

# Compulsory auricular cartilage use: Modified septal extension graft application in revision rhinoplasty

*Zorunlu kulak kıkırdağı kullanımı:  
Revizyon rinoplastide modifiye septal uzatma grefti uygulaması*

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## ABSTRACT

**Objectives:** This study aimed to demonstrate how to perform a tongue-in-groove graft with the method we developed using auricular cartilage to provide adequate nasal tip support in 17 revision rhinoplasty cases.

**Patients and Methods:** This retrospective study was conducted on 17 patients (17 females; mean age: 23.9+3.7 years; range, 19 to 30 years) who underwent revision rhinoplasty (RR) operations for a low nasal tip between February 2019 and September 2020. After auricular cartilage was removed with a standard posterior auricular intervention, it was folded in two to increase its resistance and fixed to the caudal part of the nasal septum as a tongue-in-groove graft.

**Results:** Solid nasal tip support and satisfactory nasal tip projection and rotation were achieved in all patients. One (6%) patient developed auricular hematoma as a complication on the third postoperative day, and three (17%) of our patients complained of nasal obstruction in their postoperative follow-up.

**Conclusion:** When the use of costal cartilage is limited due to social and cultural reasons in RR cases performed due to a low nasal tip, auricular cartilage can be used as a modified tongue-in-groove graft and provides a satisfactory aesthetic appearance.

**Keywords:** Auricular cartilage, low nasal tip, revision rhinoplasty, septal extension graft.

## ÖZ

**Amaç:** Bu çalışmada, 17 revizyon rinoplasti olgusunda yeterli burun ucu desteği sağlamak için kulak kıkırdağı kullanılarak geliştirdiğimiz yöntemle “tongue-in-groove” greftinin nasıl uygulandığını göstermek amaçlandı.

**Hastalar ve Yöntemler:** Retrospektif çalışma, Şubat 2019 ve Eylül 2020 tarihleri arasında burun ucu düşüklüğü nedeniyle revizyon rinoplasti (RR) ameliyatı geçiren 17 hasta (17 kadın; ort. yaş: 23.9+3.7 yıl; dağılım, 19-30 yıl) üzerinde gerçekleştirildi. Kulak kıkırdağı, standart arka kulak keçesi müdahalesi ile çıkarıldıktan sonra direncini artırmak için ikiye katlandı ve nazal septumun kaudal kısmına tongue-in-groove grefti olarak sabitlendi.

**Bulgular:** Tüm hastalarda burun ucu desteği ve tatmin edici burun ucu projeksiyonu ve rotasyonu sağlandı. Ameliyat sonrası üçüncü günde komplikasyon olarak bir (%6) hastada kulak keçesinde hematoma gelişti ve hastalarımızın üçünde (%17) ameliyat sonrası takiplerinde burun tıkanıklığı şikayeti vardı.

**Sonuç:** Burun ucunun düşük olması nedeniyle yapılan RR olgularında sosyal ve kültürel nedenlerle kaburga kıkırdağının kullanımının sınırlı olduğu durumlarda, kulak kıkırdağı modifiye edilerek tongue-in-groove grefti olarak kullanılabilir ve tatmin edici bir estetik görünüm sağlar.

**Anahtar sözcükler:** Kulak kıkırdağı, burun ucu düşüklüğü, revizyon rinoplasti, septal ekstansiyon grefti.

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In recent years, rhinoplasty operations have been one of the most common surgeries performed for nasal deformity and obstruction.<sup>[1]</sup> Consequently, there has been a rapid increase in revision cases. Studies show that the rate of revision rhinoplasty (RR) ranges between 8 and 23%.<sup>[2]</sup> A secondary graft source is needed in most RRs. Many homograft and allograft products are used in RRs. The use of nasal septal cartilage (SC), costal cartilage (CC), or auricular (conchal) cartilage (AC) grafts is common in routine daily practice. However, the use of CC and AC is more prominent due to the lack of SC in most RRs.<sup>[3]</sup> The CC taken from the anterior thoracic wall is more commonly used when large amounts of graft material and significant structural support are required.<sup>[4]</sup> Due to the difficulty of CC removal and the severe complications (thoracic wall infection, hematoma, anatomical deformity, and pneumothorax), the use of AC has become an alternative. In addition, it is observed that young females in the Turkish population are uncomfortable with the scar tissue formed on the thorax due to CC removal.

