

Nonsurgical Treatment of Prominent Ears With the Auri Method

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Objective: To present and test a new method for conservative correction of prominent pinnae in children aged between 2 weeks and 5.5 years.

Design: Prospective study on 56 pinnae from 44 children aged between 0.25 and 5.5 years, treated with the Auri method, which consists of a clip and a strip. The clip is a specially designed plastic clamp used during the night for an average of 4.3 hours per night. It squeezes the cartilage and makes a fold at the place of the missing anthelix. The strip is a double adhesive fixture used during daytime for an average of 8.9 hours per day. To test the efficiency of the treatment objective (thickness and stiffness of the pinna, cephaloauricular distance, and photo-documentation) and subjective (investigators' and parents' judgment of the shape and grade of the correction of the pinnae) parameters have been applied.

Results: Of the children, 38 (86%) achieved good to fair correction of their pinnae. Of the parents, all 44 (100%)

were satisfied with the treatment and 35 (80%) reported good to fair correction of their child's pinnae. Slight complications were observed in 13 children (30%): 10 (23%) had temporary irritation of the skin of the pinna and 3 (7%) had slight temporary squeeze marks of the pinnae. Of the 44 children, 31 were evaluated 10 months after completing treatment, and the pinnae of 38 children (86%) maintained their corrected shape.

Conclusions: Correction of the prominent pinna can be done by the new nonsurgical Auri method in children aged between 0.25 and 5.5 years, which provided good to fair results in 89% of pinnae in this study. The method is efficient in the short term and easy to use by the parents, but it requires long-term motivation of the parents as well as the child. The child can be treated at early age, avoiding psychosocial and cosmetic problems during school age.

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PROBLEMS, COMPLICATIONS, and primary results of a new nonsurgical treatment of prominent ears by applying a new device on children aged between 2 weeks and 5.5 years are described in this study. Furthermore, some new methods of evaluation and documentation of efficacy on nonsurgical treatment of prominent ears are described.

BACKGROUND

Prominent pinnae is a very common condition in the white population. In the Asian population, prominent ears is the third most frequent auricular deformity and appears in 5.5% of all newborns.¹ 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.

In Denmark, with a population of 5.1 million, approximately 2000 children

(most between ages 8 and 10 years) per year are treated for prominent ears by surgical correction with local anesthesia in otolaryngological and plastic surgical departments or in private practice outside hospitals. 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.² Surgery on prominent ears in young children is, however, not recommended, but a nonsurgical treatment of prominent ears may presumably be a good solution to the problem.

It has been known for several years that outer ear deformities can be permanently corrected with nonsurgical treatment, especially in neonates and infants. However, reports mainly describe successful nonsurgical treatment of various auricular deformities, including only a few cases of prominent pinnae in children aged up to 14 years.³ To our knowledge, no ar-

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Table 1. Age and Sex of All Attending Children and Children Who Discontinued and Finished Treatment

	No.	Age, y			Sex, M/F
		Mean	Median	Range	
Total attenders	70	2.1	2.5	0.0*-5.5	36/34
Discontinued treatment	26	1.8	1.5	0.5-5	13/13
Pulled off the device	15	1.3	1.1	0.5-2	7/8
Lack of patience	6	2.9	2.5	0.5-5	4/2
Fear of swallowing	1	0.7	0.7	...	0/1
Skin irritation	3	2.2	2.0	2-2.5	2/1
Squeeze marks	1	0.8	0.8	...	0/1
Finished treatment	44	2.2	2.0	0.0*-5.5	23/21
On 1 pinna only	32	2.8	2.0	0.2-5.5	19/13
On both pinnae	12	1.4	1.5	0*-3	4/8

*Two weeks.

ticle describes nonsurgical treatment of prominent pinnae only.

Several methods for nonsurgical treatment of prominent pinnae and other deformities of the pinna, such as Stahl ear, lop ear, cup ear, and cryptotia, have been described, but apparently none of the methods have become a routine method in daily clinical practice.

PREVIOUS REPORTS

Different mechanical devices have been used and fixed on the patient's outer pinnae for 24 hours a day over a period of weeks to months. Surgical tape with another material, surgical tape alone, and different forms of metal are 3 such devices.

