Orthotic Treatment of Cranial Asymmetries: Comparison between Early and Late Interventions

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ABSTRACT

Introduction: The incidence of cranial deformities has increased since the American Academy of Pediatrics recommended placing babies in the supine position. Cranial orthotic therapy has shown to be a beneficial therapy because by restricting skull growth in one direction (where the skull has bulging areas) and directing growth in the desired direction (in places where it is flattened) the desired symmetry is achieved. The aim of this study was to present the results of helmet treatment in infants comparing the age of treatment onset, thus showing what age range is the most effective to start treatment.

Materials and Methods: Babies treated with orthotic therapy were divided into two groups (group 1, up to 6 months; group 2, older than 6 months). Variables obtained by three-dimensional (3D) laser scanning and parents' subjective impressions were compared.

Results: Regarding the duration of treatment, the group aged 3 to 6 months had a mean duration of treatment of 3.45 months (±1.26 months), whereas the group aged older than 6 months had 4.18 months (±1.29 months). The Mann-Whitney *U* test demonstrated that the duration of treatment was significantly longer in the group aged older than 6 months. Our results showed that the variables cranial vault asymmetry index (CVAI) and diagonal difference (DD) resulted in a significant decrease in the comparison before and after treatment, but the reduction in group 1 was significantly higher. Unlike the posterior symmetry ratio (PSR), the cephalic index (CI) improved in both groups, but with no difference regarding the time of intervention.

Conclusions: Our study showed that when the treatment of cranial asymmetry is initiated before 6 months of life, the best results were obtained within a shorter time when compared with a later intervention. (*J Prosthet Orthot*. 2016;28:15–22.)

KEY INDEXING TERMS: plagiocephaly, nonsynostotic, positional plagiocephaly, helmet therapy

The incidence of cranial deformities has increased since the recommendation made by the American Academy of Pediatrics to place babies in the supine position to reduce sudden infant death syndrome. This positioning program has reduced the incidence of sudden infant death syndrome by 40% in the United States, but there has been a concomitant increase in the incidence of asymmetric (plagiocephaly) and symmetric occipital flattening (brachycephaly).[1,2]

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This incidence has been estimated as high as 16% to 48% of typically healthy infants younger than the age of 1 year, depending on the diagnostic criteria as previously reported by Xia et al.[3] These figures show that the cranial asymmetries are commonly found, so it is an issue that should be relevant in pediatric practice.[3]

Plagiocephaly is a term originating from the Greek (*kephale* meaning head and *plagios* meaning oblique), and it reflects a deformation of the occipital region that normally occurs asymmetrically.[4,5] Plagiocephaly is then characterized by a flattening of the unilateral occipital region and can also display ipsilateral ear anteriorization and bulging of the frontal ipsilateral region resulting from repeated and prolonged external pressure.[6,7]

Extrinsic factors that contribute to skull deformities have been well documented. They can start in the uterus and several aspects can be involved: a very large fetus, multiple fetuses, a small maternal pelvis or poorly formed uterus, excess or lack of amniotic fluid. Even an increase in the muscle tone of the abdomen can be a determining restrictive factor. Most of these cranial deformities resolve within approximately 6 weeks after birth, as the deformational force is removed, but it is also important to understand that several risk factors may not allow the resolution or may even develop an important skull asymmetry from a completely normal and round head[8,9] such as:

1. Prematurity: Many premature or low-birth-weight infants often spend periods in the neonatal unit and often due to necessary care, such as the use of respirators, remain for

long periods with the head in a fixed position, resulting in skull asymmetry.[10]

2. Congenital muscular torticollis: This is a deformity resulting from shortening/fibrosis of the sternocleidomastoid muscle (SCM) and is associated with plagiocephaly in almost 90% of infants. Because of this shortening, the infant maintains support of the head on only one side, tilting the head toward the side of the affected muscle and turning the chin to the opposite side. Many babies do not have an SCM with evident contracture, but some authors have reported that even a muscular imbalance can lead to the baby's incapacity to keep the head in midline, which also impairs support of the head.[10,11]
3. Multiple fetuses: This condition is related to a higher incidence of risk factors, primarily due to the fact that the "crowded" uterus means an intrauterine constraint, a factor related to deformities present at birth. It is believed that when the baby is positioned at a lower position in the uterus, there seems to be a higher risk of developing an asymmetrical skull. As the baby needs to support more weight, the mobility and capacity to change position can adversely predispose to congenital torticollis. Premature babies can have a combination of more than one risk factor, often due to prematurity and low birth weight.[12,13]
4. Changes in our current lifestyle may also have contributed to the factors of postnatal deformational or positional plagiocephaly. The use of firm mattresses, frequent use of seats (in the car and for recreation, also known as baby bouncers), and swings often cause the baby to stay for long periods in the supine position. The extensive use of these accessories would determine a greater potential to deform the skull.[14]

