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Surgical Management of 17 Children with Congenital Protruding Ears by Using a Posterior Approach and the Combination of Chong Chet and Davis Techniques.

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Abstract

Protruding ears represent the most frequent congenital anomaly of the outer ear, affecting almost 5% of the general population, while in 8% of suffering children family predisposition is identified. At the present study we aim at documenting our gained experience through the management of 17 children with pure protruding ears, following the posterior approach and applying a combination of modified Chongchet's and Davis's methods. The study included 17 children (11 females and 6 males) aged 7-16 years old (mean 10.89 years). Protruding ears were bilateral in 16 cases (94,12%) while one child was unilaterally affected (5,88%). Lack of antihelix and cochal hypertrophy were recognized in all cases (100%).

Postoperative follow-up lasted from 21 to 48 months. We recorded both the subjective assessment of the outcome by the patient himself/herself and the meticulous, objective evaluation by a member of the surgical team in both early and mid- term. The result was evaluated as satisfactory in 15/17 patients (88,23%).

In conclusion, familiarization of a skillful, experienced pediatric surgeon with most of the described surgical techniques enables him to select – through a patient-centered, individualized approach- the most appropriate technique or a combination of techniques to provide the patient with an optimal aesthetic result, minimizing the incidence rate of postoperative complications. The rear access is equally safe to the anterior, but it provided better aesthetic results. Finally, with the application of the combination of Chongchet's and-Davis's techniques, an excellent and aesthetically satisfactory result is safely achieved.

Keywords Protruding or prominent ears, Weerda Classification, antihelix, concha, child.

Introduction

Protruding ears (PEs) represent the most common congenital anomaly of the outer ear, which consists of the pinna and the external auditory canal, as a result of abnormal development of the 6th mesenchymal hillock for the formation of the pinna. (Mesenchymal auricular hillock) (1).

It is usually a congenital anomaly inherited as an autosomal dominant trait (2). According to Weerda classification of the pinna malformations, PEs are considered a first-degree malformation (Grade I) (3). It concerns 5% of the population while in 8% of cases a familial predisposition was found. (4,5)

The cosmetic aspect and the concomitant effects regarding the child's self-esteem, socialization and finally the shaping of its personality are essentially the indication criteria for the surgical treatment (6).

The purpose of this study is to share our experience in the management of 17 cases of protruding ears, with posterior approach and a combination of Chongchet and Davis techniques, while reviewing the recent literature.

Material and Methods

The study included 17 children (11 females and 6 males) aged 7 to 16 years (Avg 10.89 years) with congenital protruding ears. After a thorough assessment, cases of syndromic disorder were excluded.

The preoperative evaluation included the classification of the malformation of the antihelix, and the cartilage of the pinna as well as the conchal hypertrophy. The distances of the upper and middle third of the helix from the temporal bone as well as the lower third of the unilateral mastoid process were noted. The severity of the condition was documented by taking preoperative photographs with anterior, posterior and side (left-right) shots.

The surgery was scheduled and under general endotracheal anesthesia, after the standard preoperative examination, in all patients. Perioperative chemoprophylaxis with second- generation cephalosporin was also given. The surgical methodology included the following steps:

1) marking the fold of the emerging neo- antihelix.

2) demarcation of the concha hypertrophy and marking of the anatomical limits of the excision (Figures 1,2).

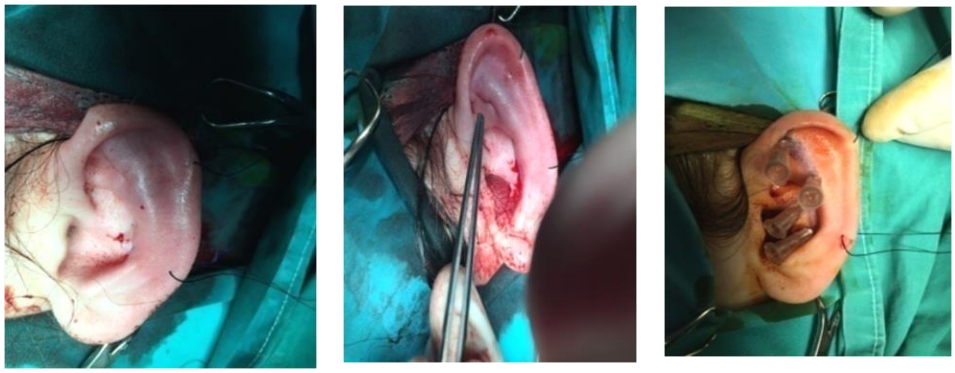
Figures 1, 2. Marking of the fold of the neo- antihelix that is under formation and demarcation of the concha hypertrophy.

