Car Seats, Infant Carriers, and Swings: Their Role in Deformational Plagiocephaly

Timothy R. Littlefield, MS, Kevin M. Kelly, PhD, Jacque L. Reiff, RN, BS, Jeanne K. Pomatto, BOC

ABSTRACT

The recent increase in incidence of deformational plagiocephaly is commonly believed to be associated with the American Academy of Pediatrics' "Back to Sleep" campaign. Other factors, however, may contribute to the development of this condition. During the past decade, we have seen a number of infants whose deformities seem to be associated with the extended use of car seats, infant carriers, bouncy seats, and infant swings. Having recognized that notes about usage were being routinely recorded in the margins of our clinical records, we began collecting information on the amount of time infants were spending in these devices. In this report, we describe our findings and document the related cranial deformities. The data and photographs were collected between 1998 and 2000 and reviewed to determine the amount of time children with deformational plagiocephaly spent in these devices. During the three-year study period, 56.6% of the infants spent less than 1.5 hrs, 28.6% spent 1.5 to 4 hrs, and 14.8% spent more than 4 hrs/day in these devices. In addition, 5.7% slept in one of these devices during their first several months of life, frequently because of problems with reflux. These infants often developed an increase in posterior head height and "squaring" or "cornering" of the head. Normal use of car seats, carriers, swings and bouncy seats is not a concern; however, caution is warranted for infants who spend extended periods of time in these devices. The constant pressure these devices apply to the back of the cranium may perpetuate the deformation. (*J Prosthet Orthot*. 2003;15:102–106.)

KEY INDEXING TERMS: Plagiocephaly, deformation, car seat, infant carrier, etiology

The recommendation by the American Academy of Pediatrics (AAP)[1] that infants sleep on their backs to reduce sudden infant death syndrome (SIDS) has been frequently cited as the reason for the recent increase in the number of infants developing deformational plagiocephaly.[2–5] Although the number of infants presenting with this condition is on the rise, and although it is difficult to ignore the apparent "cause and effect" relationship, supine sleeping position is not the only contributing factor.[6–9] Other changes paralleling the introduction of the 'Back To Sleep' campaign may also contribute to the higher incidence of plagiocephaly seen today.[10,11] These include: the practice of prohibiting soft bedding material that would normally help cushion the infant's soft cranium, use of firmer mattresses, a decrease in the amount of time an infant spends in the prone position while awake, and, as we report here, the frequent use of car seats, infant carriers, bouncy seats, and infant swings.

In recent years, we have seen a number of infants whose deformities seem to be associated with the extended use of these devices. The cranial distortion that occurs is generally more severe than the more common forms of plagiocephaly from sleeping supine on a mattress. The resulting head shape is often more complex than the typical parallelogram deformity commonly described.[4,12] The distortion frequently results in multiple planes of asymmetry, increased posterior head height, and in some instances even "cornering" or "squaring" of the head (Figures 1–3).

METHODS

For the past 15 years, we have maintained a database on infants who have presented to our center with deformational plagiocephaly. In this database, we record a detailed medical history, particularly focusing on items that help to identify the etiology of this condition. The history includes information regarding: 1) demographics—sex, race, and date of birth; 2) perinatal data—presentation, cesarean, forceps, suction, epidural, prematurity, complications, and plurality; and 3) potential etiology—in utero position, sleeping position, neck dysfunction, persistent positioning patterns, developmental delays, congenital anomalies, and craniosynostosis.

TIMOTHY R. LITTLEFIELD, MS, is affiliated with Cranial Technologies, Inc., Phoenix, AZ.

KEVIN M. KELLY, PhD, is affiliated with Cranial Technologies, Inc., Phoenix, AZ, and the Department of Occupational and Environmental Health, College of Public Health, University of Iowa, Iowa City, IA.

JACQUE L. REIFF, RN, BS, is affiliated with the Division of Neurological Surgery, Barrow Neurological Institute, St. Joseph's Hospital and Medical Center, Phoenix, AZ.

JEANNE K. POMATTO, BOC, is affiliated with Cranial Technologies, Inc., Phoenix, AZ.