The literature has also shown that the sleeping position can affect the child's width/length ratio of the skull (also known as cephalic index [CI]). Babies who sleep and spend long hours in the supine position may develop a wider and shorter skull, a condition known as brachycephaly, than those whose mothers alternate positions. The longer the baby remains in the same head position, the more significant the asymmetry will be.[15]

Although there has been no stringent prospective study, there is no evidence that cranial deformities may lead to developmental delay in these children. Some authors have shown that children who are placed in the supine position have motor skill developmental delay, such as upper-trunk strength and rolling, which are spontaneously resolved in time. Children who have positional plagiocephaly have developmental delay when compared with children without cranial asymmetry. Some authors, however, believe that conditions that cause developmental delay could also be a factor predisposing to cranial asymmetry, so plagiocephaly would be a cause of developmental delay and not a consequence.[1,16,17]

The fact is that deformational plagiocephaly does not cause life-threatening or debilitating neurological deficits, and most experts do not fear severe long-term consequences. However, the need for special assistance at school or the negative social consequences, such as bullying, are described in the literature. The fear of the parents regarding the potential consequences of untreated positional plagiocephaly should not be underestimated, and these aspects should be taken into account when discussing the problem.[18]

Thus, the management of cranial deformities involves prevention, which requires advising parents to position the babies in the prone position daily when they are awake and can be monitored, according to the American Society of Pediatrics in its campaign named "Back to Sleep, Tummy to Play" (Copyright © American Academy of Pediatrics, Revised October 2011). Also recommended, especially for the first 6 months of life, are changing the position of the baby in the crib, encouraging the baby to turn the head far to the right and to the left, not allowing the baby to spend most of the time in baby bouncers and strollers, and switching the baby's position.

The treatment for babies with mild asymmetries may consist in repositioning; for more severe conditions or when repositioning did not produce satisfactory results, the use of a cranial orthosis is recommended.[19]

Cranial orthosis is shown to be a beneficial therapy because, by restricting skull growth in one direction (where the skull has protuberances/bulging) and directing growth in the desired direction (in places where it is flattened), the desired symmetry is achieved. The orthosis then acts as a counterforce supporting areas of bulging and leaving free space inside for flattened areas.

Much has been discussed about the proper age of indication for cranial orthotic therapy. Despite being widely accepted by various international publications and the wide acceptance of the use of orthotic therapy in severe plagiocephaly, there are no data on the results for this population in Brazil. In addition, existing studies address the issue using measurements with calipers; however, laser scanning can be an instrument of greater reliability due to the precision it can offer. Thus, a study on the best time to start treatment that evaluates results obtained through the use of laser scanning has great value for the whole scientific community.[18–20]

Because of the lack of national studies, many infants probably do not receive orthotic treatment when indicated. Thus, they arrive at a specialized clinic later in life after it was realized that repositioning did not correct the condition and when it is no longer possible to perform optimal orthotic treatment, leading to parents' dissatisfaction in many cases. However, some authors have shown that the age of start of treatment is important and leads to better results in the short term.[18] A recent article has brought to light the need to establish strategies to allow better targeting of appropriate treatments according to severity of the asymmetry.[21]

The aim of this study is to present the results obtained with helmet therapy, using the STARscanner, a device that utilizes a laser, as an evaluation tool providing several anthropometric measures and calculations of parameters that allow the quantification and documentation of the evolution of treated cases. This study compares the results in two groups: one that started treatment up to the age of 6 months and another that started it after the age of 6 months.[21]

METHODS

This study is a retrospective analysis of data obtained during the treatment of patients with positional asymmetries including brachycephaly (babies with a CI greater than 89%), plagiocephaly (babies with a diagonal difference [DD] greater than 6 mm), and combo (babies with asymmetrical brachycephaly) in a clinic dedicated to the treatment of cranial asymmetries between March 2011 and May 2012. The study was approved by the Sabará Hospital ethics committee.

