Minimal Access Cartilage Anterior Scoring and Auricularis Posterior Muscle Transposition for Correction of Prominent Ears: A New Approach

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ABSTRACT

Background: Prominent ears (pinnae) are routinely corrected by anterior scoring and plication of cartilage with or without conchal setback. Anterior scoring is usually performed through a long cartilage incision in the antihelix area that usually leaves conspicuous step-like deformity on the anterior surface of the auricle. Conchal deformity is usually corrected by cocho-mastoid sutures and skin fusion that leads to unnatural obliteration of the postauricular sulcus. To overcome this problem we present the results of a new technique of cartilage scoring through a small hole in the cartilage and auricularis posterior muscle transposition for conchal setback in 15 cases.

Patients and Methods: 15 patients suffering prominent ear deformity were operated upon in plastic and reconstructive surgery department at Minia University hospital and private sector. Age ranged from 5-20 years old. General anesthesia was used in young children and operation is done under local anesthesia in older patients. Through a dumbbell-shaped incision, a small incision is made in the distal part of the cartilage through which a sharp tooth scaler is passed to make scoring of the anterior surface of the cartilage. Cartilage scoring weakens its memory and facilitates placement of Mustardé sutures [1]. Conchal deformity is corrected by transposition of auricularis posterior muscle and reinsertion in a more peripheral position on the posterior surface of the cartilage leading to conchal setback. Post-operative course went alright apart from one case of reactionary bleed and one case of keloid formation on the back of the ear.

Results: From January 2007 to July 2009, 15 cases with bilateral prominent ears were operated upon by the author. Age ranged from 5-20 years old (mean=8). 5 were females and 10 males. Operative time ranged from 40-70 minutes (mean=50) for bilateral deformity. We had complication rate of 8% in the form of reactionary bleeding and keloid formation. No Step deformity noticed in any of our patients. Both patients and parents were happy about the late aesthetic results.

Conclusion: Minimal access cartilage anterior scoring is a useful and easy to learn technique for correction of prominent ears. Conchal setback is accomplished by transposition of auricularis posterior muscle peripherally that preserves a reasonable post auricular sulcus with minimal complication rate and short operative time.

INTRODUCTION

Prominent pinnae anomaly is a very common condition all over the world especially in the white population. It is by far the most common congenital external ear deformity [1]. In the Asian population, prominent ear is the third most frequent auricular deformity and appears in 5.5% of all newborns. The most frequent auricular deformity in the Asian population is lop ear, denoting an ear with the superior portion of the helix lopping to an everted state [2].

In the Far East, prominent ears are considered a sign of good fortune while in western society, they look upon prominent ears in a far less positive manner. Children with prominent ears are often the subjects of verbal and at times physical abuse by their counterparts, resulting in adverse psychological effects.

Eighty-five percent of the final size of the ear is achieved by age of 3 years, and surgery prior to school age could result in marked inhibition of auricular growth. For these reasons, some authors prefer to limit otoplasty to patients who have achieved adolescence or adulthood without completely adjusting to their appearance. However the prominent ears may cause psychosocial problems for the child, especially when entering the school. Therefore, parents would like to have the prominent ears surgically corrected before school age [3,4].

Webster [5] stated that the main causes of the prominent ear are as follows (Fig. 1): (1) Conchal hypertrophy or excess (upper pole, lower pole, or both); (2) Inadequate formation of the antihelical fold (the root, superior crus, inferior crus, or all); (3) A conchoscapul angle greater than 90 degrees; and (4) A combination of conchal hypertrophy and underdeveloped antihelical fold. Other causes can
include cranial abnormalities, lobular protrusion and anterolateral displacement of the tail of the helix.

Janis et al. [6] proposed the following proportions of the aesthetic ear:

- The long axis of the ear inclines posteriorly at approximately a 20-degree angle from the vertical.
- The ear axis does not normally parallel the bridge of the nose (the angle differential is approximately 15 degrees).
- The ear is positioned at approximately one ear length (5.5-7cm) posterior to the lateral orbital rim between horizontal planes that intersect the eyebrow and columella.
- The width is approximately 50 to 60 percent of the length (width, 3-4.5cm, length, 5.5-7cm).
- The anterolateral aspect of the helix protrudes at a 21 to 30-degree angle from the scalp.
- The anterolateral aspect of the helix measures approximately 1.5 to 2cm from the scalp (although there is a large amount of racial and gender variation).
- The lobule and antihelical fold lie in a parallel plane at an acute angle to the mastoid process.
- The helix should project 2 to 5mm more laterally than the antihelix on frontal view.

