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Plagiocephaly Perception and Prevention: A Need to Intervene Early to Educate Parents

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Plagiocephaly Perception and Prevention: A Need to Intervene Early to Educate Parents

Abstract

Background: Plagiocephaly is a condition where the cranium has been malformed because of external forces or premature cranial suture fusion. This study's objective was to gather and examine data regarding parent and caregiver awareness of plagiocephaly and its potential impact on development as well as to determine their rate of concern for positional flattening.

Method: A cross-sectional survey study was conducted. Categorical variables were described by frequency and proportions. The study was conducted across eight outpatient pediatric sites. Approximately 1,100 parents and caregivers were targeted. Inclusion criteria required participants to be willing to answer the questionnaire, to be 18 years of age or older, and to have an infant 12 months of age or younger.

Results: There were 404 participants, most of whom were female (89.8%) and 30–39 years of age (61.1%). Nineteen children (4.7%) were reported to have plagiocephaly, torticollis, and/or muscle weakness (PTM). A greater percentage of the participants with a child with PTM knew of positional flattening or plagiocephaly (73.3%) compared to those without (53.8%). The respondents with a child with PTM had a greater concern about plagiocephaly than those without (p = .03). Many of the respondents (65.3%) would use a device designed to prevent plagiocephaly.

Conclusion: Many parents and caregivers were unaware of plagiocephaly and its potential impact on facial symmetry. A greater percentage of the participants with a child with PTM knew of positional flattening and also had a greater concern about plagiocephaly than those without.

Comments

The authors report no potential conflicts of interest.

Keywords

plagiocephaly, plagiocephaly awareness, occupational therapy, cranial deformities, positional flattening

Cover Page Footnote

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Credentials Display

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Plagiocephaly, a condition where the cranium has been malformed because of external forces or premature cranial suture fusion, is more prevalent in infants today than ever before. The American Academy of Pediatrics (AAP) reports that the incidence of positional head deformity is as high as 1 in every 4 U.S. infants (Lam & Luersson, 2016). Further, it reportedly impacts 20%–30% of infants in the US (Collett et al., 2019). Evidence points to the implementation of the recommendation for a non-prone sleep position (which included supine and lateral positioning) instituted by the AAP in 1992 to help prevent sudden infant death syndrome (SIDS) (Kane et al., 1996). In 1996, the AAP amended their stance, promoting supine sleep as opposed to a lateral sleeping position, to further reduce the likelihood of SIDS, launching the Back to Sleep campaign (Jones, 2005). Simultaneously, growing concerns arose in the medical and rehabilitative communities because of a rise in the incidence of plagiocephaly and the subsequent need for occupational therapy (OT) services. Developmental delays caused by plagiocephaly are specific to the scope of practice of occupational therapists, such as cognitive delays, ocular misalignment, and motor delays (Collett et al., 2005).

A typical infant's head shape is one-third longer than it is wide, with ears properly aligned when viewed cephalocaudally, creating an oval shape. Malformation of an infant's typical head shape often falls into three categories: plagiocephaly, brachycephaly, and scaphocephaly. Infants with plagiocephaly have flattening on the left or right posterior side, occasionally with frontal bone bossing, creating a parallelogram shape of the cranium. This axial shift in skull growth results in malalignment of the ears and often the eyes, depending on the severity, leaving one eye smaller in appearance than the other. Infants who develop brachycephaly present with heads that are wider than they are longer from a cephalic view, resulting in a flat appearance to the back of the head. When scaphocephaly is present, an infant appears to have a long and narrow head shape as opposed to the symmetrically oval shaped head of a typical infant.

