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Neonatal molding in deformational auricolar anomalies

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Abstract. – INTRODUCTION: Congenital auricular anomalies can be categorized either as malformational or deformational. The first are characterized by a partial absence of the skin or cartilage resulting in a constricted or underdeveloped pinna and require surgical correction. Deformations are characterized by a misshaped but fully developed pinna and are best treated by auricular molding.

AIM: Authors want to present their case load in treatment of infants affected by deformational auricolar anomalies and describe their techniques using early splinting for congenital auricular deformities, like prominent ear, lop ear, constricted ear, Stahl's ear

PATIENTS AND METHODS: Between 2009 to 2011, in Maxillo and Oral Surgery Unit, a nonsurgical technique was used to treat 22 ears affected by deformational anomalies in 12 patients soon after birth. Four patients were female. This kind of nonsurgical correction of the deformed auricle was performed on lop ears (n=6), constricted ears (n=8), prominent ears (n= 4), Stahl's ear (n=4). Children more than two months old were also excluded. The mean of treatment time was 5.5 weeks.

RESULTS: according to the Authors and the parents 100% of treated auricles improved. Improving at the end of the molding treatment was observed in 18% of the auricles, but recurrence to one year of stopping treatment. There were not complications caused by this procedure.

CONCLUSIONS: The nonsurgical molding has the advantage to correct at a very early age a cosmetic abnormality, giving a natural and in the most of the time a satisfactory results, with a prevalence rate of complications of much less than surgical corrections.

Key Words:
Auricular anomalies, Nonsurgical correction, Embryologic development.

Introduction

Congenital auricular anomalies can be categorized either as malformational or deformational. Malformations result from embryologic maldevelopment, that occurs between the fifth and the ninth gestational week[1]. The fetal auricular cartilage framework is fully developed by the ninth gestational week[2], so from the ninth week of gestation could be arise the less severe forms of congenital auricular anomalies. In other words malformations are characterized by a partial absence of the skin or cartilage resulting in a constricted or underdeveloped pinna, whereas deformations are characterized by a misshaped but fully developed pinna[3]. Malformational auricular anomalies generally require surgical correction during childhood or adolescence, on the contrary deformational auricular anomalies have a full complement of a chondrocutaneous components that can be manipulated to a normal shape, so deformational anomalies are amenable to early ear splinting. Deformational auricular anomalies can be classified in three types: type 1 – vertically deformed ears, where the pinna is mainly affected along the vertical axis; type 2 – horizontally deformed ears, where the limitation to the external ear development is along the horizontal axis; type 3 – focally deformed ears, divided in two sub-types: type 3a – inversely folded helix caused by a single imprint, type 3b – deformity caused by multiple imprints (as kinking of the helix or pinched helix)[4].

The Authors present their case load of 12 infants affected by deformational auricolar anomalies by splintage of 22 ears.

Materials and Methods

Between 2009 to 2011, in Maxillo and Oral Surgery Unit, a nonsurgical technique was used to treat 22 ears affected by deformational anomalies in 12 patients soon after birth. Four patients were female. This kind of nonsurgical correction of the

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Table I. Parents' estimation of results.

	Excellent	Improved	Poor improved	Total	Recurrence
Lop ear	6	0	0	6	0
Costricted	4	4	0	8	0
Prominent	3	1	0	4	4
Stahl's ear	4	0	0	4	0
Total	17	5	0	22	4
%	77.27	12.73	0	100	18

deformed auricle was performed on lop ears (n=6), constricted ears (n=8), prominent ears (n= 4), Stahl's ear (n=4). Children more than two months old were also excluded. The ages of the children at the beginning of the procedure were between 2 and 42 days, most were into the first week of life. Parents were thoroughly informed about the proposed treatment, other alternatives, and the possibility of partial or total failure in achieving the desired treatment result. After that we started ear splinting as soon as possible. We used a lead-free soldering wire inserted within a suction catheter. We curved it according to the desired shape of the helix and placed on the anterolateral surface of the auricle. Then we fixed to its place by surgical tapes (Steri-Strip) that we used also to position the auricle closer to the scalp. Follow up clinical evaluations were performed every seven days for 5 weeks or more, during these the molding materials and fixation tapes were removed, cleaned, remolded and replaced. The splint was adjusted every week according to the gain obtained. The splint was applied with no anesthesia. After achieving satisfactory correction, splintage was continued thereafter until correct shape was stable. In total the period of splint application ranged between 5 and 8 weeks.

