Surgical Treatment of Prominent Ear: 5-Year Clinical Experience in 108 Patients

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Abstract

Objective: Prominent ear is a congenital ear deformity that is commonly seen in society and has psychosocial effects. A prominent ear deformity can be due to antihelical fold underdevelopment, concave structure overdevelopment, and lobule overgrowth.

Material and Method: In total, 108 patients who underwent autoplasty at our clinic between October 2010 and October 2015 were retrospectively evaluated. These patients were comprised of 63 women and 45 men between the ages of five and 42 years (average age, 18.4 years). Among the 108 patients, 105 had a bilateral prominent ear and three had a unilateral prominent ear.

Results: Cephaloauricular angle measurements of patients before the operation ranged from 46 to 57-degree. The median cephaloauricular angle was 51-degree. The recorded upper pole-to-mastoid distance ranged from 15 to 27 mm. The median upper pole-to-mastoid distance was 20 mm. After the operation, the median upper pole-to-mastoid distance was 12 mm. The postoperative median cephaloauricular angle was 27-degree. The average follow-up duration was 18.4 months (range, 3–24 months). Two patients developed hematoma in the early postoperative period. In the late postoperative period, one patient had suture exposition, one had recurrence, six had cold intolerance, one had a bad scar, and one had a telephone ear deformity.

Conclusion: Today, autoplasty is one of the most commonly practiced aesthetic operations performed by plastic surgeons. Favorable results can be achieved in remedying the anatomical problems when proper problem-oriented surgical treatments are used. In particular, in early aged patients, it is known that good cosmetic results and important psychological improvement are provided by these procedures.

Keywords: Autoplasty, prominent ear, Mustardé, Furnas

INTRODUCTION

Prominent ear is a common congenital ear deformity. While a prevalence of 5% is reported in the USA,¹ a study conducted in Turkey found a prevalence of 4.6% among preschool children.²

The auricula embryonically derives from the first and second branchial arches and develops into its final shape in the 20th week of pregnancy. By age three, the auricula reaches 85% of its normal size; by age six, it has reached its approximate adult size. By age ten, ear width reaches 97% to 99% and ear length reaches approximately 93% of its adult size. The ear continues to grow slowly throughout adolescence; particularly, the length of the lobule increases.³
Typically, an adult ear has a length of 5.5 to 6.5 cm and a width 50% to 60% of its length. In profile view, the vertical axis of the ear deviates posterolaterally by 15 to 30 degrees. The auriculocephalic angle (the angular measurement of ear’s projection at the helical base) is 25 degrees in males and 21 degrees in females. The angle between the concha and the scapha (antihelical fold) measures approximately 90 degrees. The protrusion of the ear is measured on an imaginary plane extending from the helical margin to the scalp, which typically projects laterally by 10 to 12 mm at the upper pole, by 16 to 18 mm at midpoint, and by 20 to 22 mm at the lobule. In frontal view, the helix laterally projects from the antihelix at a distance of 2 to 5 mm.

Underdevelopment of the antihelical fold, overdevelopment of the concha, and an abnormally large, laterally deviated lobule are the underlying causes of the prominent ear deformity. Typically, several of these factors present together. Abnormalities have been identified in the transverse auricular muscle and the posterior auricular muscle in patients with prominent ear. Abnormal development of these muscles may be a cause of the prominent ear deformity.

Prominent ear is essentially treated by surgery. Numerous techniques have been described in an attempt to find the best and most effective treatment for correcting the anatomical deformities causing ear prominence; a range of combinations have been used in practice. The first otoplasty in history was performed by Dieffenbach on a post-traumatic case. The technique used involved postauricular skin excision and concha-mastoid fixation. The first elective otoplasty was described by Ely using a postauricular skin excision, conchal cartilage strip excision, and concha-mastoidal suture. The concept of restoring the antihelical fold was first described by Luckett. The skin and cartilage were excised along the antihelical fold, and the deformity was reconstructed using a mattress suture. After Becker introduced the concept of antihelical tubing using cartilage incisions and suture techniques, in 1963, Mustardé described creating the antihelical fold using permanent mattress sutures. Various cartilage scoring techniques were used in otoplasty after Gibson and Davis demonstrated that the injured cartilage tended to fold in the opposite direction. While Chongchet used sharp scoring of the scaphal cartilage (with a scalpel) to form the antihelical fold, Stenström used a rasp to trim and shape the cartilage. The use of concha-mastoid sutures in otoplasty was popularized by Furnas and later modified by Spira.

