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ORIGINAL ARTICLE

OUTCOME AND EVALUATION OF PROTRUDING EAR CORRECTION BY ADIPO PERICHONDRIAL FLAP TECHNIQUE

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ABSTRACT

Background: Protruding ear is one of the most common facial and external ear abnormalities and the incidence is 5% of normal deliveries. Protruding ear anatomically characterized by absence of antihelical fold or big conchal bowl or both defects. In general, there are two different main categories for correction of prominent ear; cartilage cutting and cartilage sparing - suturing such as Mustarde's mattress sutures or Furnas' concha-mastoid sutures and sculpting introduced by Chongchet and Stenstrom.

Methods: 14 patients with a total of 24 ears (20 unilateral and 4 bilateral); 6 of which were females and 8 were males, all had prominent ear correction by the same surgeon at Zagazig University Hospital in Egypt by same technique. General anesthesia was applied to all patients and a tight bandage was applied for 72 hours post-operatively, then they were bandaged for 8 days. The skin sutures were removed after ten days of surgery and night bandage was applied for 5 more days.

Results: We followed up our patients for 6-12 months after surgery with mean of 9 months. The operation time was 90 minutes in 1st formal case then it became 70 minutes in other cases. There were no suture extrusion, sinus formation, sharp edges of the antihelix, tissue necrosis, hematoma or recurrent protrusion.

Conclusion: From our point of view, the technique is safe, simple, and easy applicable, less traumatic and it avoids the common complication of other otoplasty techniques because there is no cartilage excision. This technique gives us a smooth rounded antihelix without sharp edges; giving satisfaction to patients and their relatives and semi natural looking antihelix.

Keywords: prominent, ear, protruding, correction, adipo-dermal, flap, outcome



INTRODUCTION

Protruding ear is one of the most common facial and external ear abnormalities and the incidence is 5% of normal deliveries. ⁽¹⁾ this deformity occurs in utero at the 10th week of gestation approximately ⁽²⁾. The abnormal appearance of the ear presents in early period of life because 85% of growth of the auricle occurs at the third year of age ⁽³⁾. These deformities are common in white Caucasians and their ratios are 1:1 for male and female cases ⁽⁴⁾. Although they do cause Functional changes, ear deformities may also cause clinically relevant psychosocial disorders ⁽⁵⁾. The distance between the auricle and mastoid bone is 17-20 mm and the auriculo-mastoid angle is 20-30 degrees. This parameter is considered normal position of the ear, otherwise it will be considered prominent ear theoretically. Prominent ear anatomically characterized by absence of antihelical fold or big conchal bowl or both defects ⁽⁶⁾. The 1st surgical correction of prominent ear was done by Dieffenbach ⁽⁷⁾ in 1845. Then various

techniques have been introduced by different authors with different satisfactory degrees to all surgeons. In general, there are two different main categories for correction of prominent ear; cartilage cutting and cartilage sparing – and some addition as Mustarde's mattress sutures or Furnas' concha-mastoid sutures and sculpting introduced by Chongchet ⁽⁸⁾ and Stenstrom ⁽⁹⁾.

PATIENTS AND METHODS

14 patients with a total of 24 ears (20 unilateral and 4 bilateral); 6 of which were females and 8 were males, all had prominent ear correction by the same surgeon at Zagazig University Hospital in Egypt by same technique.

The mean age of the patients ranged from 5 years to 25 years with 12 years median.

General anesthesia was applied to all patients and a tight bandage was applied for 72 hours post-operatively, the wounds were exposed; then they were bandaged for 8 days. The skin sutures were removed after ten days of surgery and night bandage was applied for 5 more days. Auriculo-

temporal distances of patients were measured pre-operatively and post-operatively to assess the degree of correction at 9th day, one month later, third month, six month and finally after 9 months of correction.

The patients went under photographing through six directions; right, left, right oblique, left oblique, front and behind.

Surgical Technique:

Steps followed for all participant patients in our technique for prominent ear correction:

1) Pre-operative evaluation and surgical planning:

The purpose of surgical correction should be explained and described to the patients and their relatives, also the advantages of technique and possible complication should be cleared.

