



# Management of Reconstruction of the Columella in Open Rhinoplasty Procedure: Using b-Shaped Columellar Strut Graft

## Açık Rinoplasti Prosedüründe Kolumella Rekonstrüksiyonunda b-Şeklinde Dizayn Kolumella Strut Kullanımı

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### Abstract

**Objective:** The columellar strut graft (CSG) can help to correct nasal tip (NT) deformities in rhinoplasty. The value of using the CSG technique as a routine procedure in rhinoplasty is still being debated. The reason for this ambivalence is the increased rotation effect of a CSG on the NT. In this article, "b" (small letter "B") shaped CSG was prepared differently from the traditional CSG, and two different designs of CSGs were compared in terms of nasolabial angles.

**Method:** A total of 99 patients who were operated on using CSG between September 2018 and March 2020 were included in this study. We analyzed preoperative and postoperative lateral views of photographs and case histories of 99 patients. Traditional shape and b-shaped CSGs were used for 33 (33.3%) and 66 (66.6%) of the total patients, respectively. The groups of traditional shaped and b-shaped CSGs were compared with statistical analysis.

**Results:** When postoperative nasolabial angles were evaluated, it was found that 36.4% and 7.6% of the nasolabial angles were above the optimal range in the traditional strut graft group and b-shaped CSG group, respectively. Wide-nasolabial angles were observed to be more common in cases with traditional strut grafts than in cases with b-Shaped CSG. The b-shaped CSG provided gain optimal projection without extended rotation. The difference between the two groups was statistically significant ( $p=0.00$ ).

**Conclusion:** The overall conclusion derived from this research is that an optimally shaped columella can be obtained using a b-shaped CSG without overrotation of the NT.

**Keywords:** Columella reconstruction, columellar strut graft, open rhinoplasty

### Öz

**Amaç:** Kolumellar strut greft (KSG), rinoplastide nazal tip (NT) deformitelerinin düzeltilmesine yardımcı olabilir. Rinoplastide rutin bir prosedür olarak KSG tekniğinin kullanılmasının değeri halen tartışılmaktadır. Bu kararsızlığın nedeni, KSG'nin NT üzerindeki artan rotasyon etkisidir. Bu makalede geleneksel KSG'den farklı olarak "b" (küçük harf "B") şeklinde KSG hazırlanmış ve iki farklı KSG tasarımı nazolabial açılar açısından karşılaştırılmıştır.

**Yöntem:** Bu çalışmaya Eylül 2018-Mart 2020 tarihleri arasında rinoplasti operasyonu geçiren ve KSG kullanılan toplam 99 hasta dahil edildi. Tüm hastaların ameliyat öncesi ve sonrası lateral fotoğrafları incelendi, hasta bilgileri toplandı. Toplam hastaların sırasıyla 33'ünde (%33,3) ve 66'sında (%66,6) geleneksel şekil ve b-şekilli KSG'ler kullanıldı. Geleneksel şekil ve b-şekilli KSG grupları arasındaki NLA açıları arasındaki farklar istatistiksel analiz ile karşılaştırıldı.

**Bulgular:** Ameliyat sonrası nazolabial açıları değerlendirildiğinde geleneksel strut greft grubunda ve b-şekilli KSG grubunda nazolabial açıların sırasıyla %36,4 ve %7,6'sının optimal aralığın üzerinde olduğu bulundu. Geniş nazolabial açıları, geleneksel strut greftli olgularda b-şekilli KSG'li olgulara göre daha sık gözlemlendi. b-şekilli KSG, aşırı rotasyon olmaksızın optimum projeksiyon elde edilmesini sağladı. İki grup arasındaki fark istatistiksel olarak anlamlıydı ( $p=0,00$ ).

**Sonuç:** Bu araştırmadan elde edilen genel sonuç, burun ucunun aşırı döndürülmesi olmaksızın b-şekilli bir KSG kullanılarak optimal şekilli bir kolumella elde edilebileceğidir.

