

# Fascioperichondrial Flap with a Proximal Base Combined with Prominent Ear Surgery

## *Belirgin Kulak Deformitesi Onarımında Proksimal Bazlı Fasyoperikondriyal Flep Kullanımı*

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### Keywords

Prominent ears, otoplasty, fascioperichondrial flaps

### Anahtar Kelimeler

Belirgin kulak, otoplasti, fasyoperikondriyal flep

Received/Geliş Tarihi : 09.05.2016

Accepted/Kabul Tarihi : 20.09.2016

doi:10.4274/meandros.2838

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### Abstract

**Objective:** In this article, we present a personalized surgical technique to relocate a fascioperichondrial flap with a proximal base as an additional measure to improve results and hide sharp edges which frequently occur following traditional otoplasty.

**Materials and Methods:** Fascioperichondrial flap with a proximal base prepared from the dorsal side was transposed to the anterior helix and conchal excision side and secured with stitches to hide visible edges and reinforce Furnas sutures. Nine patients operated for prominent ear deformity using this modification were included in the study and follow-up period was at least 6 months. Conchal mastoid distances were calculated from the superior and middle third of the ears before and after the operation, also in follow-up controls to determine the efficiency of the method.

**Results:** There were no suture extrusions, skin necrosis or infection. The mean difference for both the upper and middle third of the ears were considerably lower ( $p \leq 0.05$ ) at the end of six month after the operation. There were no visible skin edges and discomfort described by the patients.

**Conclusion:** Fascioperichondrial flap with a proximal base repositioning to conchal side is an easy procedure that can be applied simply as an adjunct to traditional techniques. Addition of this flap provides an additional tissue to reinforce suture repair and, the results seem to be more durable and strong. Another main advantage of this flap is eliminating the unnatural visible breakpoints in the conchal bowl.

### Öz

**Amaç:** Bu makalede geleneksel otoplasti yöntemleri sık karşılaşılan bir sorun olan keskin sınırları saklamak ve sonuçları iyileştirmek için kullandığımız bir yöntem olarak proksimal bazlı fasyoperikondriyal flep kullanımını sunduk.

**Gereç ve Yöntemler:** Cerrahi yöntemde; dorsal taraftan hazırlanan proksimal bazlı fasyoperikondriyal flep anterior heliks ve konkal eksizyon bölgesine transpose edilir ve görünür sınırları gizlemek, Furnas dikişlerine destek olmak için sütürler ile tespit edilir. Bu cerrahi teknik kullanılarak opera edilen dokuz hasta çalışmaya dahil edildi, en kısa takip süresi altı aydı. Metodun başarısını değerlendirmek için kulağın superior ve orta 1/3 bölgelerinden konkal mastoid mesafeler preoperatif, postoperatif ve altıncı ay kontrollerinde ölçüldü.

**Bulgular:** Hiçbir hastada deri nekrozu, enfeksiyon veya sütür açığa çıkması görülmedi. Kulak orta ve superior 1/3 ölçümleri altıncı ay kontrollerinde istatistiksel olarak anlamlı olarak azalmış bulundu ( $p \leq 0,05$ ). Kontrollerde görünür deri sınırları veya hastalar tarafından belirtilen rahatsızlık olmadı.

**Sonuç:** Proksimal bazlı fasyoperikondriyal flebin konkal tarafa repozisyonu geleneksel otoplasti yöntemlerine basitçe eklenebilecek bir cerrahi tekniktir. Bu flebin eklenmesi sütür onarımına ek doku sağlayarak gücünü artırır ve sonuçlar daha kalıcı ve güçlü olmaktadır. Bu tekniğin bir diğer avantajı da konkada gelişebilecek keskin kenarları engellemesidir.

