Torticollis and plagiocephaly in infancy: Therapeutic strategies; A review

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Chapter 3

Abstract

Background

Asymmetry in infancy is a diagnosis with a large spectrum of features, expressing an abnormal shape of parts of the body or unequal postures and movements, which might be structural and/or functional, with localized or generalized expression.

Purpose

The purpose of the present study is to highlight different therapeutic aspects of the most occurring asymmetries in infancy: congenital muscular torticollis, positional torticollis and plagiocephaly, based on best evidence in current literature.

Results

A flow chart is presented showing different pathways in therapeutic strategies, such as physical therapy, orthotic devices (helmet treatment and Dynamic Orthotic Cranioplasty) and surgery.

Conclusion

It is concluded that there are different views towards management on torticollis and plagiocephaly. A systematic therapeutic management to evaluate these asymmetries is indicated. The presented therapeutic flow chart might serve as a basis in order to achieve uniformity in therapeutic thinking and performance.

Introduction

Asymmetry in infancy is a descriptive diagnosis with a large spectrum of features, i.e. structural and/or functional, generalized or localized, regarding abnormal shape of parts of the body or unequal postures and movements, with a multifactorial etiologic expression.[1-7] The appearance of asymmetry in spontaneous posture and movements of the infant and an increase of the incidence of plagiocephaly without synostosis[2,4,5,8-11], is associated with the changed guidelines to prevent Sudden Infant Death (SID).[1,6,11-20]
The purpose of present study is to highlight the different therapeutic regimes regarding congenital muscular torticollis, positional torticollis and plagiocephaly. The search strategy was focused on current peer-reviewed literature in Medline, PubMed, CINAHL and Cochrane, with the keywords: asymmetry, infancy, torticollis, plagiocephaly, intervention, therapy and treatment. Related publications were also searched for in the references of all publications. No randomized controlled trials or systematic reviews were found. Non-controlled studies have different views concerning the treatment of asymmetry in infancy.[20,21] A review article concerning the diagnostic strategies for the evaluation of asymmetry in infancy has recently been published.[6]

Asymmetrical features

Most occurring are generalized asymmetry in posture and movements[2,22-27] and localized asymmetries as congenital muscular torticollis, positional torticollis and plagiocephaly.[6,22,28] These disorders are causally heterogeneous symptoms of similar nosologic entities.[6]
Torticollis, defined as localized asymmetry in infancy, with preferential posture of the head and asymmetric cervical movements, might be present at birth[22,29] or may develop in the first months of life as a result of an imbalance in the muscular function in the cervical region.[30] Secondary abnormalities of skull and muscles in the cervical region are associated.
Congenital muscular torticollis (CMT) is the type of torticollis with a unilateral contracture of the sternocleidomastoid muscle (SCM), often based on a pseudotumor of infancy.[30-34] Positional torticollis (PT) will develop in case of a persistent positional preference of the head, without evidence of morphologic changes in the SCM and may be induced by a deformational plagiocephaly at birth or/and a one-sided positioning after birth, during the first one to five months of life.[29]
Deformational plagiocephaly (DP)[31,35,36] has been attributed to the sleeping position, congenital muscular torticollis or positional torticollis, neurological or cervical defects and premature birth[11,30,37-39] (Figure 1). The asymmetry of the head may be initiated pre-natally[29] and be exacerbated post-natally, when the child is laid in a supine position.[21,40] This type of plagiocephaly often firmly increases during the first weeks of life.[30,36,41,42] DP should be differentiated from craniosynostosis, which is the result of asymmetric premature closure of cranial sutures[43,44], apparently caused by inborn errors.[45]
Localized defects may combine more or less generalized clusters of manifestations. Several synonyms referring to a generalized functional asymmetry point to abnormal position and shape of the head and face, scoliosis, rib cage molding, pelvic obliquity, as well as hip and foot

asymmetry. The appearance of morphologic asymmetries is only a matter of time; any longstanding functional asymmetry will eventually result in a deformity.[6]