3) fusiform incision on the posterior surface of the pinna, which includes the above markings.

4) exposure of the posterior surface of the perichondrium from the superficial skin and subcutaneous tissue, according to Stenstrom and Hefner.

5) incision on the posterior surface of the cartilage along the newly formed neo- antihelix, without including the anterior surface of the perichondrium.

6) folding of the cartilage at the site of its cross section and then reproduction of the antihelix. Stabilization with 3 horizontal mattress stitches from monofilament non-traumatic suture – polypropylene 3/0. The horizontal side of each stitch was 10 mm while the vertical sides were 15 mm each (Figures 4,5,6).



Figures 4, 5, 6. Folding of the cartilage and reproduction of the antihelix

7) removal of cartilage tissue from the posterior surface of the concha in a nephroid shape, without cutting the anterior surface of the perichondrium. This is followed by suturing the wound edges of the cartilage and attaching it to the periosteum of the unilateral mastoid process at the same time, with interrupted sutures of non-traumatic monofilament suture- polypropylene 3/0, without passing through the anterior surface of the perichondrium (Davis technique) (Figure 6).

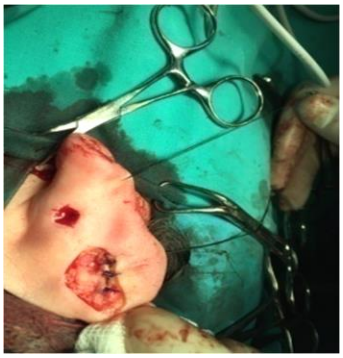


Figure 6. Suturing of the wound edges of the concha cartilage, with interrupted sutures of non-traumatic monofilament polypropylene 3-0, without passing through the anterior surface of the perichondrium.

8) thorough hemostasis using bipolar diathermy. No drainage was placed in any case.

9) suturing of the skin with an absorbable suture (Vicryl rapide 5/0) and finally bitemporal bandage with an elastic bandage wrap.

Results

In 16 cases (94.12%) the condition was bilateral and in 1 (5.88%) the congenital anomaly was located unilaterally (one case left and one right). In all cases (17/17) the lack of antihelix and hypertrophy of the concha coexisted.

Awakening of all patients was easy after the operation. On the 1st postoperative day, the surgical wound was assessed and the patients were discharged from the hospital. Patients continued oral antibiotic treatment with second-generation cephalosporins for five days while receiving non-steroidal anti-inflammatory drugs (NSAIDs) for three days, starting from the evening of the day of surgery. We did not experience any complications such as hematoma, bleeding, purulent drainage, skin necrosis or perichondritis in any patient. Follow- up of the patients was after 12 days, where the bandage was removed. (figure 7).

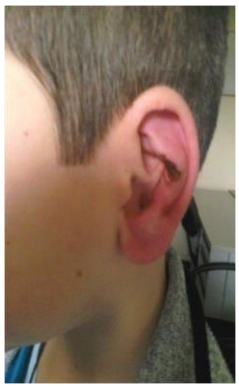


Figure 7. Evaluation of the young patient on the 10th postoperative day.

Finally, when discharged, all young patients were advised to wear the special "tennis head bandage" for 3 weeks 24/7 and then for another 3 weeks only during sleeping time.

Periodic follow-up lasted from 21 to 48 months. Both the subjective assessment of the result by the little patient himself and the objective assessment by a member of the surgical team were recorded (Figures 8.9).