**Anahtar kelimeler:** Açık rinoplasti, kolumella dikme grefti, kolumella rekonstrüksiyonu



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## Introduction

Tip control is critical to the functional and cosmetic outcomes of rhinoplasty (1). In rhinoplasty, nasal function and nasal tip (NT) support should be preserved (2). If the NT is left unsupported during surgery, loss of the NT projection and NT ptosis are observed at a high rate; as a result of these, nasal airway obstruction can occur (3).

The columella provides a balanced relationship between the alar rim on both sides and the medial cruras (1). The lateral view of the columella should not retract and overhang for satisfactory aesthetic outcomes. The natural and well-shaped columella provides a pleasant lateral aspect.

In previous studies, there are various methods to increase NT support. A columellar strut graft (CSG) is used to increase NT support (4). Other techniques are caudal extension graft, extended CSG, suturing the medial crura to a long caudal septum, and suspension of lower lateral cartilage to the upper lateral cartilage with suture administration (1). All of the methods that are mentioned above lead to some complications associated with the NT and caudal part of the nose. Retracted columella, the stiffness of the NT, over-rotation of the NT, and acute nasolabial angle (NLA) are the most common complications in the literature (1,5). The value of using the CSG technique as a routine procedure in rhinoplasty is still being debated. The reason for this ambivalence is the increased rotation effect of a CSG on the NT (6).

The upperlip, pre-maxilla, anterior nasal spine, columella and nasal base have complex anatomical relations and variable anthropometrical measurements (8). Preoperative assessment of all facial elements is important to creating harmony of the face. Several measurements are used for the assessment of anthropometrical relations. NLA is an essential parameter of preoperative and postoperative measurement. NLA indicates the quantification of NT rotation and tip position (9). Therefore, NLA measurement was used to detect NT rotation in this study.

The traditional strut's shape was believed to cause excessive NT rotation, thus the strut was created with a modified shape. In this research, "b" (small letter "B") shape CSG was prepared differently from the traditional CSG and two different designs of columellar strut were compared in terms of NLA and lateral columellar views. In this study, we wanted to present the results of the b-shaped CSG.

## Materials and Methods

The essential approval was obtained to use the hospital database. Ethical approval was obtained from the Alanya Alaaddin Keykubat University Faculty of Medicine for the study (number: 08-07, date: 28/04/2021). A total of 99 patients who operated open approach rhinoplasty with using CSG were included in this study during the period of September 2018 to March 2020. The research included all patients older than 18 who underwent a rhinoplasty procedure utilizing a traditional or b-shaped strut over the time period specified above. Thus, other changes in the NLA were standardized. Demographic features of patients, a type of CSG which was used, preoperative-postoperative NLA, and postoperative follow-up periods were recorded. The patient should be rotated until the philtral columns are aligned to have standardized lateral view photographs were taken by the same surgeon. The patients' photographs that were preoperatively and postoperatively (2 weeks-1 month-3 months-6 months-1 year) were examined. The patients' photographs which were preoperatively and postoperatively (2 weeks-1 month-3 months-6 months-1 year) were examined.

The optimal NLA was determined to be between 95 and 105 degrees, according to the literature. The measurements were taken by an impartial researcher who was not aware of the procedure using retrospective digital preoperative and postoperative photographs. The degree of NLA was analyzed objectively using two defined lines superimposed on the lateral profile of the face. The 1<sup>st</sup> line was drawn parallel to the upper lip, and the 2<sup>nd</sup> line was drawn as the projection of the columella. The NLA between the first line and the second line was measured using Synedra View Personal Version 20.0.0.4 (x64 Community Edition).