2- Marking the desired new antihelix:

To get a newly formed antihelix, we did gentle pressure to helix against mastoid area and by using a thin syringe with methylene blue dye to pass it from anterior surface of the auricle through cartilage to posterior surface of the auricle and the new anti-helical fold is marked on the cartilage and on post auricular skin guiding the surgeon during the flap elevation process.

3- Excision of skin and Elevation of the Flap:

Elliptical incision with sharp tips for decreasing post auricular sulcus depth and getting thick flap through soft tissue to perichondrium and incised the perichondrium to the cartilage, and then the flap elevated 2-3 mm distal to marked antihelix.

4- Dissection of mastoid area:

Using a blunt dissector scissors on the post auricular area to reach the level of mastoid fascia.

5- Cutting of post auricular muscle:

Cutting of posterior auricular muscle is a good idea to widen the posterior surface of the auricle allowing good visualization, making an incision through the posterior auricular muscle and suturing the concha with mastoid fixation in good anatomical and physiological place and giving it more beautiful shape.

6- Cross-hatching of dissecting cartilage:

The posterior surface of conchal cartilage is exposed after flap elevation and in adult patient, cartilage scoring is indicated to weaken the tension power of cartilage, making it more malleable and decreasing the resistance.

7- Flap suturing to mastoid periosteum:

By measuring the flap lengths and inferior, the middle and superior one third of the flap are marked, a permanent suture passing through this marking using non absorbable 3/0 polypropylene to mastoid fascia and suture knots buried beneath it preventing its extrusion. We made three sutures separated from each other and tied well and folded the auricle toward mastoid area, we maintain symmetry by measuring the Length and Width, degree of Protrusion, Inclination, Location and Dimension of the auricle preoperative and intra-operatively before tying the sutures

8- Skin closure and dressing:

By simple suture technique with 5/0 polypropylene and soaking gauze with antibiotic ointment touching all contours of ear, sticky elastic bandage used to make gentle pressure on the ear.



Figure (1): pre-operative assessments and measuring the auriculo-mastoid distance by caliper to detect the degree of protrusion and marking the newly desired antihelix by insertion of fine needle from anterior surface to posterior surface of the auricle with methylene blue dye.



Figure (2): Elevation of perichondrium from posterior surface of the auricle 2-3 mm distal to marked antihelix



Figure (3): suturing the flap to mastoid area by polypropylene and simple suture in post auricular skin
Results:

A- Macroscopic Results:

We followed up our patients for 6-12 months post-operatively with mean of nine months. The operation time was 90 minutes in 1st formal case then it became 70 minutes in other cases. There were no suture extrusion, sinus formation, sharp edges of the antihelix, tissue necrosis, hematoma or recurrent protrusion.

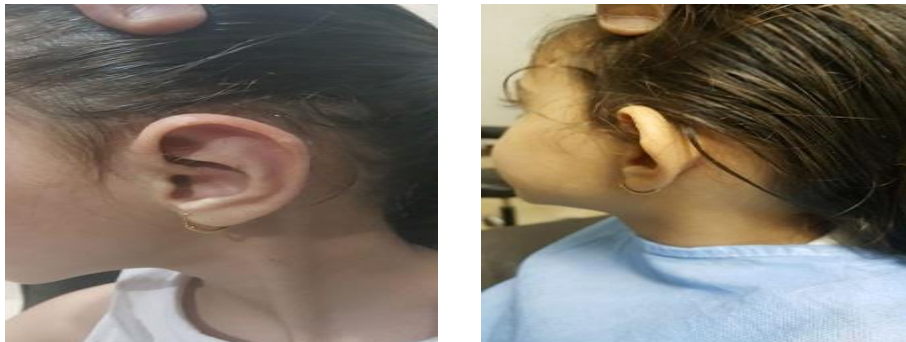


Figure (4): pre and post-operative photographing of case with unilateral (left) prominent ear (side view)



Figure (5) photographing and following up of 7 years male patient preoperative and 6 month post-operatively with desired result. (Frontal view)

B- Statistical Analysis and Results

In this study, the mean \pm SD for patients age were 11.1 ± 4.6 years; males represented about (57.1%) of patients while females represented about (42.9%). The patients with complete absence of antihelix were 71.4%, while the absences of the upper 1/3 of antihelix were about 28.6%. The success rate among the different age group showed in this table.