There are several suspected causes of plagiocephaly, including craniosynostosis, which is the premature fusion of cranial bones limiting normal brain and head growth (Golden et al., 1999). It has been hypothesized that prenatal factors, such as uterine fibroids and intrauterine growth restriction, can influence fetal head deformation as well (Moh et al., 2012). Many researchers acknowledge the causal relationship between postnatal exposure to sustained external forces, predominantly during sleep or while in positioners, and the development of positional plagiocephaly (Shamji et al., 2012). Research has also shown that plagiocephaly is more prevalent in infants with disabilities (i.e., muscular dystrophy, torticollis, cerebral palsy, etc.) and those who lack muscle control or the ability to move their head in all planes (Rogers et al., 2009).

Once plagiocephaly is identified, pediatricians are tasked with determining if their patient has craniosynostosis, which requires surgical intervention, versus positional plagiocephaly, which can be addressed conservatively. In the event that craniosynostosis is ruled out and a positional plagiocephaly diagnosis is confirmed, pediatricians must then use their clinical judgement in referring infants for additional services, such as outpatient therapy. Depending on the gauged severity of plagiocephaly, pediatricians may refer an infant to an orthotist to determine if a corrective cranial orthotic device is necessary to remold an infant's head using a helmet. Pediatricians may also elect to educate parents and caregivers on repositioning techniques, then monitor an infant's head shape for corrective remolding over time. This wait and see approach for spontaneous cranial remolding is often implemented for infants with mild plagiocephaly; however, typically, no formal measurements or standardized classification techniques are used by pediatricians to determine the degree of severity at the time of diagnosis, other than visual interpretation. This leaves room for personal judgment or bias pertaining to plagiocephaly severity.

Fontana et al. (2016) studied developmental delays associated with deformational plagiocephaly (DP) with a prospective, non-randomized study. They found an increased incidence of developmental delay in composite language and composite motor scales in children with plagiocephaly when compared to the general population. These delays impact an infants' functional engagement in their natural environment. As skilled clinicians, occupational therapists are experts in addressing these developmental domains. Following a systematic review of the literature, Case-Smith (2013) found that OT clinicians were well poised to lead interprofessional teams in implementing community and home-based interventions. Collet et al. (2012) highlighted additional concerns impacting function resulting from distinct cranial deformities that can occur, ranging from facial asymmetry, visual field constriction, astigmatism, malocclusion of the jaw, otitis media and malposition of the ears to statistically significant measured by MRI.

These impairments, among others, impact a child's ability to engage in the everyday occupations of life, which is certainly a primary focus of occupational therapists. The OT practice framework identifies occupational therapists' distinct knowledge, skills, and qualities, described as cornerstones, that contribute to the success of the OT process. These cornerstones and their complementary contributors are the foundation for occupational therapists' success. All aspects of the OT domain transact to support engagement, participation, and health (American Occupational Therapy Association, 2020). In this specific population, all children with plagiocephaly are at risk for impairment in function, whether it be developmental delay in skill acquisition or malalignment of facial structures that may impact feeding; therefore, the need for OT evaluation is paramount.

Literature Review

Positional flattening can impact a child in many ways. In a case-controlled study of 20 infants with DP and 21 controls, Collett et al. (2012) used MRI to examine brain volume and shape in infants with and without DP. They found that infants with DP show differences in brain shape and that shape measures were also associated with their development. Another study reports that children with plagiocephaly also suffer from emotional difficulties and impaired psychological wellbeing, as well as physical health problems (Waddell, n.d.).

Ryall et al. (2021) used survey-based analysis to compare quality of life in 90 infants with DP. They found that infants with DP and their caregivers had a significantly decreased quality of life compared to their healthy peers, which shows the importance of therapeutic intervention (Ryall et al., 2021). In their study, Ryall et al. also surveyed 56 participants, post-helmet use, to see if the commonly used helmet remolding therapy had any negative effects on their quality of life, and it was shown to have no statistically significant impact, highlighting the value of interventional therapies.