The purpose of our study is to show that the resistance of the graft can be increased with the technique we have developed using AC and that this graft can be used in RR operations with a low nasal tip as a tongue-in-groove graft.

## PATIENTS AND METHODS

This retrospective study was conducted on 17 patients (17 females; mean age: 23.9±3.7 years; range, 19 to 30 years) who underwent RR operations in the Otorhinolaryngology Department of the Medical Faculty of Istanbul Yeni Yüzyıl University and Bahat Hospital between February 2019 and September 2020. A period of six to eight months had passed since the first rhinoplasty operation in all patients, and the reason for revisions was low nasal tip due to insufficient support of the caudal septum. The amount of SC was not adequate for revision in all patients. Moreover, none of the patients gave consent for CC since a scar tissue would form on the chest, and consent was obtained for AC removal instead. Revision rhinoplasty operations were performed on all of the patients with a new tongue-in-groove technique using AC. A written informed consent was obtained from the patients. The study protocol was approved by the Istanbul Yeni Yüzyıl University Ethics Committee for Non-Invasive Health Sciences Research (Date: 01.11.2020 and Decision No: 2021/01-553). The study was conducted in accordance with the principles of the Declaration of Helsinki.

The AC grafts were taken from the patients under general anesthesia with a posterior auricular intervention by preserving the area where the inferior antihelical crus, helix root, and concha cavum pass into the posterior-inferior of the external auricular canal (the dimensions of the graft are approximately 28×16 mm as seen in Figure 1).<sup>[4]</sup> Starting from the interdomal region, the caudal part of the septum was exposed by using the standard technique of open rhinoplasty. A columellar flap was formed with the infracartilaginous transcolumellar V-incision. It was dissected in the subperiosteal plane up to the frontonasal junction, drawn in the middle to increase the resistance of the AC we removed, folded in two, and placed on the caudal part of the septum in an overriding way. The legs of the graft were fixed to the septum by suturing tightly with 4-0 Prolene (Doğsan Tıbbi Malzeme San. A.Ş., Trabzon, Türkiye). Thus, we formed a tongue-in-groove graft from the AC, which is strong and resistant enough to carry the nasal tip. The nasal dome was fixed on our graft by using transdomal sutures (Figure 2).

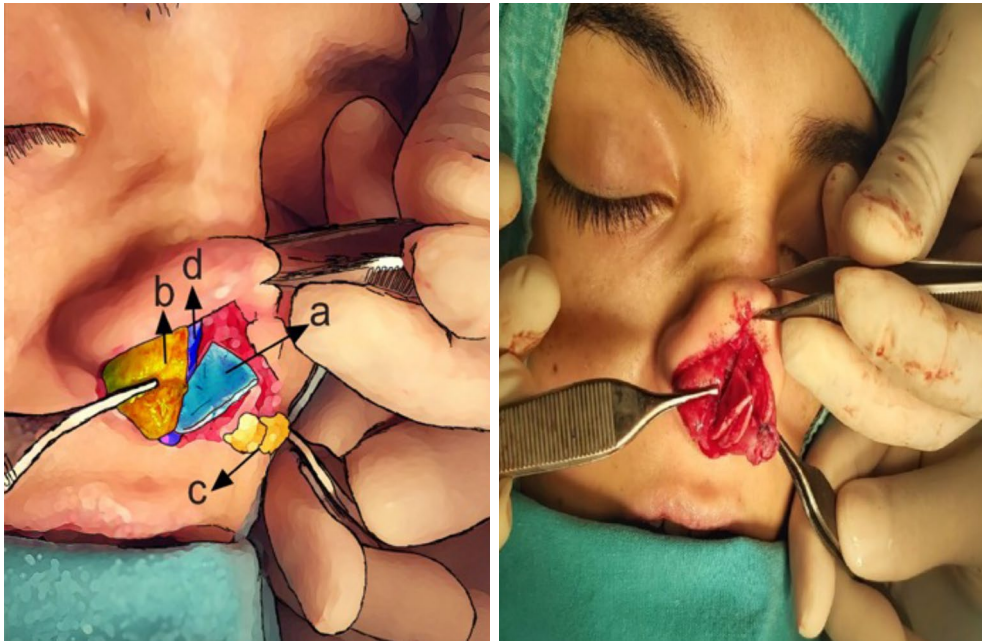
The patients were followed up after the surgery for 10 to 14 months (mean: 13±1) in terms of nasolabial angle and nasal projection index. Facial photographs of the patients were taken in the standard distance in the sagittal plane before the operation, at the postoperative first hour, and at a mean of 13±1 months after the operation; nasolabial angle (the angle between the columella and the line extending from the subnasal area to the upper lip) and projection indices [(subnasal-pronasal distance/glebella-pogonion distance)×100] were calculated and changes in nasal projection and rotation within a year were compared (Figure 3).<sup>[5]</sup>