All patients were evaluated by a single physician who recommended treatment with cranial orthosis after a clinical analysis of asymmetry. The patients received an initial scan assessment through a noninvasive device to capture a three-dimensional (3D) image of the skull without the use of ionizing radiation or need for anesthesia. The scanner emits a class 1 laser and is therefore safe for the eyes. It is emitted by four sources distributed around the head circumference and the image is captured by eight cameras and then is reconstructed using specific software, yielding very accurate measurements and indices. In addition, the virtual model of the head obtained during the assessment can be used to construct the custom-made cranial orthosis.

The data obtained by clinical evaluation and 3D laser scanning were stored in medical files and digital media and served as the basis for variable analysis to verify and document treatment progress. The same measures could be repeated during follow-up, allowing the comparison of treatment evolution. All patients were scanned again at the end of the treatment for comparison purposes.

The following data were obtained: age, baby sex, whether the child had impaired range of motion (ROM) in the neck suggestive of congenital torticollis, and prior parental attempt at repositioning treatment.

In analyzing the two groups based on age at the start of treatment (group 1: younger than 6 months; group 2: older than 6 months), the following data were also obtained during scanning: the difference between the DD at the beginning and end of treatment, the cranial vault asymmetry index (CVAI) at the beginning and end of the treatment, the posterior symmetry ratio (PSR), and the CI at the beginning and after the end of treatment in both groups.

In addition, subjective impression was collected from parents and data were stored through a questionnaire that assessed the degree of satisfaction at the end of the treatment, as well as their perception of the asymmetry severity before and after treatment.

To allow image capture during scanning, stockinet was placed on the child's head to eliminate interferences. Adhesive marks were placed in each tragus and sellion region (radix) by the same examiner to determine a plan for anatomical reference.

The DD, CI, PSR, and CVAI data were obtained with the scanner at level 3 cross-sectional area (3-cm plane above the reference plane) and represents:

- Diagonal difference: The DD is the difference in millimeter between the oblique diagonals at 30 degrees.[20]
- Posterior symmetry ratio: The PSR is obtained by dividing the smallest posterior quadrant by the largest posterior quadrant, resulting in a comparison percentage between both quadrants.
- Cranial vault asymmetry index: The CVAI is the difference between diagonals 1 and 2 at 30 degrees divided by the larger of the two diagonals expressed as a percentage. This parameter has been studied and defined as a clinical variable, being one of the most significant factors that can predict asymmetry. The expectation is that it decreases during treatment.[21]
- Cephalic index: The CI is the cranial width divided by length. It is the index most commonly disproportionate in brachycephaly; an elevated CI means the skull is wider and shorter than that of the average population.[20]

All these variables were then studied, allowing quantifying the responses in different study groups consisting of infants aged 3 to 6 months, defined as group 1, and another group older than 6 months, defined as group 2.

RESULTS

The study groups consisted of 30 children in group 1 (who started treatment up to 6 months of life), and 30 babies in group 2 (who started treatment after 6 months of life). Of these, four children (two from each group) were excluded from the analysis as they failed to attend medical assessment and scanning at the end of treatment, thus making it impossible to analyze the results obtained with treatment.

The orthosis used in the study was the Starband produced by Orthomerica Products Inc, and it was worn for 23 hours a day, being removed only for bathing and cleaning.

The χ^2 test was used to compare the groups $P = 0.081$. Regarding sex, group 1 had 23 male (82.1%) and 5 female (17.9%) infants and group 2 had 16 male (57.1%) and 12 female (42.9%) infants. There was no significant difference in sex distribution between the two groups; however, there is evidence of a higher incidence of males in the group aged 3 to 6 months (P between 0.05 and 0.10). Because the goal of the study was to assess what age is the most effective to start treatment, patient groups with plagiocephaly, brachycephaly, and combo were analyzed together.

Table 1 shows the distribution of types on groups 1 and 2, and there is no significant difference between the groups regarding the distribution of types of asymmetries.

Of the variables evaluated during the medical consultation, Table 2 shows whether the baby was repositioned before

Table 1. Distribution of types of asymmetries

		Group					
		1 (3–6 mo)		2 (>6 mo)		Total	
		n	%	n	%	n	%
Type	Plagiocephaly	16	53.3%	19	63.3%	35	58.3%
	Brachycephaly	1	3.3%	2	6.7%	3	5.0%
	Combo	13	43.3%	9	30.0%	22	36.7%
Total		30	100.0%	30	100.0%	60	100.0%

treatment, demonstrating that the majority of parents (79.6%) in both groups tried repositioning before resorting to treatment with cranial orthosis. The χ^2 test (P = 0. 177) confirmed that there was no significant difference in the distribution of repositioning between the two groups.

