EDITORIAL

Head shape at 36 months with and without helmeting

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The craniofacial group in Seattle present a follow-up study of their prior publication evaluating, in a prospective fashion, the degree of normalization of head shape in a group of 235 children with positional plagiocephaly and/or brachycephaly (PPB), compared with a control group (167 unaffected, 70 with a degree of previously undiagnosed PPB).1,2 Children were evaluated at initial presentation (average 7 months of age) and 18 and 36 months of age using family surveys and 3D photo imaging. Automated analyses of flattening and symmetry were performed to generate an absolute asymmetry score, an oblique cranial length ratio, and a cephalic index. Persistent plagiocephaly/brachycephaly was defined as at least one measure > 2 SDs relative to unaffected controls.

The most notable observation was that head shape improved, across the board, for all groups. The majority of the rounding occurred prior to 18 months, but additional rounding occurred up until 36 months. Children with PPB had greater rounding of head shape than unaffected and affected controls. Most importantly, amongst the PPB cases, helmet therapy did not impact head shape. A history of torticollis also did not impact head shape.

Although the study was prospective, and data analysis was blinded, the study does have significant limitations. There was no assessment or quantification of the nature of conservative management in the cases (i.e., “tummy time” or physical therapy). Compliance with helmet therapy was reported using a retrospective self-assessment by the parents, which is subject to significant recall bias. There were significant differences in study patient retention: a significantly higher proportion of patients with higher socio-economic status and Caucasian race, and less severe head shapes, were retained throughout the full study, which provides another opportunity for bias.

Despite the significant limitations, this study provides important data to help clinicians and families inform their decision making about treatment of deformational plagiocephaly. One can expect improvements in these patients regardless of the choice of intervention (no therapy, conservative/repositioning therapy/physical therapy, or helmet therapy). Although the study was not designed or powered to detect a difference in outcome with or without helmet therapy—which would require a large randomized prospective trial of helmet therapy versus conservative management with blinded observer analysis—the results suggest that there is no substantial effect on outcome associated with helmet therapy, the presence of torticollis, or the use of physical therapy.

Cranial orthotic use for plagiocephaly remains highly variable between practitioners within and between specialties, such as pediatric neurosurgery and craniofacial plastic surgery.3 The results from this study support those practitioners who minimize the use of cranial orthotics and physical therapy and will provide additional reassurance to families and practitioners managing these children conservatively. I congratulate the authors on this meaningful, prospective study.

https://thejns.org/doi/abs/10.3171/2017.8.PEDS17419

References


We appreciate Dr. Smyth’s comments regarding our paper and the opportunity to respond and provide a few clarifications. Dr. Smyth is correct that one of the “takeaway” messages from our study is that head shape becomes more rounded and symmetric for children with PPB through age 36 months. This should be reassuring for parents who are concerned about their infant’s head shape and for the pediatricians and other health care providers who offer anticipatory guidance.

There are a few points for clarification and emphasis in response to Dr. Smyth’s comments.

1. Differences in head shape persist through age 36 months. While it is accurate to say that “one can expect improvements in these patients,” it is important to note that we continued to find a) robust differences in head shape between children with and without a history of PPB and b) evidence that deformation persists for most children who are diagnosed with PPB in infancy (i.e., 86% of PPB cases). We do not yet know what, if any, functional significance this remaining deformation has for children (e.g., neurodevelopment, social/behavioral function).

2. Participant retention. Dr. Smyth is correct that there were differences between participants who were retained in the study and those who were lost to attrition. However, overall attrition was remarkably low (88% of our original sample). We are continuing to follow our cohort through early elementary school and plan to examine the functional significance of persistent PPB for neurodevelopment as well as social and behavioral outcomes. Another important direction for future research would be prospective studies of conservative management strategies implemented following the detection of PPB or prevention strategies that could be utilized in primary care settings before infants develop cranial deformation.

3. Assessment of conservative management. We assessed children’s participation in conservative management strategies, such as physical and occupational therapy (Table 1), with a dichotomous variable. Specifically, we collected parents’ reports of intervention participation (yes/no), which we verified through a review of children’s medical and intervention records. We carried out sensitivity analyses to determine whether these interventions modified outcomes, and found minimal effects (see Fig. 6). We did not include in our analyses the intensity of services received (e.g., total sessions, number of sessions per week), nor did we have a way to assess the quality of treatment. Further quantification would have been difficult, given that this was an observational study and the indication(s) for intervention varied across participants. Perhaps more importantly, we would have ideally gathered prospective data on parents’ use of conservative management strategies at home (e.g., infant positioning practices before and after diagnosis, such as increasing “tummy time”), which are difficult to assess reliably in retrospect.

4. Effects of orthotic helmet treatment. As we attempted to convey in our article, we are cautious about the interpretation of outcomes related to orthotic helmet treatment. This was not a primary aim of our project, and, as a result, patients were not randomized to orthotic treatment conditions, nor were there other efforts to ensure that patients who received treatment had baseline characteristics similar to those of patients who did not receive orthotic treatment. For example, as might be expected, infants receiving orthotic helmet treatment had more severe deformation on average than infants who did not receive treatment. We did find that head shape was similar at age 36 months for children with and without a history of orthotic treatment, and after statistically adjusting for baseline severity in head shape measures, improvements were similar for these 2 groups. However, given the limitations of our study and the fact that it was not designed to detect treatment effects, Dr. Smyth’s comment that “…helmet therapy did not impact head shape” may be premature, and further research is needed to confirm this impression.

5. Effects of physical therapy. Physical and occupational therapy in this population would typically be indicated for children with evidence of early motor delays or neuromuscular problems, such as torticollis or hypotonia. We felt it important to present descriptive data on the proportion of children who received these interventions, and because these interventions might also indirectly affect head shape (e.g., improved range of motion might allow an infant to reposition themselves, reducing cranial flattening), we analyzed this as a potential modifier of outcomes at age 36 months. These interventions are not typically utilized solely to treat cranial deformation. We therefore do not agree with Dr. Smyth’s comment that our findings “…support those practitioners who minimize the use of …physical therapy.” In fact, the findings of our previous research suggest that children with PPB show delays in early motor development,1–3 which may be amenable to interventions like physical and occupational therapy and warrant treatment regardless of effects on head shape.

We are continuing to follow our cohort through early elementary school and plan to examine the functional significance of persistent PPB for neurodevelopment as well as social and behavioral outcomes. Another important direction for future research would be prospective studies of conservative management strategies implemented following the detection of PPB or prevention strategies that could be utilized in primary care settings before infants develop cranial deformation. Such studies could examine strategies for ongoing assessment of parents’ positioning practices and would advance understanding of the association between positioning, infant motor development, and cranial shape. The importance of such research is underscored by the prevalence of PPB; the large number of referrals to craniofacial and other tertiary care clinics;