Prominent ear can have severe psychosocial effects, especially on pediatric patients. A study conducted by Haworth et al. showed that people tend to direct their attention to the ear region when looking at individuals with prominent ears. Especially during the school years, teasing attitudes and comments by peers can have adverse psychological effects on the individual. Most patients’ psychological states are observed to improve following prominent ear correction surgery. In addition to esthetic deformity, prominent ear can lead to psychological problems, behavioral disorders, and emotional trauma; therefore, prominent ear should be evaluated as a serious medical condition.

This study presents a summary of the development of the ear, the definition of prominent ear, the anatomic deformities associated with prominent ear, and the described corrective techniques. We also describe our approach to prominent ear surgery and the outcomes we have achieved.

MATERIALS AND METHODS

Prominent ear patients who underwent operations in our clinic between the dates of November 2010 and November 2015 were retrospectively screened and included in the study. A total of 108 patients were operated on in our clinic during this time period. Of this total, 63 were female and 45 were male; the mean age of the patients was 18.4, ranging from 5 to 42. Of the total patients, 105 presented with bilateral prominent ears and 3 with unilateral prominent ear.

The cephaloauricular angle, upper pole-to-mastoid distance, position of the antihelix in proportion to the helix, and distance between the lateral margins of the two ears were postoperatively assessed. Follow-up examinations at the first week, first month, and sixth month were evaluated for each patient. Early and late complications and patient satisfaction levels were assessed.

An elliptical skin incision corresponding to the posterior sulcus was performed in all patients. In seven patients, the skin was deepithelialized to create a laterally based dermal flap. This technique, described by Basat et al. for thin-skinned patients, was used to decrease the risk of suture exposure in later stages. Postauricular skin was marked and excised in 101 patients. After skin excision, the site was widely dissected to expose the cartilage. The auricula was folded laterally, and suture points were marked by invadion with insulin injection pens. In 19 patients with thicker cartilage, the scapha area was scored using a cartilage rasp to facilitate folding. The anterior scoring technique was used in 17 patients and the posterior scoring technique was used in 2 patients. In all patients, the antihelical fold was reshaped with permanent mattress (Mustardé) sutures (Figure 1). In 103 patients, conchamastoid (Furnas) sutures were used to correct the cephaloauricular angle and conchal prominence (Figure 2). Partial excision with a posterior approach to the conchal cartilage was performed in 31 patients with conchal cartilage hypertrophy. To prevent skin folding in the anterior area, the anterior skin was dissected and removed from the conchal cartilage during suturing following the excision. Then, the conchal cartilage was reconstructed using permanent and separated “figure-of-eight” sutures. The conchal sliding technique described by Yazar et al. was used in five patients with significant conchal hypertrophy. After the conchal cartilage was exposed, an incision...
was made along the long axis; medial and lateral cartilage segments were overlappingly positioned to the posterior, then fixed with three permanent mattress sutures. The posterior auricular muscle, which presented a hypertrophic form and abnormal insertion site, was totally excised in 9 patients. The lobule prominence in three patients was addressed by advancing with a modified fishtail incision over the lobule and posterior skin; the lobule was attached to the posterior to reduce the prominence. After reshaping the auricula and the lobule, passive drains were placed in all patients. In cases in which laterally based dermal flaps were used, the distal flap was first stitched to the mastoid fascia in the auricular sulcus; then, the conchascaphoid and conchamastoid sutures were covered. As in all patients, the skin was then sewn with continuous absorbable sutures (Table I). Finally, a compression dressing was applied with gauze strips soaked in antibiotic ointment. The passive drains were removed on postoperative day 1, and the patients were discharged.