In light of the rise in incidence of plagiocephaly, pediatricians are screening infants at well-baby visits through gross visual observation. No formal assessment recommendations for the presence and severity of plagiocephaly have been made by the AAP, although it is important to note that the first year of life is a crucial time for plagiocephaly diagnosis and treatment, as cranial sutures are patent and cranial remolding occurs most rapidly during this time. By 12 months of age an infant's cranial sutures typically fuse, merging the margins of the cranial bones into a near permanent shape of the skull that persists throughout childhood and into adulthood.

In search of the most accurate diagnostic assessment method for plagiocephaly, Siegenthaler conducted a scholarly search in 2014 for human subject research published within 10 years (English or German language with an abstract), that addressed diagnosis, classification, and monitoring of

plagiocephaly. Siegenthaler found there were six diagnostic and classification tools used for plagiocephaly assessment: visual assessment and clinical classification, anthropometric caliper measurements, flexicurve, plagiocephalometry, 3D photography, and radiographic imaging. Based on reliability data, the author concluded that plagiocephalometry and anthropometric assessment with a caliper are more reliable methods than visual assessment or measurements using the flexicurve (Siegenthaler, 2015). Because of physician time constraints during well-baby visits, the task of completing plagiocephaly screening and measurements could be delegated to an occupational therapist.

Positional plagiocephaly is, ultimately, a condition that is becoming more prevalent as a result of the Back to Sleep campaign along with the use of static positioners for infants. To educate the public about this condition, with the hope of preventing positional plagiocephaly for every infant, a survey was designed to provide clinically relevant data that concludes with evidence-based recommendations for standards of care and considers the functional implications of this diagnosis.

Parents and caregivers are a primary resource for noticing an abnormality of their infant's head shape and sharing their concern with their pediatrician. However, not all parents and caregivers are aware that plagiocephaly exists. Research shows that early parent and caregiver education about plagiocephaly aids in the awareness and prevention of this condition. In a multicenter, prospective, controlled study in 139 healthy infants (88 in the intervention group), postnatal parent and caregiver education on positioning and physical movement found that those parents and caregivers who had early education in the maternity ward pertaining to plagiocephaly prevention had successful outcomes for their infants (Cavalier et al., 2011).

Method

The researchers developed a preliminary survey and circulated it among a parent group for validation. Feedback from the parent and caregiver group was then incorporated into the survey as it evolved to its current state. After institutional review board's approval, this cross-sectional survey study was conducted across eight outpatient pediatric sites affiliated with Lehigh Valley Health Network. These pediatric sites are located in Center Valley, Fogelsville, Hazelton, Laury's Station, Madison Farms, Mountain Top, Palmer Township, Pond Road, Trexlertown, West Broad, Whitehall, and Richland Township, PA. Data collection occurred between April 1, 2019 and July 1, 2019. Approximately 1,100 parents and caregivers of infants were targeted for enrollment. Inclusion criteria required the participants to be willing and able to participate in reading and answering the English language questionnaire, be 18 years of age or older, and have an infant 12 months of age or younger. Each potentially eligible parent and caregiver was approached to complete the questionnaire. The parent and caregiver's infant was screened for age eligibility by the front desk staff at their pediatrician's office when they attended their 0–12-month-old infant's precocity wellness visit.

Protocols were established for the front desk staff at each outpatient pediatric site to ensure consistency in their approach to the parents and caregivers. Each parent and caregiver who met the inclusion criteria was handed a blank white envelope containing a cover letter with researcher contact information (method of acknowledgment and agreement of participation), and an anonymous parent and caregiver questionnaire (see Appendix) that was placed in a locked box by the front desk after completion.

Participants

Of the 1,100 surveys distributed to the eight sites, 404 surveys were collected for analysis, resulting in a 36.7% response rate. Three surveys were excluded because of inconsistent data regarding age. The

majority of the respondents were female (89.8%), in the 30–39 years of age group (61.1%) or the 18–29 years of age group (34.7%), and parents (as compared to caregivers) of the infant (97.9%).