Figures 8, 9. Postoperative follow- up

The collected data of the early as well as the long-term subjective and objective evaluation are shown in Tables 1 and 2 respectively.

Subjective rating scale	Subjective evaluation of the result (sense of satisfaction)	Early assessment (after 4 months): number of patients	Farther assessment (in 24-48 months): number of patients
0	Worse than the preoperative image	0	0
1	Minimal or no "obvious" improvement	0	0
2	Small improvement	2	2
3	Great improvement	2	2
4	Excellent aesthetic result	13	13

Table 1. Subjective evaluation of the patients themselves

	Evaluation Parameter	Early assessment (after 4 months): number of patients	Farther assessment (in 24-48 months): number of patients
1	Visible scars	1	0
2	Asymmetry	0	0
3	Remaining and with smooth formation antihelix	17/17	15/17
4	Concha size less than or equal to 1.5 cm	17/17	17/17
5	Distance of the upper pole of the pinna from the temporal bone less than or equal to 1.5 cm	17/17	15/17
6	Distance of the middle of the pinna from the mastoid process less than or equal to 2 cm	17/17	17/17
7	Suture externalization	0/17	2/17
8	Foreign body reaction	0/17	1/17

Table 2. Objective assessment by our surgical team

Discussion

The non-formation of the antihelix, the hypertrophy of the concha and their coexistence constitute the causative spectrum of the protruding ears (7,8). In all cases of the present study, both the lack of antihelix and the hypertrophy of the concha coexisted. In 16 of the 17 cases of our study (94.12%) the disease affected both pinnas. A similar effect was recorded by Anesti et al, who found that in 96/104 cases of their study (92.31%) the dysplasia had bilateral localization (2). The full development of the cartilage of the pinna, at the end of preschool age, is an essential parameter to determine the ideal age for the treatment of PEs (9,10).

Matsuo believes that congenital protruding ears can be treated conservatively due to the elasticity of the cartilage of the affected pinna. He therefore believes that if a special splint is placed on the affected pinna during early infancy, its anterior inclination will be fixed (11). This is a painless and safe procedure. However, the conservative approach is not completely acceptable because it is believed that PEs improve to some point without intervention, over time. A double-blind study is therefore required to determine the extent to which the splint on the affected pinna contributes. Remaining issues are the age of onset of the conservative treatment, its duration and finally the permanence of any improvement (12).

The first publications of applied techniques for the management of PEs were made by Dieffenbach in 1845 and Ely in 1881 (13,14). Since then, more than 150 techniques have been described for the surgical management of PEs (15,16,17). The goals of the surgical treatment set by the surgical team are exactly in line with the criteria described by McDowell and were the formation of an antihelix, stable and without tension or with a mild tendency as well as the reduction of the height of the concha (18,19,20).

Additional goals were the reduction of the distance of the helix from the temporal bone to its upper and middle third and from the mastoid process to its lower third - to make it less than or equal to 3 cm, the symmetrical result, and no visible scars (19,20) .

Access can be by either anterior or posterior incision (21). Anterior access (Chongchet technique) is considered very popular in the UK as it is chosen by 73% of surgeons (2).

The differences regarding the invasive methodology for the formation of the antihelix concern:

- Stabilizing the fold of the cartilage with interrupted sutures, respectively with the position of the antihelix (Mustarde technique) (22),
- The cross-section of the cartilage initially according to the position of the neo- antihelix and then the stabilization of this fold with sutured [technique applied by Chongchet (23), Conversen et al (24), Crikelair and Cosman (25), and finally Tolhurst (26)] This is the methodology chosen by the surgical team in all cases of the present study.
- Grinding or thinning the cartilage according to the position of the neo-antihelix and then stabilizing this fold with sutures (Stenstrom, Heftner technique) (27).

We have not had any cases with serious complications during the short postoperative period, such as bleeding, perichondritis, wound perforation, necrosis of the skin and the underlying cartilage. In particular, skin necrosis concerns 4.8% of cases according to Anesti et al (2).

