Minimally Invasive Auriculoplasty With an Anterior Approach: A 15-Year Experience

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Abstract

Background: The otoplasty technique, independently conceived by Kaye and Lewis, is a simple and effective method for correcting prominent ears with an underdeveloped antihelical fold, but it is inappropriate for correcting ears with conchal hypertrophy.

Objectives: To describe an anterior approach to otoplasty that can correct prominent ears, even for those with conchal hypertrophy.

Methods: The 100 most recent otoplasty interventions to correct prominent ears were analyzed retrospectively. Indications, aesthetic results, complications and corrections were evaluated.

Results: The 100 patients who underwent otoplasty included 40 males and 60 females with a mean age of 18 years (range, 8–62 years). Sixty-five patients underwent correction of an underdeveloped antihelical fold, 30 underwent correction of conchal hypertrophy and 5 required resection of a conchal cartilage crescent. Intervention was bilateral in 96 patients and monolateral in 4 patients. Two patients required secondary corrections, including 1 requiring monolateral correction for a trauma after 10 days. No patient experienced hematomas or infections, despite the absence of antibiotic coverage.

Conclusions: This minimally invasive otoplasty technique is a simple, quick, and effective method, even in patients with conchal hypertrophy.

Level of Evidence: 4

Ear protrusion caused by lack of an antihelical fold can be corrected using the otoplasty technique without extensive posterior auricular incisions, dissection of flaps, or excision of skin. In this procedure, the auricular cartilage is weakened by striation and the position of the antihelical fold retained by 2 or 3 permanent buried monofilament mattress sutures, with the stitches inserted percutaneously through their own needle holes. This method is both rapid and easy to perform, with results comparable to more complicated techniques. Small incisions and minimal dissection reduce the risks of postoperative bleeding and infection. Additional correction, if desired, is easy, requiring only one additional suture. This method, however, is not applicable to patients with ear protrusion due to excessive conchal depth.

More than 15 years ago, our center started using the above-mentioned method, with modifications, and stopped using the Mustardè otoplasty technique. By using an anterior rather than a posterior approach, the Kaye otoplasty method became more simple, precise, and affordable with very predictable results. Moreover, this method could be utilized in patients with conchal hypertrophy.

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METHODS

Over the last 15 years, approximately 300 patients have undergone otoplasty using the modified Kaye method. Because the details and photos of all patients could not be easily collected, the 100 most recently treated patients were considered sufficiently representative. The present study, therefore, retrospectively analyzed 100 patients who underwent otoplasty for prominent ears between June 2013 and December 2018. Indications for otoplasty, complications, aesthetic results, and corrections were evaluated. This study was performed in accordance with the principles of the Declaration of Helsinki.

Patients were subcategorized by causes of ear protrusion\(^3\) into those with underdeveloped antihelical folds, conchal hypertrophy, and wide conchoscafal angles. Because these causes are very often mixed in individual patients, their preoperative situations were analyzed (Table 1).

Ear protrusion due to an underdeveloped antihelical fold was corrected by folding the ear cartilage at the antihelical site (Figure 1). Ear protrusion due to a conspicuous concha, along with an underdeveloped or absent antihelical fold, was corrected by a fold that reduces the concha, converting the prominent conchal wall into a scaphal surface (Figure 2). Patients with conchal hypertrophy but a correct conchoscafal angle (90 degrees) underwent resection of the cartilage crescent (Figure 3). In all three situations, this technique resulted in a regular, thin, smooth correcting fold.

A folding line to adequately correct each type of ear protrusion could always be found. This line did not always correspond to an underdeveloped antihelical fold but was the one providing the best final shape of the ear.

Indications for surgery were always patient dependent. Despite precise criteria for standard ear conformation, they may not always match patient expectations. Rather, patient expectations were assessed by simulating possible changes in front of a mirror. Some patients request minimal correction, placing the upper third of the ear slightly closer to the head. Other patients request ears very close to the head; these patients may be disappointed by a “standard” ear, requiring an overcorrection to avoid a secondary correction. Other patients have ears shaped differently from standard ears and only want to correct the most prominent aberrant shape.

When operating on children, their parents’ judgment is paramount. However, the opinion of the child must also be considered.

All patients undergo surgery with local anesthesia on an outpatient basis. In the case of children, parents are recommended to wait until their children request correction. At that time, children are very cooperative, making local intervention and subsequent administration of medications much easier.