Table (1): difference in success rate among different age groups of the patients

| Age groups | Success (post-operative natural looking of antihelix) | | X ² | P value |
|-------------|-------------------------------------------------------|-----|----------------|---------|
| | N | % | | |
| < 5 years | 1 | 100 | 2.69 | 0.611 |
| 5-10 years | 5 | 100 | | |
| 10-15 years | 2 | 100 | | |
| 15-20 years | 3 | 75 | | |
| 20-25 years | 2 | 100 | | |

This table (1) shows a high success rate of surgery among all age groups of patients up to 100% success rate except for older patients from 15 years to 20 years old showed 75% success rate, with no statistical significant difference between age groups.

Table (2): Distance between the ear and mastoid area of the studied 14 Patients pre-operative and at first and third months of follow up

| Pre-operative (mm) | Pre-operative (mm) | Post-operative 1 st month (mm) | Post-operative 3rd month (mm) | F test | P value |
|--------------------|---------------------|-------------------------------------------|-------------------------------|--------|---------|
| Patient No. 1 | 20 | 10 | 11 | 28.0 | 0.000 |
| Patient No. 2 | 21 | 12 | 13 | | |
| Patient No. 3 | 28 | 17 | 18 | | |
| Patient No. 4 | 30 | 17 | 19 | | |
| Patient No. 5 | 27 | 16 | 17 | | |
| Patient No. 6 | 22 | 15 | 16 | | |
| Patient No. 7 | 31 | 18 | 20 | | |
| Patient No. 8 | 34 | 20 | 21 | | |
| Patient No. 9 | 25 | 15 | 16 | | |
| Patient No. 10 | 37 | 20 | 21 | | |
| Patient No. 11 | 22 | 14 | 15 | | |
| Patient No. 12 | 26 | 15 | 17 | | |
| Patient No. 13 | 38 | 19 | 20 | | |
| Patient No. 14 | 30 | 19 | 20 | | |
| Total mean | 27.93 ± 5.77 | 16.21 ± 2.97 | 17.43 ± 3.03 | | |

This table shows a high statistical significant difference in level of auriculo-mastoid distance from pre-operative (27.93 ± 5.77) till first and third month post-operative on follow up (16.21 ± 2.97 and 17.43 ± 3.03 respectively).

Table (3): Difference in auriculo-mastoid distance before and after surgery

| Distance | Pre-operative | Post-operative | t-test | P value |
|------------------|---------------------|---------------------|--------------|--------------|
| Mean ± SD | 27.93 ± 5.77 | 17.43 ± 3.03 | 11.99 | 0.000 |

This table shows a high statistical significant difference among studied patients between level of auriculo-mastoid distance pre and post-operative. There was a highly significant difference in auriculo-mastoid distance before and after surgery in patients of this study. 78.6% of the studied patients and their

parents were satisfied with surgery, 71.4% were satisfied with ear appearance after surgery and 85.7% were satisfied with ear symmetry post-operative, with no statistical significant difference between degrees of satisfaction by surgery.

Table (4): the auriculo-mastoid distance (degrees) percentage pre- and post-operative among studied patients.

| | Pre-operative | Post-operative | N. | % |
|----------------------------------------------|---------------------|---------------------|--------------------|----------------------|
| Auriculo-mastoid distance (degrees) | 35 – 45 | 20 – 25 | 4 | 28.6 |
| | 45 – 55 | 20 – 25 | 5 | 35.7 |
| | 55 – 65 | 20 – 25 | 2 | 14.3 |
| | 65 – 75 | 20 – 25 | 2 | 14.3 |
| | >75 | 20 – 25 | 1 | 7.1 |
| Mean ± SD | 52.86 ± 13.9 | 22.71 ± 2.27 | t-test 8.22 | P value 0.000 |

This table shows a high statistical significant difference in level of auriculo-mastoid degrees from pre-operative level ranged from 35 to more than 75 degrees with mean level of 52.86 ± 13.9, reached to post-operative level ranged from 20 to 25 degrees with mean of 22.71 ± 2.27.