## Introduction

Prominent ear abnormality is a frequent hereditary deformity affecting approximately 5% of the population; furthermore, it may be a cause of psychological problems at any age (1,2). The characteristics of this deformity comprise the deficiency of a sufficient antihelical fold, the existence of excessively developed deep conchal bowl, insufficient sharpness of the helical rim, and anomaly of the lobule. There is still no universally accepted technique to treat this common deformity, therefore, an enduring debate and search for techniques for improving results go on (3-6). In this article, we present our personal technique of rising and transposing fascioperichondrial flap as an adjunct to traditional otoplasty in order to strengthening the efficacy of surgery and eliminating visible cartilage deformities.

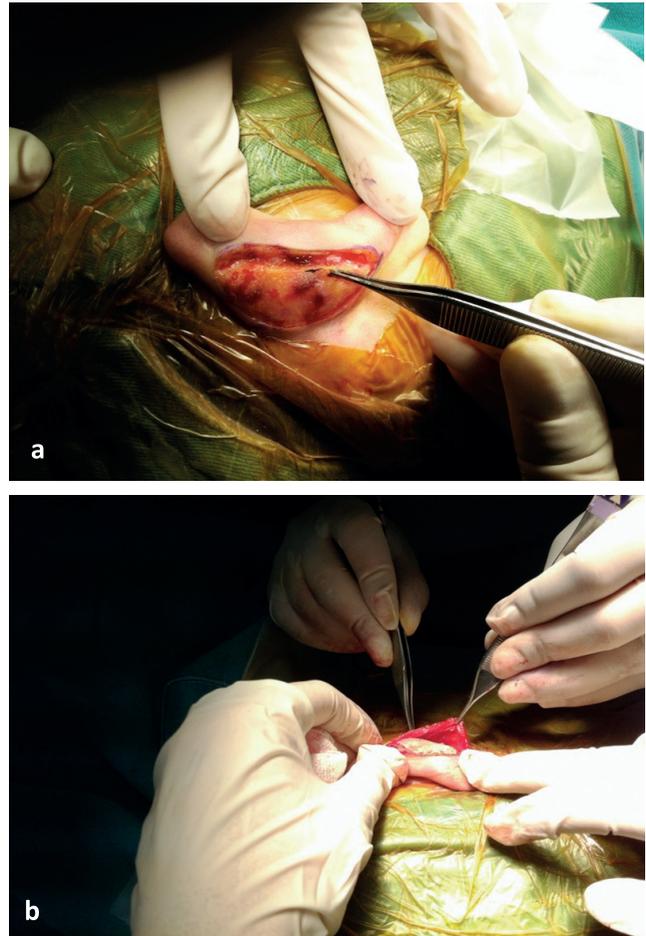
## Materials and Methods

Nine consecutive patients (six females, three males; total ears: 18), who have been operated for prominent ear deformities between 2014 and 2015, were included in the study. The mean age of the patients was  $20.2 \pm 9.28$  years (range: 9-32 years). By using a goniometer, the mean distance from the most protruding point of the helix to the mastoid bone and the mean concha-to-mastoid angle were calculated. Six months after the surgery, the same measurements were repeated. Differences between these preoperative and postoperative measurements were analysed and compared statistically. Any visible cartilage deformities were evaluated.

## Surgical Technique

For all the patients, the same surgical approach was utilized as follows: firstly, local infiltration anaesthesia with lidocaine and 1:200,000 adrenaline and great auricular nerve block was performed and, then, a very superficial skin ellipse excision was performed meticulously avoiding damage to the underlying fascial layer. Fascioperichondrium layer was carefully

identified and exposed on the posterior surface (Figure 1a). From the superior edge, a full length incision of fascioperichondrial layer was carried out down to the perichondrium. Afterwards, the proximal-based fascioperichondrial flap was elevated using the subperichondrial plane till the post-auricular sulcus (Figure 1b). The posterior auricularis muscle was cut only when necessary. For correction of the antihelix, a methylene blue-stained 30-gauge needle was inserted anteriorly on each side of the proposed antihelix in order to stain the margins for suture folding posteriorly. Anterior surface scoring was performed with multiple needle forceps following an