In case of prominent ear, after the stopping molding treatment by splint the patients wear elastic band during the night for one month. The following inspection is performed six months after completion of molding.

Statistical Analysis

The results are mean ± SD. For statistics we used the SPSS package, version 15 (SPSS Inc., Chicago, IL, USA). Paired *t* test was analyzed. $p < 0.05$ was considered statistically significant.

Results

The rates of the end results given by parents and the Authors are summarized in Table I and Table II. We asked parents to express their approval rating giving a score from 0 to 10 (10-8 = excellent; 8-6 = improve, 6-4 = poor improve) (Table III).

According to the parents, 100% of treated auricles improved of which 77.27% achieved excellent results and 12.73% significantly improved[5-7]. In 18% of the auricles they observed improving at the end of the molding treatment, but recurrence to one year of stopping treatment. According to the Authors 100% of treated auricles improved of which 68.18 achieved excellent results and 32.82% significantly improved. In 18% of the auricles they observed improving at the end of the molding treatment, but recurrence to one year of stopping treatment.

The doctors' mean rate was 8.73 (± 1.23), while parents' is 9.23 (± 0.98). The differences between doctors and parents' s rate were compared by paired *t* test. The difference between the two groups of assessors was significative ($t = -5{,}37$, $p < 0.05$).

Table II. Authors' estimation of results.

	Excellent	Improved	Poor improved	Total	Recurrence
Lop ear	5	1	0	6	0
Costricted	6	2	0	8	0
Prominent	0	4	0	4	4
Stahl's ear	4	0	0	4	0
Total	15	7	0	22	4
%	68.18	32.82	0	100	18

Table III. Parents and doctors score.

Parents	Doctors
10	10
10	9
9.5	9
10	10
10	9.5
7	6
9.5	9.50
9.5	9
10	9
10	10
10	9.50
10	10
8.5	8
8	7
8.5	7.5
8	7
7.5	6.50
8	8
10	10
10	9.50
9	9
10	9

There were no dermatitis, ulcers, necrosis or other complications caused by this procedure. Three demonstratives cases are presented in Figures 1, 2, and 3.

Discussion

There is no consensus concerning the true incidence of abnormally shaped ears; the true incidence of congenital auricular anomalies is underestimated, because existing literature not include less severe anomalies[2]. The causes of described deformities are variable and include internal/external forces applied on the auricles during the prenatal period. In these children splintage is both prophylactic and curative.

The neonatal ear is soft and moldable. A few days after birth, the auricle becomes more elastic and firm. It is postulated that this change is attributable to the decrease in levels of circulating estrogen that occurs during the first 6 weeks after birth, subsequently lower levels of hyaluronic acid[5,6]. In fact, cartilage elasticity is dependent on the proteoglycan concentration[7]. Hyaluronic acid, an important constitute of auricular cartilage, is increased by estrogen, and causes the auricle to be malleable during the prenatal and the neonatal periods[8,9]. Particularly, circulating levels of free oestradiol are highest during the first 72 h after birth and decrease rapidly thereafter. Therefore, the best results are obtained when treatment is started early. In addition in the first period of life, newborns do not have the dexterity to dislodge ear splints, the head is mostly still, and the skin sweats little so adhesive tapes stick well. Since 1980[10] many kinds of splints, stents and molding materials have been described for early nonsurgical correction of deformational auricular anomalies: Reston foam[11], dental material, a kind of gutta percha[12,13], lead-free soldering wire inserted within an suction catheter[14], a vinyl polysiloxane impression material Putty Soft[15]. The Authors consider some features to be of primary impor-