Surgical Tape With Another Material

Some authors have used surgical tape in combination with different soft, elastic, and moldable materials, such as thermoplastics, synthetic urethane foam (Reston foam), dental compound (Aluwax), or absorbable gelatin sponges (Gelfoam).^{1,3-8} To hold the pinnae in position when using these soft materials, surgical tape (eg, Steri-Strips) was used. Yotsuyanagi et al³ succeeded in nonsurgical correction of different auricular deformities, using thermoplastic splints on 50 pinnae of 45 patients aged 1 to 14 years. Twenty-seven pinnae were treated with excellent results, and 7 pinnae improved. Only 3 prominent pinnae were included in this series. Brown et al⁴ corrected abnormal folding of 5 pinnae by splinting with dental compound (Aluwax), heated under hot tap water and molded to achieve the desired normal contour. Only 1 case was a prominent pinna. Kurozumi et al⁵ applied Reston foam to splint a lop ear, and Nakajima et al⁶ splinted 5 Stahl ears after manual correction of the deformity with good results. Merlob et al⁷ described the results and follow-up of splinting therapy with Velfoam—a special soft material—in 30 neonates treated during the first 2 weeks of life. Good results were achieved in 85% of the patients and sufficient results in the remaining 15%. Nine children had protruding pinnae⁷; the others had cup ears,⁹ lop ears,⁶ and Stahl ears.⁵ Bernal-Sprekelsen and Krummel⁸ used a combination of splinting with dental material and Steri-Strips to correct

43 deformities of the pinnae of 31 infants with good results. Only 5 pinnae were prominent. Matsuo et al¹⁰ reported a series of 150 patients in whom temporary taping with dental material (gutta percha) was used. Taping was begun within the first year of life. Good results were obtained when treatment was begun within the first days after birth, but the authors did not believe that taping in older infants was very successful. Only a few cases were prominent pinnae.

Surgical Tape Alone

Some other authors used surgical tape alone to correct ear deformities in neonates and infants. Matsuo et al¹⁰ applied taping alone in few cases. Muraoka et al⁹ studied the effect of taping pinnae in 5 children aged 5 months to 5 years. They left the tape in place for several weeks and even up to several months and stated they had good to fair results. Most children had Stahl ears. Only 1 had prominent ears.

Metal Wire With Another Material

Other authors¹¹⁻¹³ have used metal wire coated with polyethylene in combination with tape to either bend or stretch the ear cartilage according to the characteristics of the ear deformity. Tan et al^{11,12} used silver soldering wire inside a polyethylene catheter and Steri-Strips. Matsuo et al¹³ used a paper clip and the tube of a scalp vein puncture needle. Jemec¹⁴ used a rectangular silicone-coated metal wire.

METHODS

PATIENTS

After the announcement of the start of a scientific trial for prominent pinnae in the local newspaper, 70 children aged between 2 weeks and 5.5 years were initially included in this prospective trial (**Table 1**). The inclusion criteria were typical bilateral prominent pinnae with flat anthelix, abnormally long cephaloauricular distance, and desire of the parents to have their children treated, as well as the ability and willingness for regular checkups of the children during and after the treatment.

Forty-four children finished the trial, but 26 children discontinued treatment for various reasons (Table 1). The mean age (1.5 years) of the dropout patients was notably younger than that of children who fulfilled the treatment. Fifteen of the youngest children pulled the devices off because the parents could not motivate their children to keep them on.

Six parents were not motivated for the long-term treatment and withdrew their children after 2 to 3 weeks. They did not have the patience every day to mount the devices on the children's pinnae. One of the parents withdrew her child, fearing that the child would swallow the device (Table 1). Three children dropped out because of irritation of the skin behind the pinna, and 1 child dropped out because of the temporary superficial squeeze marks on the back of the pinna due to the incorrect use of the device by the parents (Table 1).

Nonsurgical treatment was completed on 44 children with a mean age of 2.2 years (Table 1). The original plan was to apply the devices on 1 pinna only on each child and use the other pinna as the control, in particular, to observe an eventual spontaneous correction of the opposite prominent pinna during the