Our study was conducted in compliance with the Helsinki Declaration. While patient consent was not deemed necessary due to the retrospective nature of the study, consents were obtained from all patients prior to their surgeries.

RESULTS

The auricular deformities that affected the esthetic appearances of the patients were classified in three groups: underdeveloped antihelix, conchal hypertrophy, and lobule prominence. Cephaloauricular angles and upper pole-to-mastoid distances were measured accordingly. While all patients were observed to have underdeveloped antihelices, 36 patients also had conchal cartilage hypertrophy and 3 patients also had lobule prominence. The cephaloauricular angle mea-
urements of the patients ranged from 46 to 57 degrees. The median cephaloauricular angle was 51 degrees. The recorded upper pole-to-mastoid distance ranged from 15 to 27 mm. The median upper pole-to-mastoid distance was 20 mm. Patients with a mastoid distance greater than 22 mm at lobule level were evaluated to have lobule prominence.

The average follow-up period was 18.4 (3 to 24) months. After the operation, the median upper pole-to-mastoid distance was found to be 12 mm. The postoperative median cephaloauricular angle was 27 degrees. The distance between the lateral margins of the two ears was less than 3 mm in all patients. The helix was observed to be more prominent than the antihelix and to have smoother borders in all patients after surgery.

Early postoperative hematoma developed in two patients and was quickly treated. No early complications, such as infection, flap necrosis, wound dehiscence, or external auditory canal obstruction, were observed in any of the patients. Suture exposition was observed in one patient in the late postoperative period; however, the deformity did not recur after the exposed suture was removed. Telephone ear deformity was observed in one patient. Corrective surgery was proposed but was not accepted by the patient. Unilateral recurrence was observed in one patient as a result of Mustardé suture dehiscence on the antihelix. This patient was re-operated on to achieve symmetry. In six patients, hypersensitivity and cold intolerance were observed in the late period. Keloid formation was observed in one patient, who was treated with intralesional steroid injections. The keloid was eventually removed by excision when no improvement was observed. No other long-term complications were observed (Table II). Subjective feedback received from patients during follow-up examinations showed that they evaluated their appearances to be natural, with considerably high patient satisfaction (Figure 3, 4).

**DISCUSSION**

Currently, otoplasty is one the most frequently performed cosmetic surgeries. Depending on the patient’s age and carti-
Several goals should be borne in mind for corrective procedures of prominent ear. These reported goals are correcting the protrusion in upper 1/3 of the auricula; visibility of the helix rim beyond the antihelix in both ears; a smooth and soft helical curve; avoiding distortion or a marked decrease in the size of the postauricular sulcus; maintaining a maximum helix-to-mastoid distance of 12 mm in the upper third, in the mid third, and 22 mm in the lower third, and a difference no greater than 3 mm between the lateral distances of the two ears. These goals were taken into account in all otoplasty procedures performed in our clinic.

Non-surgical treatments are often unsuccessful in correcting prominent ears; however, success rates are known to be higher in procedures performed in the first days after birth. In their study, Tan et al. reported very successful outcomes with cartilage “molding” applications that they initiated within the first three days after birth and continued for six months. Applications performed after this period are believed to be associated with a decrease in estrogen production in maternal circulation. Petersson et al. showed that auricular anomalies can be identified by hearing screening within the first 48 hours after birth, and splitting therapy can be initiated with appropriate timing. However, the limited time interval allowing for a successful outcome is a great disadvantage of these applications.

More than 200 surgical techniques for the correction of prominent ears are described in the literature. Reshaping the antihelical fold, correcting the concha, and reducing the prominence of the lobule are the main goals in prominent ear surgeries. Many techniques have been described for correcting these deformities, including reshaping with permanent sutures, scoring, incision, cartilage excision, and cartilage sliding. One or more of these techniques can be used and successful outcomes can be achieved in consideration of anatomic problems, the forms of the skin and cartilage, and age. However, secondary procedures may be required in some patients. Problems presented by the patient should be properly identified, and the treatment should be individualized with suitable techniques.