In an article by LaTreanta, he suggested that three common anatomical goals must always be kept in mind: (1) Production of a smooth, rounded, and well defined antihelical fold; (2) A conchoscopic angle of 90 degrees; and (3) Conchal reduction or reduction of the concha-mastoid angle [7]. Georgiade et al., add to this list the importance of lateral projection of the helical rim beyond the lobule. In addition, any procedure should provide symmetrical and reproducible results and avoid unnecessary costs and complexity, scars, complications, and recurrence [8].

In 1845, Diffenbach reported the first surgical approach for the correction of prominent ears. He combined simple excision from the posterior sulcus with sutures subsequently fixing the ear cartilage to the periosteum of the mastoid [9]. Subsequently, multiple surgical techniques have been described, with over 170 being reported in the literature. These can be categorized into three groups:

1- Leaving the cartilage intact and using only sutures to reconstruct the ear, as used in the permanent suture insertion of the Mustardé technique [1] and the incisionless otoplasty of Fritsch [10].

2- Incising the cartilage in order to make it more pliable, without resecting it (the Converse’s cartilage incision technique [11] and the anterior approach technique described by Chongchet [12] and Stenstrom [13]).

3- A technique that includes excision of the cartilage.

There is also a relatively new nonsurgical approach that is effective when prominent ears are noted in infancy. The use of external temporary appliances to set the ears in a correct position for several months results in a successful permanent correction [2,14,15]. The drawback with this method is that it takes only highly motivated parents to follow the protocol.

Study design:

The present study is a retrospective clinical study.

PATIENTS AND METHODS

This study is an evaluation of a new technique for correction of a common congenital anomaly namely, prominent ears over a period of 30 months in Minia governorate region, upper Egypt.

All patients suffering bilateral prominent ears deformity operated upon by the author from January 2007 to July 2009 are included in this study. The study was carried out on 15 patients.

We counselled all patients and showed them photos of the expected results and scars.

Preoperative lab workup to check haemoglobin % and prothrombin time and concentration was done to all patients.

All parents and older patients signed an informed consent.

During preoperative evaluation of patients with prominent ears, we observed the following parameters as advised by Ellis et al. [16]:

- Degree of antihelical folding.
- Depth of the conchal bowl.
- Plane of the lobule and deformity.
- Angle between the helical rim and the mastoid plane.
- Quality and spring of the auricular cartilage.

All patients were available for follow-up. Some of them declined to give late post-operative photos.

The mean follow-up period was 8 months ranging from 6 to 12 months.
Results were assessed by clinical examination, pre and postoperative photographs by the same surgeon. In addition, we recorded both patients and parents satisfaction by directly questioning them.

*Surgical technique:*

*Position:* Supine with the head turned to left or right as needed.

*Anesthesia:* General anesthesia was used in young children and local anesthesia in older patients.

*Assistant:* A scrub nurse as well as a circulating nurse is quite sufficient.

*Prepping:* As usual using 5% povidine iodine.

*Markings:* Marking of the anterior and posterior surfaces of the ear with a demographic pen. The anterior markings refer to the areas for cartilaginous dissection and scoring and the posterior markings to the resection of the skin island (Figs. 1, 2).

Subcutaneous infiltration: 2% lidocaine solution + epinephrine in 0.9% saline to give a 1:200,000 epinephrine solution, not exceeding 10mg/kg of local anesthetic. Infiltration is done in both anterior and posterior surfaces to help in haemostasis and hydrotissection (Fig. 2).

*Technique:* Starting after about 7 minutes following fluid infiltration.

