

Congress of Neurological Surgeons Systematic Review and Evidence-Based Guideline on the Management of Patients With Positional Plagiocephaly: The Role of Repositioning

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1 **ABSTRACT**

2 **Background:** Plagiocephaly, involving positional deformity of the calvarium in infants, is one of
3 the most common reasons for pediatric neurosurgical consultation.

4 **Objective:** The objective of this systematic review was to answer the question: what is the
5 evidence for the effectiveness of repositioning for positional plagiocephaly? Treatment
6 recommendations are provided based on the available evidence.

7 **Methods:** The National Library of Medicine Medline database and the Cochrane Library were
8 queried using MeSH headings and keywords relevant to repositioning as a means to treat
9 plagiocephaly and brachycephaly. Abstracts were reviewed to identify which studies met the
10 inclusion criteria. An evidentiary table was assembled summarizing the studies and the quality
11 of evidence (Classes I–III). Based on the quality of the literature, a recommendation was
12 rendered (Level I, II, or III).

13 **Results:** There were three randomized trials (Class I), one prospective cohort (Class II) and six
14 retrospective cohort studies (Class III). Repositioning education was found to be equivocal to a
15 repositioning device and inferior to a physical therapy program. Five out of the seven cohort
16 studies comparing repositioning to helmet reported helmets to be better and take less time.

17 **Conclusions:** Within the limits of this systematic review, repositioning education is effective in
18 affording some degree of correction in virtually all infants with positional plagiocephaly or
19 brachycephaly. Most studies suggest a molding helmet corrects asymmetry more rapidly and to
20 a greater degree than repositioning education. In a Class I study, repositioning education was as
21 effective as repositioning education in conjunction with a repositioning wrap/device. Another
22 Class I study demonstrated a bedding pillow was superior to physical therapy for certain infants.
23 However, in keeping with The American Academy of Pediatrics' warning against the use of soft
24 positioning pillows in the sleeping environment, the task force recommends physical therapy
25 over any positioning device.

26 **Key Words:** infants; plagiocephaly; positional; practice guidelines; repositioning

27 **INTRODUCTION**

28 Since the recommendation by the American Academy of Pediatrics (AAP), made in
29 1992, that infants be placed on their back to sleep to reduce the risk of sudden infant death
30 syndrome (SIDS), plagiocephaly, involving positional deformity of the calvarium in infants, has
31 been one of the most common reasons for pediatric neurosurgical consultation.¹ There are two

32 types of plagiocephaly. The most common is referred to as posterior plagiocephaly in which
33 there is unilateral flattening of the parietooccipital region resulting in a rhomboid like shift of the
34 calvarium with an anterior shift of the ipsilateral ear and bulging or bossing of the ipsilateral
35 forehead. The second, less common variant, is sometimes called brachycephaly in which there is
36 flattening of the entire occipital region resulting in a foreshortened head in the anterior-posterior
37 dimension. However, the term ‘brachycephaly’ is also used in children with craniosynostosis.
38 Henceforth, the authors will refer to non-synostotic calvarial positional deformity as
39 plagiocephaly.

40 With very rare exception, plagiocephaly is a non-operative condition.² Treatments
41 include observation, physical therapy, particularly in the presence of torticollis, repositioning
42 education or assistive devices and helmet therapy. High rates of parental satisfaction have been
43 reported regardless of treatment type.³ Plagiocephaly has been the topic of numerous review
44 articles.⁴⁻¹⁰ The purpose of this systematic review is to address the question: Does repositioning
45 (education or with an assistive device) provide effective treatment for plagiocephaly?

46 **METHODS**

47 The Congress of Neurological Surgeons (CNS) and the Section on Pediatric
48 Neurosurgery initiated a systematic review of the literature and evidence-based guideline
49 relevant to the management of positional plagiocephaly.

50 **Literature Search**

51 The task force collaborated with medical librarians to search the National Library of
52 Medicine/PubMed database and the Cochrane Library for the period from 1966 to October 2014
53 using the MeSH subject headings and PubMed search strategies. Manual searches of
54 bibliographies were also conducted. The search returned 38 articles; another 7 articles were
55 found from a search through bibliographies. Twenty-four were excluded based on a review of
56 the abstract. Ten articles satisfied inclusion for this systematic review and meta-analysis,
57 including three randomized trials, one prospective cohort, and six retrospective cohort studies.

58 **Rating Quality of Diagnostic Evidence**

59 For diagnostic-type papers, evidence classification had definitions targeted toward
60 diagnosis. The issues addressed by papers on diagnosis are related to the ability of the diagnostic
61 test to successfully distinguish between patients who have and do not have a disease or pertinent
62 finding. Additional information regarding the hierarchy classification of evidence can be located

63 here: <https://www.cns.org/guidelines/guideline-procedures-policies/guideline-development->
64 [methodology.](https://www.cns.org/guidelines/guideline-procedures-policies/guideline-development-)

65 **RECOMMENDATION**

66 1. Repositioning is an effective treatment for deformational plagiocephaly. However, there
67 is Class I evidence from a single study and Class II evidence from several studies that
68 repositioning is inferior to physical therapy and to use of a helmet, respectively.

69 Strength of recommendation: Level I – high clinical certainty (repositioning being
70 inferior to physical therapy); Level II – moderate clinical certainty (repositioning being
71 inferior to helmet)

72 **CONCLUSION**

73 Positional plagiocephaly and brachycephaly are very common nowadays. This
74 systematic review has demonstrated that either repositioning therapy or devices may be effective
75 as sole therapy, improving cranial asymmetry, particularly for mild to moderate deformity.

76 Three randomized trials were included in our review. Each study compared different pairs of
77 treatments. One trial found no difference between repositioning education and a repositioning
78 device and another found repositioning education was inferior to a physical therapy intervention
79 program. Even though there is a European randomized trial that suggested a bedding pillow was
80 superior to daily stretching exercises in certain forms of positional deformity, we cannot at this
81 time endorse any sleep positioning device as it would be contrary to the repeated
82 recommendations set forth by the AAP Task Force on SIDS to avoid placing any soft surface
83 bedding in the infant's crib.¹¹ Seven out of 10 articles that were included in this review evaluated
84 repositioning education (without a specified device) as compared with a helmet or headband.
85 The majority of these cohort studies (one prospective, six retrospective) demonstrated that
86 helmet therapy provides a greater degree of correction in a shorter period of time than
87 repositioning. Thus, helmets should be the preferred treatment for severe positional deformity.

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96 **Disclosures**

97 The authors do not have any disclosures to report.

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