**Figure 1a, 1b.** Excision of a thin post-auricular skin ellipse. The underlying fascia is incised in a superior line. Afterwards, using the subperichondrial plane, the proximal-based flap is elevated to the post-auricular sulcus

anterior incision and new antihelical fold was created with 4/0 prolene mattress sutures that were placed in previously marked parallel lines. The next step was the estimated portion of conchal cartilage resection. Concha-mastoid mattress suturing was performed to reduce the cephaloauricular angle. Following this step, conchal cartilage was incised and then elevated fascioperichondrial flap with a proximal base was advanced and reposed at the anterior surface of the concha by placing primary sutures of 5.0 Monocryl (ETHICON, Inc). By this way, conchal-mastoid sutures were buried deeply and sharp cartilage edges were hidden (Figure 2a, 2b). 5.0 simple interrupted sutures were used to close the skin incision (Figure 3a, 3b).

After appropriate dressings, the patients were discharged. All dressings were removed on post-

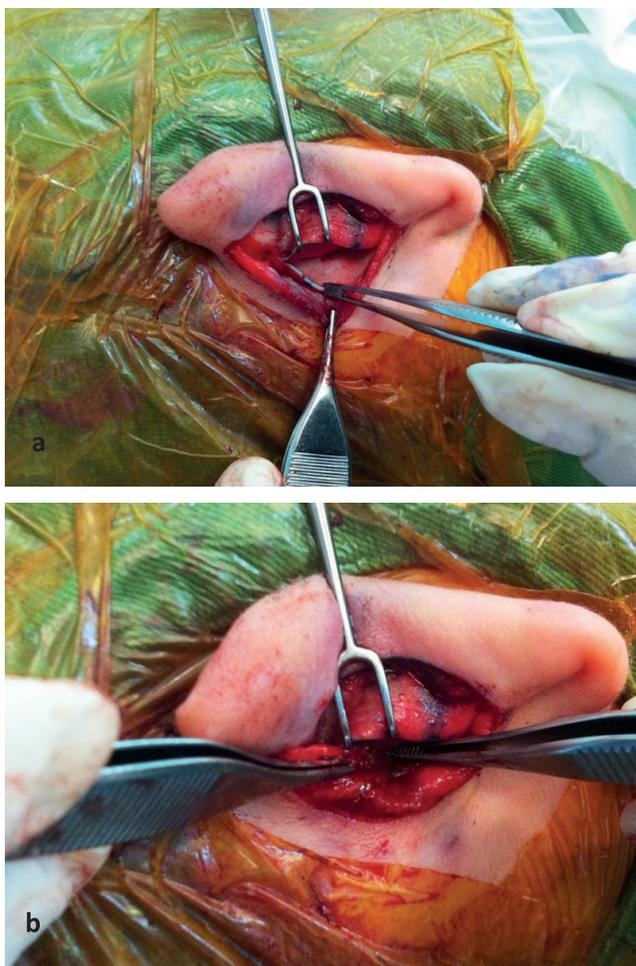
operative 3<sup>th</sup> day and for 3 weeks, appropriate headbands were used continuously. Then, nocturnal usage of headbands was recommended at least for 6 weeks.

### Statistical Analysis

The Kolmogorov-Smirnov test was used to analyse the continuous variables in the study. Compliance of the quantitative data with the normal distribution was analysed by the Kolmogorov-Smirnov test. The Wilcoxon signed-ranks test was used if normal distribution did not exist. All results were evaluated using the 9% confidence interval and a p value of less than 0.05 was considered statistically significant.