Underdevelopment of the antihelix is a major anatomic problem observed in prominent ear. Reshaping of the antihelix is typically performed using scoring techniques, suturing techniques, or a combination of these. Cartilage scoring can be superficial or deep (full-thickness) and can have an anterior or posterior approach. Both methods can yield successful results. Scoring using a full thickness incision, however, can lead to a sharp antihelical fold, resulting in an undesirable esthetic appearance. The antihelical fold can be reshaped using permanent mattress sutures with the Mustardé technique. In patients with reduced cartilage elasticity and thick cartilage structure, however, sole use of this technique may increase recurrence risk. Scoring techniques alone can be used to reshape the antihelix; however, it appears to be difficult to correct severe deformities and to achieve symmetry using only this method. Therefore, most surgeons use a combination of scoring and suturing techniques. The foremost complication associated with anterior scoring is anterior skin necrosis. This technique also carries a higher risk of hematoma development. To obviate this risk, anterior skin should be dissected within limited margins over the cartilage. In techniques involving cartilage excision and the use of aggressive scoring, the antihelical fold can show sharp borders that create an undesirable appearance. Slightly trimming the scapha cartilage by partial abrasion can prevent sharp antihelical folding; however, combining this technique with suturing techniques can achieve better results. In our series, permanent conchal scaphal mattress suturing was employed to reshape the antihelical fold in all patients. We believe that an isolated Mustardé suturing technique is adequate in many cases to reshape the antihelical fold. In some patients, however, isolated suturing techniques were deemed to increase recurrence risk; therefore, they were used in combination with anterior scoring in 17 patients and with posterior scor-

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<tr>
<td>Early</td>
<td>2</td>
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<tr>
<td>Hematoma</td>
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<tr>
<td>Total</td>
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<td>Telephone ear</td>
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<td>Hypersensitivity and cold intolerance</td>
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ing techniques in two patients with thick and rigid cartilage. To prevent a sharp-contoured antihelical fold, the cartilage rasping technique (Stenström) was employed for scoring. No significant differences were found between anterior and posterior scoring with respect to cosmetic results or complications. In cases in which a combined technique was used, no complications, such as hematoma or skin necrosis associated with scoring, were observed; however, tenderness, edema, and rash were observed to persist for a longer period of time. Late recurrence was not observed in cases in which suturing and scoring techniques were used in combination. Patients were observed to show good tolerance to extended edema and rash occurrences.

Failing to identify conchal hypertrophy can lead to insufficient surgical treatment of prominent ear. Suturing and scoring techniques can be used to correct the concha; however, excisional methods are more frequently used in these cases. Conchamastoid sutures are useful to correct conchal hypertrophy and prominence in the upper two thirds of the ear. Full-thickness sutures passing through the concha cartilage are attached to the mastoid fascia. This technique was popularized by Furnas. Conchamastoid suturing requires special care; placing sutures too far anteriorly on the mastoid or too far posteriorly on the concha can excessively rotate the concha, obstructing the external auditory canal. Spira and Stal have modified this technique. They suggest using a laterally-based conchal cartilage flap that is sutured to the mastoid periosteum. This method was deemed to offer more robust structure and to prevent obstruction of the external auditory canal. Conchamastoid sutures alone are insufficient in cases with severe hypertrophy; in these cases, excisional methods are often used. A more frequently used method for excising cartilage alone is the posterior approach described by Beasley and Jones, who suggest segmental excision over the lower part of the concha in cases with a prominent antitragus. Bauer has proposed anterior excision of the cartilage together with the skin. This is suggested to prevent skin fold formation in the anterior area after the cartilage is excised. In all our cases, we used posterior cartilage excision alone to obviate the risks of keloid formation and severe scarring in the anterior. To prevent anterior skin folding after the excision, we dissected the skin over the anterior cartilage with wider margins. The skin recovered in the long term, and the redundant skin became smooth. Crescentic cartilage excision was found to achieve adequate results in treating conchal hypertrophy. Late-stage telephone ear deformity was observed in one patient, who was treated using conchal cartilage excision. This outcome shows that a conchal reduction should be carefully planned to avoid over-correction. The conchal sliding technique can also be successfully employed in cases with severe conchal hypertrophy. This technique is beneficial in the treatment of conchal hypertrophy, given its ability to prevent over-thinning of the cartilage and redundant skin formation in the anterior area. It also carries a lower risk of cartilage deformity compared to excisional techniques. The disadvantages of this technique are the need for more dissection and the formation of a step along the segment where cartilage plates overlap. In cases in which this technique was used in our series, the conchal prominence became smooth and did not require conchamastoid suturing. In contrast, postoperative edema persisted longer in these patients, and minimal visible step formed on the anterior of the concha. These outcomes were well tolerated by the patients, who had been informed beforehand about these findings. Scoring techniques can also be used, especially with an anterior approach, in mild conchal hypertrophies; however, the risks of hematoma and anterior skin necrosis are higher in such cases. Conchal scoring was not used in any of our patients.

