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Nazım Gümüş & Sarper Yılmaz

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ORIGINAL ARTICLE

## Otoplasty with an unusual cartilage scoring approach

Nazım Gümüş<sup>1</sup> & Sarper Yılmaz<sup>2</sup>

<sup>1</sup>Plastic, Reconstructive and Aesthetic Surgery Department, Numune Research and Education Hospital, Adana, Turkey and <sup>2</sup>Plastic, Reconstructive and Aesthetic Surgery Department, Cumhuriyet University Medical Faculty, Sivas, Turkey

### Abstract

**Background:** An ideal otoplasty procedure should minimise the possible risk of severe complications of otoplasty and provide a good aesthetic outcome; however, there is no standard technique to be applied to all types of auricular deformities in different populations. The aim of this study was to present an otoplasty technique with posterior approach in which small incomplete cartilage incisions and suture fixations were used to form the auricle without a need for anterior skin incision and dissection. **Methods:** This study involved 42 patients who had bilateral prominent ears with unfurled antihelices associated with or without conchal excess. The otoplasty procedure mainly consisted of a posterior skin excision, incomplete cartilage incisions in the shape of greater mark, “>”, mattress sutures of the posterior cartilage, earlobe correction, and conchal reduction if necessary. **Results:** This otoplasty technique consists of easy, simple, and rapid surgical steps without a need for anterior skin dissection and cartilage scoring, so it has a low rate of complications in both early and late postoperative periods. Follow-up time of patients ranged from 1–9 years, with an average of 3 years. No major complications such as haematomas, chondritis, wound infection, skin necrosis, asymmetry, recurrence, hypertrophic scars, granulomas, or irregularities developed in the early and late postoperative periods. A good symmetry and natural appearance were achieved with this otoplasty technique. Patients were satisfied with the results. All over complication rate in the postoperative period was 7%. **Conclusion:** The presented technique overcomes the drawbacks of anterior skin dissection and anterior scoring, and minimises the risk of severe complications such as anterior skin necrosis, cartilage necrosis or destruction, and ear irregularities. It also reduces the operation time, swelling, bruising, and possibility of suture extrusion and recurrence.

**Key Words:** Otoplasty, posterior approach, cartilage incision, greater mark

### Introduction

Many otoplasty techniques for the correction of prominent ear deformities have been described up to now, all of which aim to correct the failure of scaphal folding, flat antihelix, deep concha, and increased conchascaphal angle, by curving the auricular cartilage with cartilage incisions and suture fixations. As a result, prominence of the ear is set back to the mastoid area with apparent antihelix and scaphal folding. Attempts to weaken the auricular cartilage focus on creating a soft and pliable cartilage which can be formed with sutures without leaving any irregularities over the ear. However, recurrence of the prominence and antihelix irregularities are major concerns for the techniques. Recurrence due to the cartilage memory strength, especially in the thick cartilage, can be reduced or avoided by using cartilage breaking techniques which cut or score the cartilage. These interventions may leave antihelix irregularities because of the remaining sharp edges of the cartilage if its lateral surface is cut. Anterior scoring also has a higher risk for haematoma, anterior skin necrosis, and folds in the cartilage because of scarring [1-3].

An ideal otoplasty procedure should decrease the possible risk of severe complications of otoplasty and provide a good aesthetic outcome; however, there is no standard technique to be applied to all types of auricular deformities in different populations. As well known, less surgical dissection and incision can shorten the duration of the procedures and healing

time, and reduce the occurrence of surgical complications of otoplasty.

The aim of this study was to present an otoplasty technique of the posterior approach in which small incomplete cartilage incisions and suture fixations were used to bend the cartilage without needing anterior skin dissection.