DISCUSSION

Congenital anomalies of the auricle occur in 5% of population ^{10}. The auricular cartilage has higher resistance to molding and it might regain its original position. Surgical attempts are used to reconstruct the antihelix therefore, can force the cartilage into the desired position ^{11}.

Correction of Prominent ear deformities has several methods and classified to two main categories: cartilage sparing and cutting techniques, the 1st surgical correction was done in 1881 by **Ely** and in 1910, **Lucket** described that the loop ear is due to absence or underdevelopment of anti-helical fold and developed skin and cartilage excision technique along the whole length of auricle creating a new antihelix ^{12}.

In 1949, Backer developed a new technique by cartilage cutting following normal ear contour and wide exposure of posterior surface of the auricle identifying the landmarks which necessary for the correction, this technique is good for decreasing the auriculo–mastoid distance to less than 20 mm and the auriculo–mastoid angle to less than 30 degrees, but the antihelix was irregular in shape and sharp due to excision part of cartilage at the site of the antihelix ^{13}.

In 1955, modification to Backer technique had been done by **Converse and his colleagues** through minimal cartilage removal at anti-helical region and thinned with a motor-driven brush and rolled together with internal fixation sutures to form the new antihelix getting a smother anti-helical fold than the original backer technique ^{14}.

Mustarde developed a new anti-helical fold by cartilage sparing with no cutting using non-absorbable mattress sutures to recreate the natural shelving curve of the anti-helical fold, blending

into the scaphoid fossa and this technique is easy to learn and had a good result in long term follow up ^{15}.

Concho-mastoid sutures were introduced by **Furnas** in 1968 to decrease the conchal height to avoid cartilage excision, but there were a high rate of recurrent protrusion ^{16}. However, such scoring techniques are associated with shape irregularities and asymmetry secondary to the release of cartilage ^{17}.

In our technique, all patients had prominent ear correction by the same surgeon at Zagazig University Hospital in Egypt by same technique.

The **advantages** of this technique are no skin necrosis, hematoma, or other complications. There is no complication or anterior ear skin dissection from the subjacent cartilage, so the circulation was not disturbed anteriorly and the hematoma formation risk was highly decreased.

Messner and Crysdale (1996) have indicated that "the recurrence was seen in the superior pole in the patients in whom cartilage-sparing otoplasty was used combining Mustarde's, Furnas, and triangular fossa-temporal fascia suture techniques" ^{18}.

The distally based perichondrio-adipo-dermal flap technique was introduced with less complication and good results and 20 patients were included in this study with average age 18.5 years ^{18}.

The new modifications added by us to the distally based perichondrio-adipo-dermal flap technique: Firstly: making cross-hatching of posterior surface of auricular cartilage to all patients regardless their ages to get more rounded antihelix and less resistance in contrary to original technique in which the adult patients were undergoes cross-hatching only.

Secondly: cutting of posterior auricular muscle to widen the undermining of the posterior surface of the auricle which allows excellent visualization.

Thirdly: The numbers of permanent Concho-mastoid sutures are three comparing to two sutures

in other technique to establish good retraction of the auricular cartilage to mastoid area. ^{19}.

The retraction of auricle backward is not only by auricle-mastoid suture but also due to scar formation all over tissue layers included in surgery, making the repair of the auricle stronger and permanent.

The obtained antihelix was acceptable and satisfactory to the surgeon, patients and their relatives, but one case of participant patients in the study had mild post-operative pain and tenderness from little abrasions on antihelix during surgery and he was treated by applying local antibiotic and soothing cream plus daily local dressing with Betadine application.

After 6-9 months of post-operative follow up of two formal cases, there was an increase of 1 to 2 mm in the protrusion of the superior pole of the auricle so, over correction of the superior pole was done later in all cases and we got a good result and desired distance and angle by following up all cases for about 9 months.

CONCLUSION

From our point of view, the technique is safe, simple, easy applicable, less traumatic and it avoids the common complication of other otoplasty techniques because there is no cartilage excision. This technique gives us a smooth rounded antihelix without sharp edges; giving satisfaction to patients and their relatives and semi natural looking antihelix.

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