Excessively protruding lobules should be addressed during otoplasty. Because prominence will be reduced in other areas, the deformity of the lobule will be aggravated, leading to an esthetically unacceptable appearance. Modified fishtail, a technique described by Wood-Smith, is the most frequently used excision technique for correcting lobule prominence. In our series, this technique was successfully employed in three cases identified to have lobule protrusion. Other successful corrective techniques are described in the literature, such as wedge excision and subcutaneous sutures from the lobule into the scalp. Presently, minimally invasive methods using percutaneous suturing techniques (percutaneous adjustable closed otoplasty, or PACO) are increasing in popularity. The advantages of this method are that it can be performed under local anesthesia in an office environment, patients can immediately see the results, and no postoperative compression bandaging is required. PACO can be considered as a suitable option in patients whose essential problems are an underdeveloped antihelix and soft cartilage structure; however, it will not be adequate in cases with additional problems, such as rigid cartilage, concha hypertrophy, and lobule prominence. A study by Özçihan et al. reports no significant differences in complication rates between the open techniques, with comparable patient satisfaction levels.

Early (within the first 14 days) and late (after the first 14 days) postoperative complications can be experienced in the surgical treatment of prominent ear. Early complications include hematoma, bleeding, skin necrosis, wound dehiscence, and infection. Overall, the incidence of early complications is observed to be lower. The most common early complication is hematoma, which is reported at a rate of 2.2%. Overall, the incidence of early complications is observed to be 0% to 8.4%, whereas that of late complications ranges from 0% to 47.3%. According to the data, late-stage complications are more common following a prominent ear correction procedure. Reported late complications are hypersensitivity, severe scarring (hypertrophic/keloid), suture exposition, and inadequate esthetic outcomes. Reported inadequate esthetic outcomes include telephone ear deformity, irregularities in cartilage,
insufficient correction, overcorrection, and recurrence.22 Additionally, facial palsy has been reported as a rare complication of otoplasty. In our series, the incidences of early and late complications were found to be consistent with the literature (1.85% and 9.25%, respectively). Hypersensitivity is reported to be the most common complication; it was also the most commonly observed in our series, with a rate of 5.56%. Suture exsion, recurrence, and severe scar formation were observed at lower rates in our series.

CONCLUSION

Prominent ear is a common congenital ear deformity; it is a major medical condition that can adversely affect the esthetic appearance of an individual and hence give rise to severe psychosocial issues. Because every individual has different problems, there is no single surgical technique that can be applied in all cases. The patient's age, skin, and cartilage features, and anatomic problems in the auricular as well as patient expectations should be carefully assessed before planning the operation. Selecting suitable surgical techniques to address the issues, good command of the surgical techniques, and meticulous surgical manipulation are the most critical factors in achieving successful results and preventing complications.

Ethics Committee Approval: Authors declared that the research was conducted according to the principles of the World Medical Association Declaration of Helsinki “Ethical Principles for Medical Research Involving Human Subjects” (amended in October 2013).

Informed Consent: Informed consent was not obtained due to the retrospective nature of the study.

Peer-review: Externally peer-reviewed.


Conflict of Interest: No conflicts of interest were declared by the authors.

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