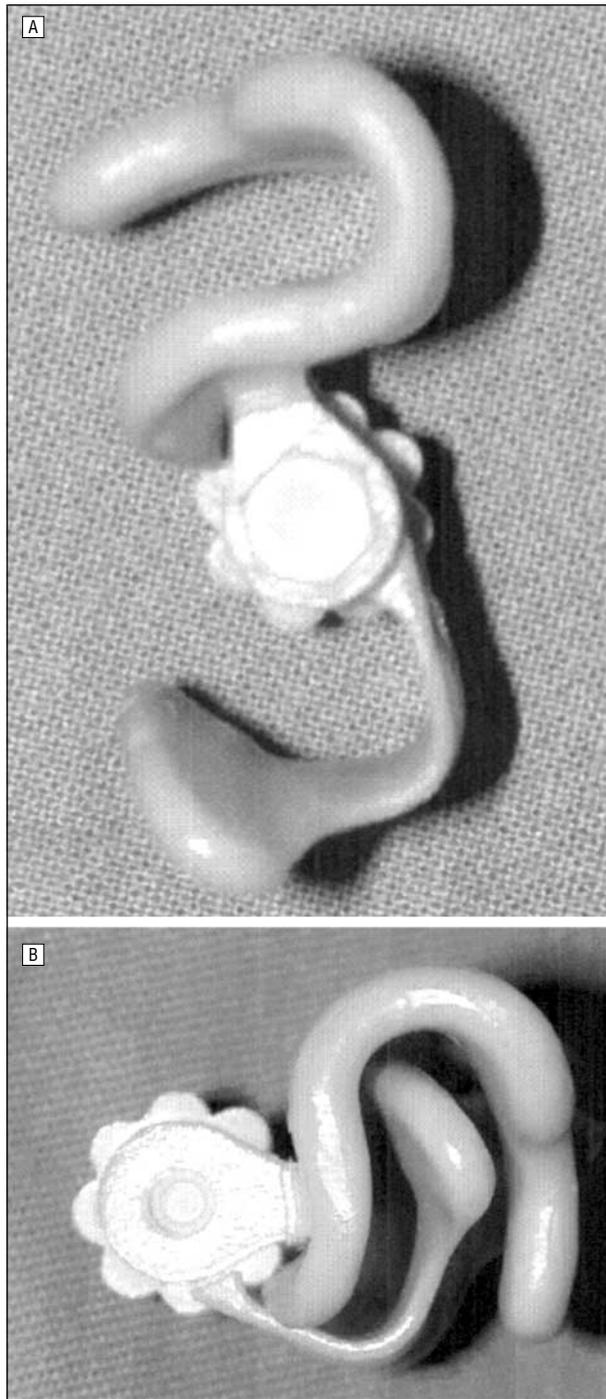


Figure 1. Auri clip in side view. A, Open; B, closed.

treatment period. This was possible in 32 of the children (Table 1). In the other 12 children, both pinnae were treated because the parents could not accept treating only 1 ear at a time.

Evaluation of efficiency of treatment was performed on each pinna separately. Thus, 56 pinnae of the 44 children were studied.

METHODS

The method used is called the Auri method and consists of 3 parts specially designed for the treatment of prominent pinnae: Auri clip, Auri strip, and a protective film (Cavilon No

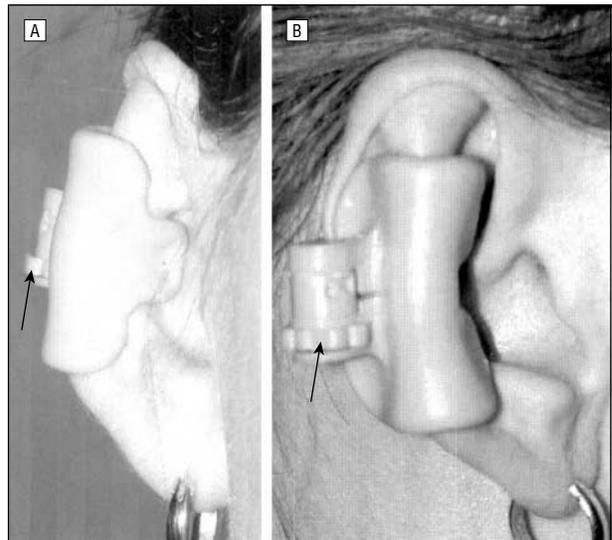


Figure 2. Auri clip is placed on the right pinna and fixed by the screw (arrows). A, Frontal view; B, side view.

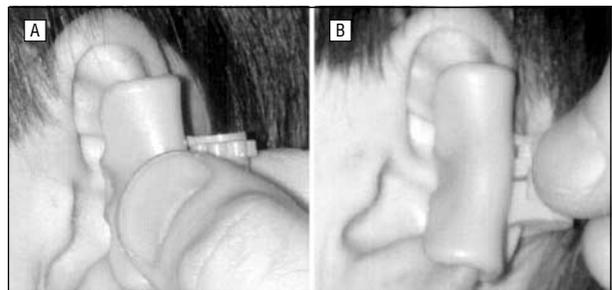


Figure 3. Placement of the Auri clip on the pinna. A, The 2 parts of the clip are pushed together from both sides of the pinna by 2 fingers, creating an anthelix. B, The clip is fixed in the position by tightening the screw with the fingers.

Sting Barrier Film). A physician showed the parents how to use the Auri method on their child's pinnae.

The clip is mainly to be used in the night and is a specially designed clamp made of plastic that bends, squeezes, and stretches the cartilage at the same time and makes a fold in the pinna at the place of the missing or flat anthelix. It measures $33 \times 28 \times 20$ mm and consists of 2 parts linked together with a swing connection—one part behind and the other part in front of the pinna (**Figure 1**). The pressure on the pinna can be adjusted individually (**Figure 2**). By pushing the 2 parts against each other with the fingers, an anthelix is made on the pinna (**Figure 3**). In this way the clip is fixed on the ear, and it is usually difficult for children to pull it off. Usually, it will not fall off during normal activities. The parents can place the clip themselves.