### Statistical analysis

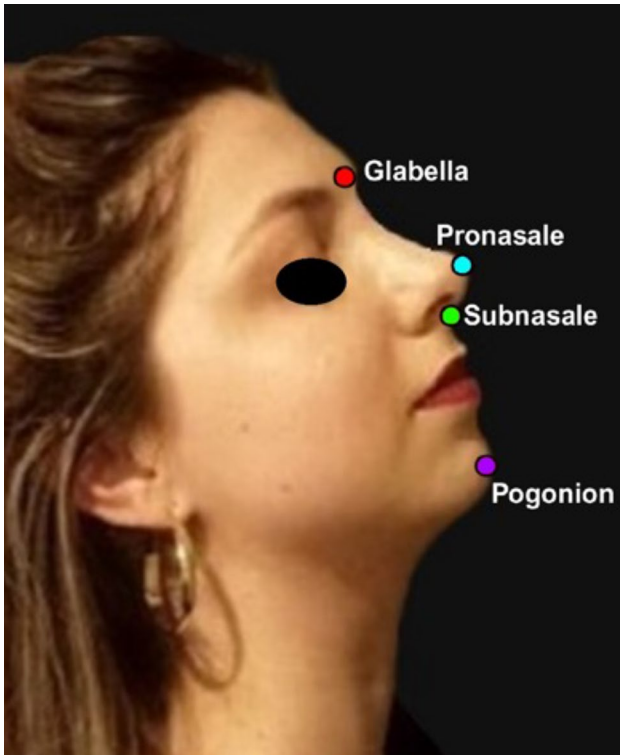
Statistical analyses were performed using the SPSS version 15.0 software (SPSS Inc., Chicago, IL, USA). The analysis of variance (ANOVA) test was used in the comparisons of measurements and repeated