### Results

Nine consecutive patients who have been operated for prominent ear correction were included in the



**Figure 2a, 2b.** Conchal cartilage is incised and then rising PBF flap is advanced and reposed at the anterior surface of concha by placing primary sutures of 5.0 Monocryl (ETHICON, Inc) although the proximal-based post-auricular fascial flap covers the concha-mastoid sutures



**Figure 3a, 3b.** Perioperative (the end of the operation) lateral photographs of prominent ear

study (total ears: 18). The mean age of the patients was 20.2±9.28 years (range: 9-32). Before and after the surgery and at least sixth month postoperative assessments were performed. The mean preoperative helix-mastoid distance and concha-mastoid angle were determined to be 26.77±2.63 mm and 43.11±2.47°, respectively, for all 18 ears. The mean postoperative concha-mastoid angle and helix-mastoid distance were calculated to be 15.44±2.24 mm and 24.11±1.45°, respectively, at the end of the six month following surgery. Preoperative, postoperative and six month postoperative conchal-mastoid angle degrees and helix-mastoid distances are presented in Table 1. The difference between the preoperative and postoperative 6-month values of helix-mastoid distance and concha-mastoid angle degree were statistically significant (p≤0.05) (Table 2). No visible cartilaginous deformities or sharp edges occurred (Figure 4a, 4b, 5a, 5b). There were no suture extrusions, skin necrosis, wound infection or hematoma. All patients were satisfied with the results and there have been no recurrences so far.

### Discussion

Modern prominent ear surgery tries to set back the ears into natural position with soft margin outlines and tries to perform a uniform correction without evidence of surgical intervention (7,8). Although otoplasty is a rewarding operation, any complication is a significant emotional burden to the patient, parents, and also to the surgeon. To decrease the risk of possible complications, preoperative, intraoperative, and postoperative detailed planning and execution of surgery are essential (9-11). The most frequent complications are wound infection, hematoma, chondritis, malposition of the ear and recurrence of the abnormality (12-15).

Several different techniques have been described in the literature for improving cosmetic results and reducing complication rates in prominent ear correction surgery. More than 200 different methods and modifications of otoplasty surgery and percentage of recurrence varying from just a few up to 24.4% have been described in the literature. Secondary revisions



**Figure 4a, 4b.** Preoperative anterior and lateral photograph of a prominent ears with absent antihelical folds and deep conchae



**Figure 5a, 5b.** Postoperative 6<sup>th</sup> month anterior and lateral photographs

**Table 1. Patient summary**

Patient	Age (years)	Sex	Preoperative helix-mastoid distance (mm)	Postoperative 6-month helix-mastoid distance (mm)	Preoperative concha-mastoid angle (°)	Postoperative 6-month concha-mastoid angle (°)
1	9	Male	27	17	40	22
2	14	Female	25	18	45	25
3	26	Male	31	16	42	27
4	30	Male	28	18	43	23
5	32	Female	26	14	40	24
6	29	Female	23	17	47	25
7	22	Female	30	14	46	24
8	9	Female	24	12	42	23
9	13	Female	25	13	43	24

are still required frequently and they cause significant emotional stress and dissatisfaction. Another common problem is unnatural look and visible sharp edges commonly encountered with traditional otoplasty techniques (16-18).

Necessary surgical steps are tailored according to the pathologic components of the prominent ear deformity. Conchal bowl depth and rigidity is generally a significant problem in many patients. The strength required to reposition the ear could conceivably provoke relapse by erosion of the cartilage by the sutures if the ear cartilage is so rigid or heavy. Further techniques are obligatory to decrease this resistance and avoid recurrences. Excess concha is generally excised and mattress sutures are usually used in the correction of a large concha mastoid angle (3,5). In contrast, these techniques necessitate a strong stress to adduct the concha to the mastoid periosteum which brings about an increased risk of suture extrusion, pain and an abnormal result. Cartilage deformities and visible sharp edges are also a common problem after conchal excision and are a frequent cause of dissatisfaction. We aimed to hide these sharp edges by transposing fascioperichondrial flap with a proximal base.