### Materials and methods

This study involved 42 patients who had bilateral prominent ears with unfurled antihelices associated with or without conchal excess, treated with this technique between 2004–2013. Of the patients, 24 were female and 18 were male, whose ages varied between 8–31 years, with a mean of 16 years. There were no additional ear deformities in the patients. The study was designed as a retrospective review for which details of patient demographics, operative techniques, complications, and specific surgical data on the techniques were collected from charts including common complications such as skin discolouration, epidermolysis, cyanosis, chondritis, dehiscence, infection, palpable or visible irregularities, asymmetry, and recurrence. Reoperation rate was also calculated. Patients who had unilateral prominent ear and other ear deformities were excluded from the study because objective assessment of their ears for symmetry was impossible. The otoplasty procedure described here mainly consisted of a posterior skin excision, running many incomplete cartilage incisions which were in the shape of greater mark, “>”,

Correspondence: Dr Nazım Gümüş, MD, Associate Professor of Plastic and Reconstructive Surgery, Numune Eğitim ve Araştırma Hastanesi, Plastik Rekonstrüktif ve Estetik Cerrahi Kliniği, Adana, Turkey. Tel: +90 532 452 87 70. E-mail: gumus1970@hotmail.com

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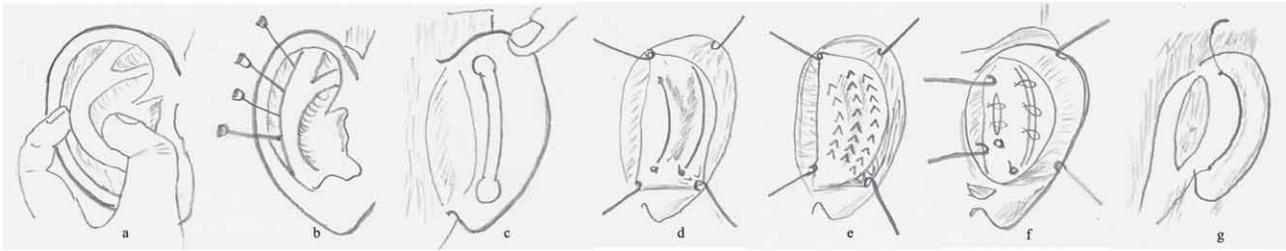


Figure 1. Schematic illustration of the procedure. (a) Preoperative folding of the proposed new antihelix. (b) Marking of the antihelix margins with needles stained with methylene blue over scaphal and conchal lines. (c) Medial surface skin incision. (d) a and b lines represent scaphal and conchal lines on the medial surface of ear cartilage. (e) Running cartilage incisions over and between scaphal and conchal lines. (f) Moulding of the antihelical fold using mattress sutures (b) and sutures placed after conchal excision (a). (g) Skin closure with subcuticular suture.

mattress sutures of the posterior cartilage, earlobe correction, and conchal reduction if necessary.

In the preoperative evaluation of ear, conchal cartilage hypertrophy, antihelical fold definition, conchascaphal angle, and auriculomastoid angle were examined and the degree of ear prominence was determined according to the technique described by Davis, measuring the distance between posteromedial helical rim and mastoid process [4]. This distance was measured again in the postoperative second week and first year, and compared to the preoperative one. Anterior, posterior, and lateral photographs of the ear were taken preoperatively and postoperatively to check the difference between them.

The level of patient satisfaction was also assessed with a telephone survey which involved four options: very dissatisfied, dissatisfied, satisfied, and very satisfied.

Preoperatively, the proposed new antihelix, its anterior border (conchal line), and posterior border (scaphal line) were marked from cranial to caudal direction on the anterior surface of the ear, while bending the auricle backward. Otoplasty was performed under local anaesthesia, often with sedation in adult patients. General anaesthesia was preferred in children. In all cases, the posterior surface of the ear was infiltrated with xylocaine 1% and adrenaline 1:100 000, leading to a bloodless field and, thus, making the procedure easy and rapid. Previously marked skin lines on the anterior surface of the ear were punctured from the anterior surface through the posterior surface, by using three small, sharp needles stained with methylene blue to dye cartilage at scaphal and conchal lines.