### Operative Technique

Before the rhinoplasty treatment, a local solution was administered to the subperiosteal and subperichondrial planes under general anesthesia. For the open method, a "W" incision was performed. Nasal skin and soft tissue were harvested from the Osseo-cartilage framework, and then the nasal dorsum was exposed. The septum was dissected subperichondrally, and a cartilaginous graft was created from the septal cartilage. The harvested graft was carved in a "b" shape. The dimensions of the thin part of the b-shaped CSG were approximately 1.5 cm x 0.5 cm, while the dimensions of the distal part of the strut graft were 0.5 cm x 0.7 cm (Figure 1A). During NT plasty, a pocket was formed between the medial crura of the alar cartilages. The pocket was prepared in a way that the distal part of the CSG would fit into it without

accessing the anterior nasal spine (Figure 1B). The CSG was positioned in the prepared pocket. The protruding part of the strut graft was toward the skin, and the bottom part of the b-shaped CSG was located from a third of the distal portion of the columella towards the anterior nasal spine. A polypropylene suture was passed from one medial crura to the distal third of the thin part of the b-shaped CSG, and then it was passed to the other medial crura and tied on one side of the strut graft.

The reduction of the dorsal hump and narrowing of the nasal bone base were performed by nasal osteotomies. Reshaping and refinement of the NT were performed using sutures. After final inspection and palpation, the incisions in the skin were closed. Both groups had the same key surgical methods and approaches to rhinoplasties.

### Statistical Analysis

Statistical analysis was performed using SPSS software version 25.0 (IBM, Armonk, NY, USA), and a p-value less than 5% was considered statistically significant. The Mann-Whitney U test was used to compare the two groups for statistical differences. Firstly, it was examined whether the data has a normal distribution or not with Kolmogorov-Smirnov and Shapiro-Wilk tests. Since the data did not show normal distribution, the Mann-Whitney U test was used to compare two independent measurements. The independent t-test was used to determine whether there was a statistical difference in NLA between the two groups.

## Results

We evaluated the preoperative and postoperative lateral view images and case histories of 99 patients who had open rhinoplasty in this retrospective analysis (Figures 2, 3). There were 61 female patients and 38 male participants in the research. The patients' average age was 23 (r=18-53) (Table 1). None of the patients had comorbidities such as diabetes or hypertension, while four patients had a history of smoking. The mean follow-up was 17.3 months. Traditionally shaped and b-shaped struts were used for 33 (33.3%) and 66 (66.6%) of the patients, respectively (Table 2). There was no statistical difference between the two groups in age, gender, or follow-up period.

When the postoperative NLAs were evaluated, it was found that 36.4% and 7.6% of the NLAs were above the optimal range in the traditional strut graft group and in the b-shaped CSG group, respectively (Table 3). The mean postoperative NLA with the traditionally shaped columellar strut was  $104.12 \pm 9.23$ , while the mean postoperative NLA with the b-shaped columellar strut was  $95.93 \pm 6.93$ . A statistically significant difference was found between the postoperative NLAs ( $p=0.00$ ) (Table 4). When the measurement was compared between the traditional strut graft group and b-shaped strut graft group, optimal NT rotation was obtained without increasing the NLA degree over the optimal degree in the b-shaped CSG group, unlike the traditional strut graft group.



**Figure 1.** The design and size of the columellar strut (A), the projection of the positioning of the graft in the pocket (B)



**Figure 2.** Pre-operative view of a 28 years old patient with a nasal dorsal hump, a low NT and thin skin of nose. The “b-shaped” CSG was performed and native lateral columellar show was obtained at the lateral view of patient  
CSG: Columellar strut graft, NT: Nasal tip



**Figure 3.** The preoperative lateral profile view shows a nasal dorsal hump and the low degree of the columellar show. The “b-shaped” CSG was performed and native lateral columellar show was obtained at the lateral view of patient  
CSG: Columellar strut graft

**Table 1. Demographic features of patients and follow-up periods**

Type of graft	Age (years)		Gender		Follow-up periods (months)	
Traditional	Min	18	F	24	Min	11
	Max	45	M	9	Max	30
	<b>Mean</b>	26	<b>Total</b>	33	<b>Mean</b>	14
b-shaped	Min	18	F	37	Min	11
	Max	53	M	29	Max	30
	<b>Mean</b>	23	<b>Total</b>	66	<b>Mean</b>	15