The strip is a double adhesive fixture, which is made of hydrocolloid material (**Figure 4**). It is used in the daytime and is almost invisible. It measures $52 \times 25 \times 0.1$ mm and is placed behind the pinna. On both sides, the adhesive material is covered with silicone paper. After removing one of the silicone papers, the fixture is put behind the pinna. Then the other piece of silicone paper is removed. The strip is placed behind the pinna with a free adhesive side outwards. By folding the pinna, an anthelix is made permanently as long as the adhesive material is strong enough to keep the fold in the pinna (**Figure 5**). Each patient should use 1 strip a day per pinna.

The protective film is a polymeric solution, which forms a film when applied as a spray on the skin. The film is placed

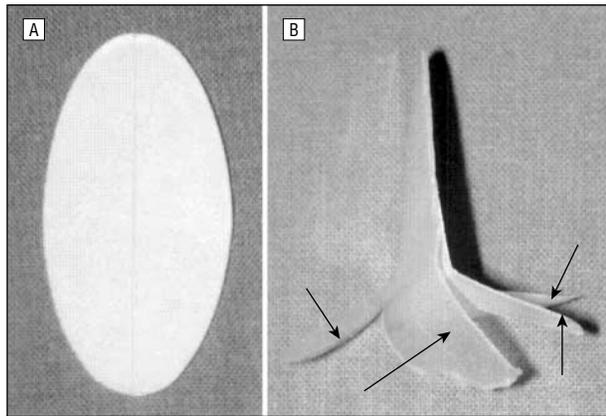


Figure 4. The Auri strip. A, The strip is a double adhesive material covered with silicone paper on both sides. B, The silicone paper (short arrows) is partly separated from the double adhesive tape (long arrow).

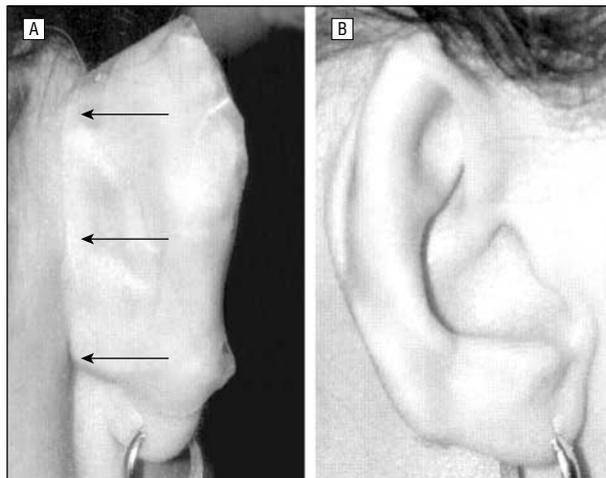


Figure 5. Placement of the Auri strip on the pinna. A, The Auri strip is placed on the posterior aspect of the pinna, which will be folded backward (arrows). Then, the strip glues itself behind the pinna, creating an anthelix on maximum bent position (arrows). Note that the strip is hardly seen. B, The Auri strip functioning behind the pinna, fixing the folded pinna during the daytime.

behind the pinna before the strip and protects the skin against irritation caused by adhesives and friction.

DURATION OF TREATMENT

The parents were informed to use the clip mainly during the night and the strip mainly during the day. Both devices should be used as many hours as possible, and every day the parents were asked to note the duration of treatment with the clamp and the strip as well as complications and other problems. These parameters will be compared with the efficiency of treatment.

The mean use time was 4.3 hours per night for the clip and 8.9 hours per day for the strip. The mean treatment time was 5.5 months with a range of 1 to 10 months and may depend on the age of the child, the thickness and the stiffness of the pinna, the initial cephaloauricular distance, the number of hours the child is treated daily with Auri method, and the number of days the treatment was interrupted.

EVALUATION AND EFFICIENCY OF TREATMENT

We have included some new objective and subjective parameters to test the efficiency of treatment and to find the optimal

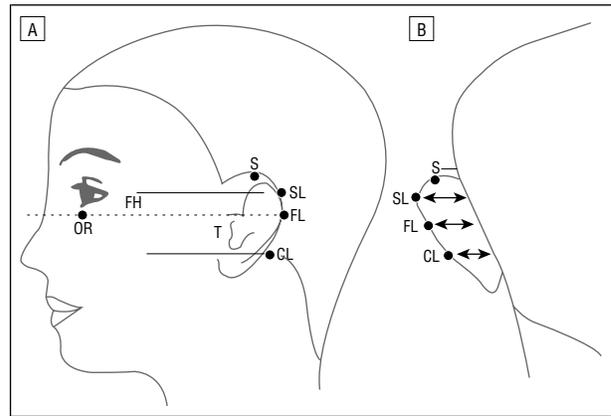


Figure 6. Measurement of the cephaloauricular distance at 4 points.¹⁵ A, Side view; B, posterior view. S indicates superior point; SL, superior line; FL, Frankfort horizontal line; CL, conchal line; OR, orbital rim; FH, Frankfort horizontal; and T, tragus.