Correspondence to: Kevin M. Kelly, PhD, Department of Occupational and Environmental Health, 100 Oakdale Campus; 178 IREH, College of Public Health, University of Iowa, Iowa City, Iowa 52242; e-mail: kevin-kelly@uiowa.edu

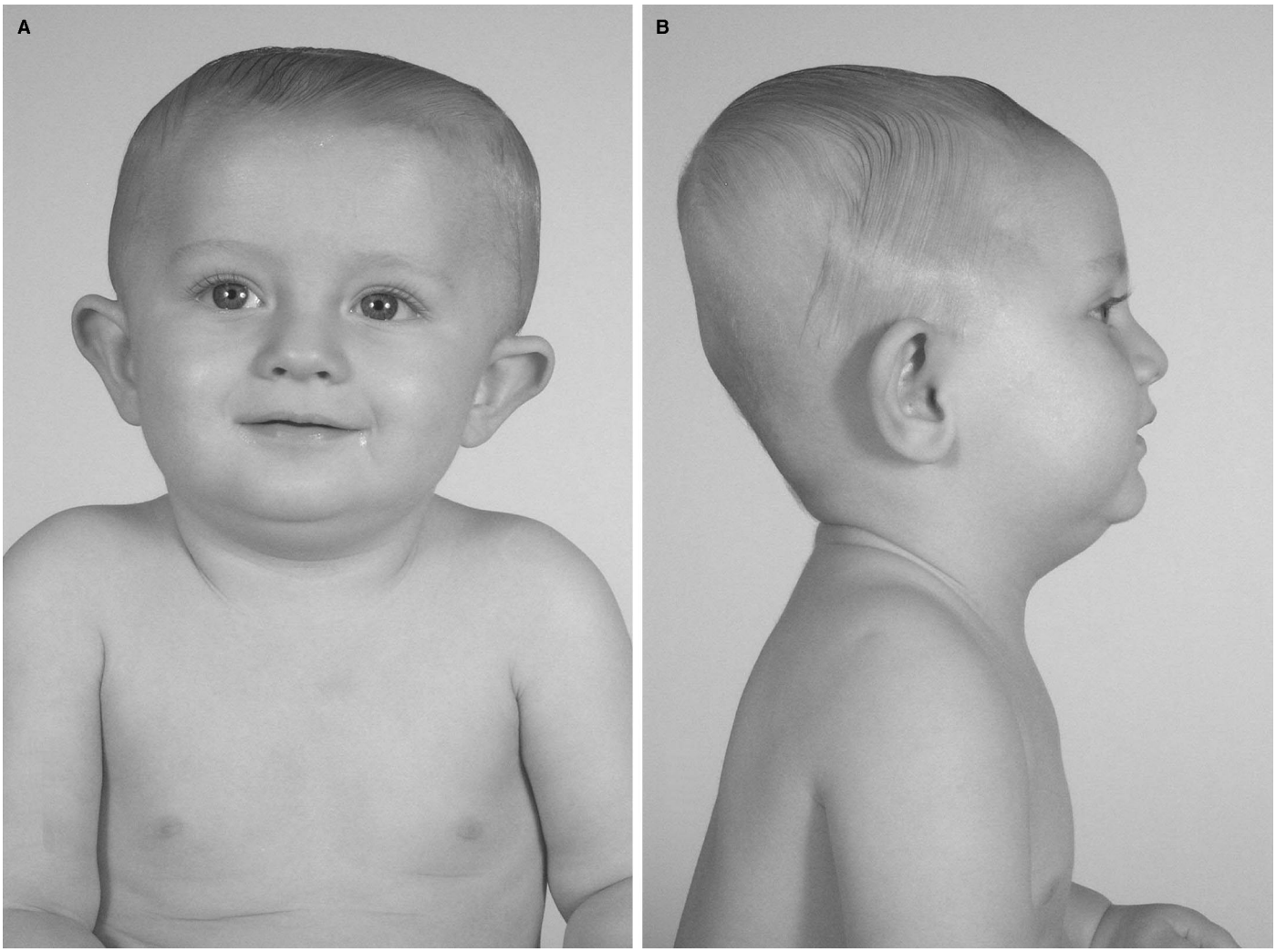

Figure 1. Nine-month-old male with severe brachycephaly who routinely spent 10 hours a day in a car seat, swing and bouncy seat. A, Anterior view reveals an increased parietal width and bulging at the squamosal sutures. B, Lateral view exhibits a superior-posterior sloping of the occiput and increased posterior head height.

In 1998, we expanded our database to include information about the amount of time that the infant spends in a car seat or infant swing. We began collecting this information after recognizing that notes about car seat and swing use were being routinely recorded in the margins of our clinical records. Thus, since 1998, we have documented the number of hours an infant spent in a car seat or swing during the first several months of life. Specifically, we also noted whether the infant had been allowed to sleep in these devices and, if so, whether this was prescribed for medical reasons (i.e., to alleviate problems with reflux or congestion).