Analysis

Categorical variables (infant age, gender, relation to child, attendance at daycare, sleep position, sleep duration, and maintenance of sleep) were described by frequency and proportions. Bivariate associations were assessed using Chi Square test or the Fisher's Exact test as indicated. The Cochran-Armitage Test for Trend was used to assess trends in proportions. All statistical tests of significance were based on a two-sided test of hypothesis with $p < 0.05$ considered significant. All statistical analyses were done using SAS Statistical software (SAS Institute Inc., 2021).

Results

In looking at infant characteristics, there was a similar percentage of female and male children represented in the responses (52.9% and 47.1%, respectively). The quantity of infants per age group varied, with the most common age groups being 6–12 months of age (33.8%) and 1–3 months of age (28.2%). Most of the children (80.6%) did not attend day care. As reported by the respondents, the most common infant sleep position was on their back (72.9%), followed by belly (9.3%) and side lying (5.0%). The participants reported that a majority of the infants slept between 5–9 hr per night (35.1%) or 10 or more hr per night (36.9%), but the quantity of infants in each group varied to a great extent. A little less than half of the children were reported to maintain their sleep position through the night (45.9%) (see Table 1).

Table 1

Characteristics of Study Participants

Proxy Participant		Child Participant	
Characteristic	**n (%)**	**Characteristic**	**n (%)**
Gender		**Gender**	
Male	40 (10.2)	Male	186 (47.1)
Female	351 (89.8)	Female	209 (52.9)
Age (years)		**Age (months)**	
18–29	137 (34.7)	0–1	39 (9.8)
30–39	241 (61.1)	1–3	112 (28.2)
40–69	17 (4.3)	3–6	55 (13.9)
Relation to Child		6–12	134 (33.8)
Parents	387 (97.9)	12–24	57 (14.4)
Non-parents	8 (2.0)	**Attends Day Care**	
		Yes	76 (19.4)
		No	315 (80.6)

Sleep Position	
Back	290 (72.9)
Belly	37 (9.3)
Side	20 (5.0)
Some combination/other	51 (12.8)
Sleep Duration	
0–4	36 (10.1)
5–9	190 (35.1)
10 or more	132 (36.9)
Maintains Sleep Position?	
Yes	181 (45.9)
No	213 (54.1)

Table 2 depicts characteristics of children who had either plagiocephaly, torticollis, or muscular weakness (PTM) in comparison to those children who did not have those specific conditions. These three conditions were combined for analysis because of the low incidence of each. Overall, only 19 children of the 401 were reported to have PTM (4.7%). The greatest difference was found when looking at whether the child attended day care, as a greater proportion of the children with PTM did not attend day care (94.7%) as compared to children without PTM (79.7%); however, this difference was not statistically significant (p = .14). There were slight differences in the position in which the child slept at night, notably that a higher percentage of the children with PTM slept in a combination of positions (26.3%) versus the children without PTM (12.2%), but again, this difference was not statistically significant (p = .17).

Table 2

Characteristics of the Child by Plagiocephaly, Torticollis, and Muscular Weakness (PTM) Status

Characteristic	**Yes n (%)**	**No n (%)**	***P* Value**
Gender			0.99
Male	9 (47.4)	176 (47.2)	
Female	10 (52.6)	197 (52.8)	
Age (Months)			0.38
0–1	0 (0)	38 (10.1)	
1–3	4 (21.1)	108 (28.8)	
3–6	3 (15.8)	52 (13.9)	
6–12	7 (36.8)	125 (33.3)	
12–24	5 (26.3)	52 (13.9)	
Attends Day Care			0.14
Yes	1 (5.3)	75 (20.3)	
No	18 (94.7)	294 (79.7)	
Sleep Position			0.17
Back	14 (73.7)	274 (72.9)	
Belly	0 (0)	36 (9.6)	
Side	0 (0)	20 (5.3)	
Combination/Other	5 (26.3)	46 (12.2)	