daily treatment time and duration of treatment for each age group. The *objective* data consisted of (1) thickness of the pinna; (2) cephaloauricular distance; (3) cartilage stiffness of the pinna; and (4) photodocumentation of the shape of the pinna before the start of the treatment and every month during the 10-month treatment period as well as 6 months after the completion of the treatment. The thickness of the pinna was measured by a thickness gauge (± 0.01 mm) at the top of the pinna between the helix and the concha (**Figure 6**). The cephaloauricular distance was measured by a ruler (± 1 mm) at 4 points (superior point, superior line, Frankfort horizontal line, and conchal line) along the helix (Figure 6). We used measurements based on the Frankfort horizontal line as described previously.¹⁵ The cartilage stiffness was measured by a dial tension gauge (gram force, ± 5) by pressing the arm of the instrument toward the lateral part of the pinna, making an anthelix. The tension is read on the scale when the anthelix is maximally folded. Photographs were taken of each pinna in frontal and in lateral views before the start of the treatment and every month during the treatment as well as 2 to 3 weeks after the treatment.

The *subjective* data consisted of repeated judgments of the investigators and the parents of the shape and grade of the correction of the pinna. For each day of each month, the parents noted in a journal (1) how many hours their child have used the clip and strip on each pinna; (2) eventual pain, skin irritation (red skin and/or eczema), or squeeze marks; (3) difficulties in using the Auri method; and (4) the number of days the treatment was interrupted. At each monthly session, the patient journals were updated and discussed with the parents, and the patients' pinnae were examined for skin irritation and squeeze marks by a physician.

STATISTICAL MODEL

The modeling of the treatment effect was performed by means of a random effects model with a random effect of ear, meaning that each child acts as his or her own control. The study was not randomized because the parents did not accept a randomized treatment of their child's pinna and wanted the most prominent pinna of their child to be treated first.

RESULTS

Forty-four children (56 pinnae) with a median age of 2.0 years (Table 1) were treated with the Auri method. The period of device application ranged between 1 and 10

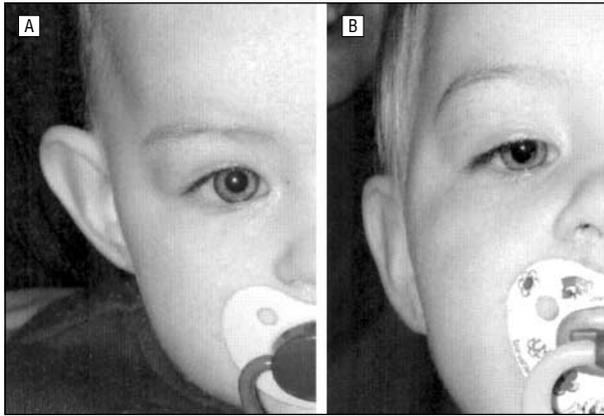


Figure 7. Frontal view of girl aged 8 months and treated for 5 months with good result. A, Before; B, after.

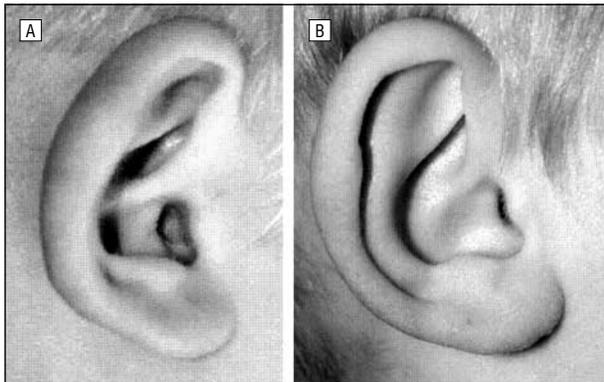


Figure 8. Sideview of boy aged 4 years and treated for 6 months. A, Before; B, after.

months, with an average of 5.5 months of treatment. The average treatment time for boys was 3.0 months and for girls, 4.9 months. The cephaloauricular distance of the treated individual pinna before and after treatment and mean correction at all points as well as maximum correction was measured on both sides and compared. There was no spontaneous change of the cephaloauricular distance of the untreated pinnae. The most notable correction in the cephaloauricular distance appears in the upper and most extended parts of the pinna corresponding to the superior point and superior line in Figure 6. Before-and-after patient examples for the Auri method are shown in **Figures 7, 8, 9, and 10**.

CORRECTION GRADE

Based on the objective parameters, such as correction of the cephaloauricular distance and the subjective judgment of the shape of the pinnae by investigators, as well as the comparison of the pretreatment photographs with the posttreatment photographs taken 2 to 3 weeks after the completed treatment, our results fall into 3 categories: (1) good correction (6-10 mm), (2) fair correction (3-5 mm), and (3) poor correction (1-2 mm) (**Table 2**).