While the ear was being pushed backward by a finger tip, the width of the excess postauricular skin was determined by pinching the skin between the two tips of an adson forceps. Then, a phone handset shape of skin with underlying

subcutaneous tissue and perichondrium was excised from the posterior surface of the ear to expose the cartilage. Running incisions were located on this side of the ear along the scaphal and conchal lines to make it soft and easily pliable. Each cartilage incision was in the shape of a greater mark (>) and in partial depth, whose legs were about 3–5 mm in length. Incisions were placed sequentially far from each other with a 5 mm interval on a line. The tip of the greater mark incision was in the direction of the upper pole of the ear. Sequential cartilage incisions were firstly located on scaphal and conchal lines, and then pliability of cartilage was checked by pinching the auricle between two fingers. If there was a significant cartilage strength or stiffness against folding of it, an additional line of sequential cartilage incisions was made between the scaphal and conchal lines. Separate incisions were also performed, where the cartilage strength made it difficult to bend the ear. In the case of protrusion of the ear lobe, the same cartilage incisions were made on the tail of the antihelix to reduce the inferior cephaloauricular distance and protrusion of the ear lobe (Figure 1).

As the incisions had an incomplete penetration to the cartilage, they did not leave sharp edges on the lateral surface of the ear, leading to a soft and natural postoperative appearance on the ear. In the presence of a conchal excess, its correction was also made in either excision of conchal cartilage in 2–6 mm width or a conchomastoid suture placement (Figure 2). Afterwards, three Mustarde type mattress sutures were placed between scaphal and conchal lines to create an antihelical fold, using a long-lasting 4/0 monofilament absorbable suture. The skin incision on the posterior surface of the ear was closed with interrupted stitches (Figure 3). Gauze pads were placed over the anterior and posterior surface of the ear to provide compression and to maintain the cartilage in its new position for 7 days. After



Figure 2. Intraoperative steps of the otoplasty. (a) Preoperative appearance of a prominent ear. (b) A phone handset shape of postauricular skin incision. (c) Marking of the conchal excess to be removed. (d) Marking of the running “greater mark” incisions to be placed along and between the scaphal and conchal lines.

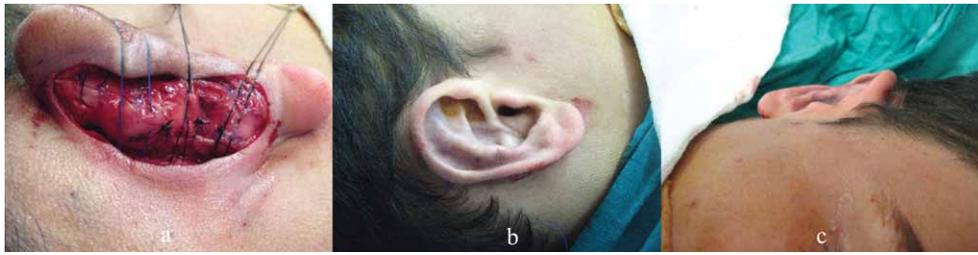


Figure 3. (a) The final step of otoplasty consisted of cartilage sutures, forming the antihelical fold. (b and c) Early postoperative results in the theatre showing smooth and natural looking ear shape without significant oedema and bruising.

they are removed, an elastic band was worn for ~ 10 days for the same purposes.

### Results

The main causes for prominent ears were underdeveloped antihelical folds in combination with overdeveloped conchae in 28 patients (66.6%), underdeveloped antihelical folds in nine patients (21.4%), and underdeveloped antihelical folds associated with overdeveloped conchae and prominent earlobes in five patients (11.9%). This otoplasty technique consists of easy, simple, and rapid surgical procedures without needing any anterior skin dissection and cartilage scoring, so it has a low rate of complication in both early and late postoperative periods. Follow-up time of patients ranged from 1–9 years, with an average of 3 years.

In the early postoperative period, no major complications such as haematomas, chondritis, wound infection, skin necrosis, skin discolouration, epidermolysis, cyanosis, dehiscence,

palpable, or visible irregularities were detected in these patients. Slight bleeding from the postauricular incision a few hours after surgery in two patients was the only early minor complication (4.7%). Asymmetry, recurrence, hypertrophic scars, granulomas, or suture extrusions were not observed in the late postoperative period (Figures 4,5,6). In one patient, undercorrection appeared 1 year later, needing reoperation (2.3%). However, this patient was satisfied with the result. All over complication rate in the postoperative period was 7%. A good symmetry and natural appearance were achieved with this otoplasty procedure.

In terms of ear shape and symmetry, outcomes of this otoplasty were assessed by the patients with a telephone survey whose grading system was made up of four levels: very dissatisfied, dissatisfied, satisfied, and very satisfied. Patients were very satisfied with 94% of ears at least 1 year after the intervention. The remaining 6% of the cases was satisfied with their ears.