In the literature, several flaps are described from the posterior surface of the ear. Posterior surface is freely moveable owing to the existence of loose connective tissue contrary to the anterior surface. This layer is speculated as an independent fascial layer which is an extension of the auricular muscle (19-21). Histologically, existence of a subdermal plexus and vascular channels separately in both the fascial and perichondrial layers makes this posterior flaps feasible. Shokrollahi et al. (22) reported the use

of a distal-based fascial flap adjunctively to support suture-based methods in a series of 15 patients (age range: 8-16 years). The authors noted that there have been no important complications over an 11-month period (22).

We have used a similar flap, but we have transposed this flap anteriorly over the cartilage excision regions to reinforce repair, hide sutures deep and prevent visible edges. In our opinion, the process is efficient and promising, and has been demonstrated to be efficient intraoperatively. The durability of the method in terms of recurrence rates and long-term follow-up when used as a primary technique is unknown particularly in adults who have rigid cartilages compared to children's cartilages. As an additional advantage by using this modification, we believe that stronger counter forces compensate cartilage memory, therefore, possibility of flap necrosis and rippling decreases.

Using Mustard's mattress sutures and posterior triangular flap combination was demonstrated to be a successful technique in antihelix creation in a study including 82 patients by Frascino (23). A triangular flap was prepared in the superior third of the ear and elevated in the subperichondrial plane. Posterior fixation of the triangular flap helped medialize the upper pole in a natural helical fold.

Post-auricular proximal-based fascial flap, illustrated by Horlock et al. (24), combined with posterior suturing has been demonstrated to be the method with the lowest recurrence and least complication rates by Schaverien et al. (25). In a follow-up period of 3.9 years (range: 1.5-7.8), the clinical recurrence rate was 4.5%.

In this study, we used fascioperichondrial flaps with a proximal base. Proximal-based flaps offer several advantages. Our technique reinserts the proximal based flap to the anterior surface for conchal cartilage of the ear. This flap supports the new position of the concha and diminishes the tension of the sutures; by this way, smaller sutures may be used. We propose that this technique strongly helps the approximation of the concha to the mastoid process of the temporal bone. Another major advantage of proximal based flap is that anteriorly transposed flap over the cut conchal cartilage bowl hides the sharp edges and eliminates visible cartilage deformities. As another advantage, possible pain triggered by periosteal stretching also decreases.

	Mean ± SD	p value
Age (years)	20.44±9.28	-
Preoperative helix-mastoid distance (mm)	26.77±2.63	0.007 <sup>†</sup>
Postoperative 6-month helix-mastoid distance (mm)	15.44±2.24	
Preoperative conchamastoid angle (°)	43.11±2.47	0.008 <sup>†</sup>
Postoperative 6-month concha-mastoid angle (°)	24.11±1.45	

SD: Standard deviation, <sup>†</sup> Wilcoxon signed ranks test

We demonstrated the safety and applicability of this surgical technique in a short series of patients in short to medium term. In our opinion, this new technique is versatile and will be useful in correction of prominent ears treated with conchal excision.

### Conclusion

There were no additional surgeries and the final result was satisfactory for all patients. We believe that anterior transposition and reinsertion of proximal based flaps have several benefits as an adjunct to corrective otoplasty in patients with hypertrophy concha.

### Ethics

**Ethics Committee Approval:** Retrospective study.

**Informed Consent:** Informed consent was obtained from all patients.

**Peer-review:** Internally peer-reviewed.

### Authorship Contributions

**Surgical and Medical Practices:** H.S.Ö., S.İ., H.K., D.Y., Concept: S.İ., Design: H.S.Ö., S.İ., Data Collection or Processing: H.S.Ö., S.İ., H.K., D.Y., Analysis or Interpretation: H.S.Ö., S.İ., H.K., D.Y., Literature Search: H.S.Ö., S.İ., Writing: H.S.Ö., S.İ., H.K., D.Y.