The estimated value for the “natural” change of the untreated pinna from before to after the treatment period is -0.215 mm with a SE of 0.220 mm (ie, certainly

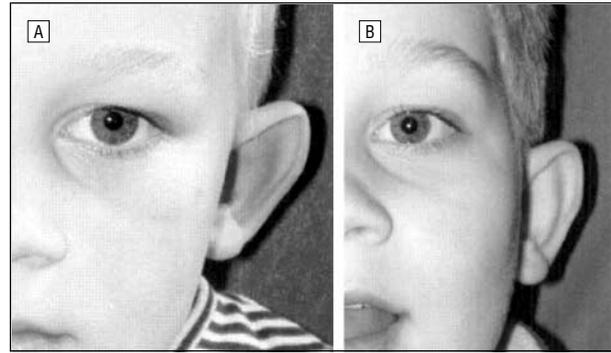


Figure 9. Boy aged 4 years and treated for 7 months with good result. A, Before; B, after.

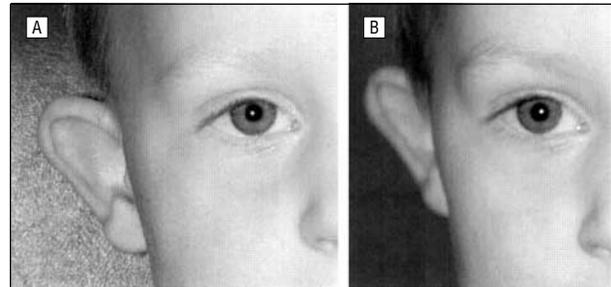


Figure 10. Boy aged 3 years and treated for 4.5 months with fair result. A, Before; B, after.

not significant). The estimated value for the “treatment effect” of the treated pinna is -2.54 mm with a SE of 0.27 mm (ie, highly significantly different from 0 [$P < .001$]). Good correction was achieved in 19 pinnae (34%), fair correction in 31 (55%), and poor correction in 6 (11%) (**Table 2**).

Correction: Sex and Age

There was no statistical difference in grade of correction between the boys and girls (**Table 2**). However, regarding age, children with good and fair grade of correction had a young median age of 2.0 and 1.5 years, respectively (**Table 3**). The 3 children with poor correction had the highest median age, but these children had the lowest mean treatment time and device application time. Among the 0- to 1-year-old children, 16 (94%) had good to fair correction (**Table 3**). A large number of good to fair corrections were also found in 1- to 3-year old children, and the treatment period was shorter. There were, however, no statistically significant differences between various age groups and grade of correction.

Table 4 gives the age classes correlated to device application time and mean treatment period. No significant difference appears between the age classes. The treatment effect was estimated to diminish by 0.19 mm per year of age, with a SE of 0.11 mm (ie, not significant [$P = .07$]).

Correction and Device Application Time

Four-hour application of the clip per night and 12-hour application of the strip per day for 6 months resulted in

Table 2. Correction Grade of the Prominent Pinnae Related to Number of Children, Number of Pinnae, Age, and Sex

Correction Grade	No. (%) of Children	Sex, M/F	No. (%) of Pinnae	1 Pinna	Both Pinnae	Age, y		
						Mean	Median	Range
Good (6-10 mm)	15 (34)	7/8	19 (34)	9	6	2.2	2.0	0.0*-5.0
Fair (3-5 mm)	23 (52)	13/10	31 (55)	17	6	1.9	1.5	0.5-5.5
Poor (1-2 mm)	6 (14)	3/3	6 (11)	6	0	3.2	3.3	1.0-5.0
Total	44 (100)	23/21	56 (100)	32	12	2.2	2.0	0.0*-5.5

*Two weeks.

Table 3. Correction Grade Correlated to Age Classes, Pinnae, Device Application Time, and Treatment Duration

Correction Grade	Age Class, y						No. of Children	No. of Pinnae	Mean Device Application Time, h/d		Mean Treatment Duration, mo
	0-1	1-2	2-3	3-4	4-5	5-5.5			Clip	Strip	
Good	6	2	3	1	3	0	15	19	3.9	12.3	6.0
Fair	10	5	5	1	0	2	23	31	5.2	7.5	5.6
Poor	1	2	0	0	3	0	6	6	2.0	5.4	4.0
Total	17	9	8	2	6	2	44	56	4.3	8.9	5.5

Table 4. Correction Grade of the Pinnae, Device Application Time, and Treatment Duration of Various Age Classes

Age Class	No. of Children	No. of Pinnae	Correction Grade per Pinna			Mean Device Application Time, h/d		Mean Treatment Duration, mo
			Good	Fair	Poor	Clip	Strip	
0-1	17	22	7	14	1	3.7	10.2	5.6
1-2	9	14	4	8	2	2.5	6.9	4.5
2-3	8	10	4	6	0	9.3	9.6	5.5
3-4	2	2	1	1	0	6.8	10.4	5.0
4-5	6	6	0	0	3	7.5	9.6	3.0
5-5.5	2	2	3	2	0	7.0	4.4	6.0
Total	44	56	19	31	6	6.1	8.5	4.9

good correction (Table 3 and **Table 5**). The children with poor correction of their pinnae had the shortest device application time of the clip as well as the strip and the most days of interruption of the treatment. The correction grade was correlated to the mean treatment duration and the mean device application time (Table 5). Among the 0- to 1-year-old children, more good to fair results were achieved (Table 3).