RESULTS

The amount of time parents reported that their infants spent in either a car seat or infant swing ranged from "none" to "nearly 24 hrs a day." To further illustrate these variations, car seat and infant swing usage was broken into three general categories. Frequent use was indicated in those cases where the infant cumulatively spent more than 4 hrs/day in either a swing and/or car seat, occasional use was indicated for 1.5 to 4 hrs/day, and spending less than 1.5 hrs/day in a car seat or swing was considered rare use.

These categories are used to illustrate how much time infants spent in these devices and do not reflect any guidelines for normal or appropriate usage (Table 1). Although we note that the vast majority of parents reported rare (56.6%) or only occasional (28.6%) use of these devices, a sizable minority (nearly 15%) reported frequent use of car seats, carriers, swings, and bouncy seats. In addition, 36 infants (5.7%—more than 1 in 20 infants) were allowed to sleep in a car seat or swing. Of the infants in this last category, six had done so for reflux, five for respiratory congestion, one for colic, and one to resolve torticollis. However, a number of parents (17) reported that the child

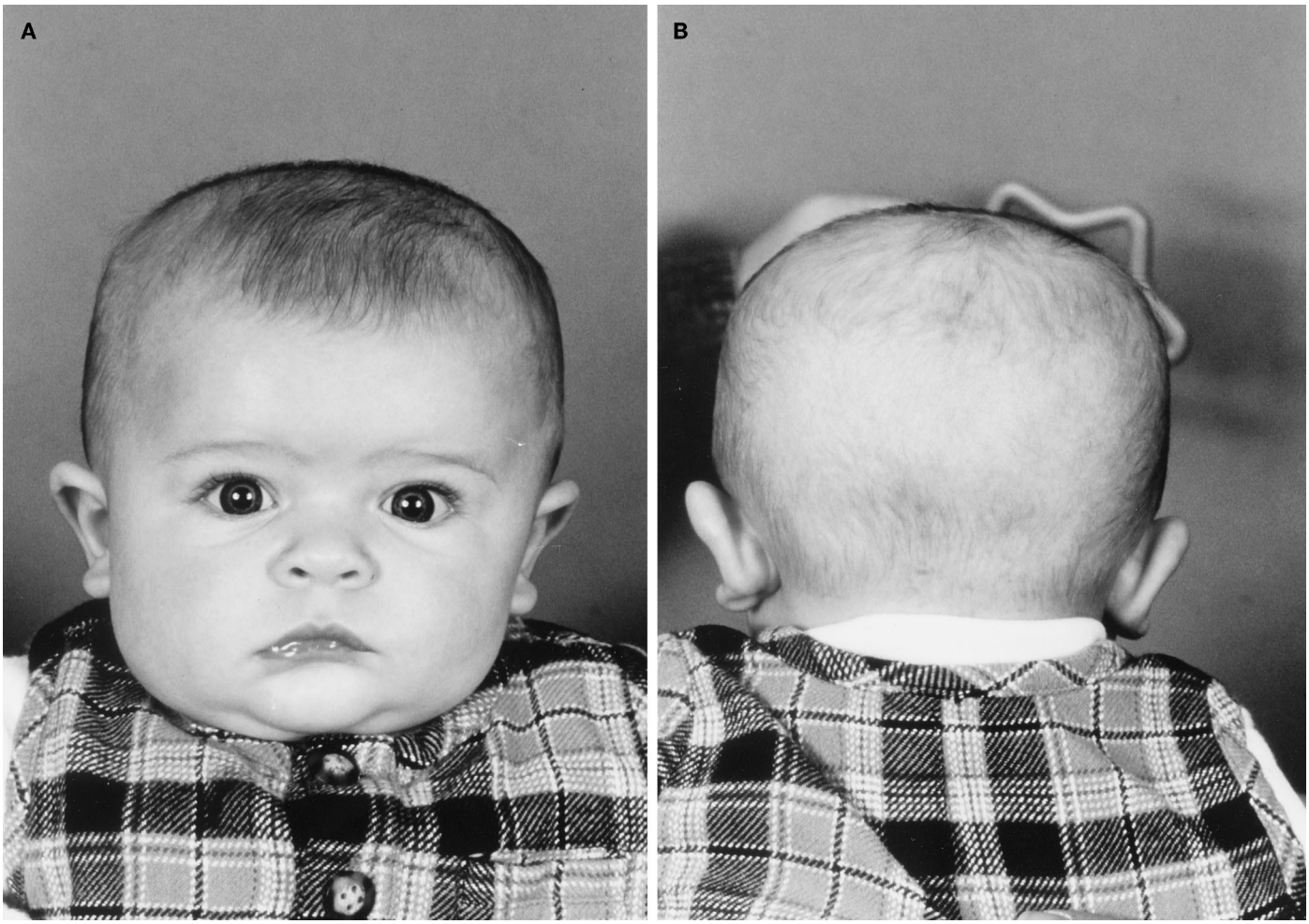

Figure 2. Four-month-old male infant who slept in a car seat for the first 4 months of life for respiratory congestion. A, Anterior view demonstrating "squareness" of head shape and increased parietal width and posterior head height. B, Posterior view demonstrating bulging at the squamosal sutures. The significant increase in lateral width in the parietal and temporal regions leads to a secondary deformity, "cupping" of the ears, commonly seen in these infants.