Surgical Technique

All operations were performed on an outpatient basis under local anesthesia. Oral anxiolytic drops are administered to patients 30 min before the operation. A permanent pencil was used to mark the exact position at which the cartilage should be folded to obtain a correctly shaped ear, as well as to mark the position of 2 or 3 internal stitches. In patients with conchal hypertrophy and a normal conchoscafal angle, the pencil was used to draw on the lateral skin the cartilage crescent that will be excised from the concha.

Using a 30-g needle, 2.5–5 ml anesthetic was injected on each side, subdermally on the anterior side on which the folding line had been marked and subcutaneously on the posterior side, on which stab incisions for stitches had been marked. The tip of the needle was used to make several small scratches on the sites indicated for stitches and stab incisions, as scratching of the cartilage may have removed the pencil marks.

To gain access to the anterior surface of the ear cartilage, an anterior vertical incision 1.0–1.5 cm long was made on the tail of the new antihelical fold position, just under the antitragus (Figure 4A). A pair of small iris scissors was introduced by blunt dissection to create a subcutaneous anterior antihelical tunnel 4 or 5 mm wide (Figure 4B). A similar posterior subcutaneous tunnel was not dissected, thereby preventing a sharp fold or cartilage irregularities. Using an appropriate scratching instrument, gently curved differently for the right and left ear, and with a finger under the cartilage, the cartilage was scratched, creating a single furrow to break its spring at the intended site of the antihelical fold (Figure 4C).

The anterior incision made scratching of the cartilage easier and more precise, allowing the ear shape to be

<table>
<thead>
<tr>
<th>Type of defect</th>
<th>Type of correction</th>
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<tbody>
<tr>
<td>Underdeveloped antihelical fold (Figure 1)</td>
<td>Properly fold the ear cartilage at the antihelical site to correct ear protrusion</td>
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<tr>
<td>Conchal hypertrophy with an underdeveloped or absent antihelical fold (Figure 2)</td>
<td>Create a new antihelical fold in the concha, converting part of the conchal wall into a scaphal surface</td>
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<tr>
<td>Conchal hypertrophy with a normal conchoscafal angle (Figure 3)</td>
<td>Resect part of the conchal cartilage through a small anterior incision, although plication of the superior third of the ear with stitches is often necessary</td>
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Table 1. Description of the Most Frequent Types of Ear Defects, Along With the Types of Proposed Corrections
controlled in a manner impossible with posterior maneuvers. Scratching was limited to the line of the fold, as the cartilage must become easy to fold, but without complete interruption of its thickness. Sufficient weakening of the cartilage was assessed by testing its minimal residual spring force with a finger.

The new fold was held in the correct position by placement of two or three mattress sutures of nylon 4/0. A posterior incision of 2–3 mm was made for every stitch on the medial cutis behind the antihelix. A needle (19 mm, 3/8 circle) with 4/0 nylon was introduced through the posterior stab incision and passed as a mattress suture beneath the skin, emerging from the same stab incision through which it was introduced (Figure 5). Easier posterior passage of the needle under the skin required some degree of posterior subcutaneous swelling resulting from infiltration of anesthetic.

If folding was insufficient or excessive, a stitch was redone several millimeters further or closer, until the desired shape was obtained. Three or four 6/0 nylon stitches were usually sufficient to close the anterior skin incision. Stitches on the small posterior stab incisions were not necessary. Video 1 shows different phases of the operation.

In the few patients with excessive conchal depth and correct conchoscafal angle (approximately 90 degrees), the cutis was marked, and an appropriate crescent of conchal cartilage was dissected and excised. This crescent corresponded to the conchal excess, with dissection always performed from the same anterior incision without enlargement. This was followed by the folding required for a well-shaped ear. Excess conchal skin was quickly reabsorbed.

At the end of the operation, the patient was asked to assess the results in a mirror. This enables immediate slight modifications, if necessary.

After surgery, cotton wool was inserted into the posterior sulcus and placed over the ears, with a light bandage maintained for 5–6 days, when the stitches were removed. Antibiotic therapy was not prescribed. Pain was minimal and limited to the first day. Any pain was controlled by treatment with paracetamol. Operation time per side rarely exceeded 15 min.
RESULTS

The 100 patients who underwent otoplasty between June 2013 and December 2018 consisted of 40 males and 60 females (mean age, 18 years; range, 8–62 years). Sixty-five patients underwent correction of an underdeveloped antihelical fold, 30 also underwent correction of conchal hypertrophy, and 5 required resection of a conchal cartilage crescent. Intervention was bilateral in 96 patients and monolateral in 4 patients. Two patients required secondary corrections. One patient required monolateral correction for a trauma after 10 days. The second patient, who was initially satisfied with the results, requested that both ears be placed 2–3 mm closer to the head 6 months later.