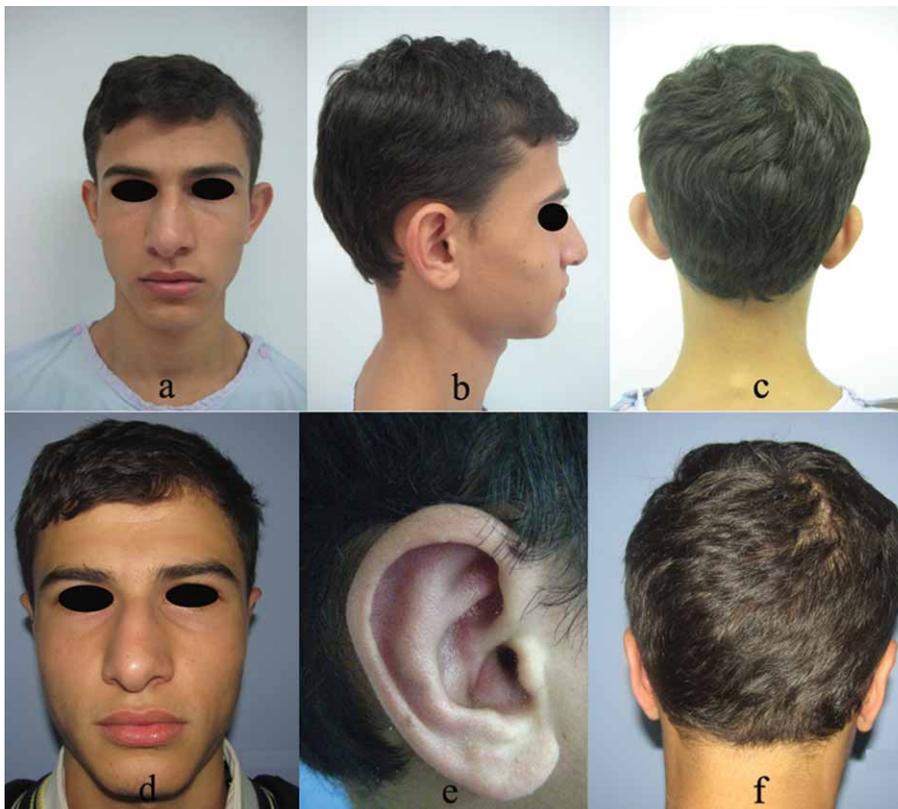


Figure 4. A 15 years old patient who had prominent ear deformity. (a–c) Preoperative view of the patient. (d–f) Appearance of him 1 year later.



Figure 5. (a-c) Preoperative view of a 34 years old patient with a prominent ear. (d-f) Late postoperative findings of her.



Figure 6. A 22 years old patient who had prominent ear deformity. (a-c) Preoperative view of the patient. (d-f) Appearance of her 2 years later. (g-i) Findings of the ear 9 years after the otoplasty.

The mean preoperative measurements of the distance from mastoid to helical rim revealed a significant difference from the mean postoperative ones obtained in the postoperative second week and first year ( $p < 0.05$ ). The preoperative mean distance was  $28.3 \pm 2.8$  mm, in the postoperative second week mean distance was  $11.9 \pm 1.7$  mm, and in the first year it was measured as  $11.7 \pm 1.9$  mm. The mean early and late postoperative changes of protrusion was significant, demonstrating an acceptable setback in the ears.