**Conflict of Interest:** No conflict of interest was declared by the authors.

**Financial Disclosure:** The authors declared that this study received no financial support.

### References

- Lockett WH. A new operation for prominent ears based on the anatomy of the deformity. *Surg Gynecol Obstet* 1910; 10: 635.
- Rogers BO. Ely's 1881 operation for correction of protruding ears. A medical "first". *Plast Reconstr Surg* 1986; 77: 222-6.
- Mustarde JC. The correction of prominent ears using simple mattress sutures. *Br J Plast Surg* 1963; 16: 170-8.
- Mustarde JC. Correction of prominent ears using buried mattress sutures. *Clin Plast Surg* 1978; 5: 459-64.
- Stenstrom SJ. A natural technique for correction of congenitally prominent ears. *Plast Reconstr Surg* 1963; 32: 509-18.
- Stenstrom SJ. A simple operation for prominent ears. *Acta Otolaryngol* 1966; 224: 393.
- Chongchet V. A method of antihelix reconstruction. *Br J Plast Surg* 1963; 16: 268-72.
- Peker F, Celikoz B. Otoplasty: anterior scoring and posterior rolling techniques in adults. *Aesthetic Plast Surg* 2002; 26: 267-73.
- Bauer BS, Margulis A, Song DH. The importance of conchal resection in correcting the prominent ear. *Aesthet Surg J* 2005; 25: 72-9.
- Hinderer UT, Del Rio JL, Fregenal FJ. Otoplasty for prominent ears. *Aesth Plast Surg* 1987; 11: 63-9.
- McDowell AJ. Goals in otoplasty for protruding ears. *Plast Reconstr Surg* 1968; 41: 17-27.
- Furnas DW. Correction of prominent ears by conchamastoid sutures. *Plast Reconstr Surg* 1968; 42: 189-93.
- Tolleth H. Artistic anatomy, dimensions and proportions of the external ear. *Clin Plast Surg* 1978; 5: 337-45.
- Johnson PE. Otoplasty: shaping the antihelix. *Aesth Plast Surg* 1994; 18: 71-4.
- Spira M. Reduction otoplasty. In: Goldwyn RM (ed) *The unfavorable result in plastic surgery*. Little Brown, Boston, 1984, pp. 307-3.
- Jeffery S. Complications following correction of prominent ears: an audit review of 122 cases. *Br J Plast Surg* 1999; 52: 588-90.
- Caouette-Laberge L, Guay N, Bortoluzzi P, Belleville C. Otoplasty: anterior scoring techniques and results in 500 cases. *Plast Reconstr Surg* 2000; 105: 504-15.
- Messner AH, Crysdale WS. Otoplasty: clinical protocol and long-term results. *Arch Otolaryngol Head Neck Surg* 1996; 122: 773-7.
- Yugueros P, Friedland JA, Furnas DW. Otoplasty: the experience of 100 consecutive patients. *Plast Reconstr Surg* 2001; 108: 1045-53.
- Minderjahn A, Huttli W, Hildmann H. Mustarde's otoplasty: evaluation of correlation between clinical and statistical findings. *J Maxillofac Surg* 1980; 8: 241-50.
- Adamson PA. Complications of otoplasty. *Ear Nose Throat J* 1985; 64: 568-74.
- Shokrollahi K, Cooper MA, Hiew LY. A new strategy for otoplasty. *J Plast Reconstr Aesthet Surg* 2009; 62: 774-81.
- Frascino LF. The use of a retroauricular fascioperichondrial flap in the recreation of the antihelical fold in prominent ear surgery. *Ann Plast Surg* 2009; 63: 536-40.
- Horlock N, Misra A, Gault DT. The postauricular fascial flap as an adjunct to Mustardé and Furnas type otoplasty. *Plast Reconstr Surg* 2001; 108: 1487-90.
- Schaverien MV, Al-Busaidi S, Stewart KJ. Long-term results of posterior suturing with postauricular fascial flap otoplasty. *J Plast Reconstr Aesthet Surg* 2010; 63: 1447-51.