Costal Cartilage or Conchal Cartilage for Aesthetic and Structural Reconstruction of Lower Pole Ear Defects

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Abstract

Background: Lower pole defects of the ear involve loss of the ear lobule with a variable degree of cartilaginous helical rim and antihelix.

Objectives: The authors describe a method of reconstructing lower pole ear defects with local skin flaps by incorporating conchal or costal cartilage grafts.

Methods: The authors retrospectively evaluated the charts of 13 patients who presented between 1998 and 2007 with lower pole auricular defects. For defects primarily involving the earlobe (seven cases), conchal cartilage was sandwiched between an anterior transposition flap and a posterior V-Y advancement flap. For defects extending into the inferior portions of the helical rim and antihelix (six cases), a costal cartilage framework was inserted into a skin pocket and released after six months.

Results: The mean follow-up for the 13 patients in this series was three years. Both techniques resulted in satisfactory long-term outcomes with excellent contour of the ear. All patients were satisfied with their reconstruction. Data showed that costal cartilage reconstructions required a minimum of two stages and that construction with conchal cartilage resulted in a softer lobule but was more likely to require minor aesthetic revision.

Conclusions: With appropriate preoperative planning, these cartilage graft techniques produce excellent aesthetic outcomes in reconstructing complicated defects of the lower pole of the ear.

Level of Evidence: 4

Keywords
ear, reconstruction, lobule, costal, conchal, cartilage graft

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METHODS

We retrospectively collected data from the charts of 13 patients who presented with lower pole auricular defects resulting from either injury or congenital abnormality to one author’s (WS) outpatient clinic over a 10-year period from 1998 to 2007. Data sources utilized in our analysis included case notes, particularly the operative and outpatient notes, as well as pre- and postoperative photographs. The primary
operating surgeon remained constant for all cases (WS), with an average of one additional (variable) surgeon assisting (AC). Patient demographics—including age, sex, occupation, past medical history, and smoking status—were noted. Indication details were collected, including mechanism of injury (if applicable), as well as the side and the type of defect. Operative parameters, including the surgeon and reconstructive technique, were assessed. Note was made of the skin donor site, the cartilage graft type, whether a z-plasty was incorporated, and whether antibiotics were given. Discrepancies in the number of planned or unplanned revisions or second-stage procedures were noted and assessed for each type of reconstruction. Pre- and postoperative photographs were subjectively graded by each patient as a measure of satisfaction. This information was combined with an examination of complication rates with each technique for an overall outcomes assessment.

**Technique**

For ear lobule–only defects with minimal cartilage loss, conchal cartilage was sandwiched between an anterior transposition flap and a posterior V-Y advancement flap (Figure 1). A variety of local random pattern skin flaps were raised, often providing posterior access for conchal cartilage graft harvest from the conchal bowl. If possible, this conchal cartilage was dissected into an island on a posterior/inferior-based vascular pedicle. The skin flaps were then opposed, encasing the conchal cartilage graft. The final result often generated a posterior-based, random-pattern V-Y advancement flap.

For defects extending into the inferior portions of the helical rim and antihelix, a costal cartilage framework was inserted into a skin pocket and released after six months. The grafts were harvested through anterior chest wall incisions down to the cartilaginous costal margin. A template was fashioned of the patient’s contralateral (undamaged) ear, and the cartilage was crafted to fill the cartilage defect (Figure 2). This was then inserted into an inferior skin pocket, and vacuum suction was applied with a Vacutainer drain (Beckton, Dickson and Company; Franklin Lakes, New Jersey) to allow skin contouring of the graft.

Clinical results are shown in Figures 3 and 4.

**RESULTS**

Eight male and five female patients were included in this study. The patients had an average age of 17 years. Mean follow-up time was three years. Causes of auricular defect in this patient series included road traffic accident (RTA) (one case), human bite (six cases), congenital abnormality (four cases), infection following piercing (one case), and knife laceration (one case). Seven cases were considered earlobe-only defects (which were reconstructed with conchal cartilage flaps). Six cases involved trauma or congenital absence of a sufficient amount of inferior cartilage such that a costal cartilage graft was required.

The most frequent complication encountered in lobule–only reconstruction was keloid scarring (n = 3; 42.8%). Complications of costal cartilage graft reconstructions included one case of wound infection (17%), which required antibiotics, and one case of wire protrusion (17%). A subjective satisfaction grading form was completed by each patient in writing during a clinic follow-up visit at one year postoperatively with a subjective rating scale described as excellent/good/satisfactory/poor. The results were as follows: six.
patients (three lobule-only patients, three lower pole) felt that their outcome was “excellent” (46%); five felt that it was “good” (six lobule-only, two lower pole; 38%); two felt that it was satisfactory (one lobule-only, one lower pole; 15%); and no patients felt that their outcome was “poor.” Seven patients (six lobule-only, one lower pole) required single-stage operations, while three (one lobule-only, two lower pole) required two stages, and three (all lower-pole defect patients) required three stages. When required, the second and third stages involved release of the reconstruction after six months.

