

Literature review / Revue de la littérature

Non-surgical management of posterior positional plagiocephaly: Orthotics versus repositioning

*Prise en charge non chirurgicale de la plagiocéphalie postérieure positionnelle :
appareillage orthétique versus programme de repositionnement*

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Abstract

Objective. – Evaluate from the literature, the evidence of comparative efficiency of non-surgical treatments (orthotics or head repositioning therapy) in posterior positional plagiocephaly.

Material and methods. – Systematic review from scientific articles (original cohort studies and review of literature), published in French or in English, searched on five online literature data bases, comparing non-surgical treatments (repositioning and orthotics therapy) for deformational plagiocephaly. A standardized method guidelines (Critical Review Form–Quantitative Studies) has been used.

Results. – Only 11 cohort studies met the inclusion criteria and six reviews of literature were analyzed. Many biases have been identified, most of the time, favoring the repositioning groups (older infants and plagiocephaly more severe).

Conclusions. – Several different orthotics seem to correct head deformities better and faster than repositioning protocols. Evaluation methods, treatment indications and long-term efficacy should be clarified. Studies about treatment risks are warranted.

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Keywords: Plagiocephaly; Orthosis; Repositioning

Résumé

Objectif. – Évaluer, à partir des données de la littérature, les preuves de l'efficacité comparée des techniques non chirurgicales de prise en charge de la plagiocéphalie postérieure positionnelle (techniques orthétiques ou protocoles de repositionnement).

Méthode. – Une revue de littérature a été réalisée à partir d'articles (revues de littérature ou études de cohortes) publiés en anglais ou en français, recensés sur cinq bases de données sur la comparaison des protocoles non chirurgicaux de traitement de la plagiocéphalie postérieure positionnelle. Une grille de lecture standardisée a été utilisée (Critical Review Form–Quantitative Studies).

Résultats. – Six revues de littérature ont été retrouvées sur le sujet ainsi que 12 articles originaux parmi lesquels 11 ont été retenus. De nombreux biais ont pu être mis en évidence, le plus souvent en faveur du repositionnement (les enfants étaient souvent plus âgés et avec une plagiocéphalie plus sévère dans les groupes appareillés).

Conclusion. – Plusieurs types d'orthèses crâniennes semblaient aboutir à des corrections plus importantes et plus rapides que les protocoles de repositionnements. Une clarification des méthodes d'évaluation et des indications de traitement ainsi que des évaluations des risques et du maintien de l'efficacité à plus long terme seront nécessaires.

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1. English version

1.1. Introduction

The term “plagiocephaly” stems from the greek “plagios” which means “oblique” and from “kephalê” meaning “head”. Positional plagiocephaly leads to cranial deformity, typically resulting in a parallelogram-shaped skull, with occipital flattening on one side, anterior shifting of the homolateral ear and prominence of the forehead, or even of the homolateral zygomatic region [21]. It contrasts with the symptomatic plagiocephalies of craniostenosis by premature unilateral closure of lambdoid or coronal suture.

Differential diagnosis is clinical through the skull form and the deviations of the homolateral cheekbone and ear. In case of doubt, X-rays or even a scanner with bone window setting are performed to confirm the cranial suture opening [34].

Posterior positional plagiocephaly develops progressively during the first weeks of life owing to supine position whereas the cervical tonus does not allow the infants changing their position [40]. It can also be the consequence of external intrauterine pressures.

The incidence of posterior positional plagiocephaly has dramatically increased some 20 years ago following the new recommendations of the American Academy of Pediatrics in 1992 [1] prohibiting the infants’ prone position during sleep. Indeed, at the same time as sudden infant death syndrome decreased for more than 40% (from an incidence of 1.2/1000 births in 1992 to 0.56/1000 in 2001 [33,1]), the number of young children presenting with posterior plagiocephaly grew from one birth out of 300 [7] to one out of 60 [3].