Sleep Duration			0.40
0–4	0 (0)	36 (10.7)	
5–9	10 (55.6)	178 (52.7)	
10 or more	8 (44.4)	124 (36.7)	
Maintains Sleep Position			0.49
Yes	7 (36.8)	172 (46.2)	
No	12 (63.2)	200 (53.8)	

Table 3 focuses on the characteristics of the respondent and their associations with respect to PTM diagnoses. A greater percentage of the respondents with a child with PTM had heard of positional flattening or plagiocephaly (73.3%) as compared to those having a child without PTM (53.8%), although this was not statistically significant (p = .10). Overall, a greater number of the respondents were more interested in a preventative device (65.3%) than were not. Of those interested in a preventative device, a higher percentage of the respondents with a child with PTM were interested (83.3%) than those having a child without PTM (64.8%), but this difference was not statistically different (p = .13).

Table 3

Characteristics of Proxy and their Associations with Respect to Sleep-Position-Related Diagnoses

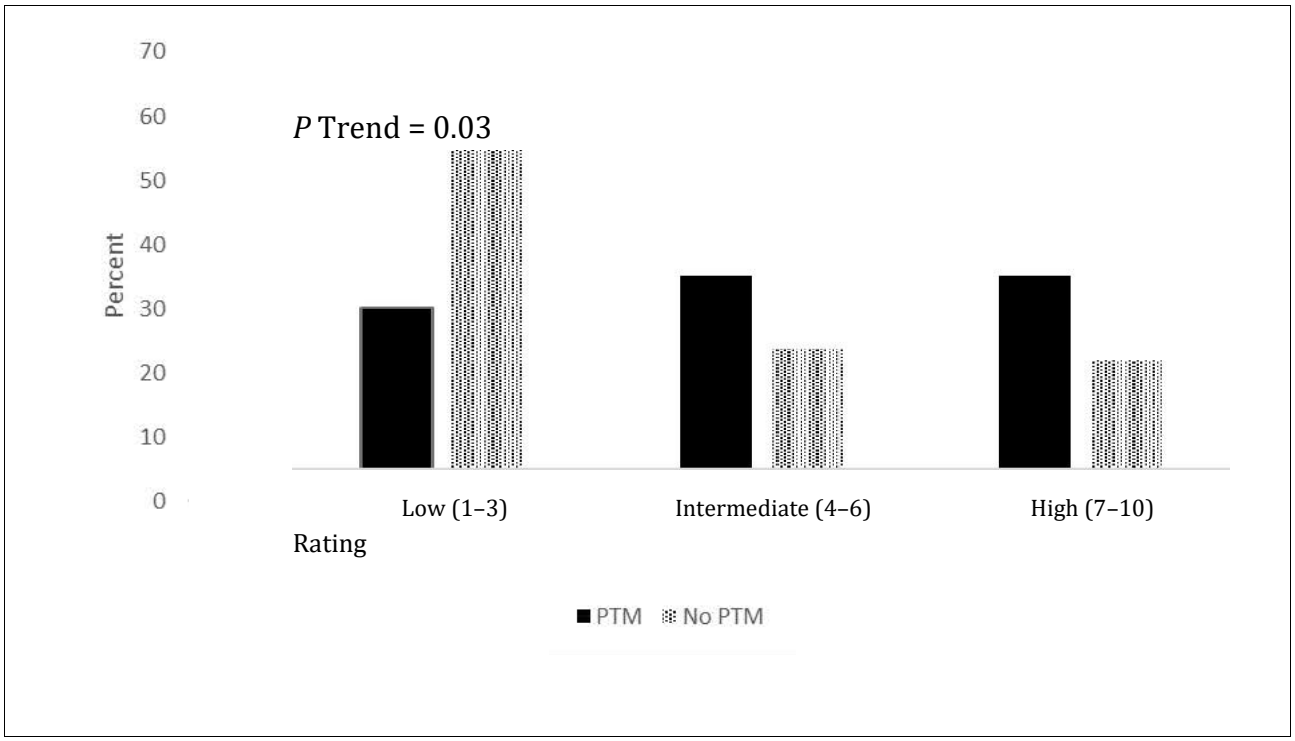
		PTM		
Characteristic	**Overall n (%)**	**Yes n (%)**	**No n (%)**	**P Value**
Gender				
Male	40 (10.2)	1 (5.6)	39 (10.5)	0.99
Female	351 (89.8)	17 (94.4)	331 (89.5)	
Age				
18-29	137 (34.7)	6 (31.6)	130 (34.9)	0.84
30-39	241 (61.1)	12 (63.2)	227 (60.9)	
40-69	17 (4.3)	1 (5.3)	16 (4.3)	
Relation to child				
Parents	387 (97.9)	18 (94.7)	366 (98.1)	0.33
Non-parents	8 (2.0)	1 (5.3)	7 (1.9)	
Heard of Positional Flattening or Plagiocephaly?				
Yes	215 (54.6)	14 (73.3)	200 (53.8)	0.10
No	179 (45.4)	5 (26.3)	172 (46.2)	
Interest in Preventative Device?				
Yes	243 (65.3)	15 (83.3)	228 (64.8)	0.13
No	129 (34.7)	3 (16.7)	124 (35.2)	
Other Children Impact Holding Infant?				
Yes	125 (32.2)	3 (15.8)	120 (32.8)	0.14
No	263 (67.8)	16 (84.2)	246 (67.2)	