Concerning the evaluation of cervical ROM, group analysis showed that 32 infants (57.1%) had no change in cervical ROM, which could raise the suspicion of a congenital torticollis; on the other hand, 24 infants (42.9%) showed limitation in cervical rotation and tilt. The distribution is shown in Table 3.

The χ^2 test confirmed that there was no significant difference in the distribution of babies with plagiocephaly or brachycephaly between the two groups, as 27 infants in each group had plagiocephaly and 12 infants in the group aged 3 to 6 months and 10 infants in the group aged older than 6 months also had brachycephaly.

Regarding the duration of treatment, the group aged 3 to 6 months had a mean duration of treatment of 3.45 months (±1.26 months), whereas the group aged older than 6 months had 4.18 months (±1.29 months). The Mann-Whitney U test demonstrated that the duration of treatment was significantly longer in the group aged older than 6 months.

For the analysis of the variables obtained by 3D laser scan, analysis of variance (ANOVA) was applied to those who had initial and final assessments with two factors: group (comparison between aged 3–6 months and older than 6 months) and the moment (comparison between initial and end of treatment).

Table 4 shows the diagonal difference values, with a significant reduction in the DD between the initial and final measurements in both groups. The significant interaction indicates that the reduction in group 1(<6 months) was significantly higher than in group 2 (aged older than 6 months).

Cranial vault asymmetry index also decreased significantly between the initial and final assessments in both groups. The significant interaction indicates that the reduction in the group aged 3 to 6 months was significantly higher than in the group aged older than 6 months, as shown in Table 5. Also shown is significant reduction between initial and final CVAI in both groups. The significant interaction indicates that the reduction in group 1 (<6 months) was significantly higher than in group 2 (aged older than 6 months).

Table 2. Repositioning distribution among groups

		Group				Total	
		1 (3–6 mo)		2 (>6 mo)			
		n	%	n	%	n	%
Repositioned	No	3	11.1%	8	29.6%	11	20.4%
	Yes	24	88.9%	19	70.4%	43	79.6%
Total		27	100.0%	27	100.0%	54	100.0%

Chi-square test (p) = 0.177. There was no significant difference in the repositioning distribution between the two group.

Table 3. Baby had impaired ROM before treatment in both groups

		Group				Total	
		1 (3–6 mo)		2 (>6 mo)			
		n	%	n	%	n	%
Limitation of ROM	No	13	46.4%	19	67.9%	32	57.1%
	Yes	15	53.6%	9	32.1%	24	42.9%
Total		28	100.0%	28	100.0%	56	100.0%

Chi-square test (p) = 0.177. There was no significant difference in the distribution of change in ROM between the two groups.

Posterior symmetry ratio was also assessed, demonstrating a significant increase from baseline to the end of treatment, but this increase was similar in both groups (Table 6). Posterior symmetry ratio was not significant for the group, but interaction was significant for the moment. Table 6 displays a statistically significant increase between the initial and final PSR in both groups. The nonsignificant interaction indicates that this increase was similar in both groups.

Cephalic index was also evaluated, and it showed similar results to PSR. As shown in Table 7, CI was not significant for the group and interaction, but was significant for moment. There was significant reduction in initial and final CI in both groups. The nonsignificant interaction indicates that this increase was similar in both groups.

Finally, we evaluated the parents' perception of the asymmetry as seen at the beginning and end of the treatment. The asymmetry assessment by the parents was considered as follows: 0, absent; 1, very mild; 2, mild; 3, moderate; 4, severe; and 5, very severe. The results showed a reduction in mean value between the initial and final assessments in both groups. However, there was a significant interaction indicating that this reduction was similar in both groups; that is, there was a significant improvement in parents' perception and that this improvement was similar in both groups.

DISCUSSION

It is known that nonsynostotic plagiocephaly does not spontaneously improve; without intervention, these conditions can worsen over time, and in severe cases it may be associated with cosmetic and neurological problems.[22–24]

Some studies have also questioned previous recommendations in literature to delay treatment with cranial orthosis until other treatment options (repositioning, tummy time, and physical therapy) have failed, such as the study by Kluba et al.[18] because such conducts may postpone or even minimize improvement in difficult cases.