The most frequently quoted consequences of posterior positional plagiocephaly are of esthetic order [4]. Although less frequent, other more severe consequences may appear. They may affect the relationships between the infants and their parents, and later the psychological status of the children [30]. No rigorous study investigates the further development of children presenting with posterior positional plagiocephaly [34], but a few authors [26,31] reveal a more important rate of development delay and of the need to perform schooling adaptations in children with plagiocephaly. On the other hand, the frequency of facial and maxillofacial deformity, cervical scoliosis, visual and hearing difficulties seems more important in children who presented plagiocephaly [2,9,12,21].

There is no “gold standard” for evaluating and quantifying the importance of plagiocephaly. The methods of evaluation may be based on subjective scales worked out by the authors [23,33,41], based on purely visual evaluations, including sometimes the parents’ opinion [8,33]. There are also some objective evaluations based on anthropomorphic measurements [12,13,24,27,29,35,39]. Their advantage is to be more easily reproducible than the three-dimensional pictures (3-D) [13] and to prevent the infant from exposure to the radiations used during X-rays or scanning, but they lead to a loss of information because they are two-dimensional [2], and their reproducibility may be tricky in some cases [22].

Several means are considered to allow 3-D evaluation. Hutchison et al. [13] are using a 3-D picture system in association with anthropomorphic measurements. Mottolese et al. [28] opt for a 3-D reconstruction starting from a cerebral tomodensitometry (TDMc). As regards surface scanner, it was the subject of several studies [16,17,22,32] with the production of a mathematical and statistical method of results comparison in order to assess the efficacy of the management [17].

The treatment options are conditioned by the selected evaluation method and remain dependent on the examiner. Besides, according to Lee et al. [20], these discrepancies are important between the neurosurgeons and the plastic surgeons. To evaluate the management efficacy, these same measures are being used, as well as the degree of satisfaction of the parents or of the examiner [23,33,34]. Some authors, like Losee et al. [23] assess it upon the changes of the head position during sleep (which would be secondary to an improvement of posterior plagiocephaly).

The non-surgical management techniques of posterior positional plagiocephaly are the repositioning programs, cranial orthosis (with or without associated physical therapy) and sometimes a wait-and-see policy with the hope of spontaneous correction. If the decision of any management is taken, it must be made early in order to be supported by the remodeling capacities due to the growth of the skull (85% during the first year of life) [17,33].

Repositioning consists in alternating the positions of the head during bedding, while limiting the predisposing factors (in particular the time spent with a posterior resting surface) and increasing the time spent on the tummy when not sleeping (“tummy time”).

The first descriptions of cranial orthosis of helmet type go back to the end of the 1970s with the works by Clarren et al. [7]. Despite a lack of methodology quality [34], most of the studies are in favor of a good short-term efficacy (helmet [9,13,21] or other [27,32]), as is shown in the work aiming the certification of the helmets by the American Food and Drug Administration (FDA) [17,24,30], in particular for the aged children presenting with a severe plagiocephaly, beyond 6 months’ delay and if the response to the conservative treatment is insufficient [10]. However, a retrospective study suggests that there would be no long-term efficacy of the helmet [20], and the recent study by Flannery et al. [10] reminds that the helmet efficacy would need new studies, of high standard of evidence.

The helmets are made from a molding on a semi-rigid material; most of them have an expansion zone facing the occipital flattening and a head-rest at level of the forehead bulge. Teichgraeber et al. [39] propose a cranial orthosis made of bands (DOC bands) which would allow reducing significantly ($P < 0.001$) the asymmetry of the base of the skull.

The complications secondary to the use of cranial orthosis are rare [30,36]. They may lead to contact dermatitis, cutaneous irritation, pressure sore, cervical trauma due to the displacement of the gravity centre, or psychological consequences at the children, and especially at the parents [24,38]. In the Anglo-Saxon countries, a controversy exists concerning the cost/efficacy relationship of cranial orthosis, which was reinforced

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