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Otoplasty: A Cartilage Sculpting Technique

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ABSTRACT

Numerous otoplastic techniques have been described for the correction of protruding ears. Technique selection in otoplasty should be done only after careful analysis of the abnormal anatomy responsible for the protruding ear deformity. The present work included 30 patients presenting with protruding ear deformity (18 males, 12 females). The age of the patients ranged between 5-24 years with an average of 11.6 years. Twenty five patients presented with bilateral protruding ears, while 5 patients had a unilateral deformity, with a total of 55 operated ears. Preoperative evaluation showed that all patients had antihelical unfurling, while 6 patients (20%) had, in addition, an overprojecting conchal bowl.

In the current study, a cartilage sculpting technique was used for antihelical recreation. This was combined with concha-mastoid sutures or conchal reduction for conchal setback. The technique resulted in adequate medialization of the ear achieving good to excellent ear to ear symmetry in 96.7% of cases.

INTRODUCTION

Numerous otoplastic techniques have been described for the correction of protruding ears. Technique selection in otoplasty should be done only after careful analysis of the abnormal anatomy responsible for the protruding ear deformity **[1]**.

For conchal protrusion, the concha-mastoid suture technique of Furnas (1968) **[2]** remains the technique of choice. Conchal cartilage excision whether partial or full-thickness has also been described to achieve conchal setback **[3,4]**.

The plethora of procedures described to restore a missing antilelix underscores the lack of total satisfaction of any one technique.

As otoplasty techniques were developed in the middle of the 20th century, two schools of thought emerged; suture techniques and cartilage sculpting techniques **[5]**.

The first following the teachings of Mustarde **[6]**, performed the procedure using sutures to recreate the antihelix. The second group of techniques all involved surgical alteration of the cartilage, whether through incisions, scoring, rasping, or dermabrasion **[7-12]**.

In the current study, a cartilage sculpting technique was used for antihelical recreation. This was combined with concha-mastoid sutures or conchal reduction for conchal setback.

PATIENTS AND METHODS

The present study included 30 patients presenting with protruding ears. Each patient was subjected preoperatively to a thorough evaluation of the auricular deformity regarding:

- Size and depth of the concha.
- Extent of development of the antihelical fold.
- Extent of protrusion of the antitragus and ear lobule.
- Degree of stiffness of the auricular cartilage which was evaluated by manipulation and categorized as limber, stiff, floppy, or scarred cartilage **[13]**.
- Quantitative evaluation of the degree of protrusion by measuring the mastoid helical distance at three levels (Fig. 1) **[15]**:

1- Upper level, at the superior aspect of the helix.
2- Middle level, at the level of the external auditory canal.
3- Lower level, at the level of the lobule.

These measures were recorded preoperatively, at the end of surgery, six months and one year postoperatively.

- Side to side disparity in size and degree of protrusion.

Surgical technique:

Children below 10 years of age were operated under general anesthesia; otherwise the procedure

was done under local anesthesia with intravenous sedation. The ear was infiltrated using a solution of 2% xylocaine with 1:100.000 epinephrine.

The patient was placed on a headrest with both ears exposed during the procedure. Finger manipulation was used to create the antihelical fold, which was then outlined with a marking pen. Using a 25-gauge needle, the auricle was penetrated from an anterior to posterior direction at the line of the proposed antihelix. The needles were then tattooed with methylene blue and withdrawn; this tattoos both the posterior skin and the auricular cartilage.

An elliptical piece of postauricular skin was marked and excised. In case of a prominent ear lobule, an hourglass-shaped excision was performed. Standard postauricular undermining was then done. An incision through the auricular cartilage was made approximately 5 mm anterior to the tattoo marks indicating the apex of the neoantihelix. The incision was curvilinear, parallel to the helical rim, and extending from approximately 5 mm from the superior aspect of the helical rim to the cauda helicis. The cauda helicis was left in place if it followed the contour of the helix. Resection of the cauda helicis was performed if it was rotated anteriorly to eliminate bowing of the lobule.

The perichondrium was dissected off the anterior surface of the medial cartilage for a distance of about 1 cm. The anterior surface of the medial cartilage was then scored using a no. 15 blade until a round and smooth neoantihelix and superior crus were formed. No sutures were placed in the cartilage.

After completing the antihelix, the degree of ear protrusion was reevaluated before any conchal setback was attempted. The setback was started by excising the intervening muscle and fascia overlying the mastoid periosteum. Furnas concha-mastoid sutures were used to medialize and fix the auricle to the underlying mastoid periosteum **[2]**.

In rare cases of overprojecting conchal cartilage, a conservative cartilage trimming was performed. At the completion of the procedure, the postauricular incision was closed in a single layer using 4/0 prolene subcuticular suture.

RESULTS

This work included 30 patients presenting with protruding ear deformity (18 males, 12 females). The age of the patients ranged between 5-24 years with an average of 11.6 years. Twenty five patients presented with bilateral protruding ears, while 5 patients had a unilateral deformity, with a total of 55 operated ears (Figs. 2-6). Preoperative evaluation showed that all patients had antihelical unfurling, while 6 patients (20%) had, in addition, an overprojecting conchal bowl (Figs. 3,5). In 16 patients (53.3%) the auricular cartilage was of the limber type, 11 patients (36.7%) had stiff cartilage; one patient (3.3%) had a floppy type of cartilage, while in 2 patients (6.7%), previously operated, the cartilage was scarred.