- We use Dumbbell-shaped skin excision over the dorsal surface of the pinna that avoids the telephone ear deformity that might complicate the usual elliptical incision (Fig. 3).
- Elevation of anterior and posterior skin flaps by undermining.
- Haemostasis using bipolar diathermy.
- Small incision in the caudal part of the cartilage (3mm) through which a dental scaler is introduced to do blind longitudinal scoring of the anterior surface of the cartilage (Figs. 4, 5).
- 3 Mustardé sutures (upper, middle and lower) are placed in the posterior surface of the cartilage to form the antihelix. We use 3/0 prolene sutures for this purpose.
- When conchal deformity is present, we perform auricularis posterior muscle detachment and re-insertion in a more peripheral position on the posterior surface of the cartilage. This leads to conchal setback.
- Re-check haemstasis using bipolar diathermy.
- Wound closure using subcuticular 4/0 PDS sutures.

- *Dressings:* We tape the ends of the subcuticular sutures with Steri-Strips. Mold of Vaseline and cotton wool is molded into the lateral contours of the ear and in the postauricular sulcus (Fig. 7). Ears are covered with soft gauze pads. Head is wrapped with pressure bandage to apply gentle and even pressure to both ears. The bandage is taped to the skin at several points to minimize shifting. Remove the dressing on the first post-op day to check for hematoma.

*Post-operative:*

Home same day on oral antibiotic and analgesia.

**RESULTS**

From January 2007 to July 2009, 15 cases with bilateral prominent ears were operated upon by the author.

*Demographic data:* Analysis of data showed that the age of the patients at the time of operation ranged from 5 to 20 years old (mean=8). 10 patients were males and 5 patients were females. We made sure all patients had preoperative hemoglobin % of 11g/dl or more and prothrombin concentration of 85% or more (Table 1).

*Operative time:* Ranged from 40 minutes to 70 minutes (Mean=50 minutes).

All patients had the limited access anterior scoring of cartilage to form the absent antihelix. In 5 patients we added auricularis posterior muscle transposition to correct conchal deformity.

*Complications:* No major complications recorded. Only minor complications noticed (Table 2).

Patient satisfaction: All patients were happy with the final aesthetic results (Figs. 8, 9).

![Fig. (1): Main causes of the prominent ear.](image-url)
Fig. (2): Fluid infiltration.

Fig. (3): Dumbbell shaped incision.

Fig. (4): Incision in caudal cartilage.

Fig. (5): Tooth scaler used for scoring of cartilage.

Fig. (6): Dressings. Left, Mold of Vaseline and cotton wool is molded into the lateral contours of the ear and in the postauricular sulcus. Right, head is wrapped with pressure bandage that is taped to the skin at several points to minimize shifting.

Fig. (7): 8 years old boy with bilateral prominent ears. Above left, left oblique view. Above right, right oblique view. Below left, anterior view. Below right, posterior view. Note deficient upper anti-helix and prominent concha.
Fig. (8): Immediate postoperative results. Above left, left oblique view; Above right, right oblique view; Below, anterior view. Note the nicely formed antihelix and conchal setback.

Fig. (9): 20 years old male with mild bilateral ear prominence. Note not fully formed antihelix with shallow concha.

Fig. (10): Above, immediate postoperative results. Below, six months postoperative.
Infiltration of adrenaline/saline solution used in our technique as mentioned above will help in haemostasis and produce hydro-dissection of the skin away from cartilage that is very helpful with the rest of steps of the operation.

The usual access incision used by most authors is the elliptical incision on the posterior surface of the ear. In most instances, it results in what is called telephone ear deformity. In the present study, we insisted on the use of a dumbbell-shaped incision to avoid that problem.

There are more than 170 different techniques and modifications mentioned in literature so far.

When surgery becomes necessary and despite the availability of a wide variety of procedures, the surgeons should be able to select the best features of the most useful technique for correction of this deformity.

In this article, a simple and easy approach is presented for correction of this deformity. This approach provides good results and avoids disadvantages of similar approaches with high level of patients and parents satisfaction and minimal complications. The idea of the technique is based on the finding and the work of Gibson et al. [19].

They noticed on the ability of injured cartilage to warp away from the injured surface led to the Chongchet [12] and Stenstrom [13] techniques. Fry later confirmed this observation and attributed it to “interlocked stresses” that were released by a perichondrial incision [20]. Chongchet’s technique used sharp scoring of the lateral scaphal cartilage (with a scalpel) to form an antihelix [12]. Stenstrom, in contrast, used a rasp to score the antihelix [13]. Stenstrom’s initial technique consisted of anterior scaphal scoring to produce an antihelical fold. He later modified his technique with the addition of a posterior approach. It is important to note that the desired amount of cartilage warping can be adjusted by the extent of the scratching or scoring. Both authors accessed anterior cartilage through a long cartilage rim deep incision that often leaves a step-like deformity on the lateral surface of the cartilage. However, in the present study scoring of cartilage is done through a small cut in the cartilage and by using a tooth scaler so as to avoid the step deformity.