What our results have shown is that even with prior repositioning, 79.6% of the children continued having asymmetry, which was the factor that motivated parents to seek the use of a cranial orthosis in search of correction, as repositioning results were not satisfactory. Furthermore, we observed that in group 2 (aged older than 6 months), 57.1% of the infants had a normal cervical ROM, but maintained cranial asymmetry,

Table 4. Significant reduction in DD between initial and final measurements in both groups

		Group		
		1 (3–6 mo)	2 (>6 mo)	Total
Initial DD	Mean	10.51	10.39	10.45
	Median	10.65	9.80	10.15
	SD	4.29	5.29	4.77
	n	28	28	56
Final DD	Mean	**2.96**	**4.67**	**3.82**
	Median	2.40	4.40	3.40
	SD	2.19	2.94	2.71
	n	28	28	56

ANOVA Table

Effects	*P*
Group	0.3974
Moment	<0.0001*
Group × moment	0.0466*

Not significant to the group; significant for moment and interaction

For multiple comparisons:

Crossings (*P*)	Group (3–6 mo), Initial	Group (3–6 mo), Final	Group (>6 mo), Initial	Group (>6 mo), Final
Group (3–6 mo), initial				
Group (3–6 mo), final	**0.0002***			
Group (>6 mo), initial	0.9974	0.0002*		
Group (>6 mo), final	0.0002*	0.0463*	**0.0002***	

The significant interaction indicates that the reduction in group 1 (<6 m) was significantly higher than in group 2 (>6 m).

Table 5. Table showing significant reduction between initial and final CVAI in both groups

		Group		
		1 (3–6 mo)	**2 (>6 mo)**	**Total**
Initial CVAI	Mean	7.19	6.59	6.89
	Median	7.35	6.10	6.90
	SD	2.83	3.18	3.00
	n	28	28	56
Final CVAI	Mean	1.94	2.91	2.43
	Median	1.60	2.70	2.25
	SD	1.41	1.80	1.67
	n	28	28	56

ANOVA Table

Effects	*P*
Group	0.7486
Moment	<0.0001*
Group × moment	0.0088*

Not significant to the group; significant for moment and interaction

For multiple comparisons:

Crossings (*P*)	Group (3–6 mo), Initial	Group (3–6 mo), Final	Group (>6 mo), Initial	Group (>6 mo), Final
Group (3–6 mo), initial				
Group (3–6 mo), final	**0.0002***			
Group (>6 mo), initial	0.4635	0.0002*		
Group (>6 mo), final	0.0002*	0.0939*	**0.0002***	

The significant interaction indicates that the reduction in group 1 (<6 m) was significantly higher than in group 2 (>6 m).

Table 6. Not significant for the group and interaction; significant for the moment

		Group		
		1 (3–6 mo)	2 (>6 mo)	Total
Initial PSR	Mean	0.88	0.85	0.86
	Median	0.88	0.85	0.87
	SD	0.08	0.08	0.08
	n	28	28	56
Final PSR	Mean	0.95	0.91	0.93
	Median	0.96	0.92	0.94
	SD	0.04	0.05	0.05
	n	28	28	56

ANOVA Table

Effects	*P*
Group	0.0907
Moment	<0.0001*
Group × moment	0.7107

Statistically significant increase between initial and final PSR in both groups. The nonsignificant interaction indicates that this increase was similar in both groups.

leading us to believe that even if the preference for the cervical position is no longer present, asymmetry is still present.

Flannery et al.[22] in their clinical decision meeting showed that early intervention is essential. Referral to the craniofacial team, at any age, is appropriate (when the diagnosis is unclear, asymmetry is severe, or when the health care provider desires additional input). The American Academy of Pediatrics in its *Bright Future: Guidelines for Health Supervision of Infants, Children, and Adolescents* recommends checking the newborn for head dysmorphia at 1 week and skull deformities at 1 month.[25]

Determining the severity may be of great importance in order not to waste time in an inaccurate treatment indication, once the results show that the intervention results may differ significantly if performed before or after the age of 6 months. To address this issue, the use of laser scanning has proved to be a very useful tool due to the high degree of accuracy and objectivity, making the process more efficient and potentially more effective.[19]

Furthermore, Plank et al.[19] also demonstrated that some of the variables used in our study such as CVAI and PSR are also important clinical tools, as they allow a reproducible comparison between subjects.