DISCUSSION
The goals for reconstruction of the external ear include providing skin of appropriate thickness and texture, constructing a framework for support, and maintaining simplicity in the approach. As with other defects of the ear, lower pole reconstruction requires a customized procedure combining known principles and techniques. As a rule, the appearance of the reconstructed ear should not be distracting when viewed from a conversational distance.

Numerous articles have concentrated on techniques for reconstructing the external ear, but few have specifically addressed lower pole defects. This article presents a series of patients with lower pole defects who underwent reconstruction with various techniques, including local flaps, microvascular free flaps, and autologous tissue therapies. The outcomes were assessed using a modified version of the modified Fitzpatrick Scale, with patients evaluating their overall satisfaction with the results of the reconstruction.

Figure 3. (A) This 18-year-old woman presented with a lost lobule on her right ear, with relative sparing of inferior antihelical rim after an infective complication from ear piercing. (B) One year after lobule reconstruction with conchal cartilage. The patient’s intraoperative procedure is shown in Figure 1.

Figure 4. (A) This 28-year-old man presented several months after sustained loss of the majority of his right earlobe and a large portion of the helical and antihelical rim from knife laceration trauma. (B) 18 months after reconstruction with ipsilateral costal cartilage. This patient’s graft is shown in Figure 2.
correcting partial external ear defects. Most of these focus on superior, \(^2\) helical, \(^3,4\) and conchal \(^5\) defects. Earlobe reconstruction mostly relies on skin flaps. \(^6,8\)

In light of these options, identifying the structural defect is perhaps more important than the question of which reconstructive technique to select. Once the defect has been identified, an individualized technique can be chosen from the variety of local and regional flaps that have been described for ear reconstruction. \(^9,12\) To properly select a technique, full appreciation of the aesthetic anatomy and structural subunits of the ear is needed. The ear lobule (earlobe) consists of fibrous tissue, fat, and blood vessels covered by skin. The arterial supply is composed of the superficial temporal artery and the great auricular artery. The skin of the auricle is supplied by the great auricular and auriculotemporal nerves. The great auricular nerve supplies the superior surface and the lateral surface inferior to the external acoustic meatus with nerve fibers from C2. The auriculotemporal nerve supplies the skin of the auricle superior to the external acoustic meatus.

For lower pole ear defects, regardless of cause, selection of the reconstruction technique should rest on whether the defect is mostly lobule or lobule plus inferior cartilage. If it is a lobule-only defect, the cartilage should be utilized, since this will maintain structure. If the cartilage is involved in the defect, a larger costal cartilage graft is needed. As always, a clear discussion with the patient is necessary, to ensure that the surgeon understands the patient’s desires and expectations and candidly communicates the available treatment options.

The advantages of the techniques described in this article are their bespoke nature; they allow the surgeon to appreciate that each defect is unique and therefore requires a specifically-tailored reconstructive method. We believe a better aesthetic and functional outcome can be achieved with this approach, rather than just applying a rigid formula to a problem that by its nature can be achieved with this approach, rather than just applying a rigid formula to a problem that by its nature requires a degree of invention and artistry. In our experience, the conchal and costal cartilage techniques both yield excellent results, and both can be applied to congenital and traumatic defects.

One disadvantage is that these techniques require a somewhat significant level of patient commitment. Reconstruction with costal cartilage requires multiple stages, while lobule-only reconstruction with local flaps and cartilage is more likely to require aesthetic revision—although in this series, only one patient required a formal, planned second-stage procedure. With full lower pole reconstructions with costal cartilage, two patients needed a planned second-stage procedure and three required a third stage. As with all operations, the techniques utilized in this series were not without complications that affected the aesthetic result, including scarring or keloid formation, wound infection, and wire protrusion.

**CONCLUSIONS**

We advocate accurate preoperative clinical assessment when selecting a reconstructive technique for lower pole ear defects. Lower pole reconstruction should be determined based on whether the defect involves mostly the lobule or lobule plus inferior cartilage. Through a tailored approach to reconstruction, utilizing either existing conchal cartilage for lobule-only defects or costal cartilage when the helical rim and antihelix are involved, surgeons can provide a final result that is aesthetically pleasing and structurally robust.

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**REFERENCES**