**Table 2. Minimum, maximum, and average preoperative and postoperative angles for each type of columellar strut graft**

Type of graft	Preoperative NLA		Postoperative NLA	
Traditional	Min	70	Min	85
	Max	115	Max	125
	<b>Mean</b>	90	<b>Mean</b>	104
b-shaped	Min	54	Min	82
	Max	120	Max	120
	<b>Mean</b>	93	<b>Mean</b>	95

NLA: Nasolabial angle

**Table 3. The frequency and percentage of nasolabial angles above the optimal range for each group**

Type of graft			Frequency	Percent	Valid percent	Cumulative percent
<b>Traditional</b>	Valid	Above optimal range	12	36.4	36.4	100.0
		Total	33	100.0	100.0	
<b>b-shaped</b>	Valid	Above optimal range	5	7.6	7.6	100.0
		Total	66	100.0	100.0	

**Table 4. The mean of postoperative nasolabial angles**

	Type of graft	N	Mean	Standard deviation	Standard error mean
<b>Postop NLA</b>	b-shaped	66	95,9394	6,93459	0,85359
	Traditional	33	104,1212	9,23566	1,60772

p=0.00

Postop: Postoperative, NLA: Nasolabial angle

Complications such as hematoma, wound infection, and skin necrosis were not observed. In the b-shaped CSG group, columella, stiffness of the NT, over-rotation of the NT, and acute NLA were not observed. Only one patient was able to feel the prominent distal part of the b-shaped CSG, but it was not visible. Thus, any revision procedure was not demanded.

## Discussion

NT integrity that is formed by healthy and stable attachment is important to ensure good nasal function and to avoid aesthetic problems (7). However, correction of the NT deformity requires a complex procedure and control of the long-term view of the most difficult component of rhinoplasty (2-9). CSG is the most preferred technique for correcting NT deformity. The CSG can help to support a central scaffold, correct asymmetry of the medial crura, provide much-needed support for lower lateral crura and also maintenance and optimization of tip projection (10,11). In this study, CSG was used for all patients depending on various reasons.

Tripod theory is a concept that involves changing the length of the alar cartilage to change the appearance of the NT. The role of both alar cartilages in the base dynamics is highlighted in this theory. A CSG can be placed between the medial crura along the caudal edge of cartilaginous septum to replace medial limb of the tripod (10). In this study, two different shapes of CSGs -a traditional CSG and a b-shaped CSG- were compared in terms of NT rotation. When postoperative NLAs were measured, 36.4% of the NLAs were above the optimal range in cases where the traditional strut was used. Wide NLAs were observed more frequently

in cases where the traditional CSG was used than in cases where the b-shaped CSG was used. Both designs of CSG increased the projection of the nose after the operation in agreement with the literature (10,12,13). Therefore, the measurement of tip projection was not included in this study. However, the b-shaped CSG provided gains in projection without extended rotation. When a CSG is used, the NT position changes progressively during the healing period. It is generally believed that the final result is not seen until at least 12 months after rhinoplasty surgery (8). Therefore, the postoperative photos analyzed in this study were taken at least 12 months postoperatively.

The NT includes polygons and breakpoints, and the aesthetically pleasing reconstructed columella should also be designed as a geometric form that has angles similar to those of a natural columella (14). In our clinical experience, the columella is observed as a straight line in cases where a traditional CSG is used; therefore, in this study, a CSG was designed with a geometric shape different from that of the traditional CSG. We believe that the angled appearance of the columella cannot be obtained using a traditional columellar strut, which is prepared in the form of a straight strip. However, when a b-shaped CSG is used, a lateral view of the columella is more pleasing and natural.

## Conclusion

The overall conclusion derived from this research is that an optimally shaped columella can be obtained by using a b-shaped CSG without over-rotation of the NT.

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## Ethics

**Ethics Committee Approval:** The essential approval was obtained to use the hospital database. Ethical approval was obtained from the Alanya Alaaddin Keykubat University Faculty of Medicine for the study (number: 08-07, date: 28/04/2021).

**Informed Consent:** Consents of patient were obtained from all our patients.

**Peer-review:** Externally and internally peer-reviewed.

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