When comparing the respondents' level of concern about plagiocephaly, the majority of the respondents had a low concern rating (56.7%). However, 35.3% of the respondents who had a child with PTM had a high level of concern about plagiocephaly and another 35.3% had an intermediate level of concern. This is compared to the participants whose child did not have PTM, where only 19.9% of parents had a high-level concern and 21.9% had an intermediate level of concern. Overall, there was a significant

trend in level of concern between the respondents with a child with PTM and those without (p = .03) (see Figure 1).

Figure 1

Rating of Level of Concern About Plagiocephaly by Plagiocephaly, Torticollis, or Muscle Weakness (PTM) Status



Discussion

Plagiocephaly is a preventable condition that is on the rise, currently impacting 20%–30% of infants (Collett et al., 2019; Lam & Luersson, 2016). The findings reported herein suggest that it is likely unrecognized by many parents and caregivers and appears to generate a low rating of concern if not already diagnosed. Educating caregivers about positional plagiocephaly as part of the Back to Sleep literature can be an effective means of sharing this information. Pediatricians use gross visual assessment of an infant's head to determine if plagiocephaly exists, as recommended by the AAP, and base their recommendations for treatment on their perceived concern for severity. The addition of anthropometric head measurement could be added to physician's current routine of performing head circumference measurements. There is a narrow window of time to provide intervention for infants with plagiocephaly as cranial suture fusion occurs at 12 months resulting in the cranial shape remaining nearly fixed beyond 1 year of age.

Because of the narrow window of time for providing intervention to infants with plagiocephaly, many studies have been conducted to evaluate the effectiveness of different intervention techniques in preventing and treating plagiocephaly (Robinson & Proctor, 2009). In Sweden, a prevention project structured around nurse repositioning of infants was initiated and found that educating nurses on how to assess for cranial deformity facilitated early detection of such deformities (Lennartsson et al., 2015). A combination of alternating supine sleep position and prone play time positioning, as well as counter positioning, are reported to have profoundly positive effects on plagiocephaly prevention (Jones, 2005).

In a large-scale study performed by Steinberg et al. (2015), repositioning an infant at consistent intervals resulted in complete correction of cranial deformity in 77.1% of patients. In an article published by Waddell (n.d.), repositioning therapy was only deemed effective for mild to moderate cases of plagiocephaly if treated prior to 5 months of age.