**Figure 1.** Auricular cartilage (AC) graft.

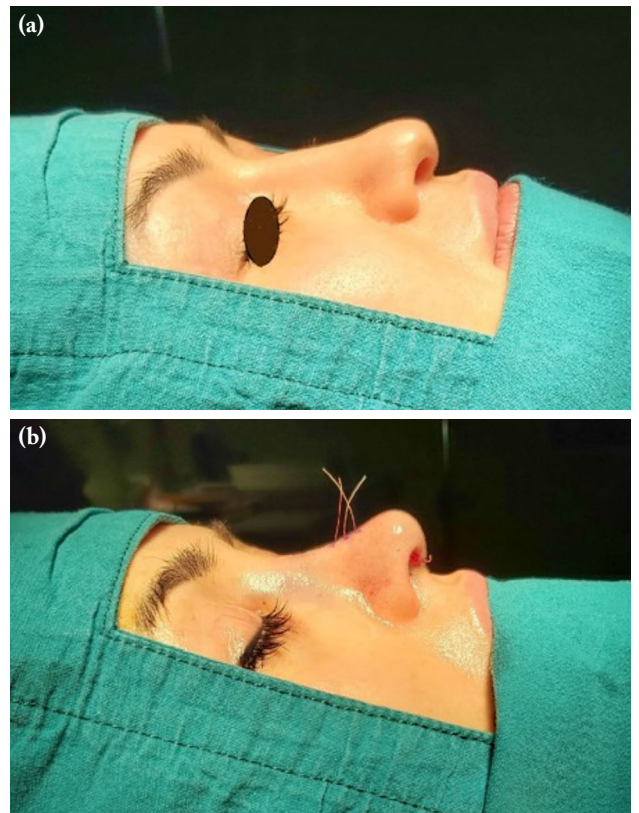


**Figure 2.** Application technique of septal extension grafts (SEG)  
 a: Auricular cartilage (AC); b: Left lateral alar cartilage; c: Right dom; d: Caudal part of the septum.

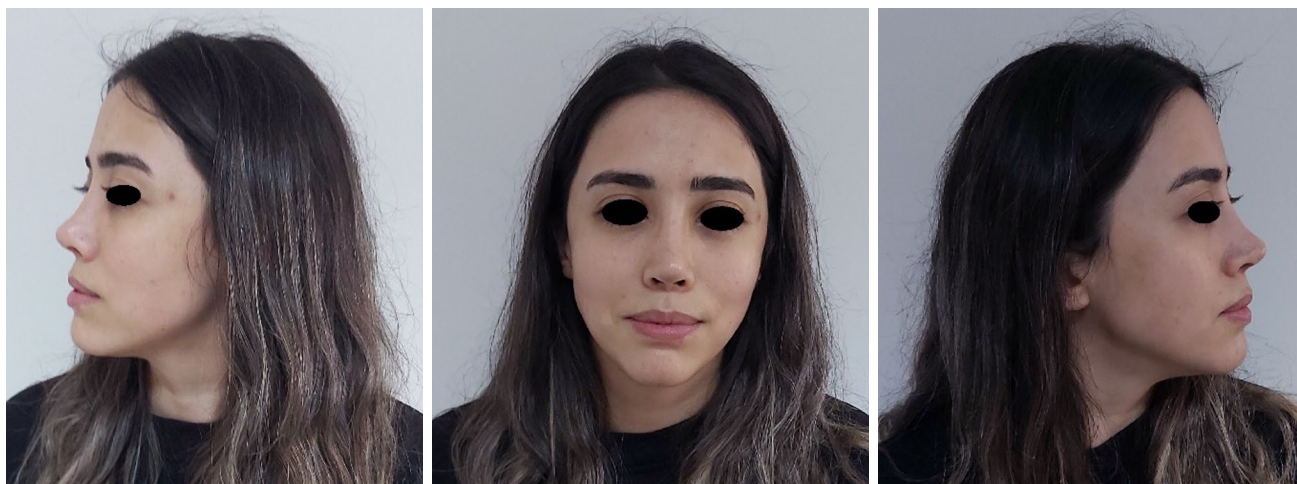


**Figure 3.** Anatomical landmarks for nasolabial angle and projection index.

Glabella: The most prominent point between the eyebrows in the midline, Pronasale: The most prominent point at the tip of the nose, Subnasale: The point where the columella meets the upper lip in the sagittal plane, and Pogonion: The foremost point of the chin.  
 Nasolabial angle (the angle between of columella and line extend from subnasal to upper lip in) and projection indices [(subnasal-pronasal distance / glabella-pogonion distance) × 100]



**Figure 4.** (a) Preoperative view, (b) postoperative first hour view.



**Figure 5.** Postoperative 13<sup>th</sup> month view.

Table 1				
Statistical analyses of projection index and nasolabial angle				
	Preoperative	Postoperative 1 <sup>st</sup> h	Postoperative 13 <sup>th</sup> month	
	Mean±SD	Mean±SD	Mean±SD	<i>p</i>
Nasolabial angle	82.1±3.8	99.2±4.9	94.1±4.0	<0.001
Projection index	12.0±1.8	16.0±2.0	15.0±2.0	<0.001
SD: Standard deviation.				

measurements. The Bonferroni test was used as a post hoc test in advanced paired comparisons. The Kolmogorov-Smirnov test was used to evaluate the compliance with normal distribution. A *p* value of <0.05 was considered statistically significant.