We believe that avoiding excessive stripping of the posterior surface of the cartilage, performing general anesthesia in children against topical injection of bupivacaine with adrenaline, avoiding the administration of a non-steroidal anti-inflammatory drug as a painkiller during the first twelve hours postoperatively -as our surgical team acted- , the early recognition and drainage of a developing hematoma and finally the avoidance of a tight bandage are essential parameters for the prevention of necrosis. We took advantage of the report by Messner and Crysdale on the need for medium-term postoperative follow-up for about 4 years, as in 1/3 of their cases the immediate surgical result was largely lost (28).

Therefore, during the reassessment of the patients of the study, it was found that in 2 of the 17 cases (11.76%) the formed antihelix was not maintained satisfactorily. Based on both objective and subjective criteria for assessing the ultimate surgical outcome, this was satisfactory in 15/17 of our patients (88.23%), a percentage that is compatible with corresponding studies (29.30).

The need for reoperation ranges from 0.17-10% (2). Mustarde refers to the results of 600 cases of PEs in a twenty-year period, applying the method he invented. It therefore was found that reoperation was required in only 10 cases (0.12%) (22). Calder and Naasan treated 562 cases with anterior access and had 45 relapses (8%) (30).

Niamtu considers that posterior access has an advantage over anterior access due to the reduced risk of complications such as skin necrosis or hematoma, but lags behind in maintaining the surgical outcome (17). He found that the newly formed neo- antihelix was lost in 24% of patients who underwent the Mustarde technique.

On the contrary, only in 10% of patients treated according to the principles of the Chongchet technique recurred. Regarding the increased impact of reoperation of the subgroup that underwent the Mustarde technique, ie 24% versus 11.76% of our study, we estimate that the combination initially of the cartilage cross section and then the stabilization of its fold with sutures ensures its prevention and the maintenance of the neo- antihelix. In other words, we consider the thinning or the cross-section of the cartilage before its folding as an essential parameter for the formation of a stable neo- antihelix. As a second important parameter regarding the maintenance of the result, we consider that it is the typical application of the technique described by Davis by removing the excess concha in the shape of a nephroid and then by fixing the reduced concha in the periosteum of the respective mastoid process (29,31,32).

The opposite conclusions, as shown in Table 3 regarding the possibility of developing complications, were reached by Esharri San Martin et al while dealing with 25 cases of PEs, of which in 11 they performed posterior (group A) and in 14 anterior access (group B) (29).

Complication/ Group	Group A (posterior access)	Group B (anterior access)
Sutures externalization	3/14(21%)	9/11(82%)
Foreign body reaction	1/14(7%)	1/11(9%)
Relapse	1/14(7%)	4/11(28%)

Table 3. Comparative postoperative results of groups A and B of the Esharri San Martin et al study.

In 2/17 cases of our study (11.76%) the sutures were externalized, while based on the report of Esharri San Martin et al the corresponding percentage was 21%. We did not find that suture externalization is associated with loss of surgical outcome in neither of the cases (29,33). Shehab El-Din treated 23 patients with PEs with posterior access. The only difference from the technique we applied is that they thinned the cartilage instead of applying the cross section, while they found externalization of the sutures in 2/23 patients (8.69%) (34). They associated this complication with the resulting loss of the formed antihelix respectively to the upper pole of the pinna (36). We believe that the delayed manifestation of this complication has a less aggravating correlation with the development of recurrence.

Conclusions

Based on the experience gained and the data of the extensive revision of the relevant literature, we came to the following findings:

- By familiarizing a skilled and experienced surgeon with most of the described techniques for the management of PEs, he is given the opportunity to choose - individually - the most appropriate technique or combination of techniques, in order to give an optimal aesthetic result, minimizing the possibility of complications.
- We believe that the posterior access is equally safe compared to the anterior, but it has an advantage over it in achieving an optimal aesthetic result.
- With the application of the combination of Chongchet and Davis techniques, an excellent and stable result is safely rendered, from an aesthetic point of view.

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