of tip projection was 36.8mm while the normal range was (32.6-34.5). 6 months postoperative Rhinobase value of tip projection was 33mm. regarding tip rotation it was 78 degrees while its 6 months postoperative value was 92.3 degrees.



Fig. (6): Right lateral calibrated views preoperative (above) and 6 months postoperative (below).

Case (2): 23 years old male patient, presented with crooked nose with the dorsum deviated to the right side, bilateral nasal obstruction with more on the left side. Rhinoplasty was done and SEG was used. The tip projection preoperative was 35.1mm while the normal range was (29.2-32.5) while its 6-month postoperative was 29.7mm. Regarding tip rotation, it came preoperative and 6 months postoperative with the same value 100 degrees.



Fig. (7): Right lateral views preoperative (above) and 6 months postoperative (below).

Discussion

This study was conducted at Beni-Suef University Hospital, Egypt. The main aim was to evaluate columellar strut graft and septal extension graft regarding maintaining or improving tip projection and rotation after a 6-month period postoperative. Computer software was used for evaluation with the optimum goal of predicting the amount of tip changes, aiming to reach a more predictable pre-operative planning. Upon comparing both techniques, our study revealed no significant changes between both groups regarding tip projection and rotation when compared at 4 different timings. Age and gender did not significantly differ between the two study groups in our study. Şirinoğlu et al., showed in their study about floating columellar strut graft an average age of 25.4 years and ages ranging from 18 to 42, there were 35 females and 9 males [14].

Also, Santareno et al., showed in their study about columellar strut graft in open rhinoplasty that the mean age was 26.4 years old (range, 17-43 years) for 272 females and 56 males [15]. The difference in sex in all studies could be explained as most cases in our study were traumatic and males are more susceptible to trauma. Hacker et al., reported that Breathing problems, septal deviation, inferior turbinate hypertrophy, and dorsal hump were the most frequent indications for rhinoplasty [16]. Our study included only patients with primary rhinoplasty and most of them were post traumatic not disease related Sawh-Martinez et al., had similar results in their study [17]. They revealed that for the columellar strut group, tip projection was measured to be 32.3 ± 3.1 mm and 35.7 ± 7.3 mm postoperatively. They reached a decrease in value between early (6 weeks) and late postoperative (12 months) by about 1.7 percent while in our study the decrease was 2.1 percent. Also, in the septal extension graft tip projection was measured to be 31.2 ± 4.1 mm preoperatively, 33.8 ± 6.4 mm postoperatively. They reached a decrease in value between early and late postoperative by about 2.2 percent while in our study it was 1.34 percent. Comparing that decrease between both groups was not significant, which was the same result in our study. As regards the tip rotation, the average nasolabial angle for the columellar strut group was 107.3 ± 17.3 degrees preoperatively and 112.5 ± 11.0 degrees postoperatively. In the septal extension graft group, the average nasolabial angle of 115.1 ± 13.1 degrees preoperatively and 115.8 ± 15.0 degrees postoperatively. Comparing both groups revealed a more significant decrease in tip rotation values between early and late postoperative in columellar strut group, a result that was not concordant with our study that revealed a non-significant decrease in both groups between early and late postoperative regarding tip rotation. This difference with their study may be due to longer post-operative follow-up (12 months) compared to 6 months in our study.

Bilgili and Çerçi Özkan revealed a significant statistical difference between the measurements of tip projection preoperative and 1-year follow-up post-operative in patients with septal strut graft [18]. Bucher et al., concluded in their study that CSGs without any additional surgical step can enhance both nasolabial angles as well as nasal tip projections and rotation, but only if specifically intended to by the surgeon [19]. Lathif et al., agreed with the results of our study partially. They demonstrated that both surgeons and outcome measures reported by patients for function were similar between columellar strut graft and septal extension graft subpopulations, but CSG patients reported inferior cosmeses than SEG patients. They also stated that the change in airway analysis outcomes was similar between CSG and SEG subpopulations which is concordant with our study regarding breathing issues [20].

Conclusion:

From the immediate postoperative position, nasal tip projection and rotation seem to have decreased. The tip projection and rotation in patients with columellar strut and those with septal extension graft both exhibit the same changes with no significant differences between both groups when followed-up for 6 months postoperative.

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