Figure 2. An 18-year-old woman with conchal excess and almost absent antihelical fold (A) before, (B) with preoperative markings, and (C) after 12 months.

Figure 3. A 55-year-old woman with conchal hypertrophy with correct conchoscaphal angle fold (A) before, (B) with preoperative markings, and (C) after 10 months.
None of these patients experienced hematomas or infections, despite the lack of antibiotic administration. Scars were initially inconspicuous, and never became hypertrophic. Visible cartilage irregularities were not observed. Although patient satisfaction was not rated quantitatively, it was generally very high, and not precisely related to perfect aesthetic results.

Postoperative photographs were taken immediately after surgery, after 6 days, and after 6–12 months. There were no significant differences between photographs obtained immediately and after 6–12 months. Except for 8 patients who did not return, the minimum follow-up was 12 months (range, 12–56 months) Aesthetic results were rated by comparing preoperative and postoperative photographs. Factors associated with good aesthetic results include good correction of the superior third of the auricle, a helix with a smooth and regular contour and visible from the anterior view lateral to the antihelix, a normal retro-auricular sulcus, and an appropriate helix/mastoid distance of 17–20 mm. Based on these factors, two plastic surgeons independent of the study rated the results as sufficient in 10 patients, good in 35 and very good in 47 patients. The remaining 8 patients did not return for evaluation. Photographs from two cases are available as Figures 6 and 7.

When this method was first introduced, more than 15 years ago, some patients experienced recurrences related to insufficient breaking of the cartilage spring.
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Others showed sharp antihelices secondary to complete breakage of cartilage and caused by excessive scratching and both anterior and posterior subcutaneous tunneling.

**DISCUSSION**

A literature search found more than 800 publications on otoplasty using more than 200 techniques. Although experienced surgeons can obtain good results with very different techniques,~2,5,6 many patients experience immediate and delayed complications, including hematomas, infections, chondrites, hypertrophic scars, recurrence of prominence, asymmetries, irregularly shaped ears, residual hyperesthesia, residual pain when touched, and sensitivity

**Figure 5.** (A-G) The figures show how the stitches are put to fold the cartilage without incision in the way described by Kaye. The knot is buried in a stab incision in the skin on the posterior side of the ear that is not sutured.

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**Video 1.** Watch now at https://academic.oup.com/asjopenforum/article-lookup/doi/10.1093/asjof/ojaa004

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*2.5-5 ml anesthetic was injected on each side*
to cold or touching. These complications suggest a need for a new otoplasty technique.

It is important to distinguish anterior and posterior approaches. Previous studies have described an anterior approach with longer conchal incisions. Working on the lateral side of the ear is easier and permits optimal control of cartilage folding. The ear can be regarded as a type of composite flap with a posterior neuro vascular pedicle. An anterior approach will not disturb its neuro vascular system.

Similar to previous studies, none of the patients in the present study experienced hypertrophic scars or keloids.

Figure 6. A 23-year-old woman with conchal excess and almost absent antihelical fold (A, C) before and (B, D) after 12 months.
Figure 7. A 9-year-old male patient with conchal excess and underdeveloped antihelical fold (A, C) before and (B, D) after 12 months.

Anterior ear skin is thin and lacks a subcutaneous layer, similar to eyelid skin. This may explain the differences in healing processes between anterior and posterior approaches.8

The likelihood of hematoma formation is very low, as the creation of a single anterior subcutaneous tunnel interrupts only very small capillaries. Infection is also unlikely, as trauma is minimal and vascularization of the entire
ear is maintained. Recurrence of prominence and hyperesthesia have never been observed using this technique, and the retro-auricular sulcus is always normal.

In contrast to previous reports,8,9 none of our patients underwent wide subcutaneous dissections with extended cartilage scratching. Responses of cartilage to scratching can depend on patient age and the thickness of the cartilage. Moreover, overall ear shape can change over time, with possible recurrence of ear protrusion. The ear position will remain stable over time only if the stitches lack tension.

Four patients required removal of some stitches due to stinging on the posterior cutis, with one patient requiring removal after 14 years. Stitch removal, however, did not alter ear shape.

CONCLUSIONS

The minimally invasive anterior approach to otoplasty is simple and rapid to perform, with good and predictable results and very few complications. Undermining is minimal and the posterior neuro vascular pedicle of the ear is completely saved. By choosing the appropriate folding line, this technique can be used to correct ear protrusion due to any cause. This approach is more reasonable and biologically correct than some devices recently proposed to easily correct ear protrusion. The short operation time and the ability to perform surgery on an outpatient basis result in a very good cost–benefit ratio.

Disclosures

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REFERENCES