## RESULTS

The patients' preoperative, postoperative first hour, and postoperative 13<sup>th</sup>-month nasolabial angle values were 82.1±3.8, 99.2±4.9, and 94.1±4.0, respectively; whereas projection index values were 12.0±1.8, 16.0±2.0, and 15.0±2.0, respectively. A statistically significant difference was observed between preoperative, postoperative first hour, and postoperative 13<sup>th</sup>-month nasolabial angle and nasal projection values (*p*<0.001). A statistically significant difference was found between the measurements in all advanced paired comparisons (*p*<0.001). Therefore, we concluded that satisfactory nasal tip projection and rotation were achieved (Figures 4, 5 and Table 1). In our cases, we detected no infection, auricular asymmetry, graft absorption, or columellar asymmetry in the postoperative period; however, three (17%) patients developed nasal

obstruction complaints and one (6%) patient developed auricular hematoma as a complication on the third postoperative day.

## DISCUSSION

Today, in parallel with the increasing rhinoplasty surgeries, RR operations are increasing rapidly. In patients scheduled for RR, the physician should carefully evaluate what the nasal deformity is and what should be done.

According to the studies, nasal tip problems are the leading reason for RR procedures. The nasal tip has an important place in the aesthetic appearance of the nose; it also plays a key role in nasal anatomy and physiology. Therefore, nasal tip surgery is critical in a successful rhinoplasty.<sup>[6]</sup>

The nasal tip consists of the domes of both lobular cartilages, interdomal soft tissue, and overlying skin. During the tip surgery, evaluating and protecting the tip supports well and paying attention to their reconstruction can reduce complications. Tip supports can be divided into major and minor support

mechanisms. Major components supporting the tip are the shape, thickness, and structure of alar cartilages, ligamentous connections between the medial crural footplate of the alar cartilage and the caudal part of the septum, and ligamentous connections between the lateral crusts of alar cartilages and the upper lateral cartilages. The minor supporting elements are the connections between domes of alar cartilages, the dorsal part of the cartilaginous septum, the skin over alar cartilages and its connections with the muscle tissue, the anterior nasal spine, the membranous septum, and the sesamoid cartilage complex supporting lateral crura of alar cartilages.<sup>[7]</sup>

Several techniques are used to strengthen the mechanisms supporting the nasal tip and increase nasal projection in RR surgeries. The most important of all these is the columellar strut graft. This technique is preferred in patients with columella retraction as a result of anterior septum deficiency, and correspondingly, with poor type-support. When the columellar support graft is correctly placed between the medial and middle crura, it may potentially have multiple effects except for the ability to increase type-projection. By behaving as a stent between the medial crus, they can assist in protecting the shape and profile of the crus, provide a controlled change at the columellar breakpoint, and be used for positioning the medial crural elements in the cephalic-caudal direction, increasing or decreasing the columellar view and lengthening or shortening the nose. In addition, they can be convenient in correcting intercrural deformities, can be used to lengthen the medial and middle crura, or protect the type-projection by connecting to the dorsal septum.<sup>[8-11]</sup> Septal extension grafts (SEGs) are widely used in rhinoplasty to control nasal tip projection and rotation. In the application of SEGs, the cartilage graft is fixed to the dorsal or caudal part of the septum. In the tongue-in-groove technique, the medial crura are directly sutured to the SEG. This grafting technique is used in noses with weak tip support, malpositioned lower lateral crura, and short nose or caudal septal deviation.<sup>[12,13]</sup> Septal extension graft applications are performed end to end or side by side. Although SEG is an effective technique in improving nasal tip rotation and projection, it may cause nasal obstruction, particularly in side-by-side applications, even though strong stability is provided.

Since it is necessary to leave the SC in the form of an L-strut in order not to impair the stability of the nose in RRs, there is not enough SC to repair the nasal tip.<sup>[14]</sup> In this case, CC or AC should be used. The grafts used in such operations should be easily accessible, compatible with the surrounding tissues, and strong. Therefore, the

use of autogenous grafts is widespread, and SC, CC, and AC are used depending on the situation.