The majority of the participants in this study stated that their infants sleep supine, which adheres to the AAP Back to Sleep protocol. There was an overall low incidence of PTM, which may be a result of the parents not recognizing or not knowing how to recognize if their child had PTM. Overall, more of the respondents were aware of the condition of plagiocephaly than were not aware, but a greater percentage of the respondents with a child with PTM were aware of plagiocephaly as compared to those without a child with PTM. This indicates that there are still deficiencies in awareness about plagiocephaly, particularly among parents and caregivers that do not have children with these conditions. These deficiencies may be because no formal screening occurs at well visits. The lack of screening at well visits not only hinder plagiocephaly awareness, but also could mean that the prevalence of plagiocephaly is much higher than reported.

The literature supports the benefit of a child receiving OT through early intervention services in an effort to support the developmental delay and anatomic malformation concerns addressed in this study: cranial defects impacting psychosocial development, (social) language development impacting social engagement, cognitive impairment impacting academic performance, and dental malocclusion impacting feeding (Collett et al., 2005). All of these findings pave the way for consideration of occupational therapists being critically needed team members for this condition. Occupational therapists can assume the role of educating families about plagiocephaly, perform formal screening, and measure infants during their well-baby visit to ensure plagiocephaly is prevented or treated.

Occupational therapists can provide instructional handouts on positioning and tummy time activities at the AAP's recommended periodic well visits at 1 month, 2 months, 4 months, 6 months and 9 months, as well as provide parents and caregivers with proactive measures to take in preventing plagiocephaly for their infant. Furthermore, research pertaining to OT interventions in the prenatal realm is underway to see if provision of services in the perinatal realm is an effective practice area for the OT profession. While improving function may be of interest to other providers, it is particularly well suited to the OT framework. OT is structured to evaluate (at the person, group, and population level), intervene, and evaluate outcomes to measure and assess progress, transition between providers, and implement discontinuation after short- and long-term goals have been achieved. All of these attributes align with the ideal management of patients with plagiocephaly (American Occupational Therapy Association, 2020).

Overall, plagiocephaly, as a preventable diagnosis, creates unnecessary health care costs with potential long-term detrimental effects for affected infants. Providing parents with early education by an occupational therapist, either at the hospital or during the established precocity schedule of infant well visits between 1-9 months, can markedly reduce the likelihood of an infant developing plagiocephaly. Once plagiocephaly is diagnosed, treatment measures through repositioning, outpatient OT, or cranial orthosis may be implemented. Beginning the education process as early as possible for parents and caregivers will allow occupational therapists to become involved in their care as soon as possible and prevent plagiocephaly from causing long-term harm to the infants.

Future Directions

There are several possible areas of future research needed to address remaining questions about plagiocephaly. First, how much sustained pressure does it take to cause plagiocephaly, and does the degree

of plagiocephaly vary based on the duration of sustained pressure? Research has shown that plagiocephaly is more prevalent in infants with disabilities like torticollis and those who lack muscle control or the ability to move their head in all planes. However, plagiocephaly is also prominent in typically developing infants who are left in positioners that cause sustained pressure to the back of the head. In addition, do pediatricians only recognize torticollis when plagiocephaly is present? Or, is it possible that plagiocephaly is only assessed when a comorbid condition exists? For future research, we recommend asking parents about who first discussed plagiocephaly with them, for example, a pediatrician or other health care provider, such as an occupational therapist. Then, we recommend asking if said health care provider does developmental evaluations during pediatric visits, or if the child's health care provider ever talked about the shape of the child's head. Conducting a thorough literature review to determine the frequency of plagiocephaly diagnosis alone or with a comorbid condition, how frequent pediatricians are discussing plagiocephaly with parents, if developmental evaluations are done, and if the child's head shape is discussed at all may help to determine the accuracy of capturing the diagnosis. Researchers may also explore the role of OT in the perinatal realm for developmental education and developmental delay prevention as it is related to plagiocephaly.