In general, however, full-thickness penetration of the cartilage usually results in a sharper antihelical fold, which is undesirable [21,22]. Luckett’s original procedure to create a new antihelical fold

<table>
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<th>Criteria</th>
<th>Patients</th>
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<tbody>
<tr>
<td>Age, yrs</td>
<td>5-20 (mean–8)</td>
</tr>
<tr>
<td>Gender</td>
<td>5 ♀, 10 ♂</td>
</tr>
<tr>
<td>Hemoglobin %</td>
<td>All above ≥1 l/dl</td>
</tr>
<tr>
<td>Prothrombin concentration</td>
<td>All above 85%</td>
</tr>
<tr>
<td>Follow-up period (mins)</td>
<td>6-12 (mean–8)</td>
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Table (2): Complications.

<table>
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<tr>
<th>Complication</th>
<th>Patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactionary bleed</td>
<td>1</td>
</tr>
<tr>
<td>Keloid formation</td>
<td>1</td>
</tr>
</tbody>
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involved excising a crescentic segment of cartilage posteriorly and reapproximating the remaining edges to each other. However, this creates a sharp, unnatural appearing fold \[23\]. The present study described a technique for cartilage scoring through a small hole in the caudal cartilage that leaves no sharp cartilage folds.

Various suturing techniques will also produce an antihelix. The Mustardé approach is used to create an antihelical fold for correcting the prominence of the upper third of the ear \[1\].

His technique involves mattress sutures placed in the posterior cartilage that incorporate the full thickness of the cartilage and anterior perichondrium (but not the anterior skin) (Fig. 3). This is the suture technique in the present study. Recreation of the curvilinear sweep of the antihelix is important to create a natural “unoperated appearing” ear. This fine point is addressed by Johnson \[24\] who supports the use of Mustardé sutures placed in an oblique, rather than radial, fashion because he believes this will better correct upper pole prominence and also prevent overfolding of the antihelix.

Kaye and Tramier advocate an anterior approach to placing the plication sutures \[25,26\]. Proponents of this anterior approach believe it eliminates the need for extensive flap dissection, thereby minimizing postoperative discomfort and risk of infection and hematoma.

Pilz et al., prefer a modification of the technique originally described by Stark and Saunders, whereby a postauricular skin excision is combined with controlled dermabrasion of the posterior scaphal cartilage surface \[27\]. Scapha-mastoid sutures then create the desired amount of antihelical folding. Pilz et al.’s modification adds any combination of additional scapha-conchal, concha-mastoid, and/or helical sulcus-conchal sutures \[28\]. The above mentioned technique tends to un-naturally obliterate the post-auricular sulcus.

Conchal deformity can be addressed by several methods, including suturing techniques, excisional techniques, and scoring.

In the present study, Conchal deformity is corrected by transposition of auricularis posterior muscle and re-insertion in a more peripheral position on the posterior surface of the cartilage. This leads to conchal setback and produces a more physiologic and more natural appearance than the usual concho-mastoid sutures and also preserves a reasonable post-auricular sulcus.

Conclusion:

The above mentioned study has described a technique that has several advantages and gave good results in dealing with the problem of prominent ear deformity as follows:

- The access skin incision: We prefer to use a dumbbell-shaped incision to avoid the troublesome telephone ear deformity that might complicate the usual elliptical incision.
- Small cartilage caudal incision allows adequate anterior scoring of cartilage avoiding the traditional long cartilage incision that leads to conspicuous step deformity on the outer skin.
- Conchal deformity is corrected by transposition of auricularis posterior muscle and re-insertion in a more peripheral position on the posterior surface of the cartilage. This leads to conchal setback and produces a more physiologic and more natural appearance by preserving the post-auricular sulcus. The later is usually lost when using concho-mastoid sutures to correct the deformity.

REFERENCES