Although SC is frequently used in primary rhinoplasty, as we have noted, CC and AC are primarily used in RR.<sup>[1,15-17]</sup> Costal cartilage and AC each have advantages and disadvantages. Although CC provides a large amount of strong and elastic graft material, it creates a secondary surgical field, exposing the patient to more complications (thoracic wall infection, pain, hematoma, anatomical deformity, and pneumothorax) and a higher risk of morbidity. In addition, the deformation and resorption of the graft over time pose a problem.<sup>[18]</sup> Although the removal of AC graft is easy and has few complications, its disadvantages are its limited amount and insufficient strength. Nonetheless, AC is an attractive alternative in RR operations when a small amount of graft material is required and nasal SC is diminished. An AC graft can be used in a variety of applications, including nose cap graft, dorsum graft, lateral crural graft, or columellar support. Auricular cartilage graft for RR has become a popular and safe procedure with positive aesthetic results that can satisfy both the physician and the patient.<sup>[19,20]</sup>

In our routine work, we prefer the use of CC in RR cases as the cartilage can be removed in large amounts and it is strong and elastic. However, our young female patients do not prefer CC since its removal will cause scar tissue on the breast skin and other complications. Consequently, AC was used due to the lack of sufficient amount and quality of SC in this study of 17 patients. All the patients had complained of low nasal projection and rotation. Therefore, the AC graft was drawn in the middle and folded in two to increase its resistance and robustness, and it was sutured on the caudal part of the septum in an overriding way. Satisfactory rotation and projection of the nasal tip were achieved with this tongue-in-groove technique (Figures 4 and 5). It is also possible to use this technique as a SEG.

The columellar strut has some disadvantages. When the graft is placed on the maxillary spine, it may undergo unwanted displacement. In addition, a study found that although the support structures are preserved as much as possible by using the columellar strut graft after the caudal septal resection, there is a 16% reduction in support in accordance with the preoperative evaluation.<sup>[21]</sup> It is possible to use our AC graft technique as a SEG, but since it does not provide sufficient nasal tip rotation, it was used only as a tongue-in-groove graft in our cases. Another study found that 92.3% of the patients in the group for whom the tongue-in-groove technique was performed and 75% of the patients for whom the columellar strut was applied felt nasal tip rigidity after the surgery.<sup>[22]</sup> They also reported that they encountered

a higher resistance compared to the preoperative period in their evaluation after the tongue-in-groove and SEG procedures. This resistance was found to be much less after tip suturing and columellar strut application. In light of this information, our study found that nasal tip support significantly increased with the tongue-in-groove technique and the use of AC.

The most noteworthy of the postoperative complications reported after AC graft removal is hematoma (6.7%). Other complications include sensory impairment (12.9%), delayed wound healing (1-2%), hypertrophic scars (1%), and asymmetry of the ears (1%).<sup>[21,23,24]</sup> In our study, auricular asymmetry was not observed in any patient. Auricular hematoma (6%) developed on the third postoperative day in only one patient. In addition, in our practice, AC was applied bilaterally side by side and provided strong septal stabilization and satisfactory nasal tip support. However, nasal obstruction complaints were observed in three (17%) of our patients in their postoperative follow-up.<sup>[25-27]</sup> Considering that the possibility of nasal obstruction complaint may be high in our technique, we plan to measure this possibility in future patients with preoperative and postoperative rhinomanometric tests.

The negative side of this technique is to cause complaints of nasal congestion because of the created SEG narrowing the nasal valve angle, unsatisfactory surgical results in frail patients, and thin AC structure alongside complications such as auricular deformity and hematoma. In future studies, graft resorption should also be examined and evaluated in long-term follow-up.

In conclusion, AC with increased resistance after modification can be used as a modified tongue-in-groove graft in young female patients for whom the use of CC in RR cases is limited due to social and cultural reasons. This is true particularly in cases of low nasal tip and those in need of solid tip support, in which the technique provides a satisfactory aesthetic appearance.

#### Declaration of conflicting interests

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