### Discussion

The principle goal for otoplasty techniques is creation of well shaped, symmetric, and natural looking ears without any obvious signs of surgery remaining, such as palpable or visible irregularities, skin discolouration, and hypertrophic scarring. Well known otoplasty procedures can be divided into three categories: cartilage breaking, suturing, and combination techniques. Cartilage breaking methods cut or score the auricular cartilage and then reshape it to set back the auricle. After shaping and bending the auricle, sutures can be used to fix and maintain the form of cartilage and auricle. These methods are usually preferred for patients who are older than 6–7 years and have thick cartilage that is difficult to reshape without sculpting it due to the reduced elastic properties of the auricular cartilage [5]. While cartilage breaking techniques permanently alter the structure of the ear cartilage in adolescent and adult patients who have stiffer and less pliable ear cartilage, they increase the risk of complications, and can leave some obvious signs of surgery such as irregularities, haematoma, and skin necrosis [6,7]. The most frequently used cartilage breaking technique, anterior scoring increases the complication rate up to 23.75% including anterior skin necrosis, cartilage destruction, and cartilage irregularities, whereas the recurrence rate of prominence is reported to be significantly low [1,6]. A high rate of complication seems to be related to not only extensive dissection of the cartilage and its both anterior and posterior skin coverage, but also cartilage incisions. In the presented approach, there is no need for anterior skin incision and dissection, so the likelihood of haematoma, skin discolouration, bruising, and skin necrosis is avoided after the procedure. Intact anterior skin can also provide a well vascularised skin coverage for the ear cartilage, supporting the healing of skin and cartilage incisions.

Cartilage breaking incisions reduce the stiffness of cartilage and make it pliable to bend and reshape during the otoplasty, decreasing the possibility of recurrence. However, cartilage incisions and scoring as a part of cartilage breaking techniques may result in cartilage destruction and especially palpable or visible ear irregularities because of the remaining sharp edges of the cartilage [7-12]. In our otoplasty procedure, cartilage incisions were located at the posterior surface of the cartilage, so their surface irregularities were hidden at the posterior auricular sulcus after mattress sutures were placed to the cartilage, resulting in a natural and smooth surface over the ear. Posterior incomplete cartilage incisions decrease the cartilage strength, making it became softer and more pliable, to be formed without leaving any destruction or irregularities at the anterior surface of the ear. As a result of the posterior approach, the lateral surface of the ear, including skin and underlying cartilage, could be left

intact with a natural appearance and protected from the undesired effect of surgical intervention.

Suturing techniques for otoplasty benefit from the elastic properties of ear cartilage to reshape it. These features of cartilage are age-dependent, so these techniques are considered to be suitable for patients under the age of 6 years whose cartilages are elastic and pliable. Correction of their prominent ears with the suture techniques can be performed successfully with a low recurrence rate without leaving any visible destruction or irregularities at the anterior surface of the ear. These procedures use either closed or open suture placement to the cartilage to form it and usually don't dissect the skin of the anterior surface, decreasing the relevant complications [2,5,6]. However, complete relapses and complications particularly related to permanent sutures are not infrequent in adolescent and adult patients. As our patients were older than 7 years old, correction of their prominent ears by means of utilising a suture technique only seemed not to be possible, and a cartilage breaking method in combination with suture fixation was chosen to make the ear cartilage soft and pliable in the correction of ear prominence. As cartilage incisions were used in the technique to reshape the cartilage, monofilament absorbable suture could be placed in the cartilage to maintain the new form of the ear. After the procedure, any complications related to sutures such as granulomas or suture extrusions were not observed in the follow-up period, as stitches were absorbed with time.

Recently, lasers have been used in reshaping the auricular cartilage as a less invasive procedure. Application of the laser to ear cartilage changes its ultrastructure and subsequently its biophysical features, resulting in soft and pliable ear cartilage to be formed. When a laser is used for the reshaping of cartilage, posterior skin incision and excision are necessary to reach the cartilage and apply the laser to the cartilage. Absorbable sutures are also placed to the cartilage to fix and maintain the shape of the ear [13,14]. There is no need for anterior skin dissection, reducing the possibility of bruising, haematoma, and skin necrosis. The otoplasty procedure we used utilises similar incisions, sutures, and skin dissections with the laser application, but cartilage reshaping is made with a number of incomplete small incisions. This approach seems to not be more invasive than the laser otoplasty. Using only a posterior skin incision facilitates the otoplasty procedure, shortens the duration of surgery, and reduces the likelihood of complications particularly related to the anterior skin dissection.

In conclusion, this otoplasty technique avoids the major drawbacks of anterior skin dissection and anterior scoring, and minimises the risk of severe complications such as anterior skin necrosis, cartilage necrosis or destruction, and ear irregularities. It also reduces the operation time, swelling, bruising, and the possibility of suture extrusion and recurrence.

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