Our results showed that the variables CVAI and DD resulted in a significant decrease in the comparison before and after treatment, but the reduction in group 1 was significantly higher. When managing cases of plagiocephaly and asymmetric brachycephaly, this finding has major importance when choosing the time of treatment. It may indicate that the sooner the treatment is established, the sooner and better the responses that can be obtained, especially if we consider the diagonal difference, even though skull growth is a variable that remains the same. The diagonal difference allows us a strong, clinically relevant comparison tool in daily practice.

Unlike the PSR, the CI also improved in both groups but with no difference regarding the time of intervention. These findings demonstrate the treatment effectiveness, which, besides numerical gains, was expressed as the result of parents' satisfaction as well. Parents' satisfaction is represented by the improvement in their perception of the asymmetry, regardless of the analyzed group.

It is important to educate parents by explaining that postponing treatment may still represent a significant improvement, but with a longer treatment period. Even if it does not modify the parents' final perception, as also demonstrated in a previous study[26] in which both groups showed improvement in subjective perception, this increased time of treatment was confirmed by the numerical findings. Our study showed that while the mean treatment time in group 1 was 3.45 months (±1.26 months), it was 4.18 months (±1.29 months) in group 2. This finding corroborates the clinical perception that the earlier the intervention, the faster and better are the results achieved. Although both results were statistically significant, the group with younger babies achieved such improvement in less time, showing that age may be an important variable in the choice of treatment, as the correction is performed accompanying the rapid growth of younger babies.[27]

Moreover, as previously discussed by Kluba et al.,[18] as helmet therapy is associated with some responsibilities for parents (e.g., checking its correct position, daily cleaning, and the heat discomfort in a tropical country, which has a strong influence on the baby), the reduction of the duration of therapy is also an important factor and should be taken into consideration when the doctor is treating severe asymmetry in a small baby. In addition, the correction rate of plagiocephaly with helmet therapy decreases with the infant's increasing

Table 7. Not significant for the group and interaction; significant for moment

		Group		
		1 (3–6 mo)	2 (>6 mo)	Total
Initial CI	Mean	0.89	0.89	0.89
	Median	0.89	0.89	0.89
	SD	0.07	0.08	0.07
	n	28	28	56
Final CI	Mean	0.86	0.86	0.86
	Median	0.86	0.86	0.86
	SD	0.05	0.06	0.05
	n	28	28	56

ANOVA Table

Effects	*P*
Group	0.8920
Moment	<0.0001*
Group × moment	0.7214

There was significant reduction in initial and final CI in both groups. The nonsignificant interaction indicates that this increase was similar in both groups.

age, because with increasing age the cranial growth is lower and the skull is more rigid.[27]

It is important to consider that the analysis of the groups was made together (plagiocephaly, brachycephaly, and combo). However, because of the percentage distribution, there is no reason to believe that there are differences between the groups regarding the distribution of types, because due to the low incidence of patients with symmetrical brachycephaly, there is no statistical test that allows differentiating them. In addition, due to a small sample size, it would not make sense to split the groups even further for analysis.

Another limitation of our study is the absence of a control group; however, ethical circumstances required a treatment for infants with moderate to severe asymmetries. It is increasingly important to have a thorough assessment to allow the identification of babies who need treatment, as there is no doubt that an infant's abnormal skull shape is of great concern for parents. In our society, abnormal cranial and facial asymmetries are mostly associated with functional impairment.

A recent study by Collet et al,[28] for example, showed that developmental differences between children with and without plagiocephaly persist up to 36 months, so an accurate assessment is essential for an accurate indication of therapy. The laser scanner has a key role in the acquisition of anthropometric data, enabling an adequate indication. Thus, referring babies for treatment as soon as possible results in not only in a better outcome regarding the child's cranial asymmetry, but also in parents' satisfaction within a shorter period of treatment. That is an important factor, as parents are undoubtedly experiencing great distress when faced with their baby's skull deformities.

Our study showed that early orthotic treatment is an important therapeutic option, being a shorter, very low-risk noninvasive treatment leading to parents' complete satisfaction. Our study, as well as those by Kluba et al.[18] and Thompson et al.,[29] has shown that the best results are obtained at the earliest stage, and hence, to achieve the best results, an early diagnosis and treatment must be indicated in cases of moderate to severe asymmetries.[27]

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