Correction Correlated to the Initial Cephaloauricular Distance, Thickness, and Tension of the Pinna

There were no statistical differences in grade of correction between children with thicker and more tensed pinnae and children with thinner and less tensed pinnae. There were no correlations between the grade of correction and the initial cephaloauricular distance (**Table 6**). The mean final cephaloauricular distance, 2 to 3 weeks after completion of the treatment, was considerably reduced in all 3 groups. Children with good results had less resistant pinnae.

INVESTIGATORS' EVALUATION AND VALIDATION

As mentioned earlier in the "Correction Grade" section, the correction of the children's pinnae were divided into 3 groups. Fifty (89%) of the pinnae achieved good to fair correction, and 6 (11%) poor correction.

PARENTS' EVALUATION

In the telephone interview 4 to 6 months after the completion of the treatment, the parents reported good to fair correction of their child's pinnae in 45 (80%) of the pinnae (23 pinnae good and 22 pinnae fair). In 11 (20%) of the pinnae the parents reported little correction of their child's pinnae. No parents reported lack of correction or lack of results of the treatment.

On a separate questionnaire to the parents, at the same telephone interview, the parents were asked about the satisfaction with the new treatment and its convenience. All parents (100%) were satisfied with the treatment, even those whose child received poor correction.

Table 5. Correction Grade of Prominent Pinnae Related to Device Application Time, Treatment Duration, and Treatment Interruption

Correction Grade	No. of Pinnae	Mean Device Application Time, h/d			Mean Treatment Duration, mo	Mean Treatment Interruption, d
		Clip	Strip	Both		
Good (6-10 mm)	19	3.9	12.3	16.2	6.0	6.7
Fair (3-5 mm)	31	5.2	7.5	12.7	5.6	7.3
Poor (1-2 mm)	6	2.0	5.4	7.4	4.0	10.8
Total	56	4.3	8.9	13.1	5.5	7.8

There were some disagreements between the evaluation of the parents and the investigators. Of the pinnae categorized as good to fair correction, 50 (89%) were evaluated as such by the investigators and 45 (80%) by the parents. Two pinnae evaluated by the parents as good were evaluated by the investigators as fair, but 5 pinnae evaluated by the parents as poor correction were evaluated by the investigators as fair. Disagreement between the investigators and the parents appeared in 14 pinnae (25%).

The children did not use the splints for a range of 1 to 44 days and an average of 6 days per patient during the whole treatment. Some children did not use the devices during summer holidays. The children reported treatment time from a few hours per day to 24 hours per day, with an average treatment time of 13.1 hours per day (Table 5).

COMPLICATIONS

No severe complications, such as necrosis of the skin or the cartilage, were seen. No children swallowed the clip or the strip. Slight complications were observed in 17 pinnae (30%) (Table 7). On the back sides of 3 pinnae (5%), squeeze marks of light degree caused by the clip were observed. The marks lasted for a maximum of 2 days, leaving no permanent scars behind the ear. Fourteen pinnae (25%) got skin irritation on the back side caused by the strip, which disappeared within 3 days. No patients had pain during the treatment. Most of the pinnae (94%) with complications achieved good or fair results.

COMMENT

In this series we attempted and succeeded in nonsurgical treatment of prominent pinnae using the Auri method, developed at the Ear, Nose, and Throat Department at Gentofte University Hospital, Hellerup, Denmark. Several prototypes of the plastic clip and the strip have been tested to develop the best devices for the treatment.

