



Literature Review

Methods to Diagnose, Classify, and Monitor Infantile Deformational Plagiocephaly and Brachycephaly: A Narrative Review



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Abstract

Objective: The purpose of this study is to review the literature for possible methods in diagnosing, classifying, and monitoring deformational plagiocephaly and brachycephaly.

Methods: A search was conducted on articles through February 2014 in PubMed (Medline) and Google Scholar. Articles were included if they met the following criteria: (1) they were written in English or German; (2) they involved humans; (3) they were published in the last 10 years; (4) they had a primary research question about all possible methods for diagnosing, classifying, and monitoring deformational plagiocephaly and brachycephaly; and (5) an abstract was available.

Results: The search resulted in 58 articles. After the review, the number was reduced to 16. Of the 16 articles included, 9 were reliability studies on measurements of deformational plagiocephaly. Six measurement tools for diagnosing, classifying, and monitoring deformational plagiocephaly and brachycephaly were found: visual assessment, anthropometric measurements with a caliper, measurements with a flexicurve, plagiocephalometry, 3-dimensional photography, and radiological imaging.

Conclusion: This study found that visual assessment, flexicurve, anthropometric measurements with a caliper, and plagiocephalometry are useful measurements. At present, the plagiocephalometry and the anthropometric measurements with a caliper are more reliable methods than the visual assessment and the measurement with a flexicurve.

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Introduction

Cranial asymmetry in infants due to nonsynostotic deformation of the skull, also called *positional or deformational plagiocephaly* (DP), has been documented in the literature since 1992.¹ In 1992, the American

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Academy of Pediatrics released a statement recommending that infants should sleep in the supine position, which has lowered the incidence of sudden infant death syndrome by 40%.² A consequence of the recommendation is the increasing incidence of DP.³ The incidence of DP was found to be 46.6% in 7- to 12-week-old infants in a cohort study carried out in 2013.² Of these infants, 63.2% were affected on the right side. Deformational plagiocephaly occurs primarily in infants with a preference for turning their head to one side or infants suffering from torticollis.⁴ Furthermore, there is some evidence that intrauterine constraints can cause DP⁵ and, moreover, that intrauterine constraints and birth trauma can lead to asymmetry and, consequently, to DP.⁶ Rogers³ stated that infants are more affected on the right side because of the common left occiput anterior intrauterine position, where the fetus lies with the head in a slight right rotation. In addition to DP, brachycephaly, a symmetrical occipital flattening and compensatory parietal widening, is often seen in infants without a preferred head rotation as a consequence of the recommended supine positioning.³

Currently, there are no standards for diagnosing, classifying, and monitoring DP and brachycephaly.^{7,8} Likewise, there are no standards for deciding whether or not to treat and which treatment, like for example active repositioning, physical therapy, orthotic helmets, or chiropractic or manual therapies, to choose. In general, DP and brachycephaly are considered cosmetic problems, although children with severe DP might have a higher risk of strabismus and auditory problems.⁹ In addition, facial asymmetry due to DP might lead to mandibular asymmetry, which can change the form and function of the orofacial system.^{9,10} A causal relationship between DP and secondary changes in the orofacial system, however, has not yet been established. Brain dysfunction with developmental delays is sometimes associated with DP and brachycephaly.⁹ This hypothesis, however, has not yet been confirmed, and it is more probable that the developmental delay causes skull deformity than vice versa.

Chiropractors and other practitioners working with infants are often confronted with DP in combination with preferred head rotation to one side, and infantile torticollis. Furthermore, parents of children with brachycephaly might choose to consult a chiropractor for advice and treatment. Therefore, the purpose of this article is to review the literature for methods in diagnosis, classification, and monitoring of DP and brachycephaly.

Methods

A search was conducted through February 2014. The search was performed on the following databases: PubMed (Medline) and Google Scholar. In addition, the reference lists of the retrieved articles were screened. Articles were included if they met the following criteria: (1) they were written in English or German; (2) they involved humans; (3) they were published in the last 10 years; (4) they had a primary research question about all possible methods for diagnosing, classifying, and monitoring DP and brachycephaly; and (5) an abstract was available. Excluded were articles that described craniosynostosis and articles that measured outcomes of treatments of DP and brachycephaly.

Search Terms

The first search included the keywords *plagiocephaly* and *diagnosis*. Then, the keywords *plagiocephaly* and *diagnosis* were combined with *measurement and classification*. The second search included the keyword *positional plagiocephaly*, the third search included the keyword *deformational plagiocephaly*, the fourth search included the keyword *non-synostotic plagiocephaly*, and the fifth search included *brachycephaly*. The second, third, fourth, and the fifth keywords were then each combined with the words *diagnosis, measurement, and classification*.

Results

The search resulted in 58 articles that were all carefully reviewed. After the review, the number was reduced to 16. Articles were excluded from the review if they were not relevant to the research question. Of the 16 articles included, 9 were reliability studies on measurements of DP. The 9 nonreliability studies found in the search included reviews of DP in general. Brachycephaly is less discussed in general in the medical literature, probably because of the posterior, symmetric skull deformity without ear shift and facial scoliosis.

Altogether, 6 measurement tools for diagnosis, classification, and monitoring DP and brachycephaly were found: visual assessment/clinical classification, anthropometric caliper measurements, flexicurve, plagiocephalometry/molding device, 3-dimensional

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