slept in one of these devices because it was simply where the infant slept best.

DISCUSSION

In conjunction with data presented in Table 1, information on the severity and type of cranial distortion observed provides us with a better understanding of the role of car seats and infant swings in the development of deformational plagiocephaly. Overall, the number of parents who reported only rare or occasional use of these devices was significant, representing more than 85% of our sample population.

In those infants who were reported to have slept in car seats or swings for long periods of time (often the first 3 to 5 months of life), the resulting deformity took on a very distinctive look (Figures 1 to 3). In fact, in many of these cases, our clinicians were actually able to identify the infants who had slept in these devices before the parents disclosed this information. The cranial distortion results from the unique restrictions placed on infants while they are in these devices. The surface presented to the infant's occiput is much more rigid and unyielding than a mattress and is often oriented at an angle to the back of the head. When the head rests against this hard, sloping surface for long periods, a brachycephalic configuration is most frequently the result. The occiput in this situation, however, is not just flattened uniformly, as in brachycephaly, but often can develop a superior-posterior slope and an associated increase in posterior head height. Another feature frequently observed in these infants is a "squaring" or "cornering" of the back of the head.

When placed in these devices as newborns, the infants have very malleable craniums and have not yet developed sufficient head and neck control to maintain their heads in midline against gravity. Subsequently, the head often comes to rest in a corner of the car seat or swing, where it is restricted along two planes. The resulting deformity is a squaring of the parietal-occipital region and compensatory growth on the contralateral side resulting in asymmetrical head height. This situation is further exacerbated by the

Figure 3. Five-month-old male with severe brachycephaly who spent a significant amount of time in a car seat. A) Anterior view demonstrating increased parietal width and bulging at the squamosal sutures. B, Lateral view demonstrating superior-posterior sloping of the occiput and increased posterior head height.

Table 1. Cumulative time spent in either a car seat or infant swing

	1998	1999	2000	3-Year Totals
Sample size	226	224	186	636
<1.5 hrs/day	149 (65.9%)	131 (58.5%)	80 (43.0%)	360 (56.6%)
1.5–4 hrs/day	45 (19.9%)	61 (27.2%)	76 (40.9%)	182 (28.6%)
>4 hrs/day	32 (14.2%)	32 (14.3%)	30 (16.1%)	94 (14.8%)
Slept in car seat/swing	12 (5.3%)	11 (4.9%)	13 (6.9%)	36 (5.7%)

presence of a torticollis, which again does not allow the infant to maintain its head in midline.[13,14]

The purpose of this article was simply to raise awareness and share concerns derived from extensive clinical experience about allowing infants to spend *extended* periods in a car seat or infant swing. Similar concerns are just now beginning to be raised in the medical literature[15–17] as well as other types of media. In addition, one can certainly see parallels between the effects of these modern devices and the cradle boards used by many Native American cultures.[15,18]

We are aware that because many infants are quite content in their car seats or swings, well-intending parents respond by leaving them there and orienting toys or other entertainment to accommodate. Battery-operated swings, although they provide some relief for the parent, are probably used in greater frequency and for longer periods than their old hand-crank predecessors. For this reason, we believe that parents should be advised that if an infant demonstrates a propensity for sleeping in a car seat, infant carrier, or swing, the infant should be gradually weaned from this practice. Likewise, if

retaining an infant in a car seat is advised for medical reasons, such as to alleviate problems relating to reflux or respiratory congestion, parents should be educated about deformational plagiocephaly and instructed on the early warning signs.

In conclusion, although "normal" use of infant car seats and swings should not be considered a significant risk factor for the development of deformational plagiocephaly, it is important to recognize that the *potential* does exist to deform the cranium with extended use of these devices. We have demonstrated several examples in which this has occurred. The resulting deformity can often be more complex than what is traditionally seen from plagiocephaly resulting from sleeping supine on a mattress; in the last several years, we have observed a number of infants whose heads seem to have been deformed in this manner.

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