The described Auri method is easy to use and easy to apply on the pinna, and the parents themselves can treat their children. The clip is visible and is therefore used at night, but the strip is hardly seen during the treatment and is used in the daytime. The Auri method is efficient because the clip squeezes, bends, and stretches the

Table 6. Correction Grade of the Pinnae Related to Maximal Cephaloauricular Distance Before Treatment, Thickness, and Tension of the Pinnae

Correction Grade	No. of Pinnae	Maximum Cephaloauricular Distance Before Treatment, mm		Thickness, mm		Tension, Gram Force	
		Range	Mean	Range	Mean	Range	Mean
		Good	19	17.3-27.0	23.0	2.1-3.8	2.5
Fair	31	13.5-28.0	22.2	2.5-3.7	2.6	20-60	40
Poor	6	22.3-28.0	24.8	2.1-2.7	2.4	30-60	41
Total	56	17.3-28.0	22.8	2.1-3.8	2.4	15-60	39

Table 7. Complications of Children Treated With Auri Method

Complication	No. of Pinnae	Median Age, y	Sex, M/F	Treatment		Correction Grade		
				Clip	Strip	Good	Fair	Poor
Skin irritation	14	2.0	4/6	0	14	6	7	1
Squeeze marks	3	2.5	2/1	3	0	1	2	0
Pain	0	0	0/0	0	0	0	0	0
Total	17	2.0	13	3	14	7	9	1

cartilage of the pinna at the same time in 3 different planes, and the strip makes a very sharp anthelix. The combination of the 2 devices makes it possible to treat the children for many hours a day without discomfort. Furthermore, the devices are well fixed at the pinna and do not easily fall off during normal physical activity.

In this series, 26 (37%) of 70 children discontinued treatment (Table 1), mainly because the parents could not motivate their children. Twenty of these parents wished to try the treatment again later on, when their child got more mature. Motivation is the main problem in particular because it takes 4 to 6 months to get a good result, and the children should use the devices every day. A great and persistent long-term desire of the parents to correct their child's pinna is therefore mandatory, and we must accept the dropouts of all ages.

Objectively, 38 (86%) of the 44 children had good to fair correction of their pinnae. All 44 parents (100%) were satisfied with the treatment, and 80% of the parents reported good to fair correction of their child's pinna (Table 2).

The deformities on the nontreated pinna in 34 children did not improve spontaneously, and these children are now in process of treatment with the Auri method. But the "treatment effect" of the method was highly significant.

We have tried to introduce measurement of the cephaloauricular distance at 4 points in evaluation of the correction, but not all 4 distances are reduced. Less reduced is the distance at the point of the conchal line (Figure 6), but the distance at the point of the Frankfort line also changes relatively little and inconstantly. Therefore, the mean correction of all 4 distances is low (Table 2) compared with the maximum correction, which of-

ten takes place at the superior and superior lateral points. Measurement of the cephaloauricular distances at the lower 2 points (Figure 6, Frankfort line and conchal line) can later be abandoned if further studies on older children show the same tendencies as in the present study on younger children.

Measurement of the thickness seems not to provide any correlation to the correction grade of the pinna, but studies on older children have to be done. They may reveal larger differences in thickness of the pinna in older children.

There seems to be lower stiffness of the cartilage of the pinnae achieving good correction. This is logical, but further studies on tension of the cartilage in older children will be interesting.

Even though we believe that the achieved results 2 to 3 weeks after finishing the treatment are stable, we do not know if they will remain stable during the growth of the child. In a recent evaluation of the children to prolong the posttreatment observation time, 31 of all 44 children were investigated 10 months after completed treatment. In 27 children (87%), the achieved correction was unchanged. In the remaining 4 children, there was some degree of recurrence. Therefore, 1-, 2-, and 5-year follow-ups of all children are necessary in this age group.

We cannot compare the achieved results with the results of other series or with other devices because they do not exist and only few outstanding pinnae have been included in the previous series. Neither can we compare this result with the results of surgical correction because such series do not exist for the age group of 0 to 5 years.

Even we do not know yet the results of the treatment in children aged between 5 and 10 years as well as in teenage groups. The present study indicates, however, that it is worthwhile to try nonsurgical treatment of severe prominent pinnae at age 5 to 10 years, and we have started nonsurgical treatment in these age groups and will be able to compare the results and duration of treatment in the older children with the younger children. One should expect that age must have some influence on duration of treatment (ie, the earlier the treatment is started, the shorter the treatment time). However, Table 4 data can hardly demonstrate any significant differences in the outcome and the treatment time between the different age groups during the first 5 years of life. It will therefore be of great interest to show how long the treatment time should be to achieve good results in children aged between 5 and 10 years or in the teenage group.

We consider that nonsurgical treatment of prominent ears should be tried first and recommend using the Auri method, even in older children. If only partial cor-

rection is obtained, an excellent result with the help of otoplasty would be made easier.

At present, we are also evaluating the results of children and adolescents aged 6 to 15 years, treated with the Auri method, and we will later publish follow-up results, which are needed. Many aspects of nonsurgical treatment of prominent pinnae are not known, especially its long-term effect and influence on growth. Therefore, the interpretation of these relatively good results should be considered with some reservation until the long-term results have demonstrated its stability.

Finally, we want to stress again that this is a preliminary study, showing mainly the method of treatment and the duration of treatment needed to achieve a positive result. Future long-term evaluation will show to what extent the correction will become permanent during the growth of the child.

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Further information on the Auri method is available at <http://www.aurimethod.com>.

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