In all patients, the antihelical fold was recreated using a cartilage sculpting technique. Furnas concha-mastoid sutures were used to achieve conchal setback in patients with overprojecting concha (20%), while in three patients (10%) resection of a strip of conchal cartilage was necessary to achieve proper medialization of the ear.

Preoperative measurements of the degree of auricular protrusion showed an average of 29.6 mm at the upper level, 26.1 mm at the middle level, and 22.7 mm at the lower level. Immediate postoperative measurements showed an average of 13.2 mm at the upper level, 15.9 mm at the middle level, and 16.2 mm at the lower level.

Reevaluation at 6 months postoperatively showed no loss of correction at the upper level, an average loss of correction of 2 mm at the middle level, and 1.2 mm at the lower level. The degree of protrusion was reevaluated at 1 year postoperatively and showed no significant change from the values recorded at 6 months.

Ear-to-ear symmetry was assessed by comparing measures between both sides. Symmetry was rated excellent when no more than a 2-mm difference existed at any of the three recorded levels, good when less than a 4-mm difference was present and poor when more than a 4-mm difference existed at any of the three levels recorded.

Preoperatively, 16 cases (53.3%) had poor symmetry, 12 cases (40%) had good symmetry, and only 2 cases (6.7%) showed excellent symmetry. Comparing the values recorded for both ears at 6 months postoperatively, 23 cases (76.7%) showed excellent symmetry, 6 cases (20%) good symmetry, and one case (3.3%) poor symmetry.

The overall complication rate was 10% (3 patients). Complications encountered included ulceration at the cauda helicis in one patient that healed conservatively, suture granuloma and extrusion in one patient with concha-mastoid sutures that occurred 3 months postoperatively, and slight telephone deformity in another patient.

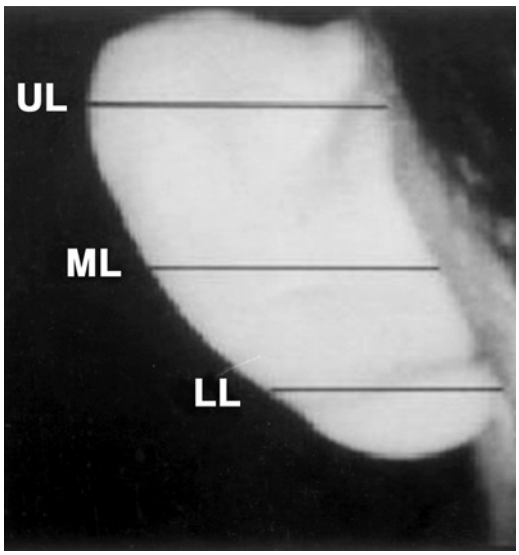

Fig. (1): Evaluation of the degree of auricular protrusion at the upper level (UL), middle level (ML), and lower level (LL). (Courtesy of Foda HMT **[15]**).

Fig. (2): A 10-year old boy with bilateral protruding ears showing antihelix unfurling.

Fig. (2-A): Preoperative view showing poor ear-to ear symmetry.

Fig. (2-B): 8 months postoperative showing excellent postoperative symmetry.

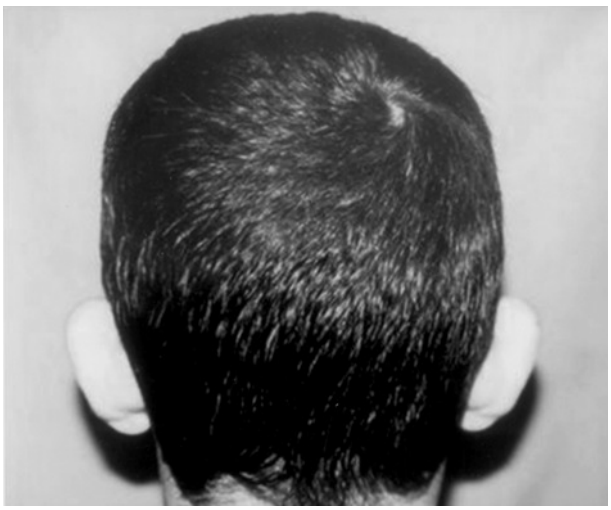

Fig. (2-C): Preoperative posterior full-head view.

Fig. (2-D): Postoperative posterior full head view.

Fig. (3): A 9-year old boy with bilateral protruding ears showing both antihelix unfurling and conchal excess.

Fig. (3-A): Preoperative view showing poor preoperative ear-to ear symmetry.

Fig. (3-B): 1 year postoperative showing excellent postoperative symmetry.

Fig. (3-C): Preoperative posterior full-head view.

Fig. (3-D): Postoperative full head view.

Fig. (4): An 18-year old male with right unilateral protruding ear showing antihelix unfurling.

Fig. (4-A): Preoperative view.