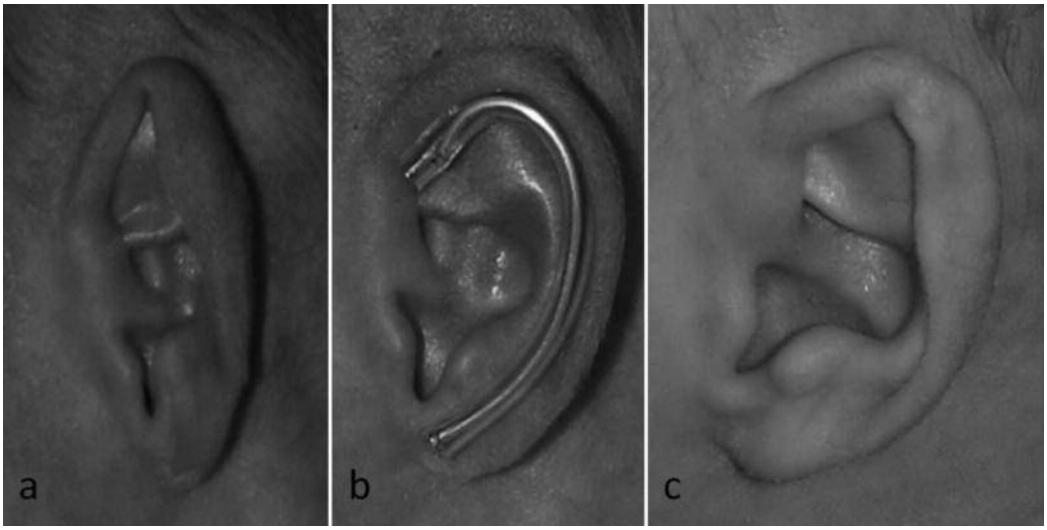

Figure 1. ***A,*** Pre-treatment vertically deformed ears. ***B,*** Example of forcing the helical rim upward. ***C,*** Post-treatment results.

Figure 2. ***A,*** Pre-treatment horizontally deformed ears. ***B,*** Post-treatment results.

tance for the adequate choice of molding material: it should be enough soft and light to avoid the creation of a pressure ulcer, nonirritating to avoid arising dermatitis, also it should be not expensive and readily availed. The molding material that we have choosen fulfills these criteria, also it stands out for the malleability, allowing to make really a splint custom made, for achieving the desiderate shape.

Surgical tapes (Steri-Strip) have the function to hold the stent in adequate and stable position, molding the helical and antihelical shape and to

Figure 3. ***A,*** Deformed ears with inversely folded helix. ***B,*** Focally deformed ears with multiple imprints.

position the auricle closer to the scalp. Particularly in vertically deformed ears (Figure 1a), interest was applied primarily in forcing the helical rim upward; in horizontally deformed ears (Figure 2a), the aim of the splintage was to 'push out and back' the auricular cartilage to recreate normal distance and proportions between the concha and helical rim (Figure 2b). In focally deformed ears with inversely folded helix (Figure 3a), we treated the deformity by interposition of the splint between helix and antihelix, thus recreating the groove. In focally deformed ears with multiple imprints (Figure 3b), the splint was shaped to counter act the deformed helix in different directions as required. When anterior protrusion of the scapha was associated, correction was obtained by affixing the pinna to the mastoid region with surgical tape, thereby reducing the auricular-cephalic angle. In some more severe deformities, such as severe prominent ear, the splint alone is not enough to correct ear, but it can prevent the evolution of deformation and thus allows parents to be able to wait with more tranquility, 5 years, the correct age for the surgical treatment. In fact these families are uniformly concerned with the effect that prominent ears may have on child's self image.

Conclusions

The nonsurgical molding has the advantage to correct at a very early age a cosmetic abnormality, giving a natural and in the most of the time a satisfactory results, with a prevalence rate of complications of much less than surgical corrections. So it could be prevent the embarrassment and potential negative psychological effect caused by this deformation at the time of primary school and could be avoid later surgical procedures.

According Authors and parents this technique improve the auricular shape reaching excellent results in almost of patients.

We believe that the fundamental prerequisite for a good aesthetic result to be a proper diagnosis of deformational auricular anomalies and a correct timing of treatment. So neonatal pediatricians and and consequently to a proper treatment.

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