Limitations

The study was limited by the low incidence of plagiocephaly in our population; our results may not fully represent the population. In addition, several of the distribution sites had populations that were predominantly Spanish speaking. Having this survey available in both English and Spanish would have broadened the population who could participate in this study and improved the ethnic diversity of the sample. In addition to providing more language options, it would have been beneficial to use simpler language on all surveys, so those with low health literacy could have participated. Also, revisions to the sites selected for survey distribution were made because of changes in Lehigh Valley Health Network Pediatric service provision, which altered the strategic demographic representation of the survey population. Lastly, survey distribution was limited to the outpatient pediatric setting. The inclusion of infants in other settings, such as NICU, inpatient hospital, or rehabilitation stays may have provided a broader representation of the pediatric population.

Implications for OT

The long-term sequelae of this diagnosis on the social, emotional, and global development of a child are still being assessed. Occupational therapists are uniquely qualified to provide intervention, both preventative and therapeutic, in the realms of motor development, feeding, and beginning language stimulation through a sensory based approach. As our results show, there is a need to educate parents and caregivers. Through parent and caregiver education on stretching and repositioning, we have an opportunity to decrease the occurrence of positional plagiocephaly. As clinicians, occupational therapists have the knowledge of anatomy and pediatric development enabling expert provision of preventative intervention. Occupational therapists provide care in hospitals, homes, and clinic-based settings, adding to the diversity of service locations and access to care. A proposed area of emerging practice for OT would be as consultants in perinatal care in the hospital setting to educate parents and caregivers on plagiocephaly prevention techniques through positioning and tummy time exercises. Occupational therapists could provide in-home training for environmental adaptations to maximize sleep positioning, enhance motor development, and empower parents to optimize their infant's growth and development while monitoring for plagiocephaly. Infant check-ups during the AAP established precocity well visits provide an excellent arena for occupational therapists to screen and formally evaluate plagiocephaly and provide prevention education.

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Appendix

Thank you for participating in this brief, anonymous, 5-min questionnaire. The purpose of this questionnaire is to gather data regarding parent and caregiver awareness of sustained positioning and the effect it may have on the shape of a child's head (plagiocephaly) and facial symmetry. Once completed, please place the questionnaire back in the envelope and then in the locked box provided at the check-in station. **This questionnaire is designed for parents and caregivers of infants ranging from 0-12 months of age. Please answer the following questions in relation to the child being seen for their wellness visit. When possible, please circle the appropriate answer or fill in the blank:**

1. **Circle your gender:** Male Female
2. **Circle your age:** 18–29 30–39 40–49 50–59 60–69 70–79 80 +
3. **Are you the child's:** Mother Father Grandparent Caregiver Other_____
4. **Circle your child's gender:** Male Female
5. **How old is your child (in months)? _____**
6. **Does your child have any medical conditions?** Yes No

   If yes, circle the answers that apply:
   Plagiocephaly Decreased muscle tone Down syndrome Torticollis (neck muscle tightening)
   Other_____
7. **How do you position your child at night for sleep?**

   On their back Belly Side lying Other_____
8. **How many hours does your child sleep at night? _____**
9. **Have you ever heard of positional flattening or plagiocephaly and its potential impact on facial symmetry?** Yes No
10. **Please rate your concern about plagiocephaly on a scale of 1–10 (1 being *not concerned at all*, 10 being *most concerned*):**

    1 2 3 4 5 6 7 8 9 10
11. **On average, how many hours does your child spend in a positioning device during the day (car seat, high chair, bouncy seat)? _____**
12. **Does your child maintain the same sleep position?** Yes No
13. **Is your ability to hold your infant influenced by having other children?** Yes No
14. **Does your child attend daycare?** Yes No
15. **If there was a device designed to prevent head flattening or facial asymmetry, would you use it?** Yes No