Fig. (4-B): 18 months postoperative.

Fig. (4-C): Preoperative posterior full-head view.

Fig. (4-D): Postoperative posterior full head view.

Fig. (5): A 12-year old girl with left unilateral protruding ear showing both antihelix unfurling and conchal excess.

Fig. (5-A): Preoperative view showing poor preoperative ear-to ear symmetry.

Fig. (5-B): 1 year postoperative showing excellent postoperative symmetry.

Fig. (6): A 5-year old girl with bilateral protruding ear showing antihelix unfurling.

Fig. (6-A): Preoperative view.

Fig. (6-B): 6 months postoperative.

DISCUSSION

The goal of any otoplasty is to result in natural-appearing symmetrical auricles. The surgical techniques used for the correction of the protruding ear are dependant on the preoperative analysis; whether it is due to an antihelical deformity, conchal protrusion, or both **[15]**.

In this study, all patients had antihelical unfurling, while 6 patients (20%) had, in addition, an overprojecting conchal bowl. In all patients, the antihelical fold was recreated using a cartilage sculpting technique. Furnas concha-mastoid sutures were used to achieve conchal setback in patients with overprojecting concha (20%), while in three patients (10%) resection of a strip of conchal cartilage was necessary to achieve proper medialization of the ear.

Preoperative measurements of the degree of auricular protrusion showed an average of 29.6 mm at the upper level, 26.1 mm at the middle level, and 22.7 mm at the lower level. Immediate postoperative measurements showed an average of 13.2 mm at the upper level, 15.9 mm at the middle level, and 16.2 mm at the lower level. These measurements are in accordance with those described for normal ears **[14]**.

Reevaluation at 6 months postoperatively showed no loss of correction at the upper level, an average loss of correction of 2 mm at the middle level, and 1.2 mm at the lower level. The degree of protrusion was reevaluated at 1 year postoperatively and showed no significant change from the values recorded at 6 months.

The stability of the degree of medialization of the auricle achieved in this study is consistent with

the results of other works adopting cartilage sculpting techniques [16,17]. On the contrary, recent review articles demonstrating long-term results of cartilage- sparing techniques reported an average loss of correction of 46-59% more noticeably at the upper pole [18,19].

The most common cause for "reprotrusion" is the resilience of the cartilage, which has been attributed to a cartilage "memory" that places constant strain on the fixation sutures leading to either stretch of the sutures or tearing of the cartilage. The upper level is more likely to be affected due to the fact that the auricle is relatively larger at that level [15, 20].

Different maneuvers have been described to lessen this memory. Adhering to physiologic principles, scoring of the anterior surface of the auricular cartilage, would promote its bending in the desired direction producing bowing with a convex anterior surface. The original studies for this derive from the work of Gibson and Davis [21], who studied the mechanical properties of ear cartilage. They found that the ear maintains its shape by a balance between the forces of the outer layers of the two sides of the cartilage. If only one layer is incised, the tension on that side is released and the cartilage will bend toward the opposite side. Scoring the anterior surface of the auricular cartilage at the site of the new antihelix has been done with a scalpel [9,16], a rasp [10], an abrader [22], a burr [11,23], or a needle [24].

In this study, the overall complication rate was 10% (3 patients).One patient had a small area of skin necrosis at the site of the cauda helicis. This patient had a relatively sharp edge at the site of the antihelical tail that resulted in pressure necrosis of the skin. Following that case, it was our experience to leave the cauda helicis in place only if it followed the contour of the helix but if it was rotated anteriorly it was resected.

Suture granuloma and extrusion occurred in one patient with concha-mastoid sutures 3 months postoperatively. The suture was removed and it did not affect the degree of conchal setback. Suture granuloma and extrusion are not uncommon following suture procedures for otoplasty and may occur at anytime in the postoperative period. It may result from incorrect suture placement, from excess tension on the auricular cartilage, or from infection. Early suture extrusion may require revision surgery to restore the correction. Authors reported an incidence of 15-20% following Mustarde sutures. On the other hand, cartilage sculpting techniques do not require permanent suture placement. This lessens the foreign body-related related risks associated with Mustarde procedures [5,18,25].

One patient had a slight telephone deformity. In this patient, conchal cartilage excision was performed and resulted in slight overcorrection at the middle level with the resultant deformity. In the other two patients in whom conchal cartilage excision was performed, we were conservative with the resection.

It is very important that the ear does not have a "telephone deformity" at the end of the procedure. If this is the case, either the upper pole of the ear or the lobule or both need to be moved closer to the temporal scalp. Tanzer [26] stated that it is desirable to be able to see the helix as the most lateral structure along the whole cartilaginous part of the ear. This is always the goal, but there are quite a few cases in which the helix is lacking its usual anterior curl in the midportion of the ear and one has to accept that the antihelix is slightly more prominent than the helix. This is also commonly seen in non-prominent non-operated ears.

In conclusion, the combination of a cartilage sculpting technique for antihelical recreation with concha-mastoid sutures or conchal reduction for conchal setback resulted in adequate medialization of the ear achieving good to excellent ear to ear symmetry in 96.7% of cases.

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