Conservative strategies

Conservative strategies to intervene in positional torticollis, congenital muscular torticollis and deformational plagiocephaly are primarily physical therapy and helmet treatment[5,42,46,47] or Dynamic Orthotic Cranioplasty (DOC).[30,36,38,48-52] No randomized clinical trials could be found in literature. In general however, conservative treatment seems to be beneficial when applied between ~ 2-8 months old infants.[53]
Preventive counseling of parents on positioning, handling and nursing of the infant is important to minimize the risk of positional preference and to correct DP.[1,10,19,54,55] The content of the guidelines does not contradict with the recommendations on SID.[1,54]
Whereas neonatal occipital flattening of the skull is a precursor to DP, Peitsch et al.[29] suggested an adjustment of the AAP recommendations to let children sleep in alternating head positions and sleeping in side-laying position. In order to stimulate the quantitative and qualitative motor development, it is recommended to place infants, when awake and under supervision, regularly in the prone position ('tummy time'), likely more than 5 minutes a day.[4,8,10,16,19,54,56]

Fig 1.
Deformational plagiocephaly
(Erasmus MC Rotterdam)

Physical therapy

No randomized controlled trials concerning physical therapy intervention and asymmetry in infancy could be found. However, there is agreement regarding the goals of treatment. Knowledge of the natural course of the asymmetry and differential diagnostics is essential when decisions about intervention have to be made.[6]

Handling, positioning and movement therapy focus on active and passive symmetry in posture and movements. The first few months of life, a physiological asymmetry of the trunk is common, but has to disappear spontaneously before the first birthday.[57] Treatment of generalized asymmetry, without clear pathological signs or/and not combined with a localized problem, is not necessary before the age of 4 months, because of a physiological asymmetry possibly caused by neurological maturation.[57] Only handling and positional advices, to stimulate more symmetry in position and movements, are instructed to the parents.[1,10,55] Follow-up may be mandatory.

In case of torticollis, range of motion in the cervical region has to be normalized, an eventually occurring SCM imbalance should be treated and the spontaneous positional and movement preferences should be minimized.[19,30,58] This will lead to symmetric motor performance and alignment, without structural impairments in range of motion or muscle function. The first 4-6 months of life intervention is expected to be most effective.[21,30,41,53,58,59] In case of the existence of a pseudotumour, a palpable mass centrally in the SCM related to CMT, physical therapy is indicated, even before 2 months of age, because of the negative influence on motor development. An increase of asymmetry may develop, due to fibrosis of the SCM eventually resulting in structural asymmetry with deformational plagiocephaly.

Lying on the not flattened side of the occipital skull initiates natural remodeling of the skull.[19] The aim of physical therapy is to advise the parents about specific handling and positioning, but also to design a home treatment program.[19] In recent publications fair-to-excellent results of physical therapy interventions are reported; however, the studies were not randomized nor controlled and had small sample sizes.[33,59-61]

There are several ways to increase range of motion. Passive stretching is mentioned, but the method is rarely explicated or explained.[7,59] Demirbilek and Atayurt[60] recommended passive and active stretching of the SCM on the affected side in CMT, using firm pressure in both techniques. When therapy started before 3 months of age, the outcome was excellent. If therapy started within 3-6 months of age and within 6-18 months of age 25% and 71% respectively, had a fibrous contracture of the SCM muscle requiring myotomy. In a retrospective review of 277 patients with CMT, Binder et al.[41] described treatment strategy, divided in advices of positioning, handling and stretching under 3 months of age. The exercises focused on neck and trunk range of motion, equal weight bearing of the trunk and mid-line activities of the upper extremities, when older than 3 months of age. Several prospective, but non-controlled studies, by Cheng et al.[33,62,63] reported the good overall results of gentle manual stretching.

Taylor and Norton[59] advocated a program to increase active range of motion and positioning to improve passive range of motion avoiding pain and resistance, with good-to-excellent outcomes in 96% of the children. The choice for this program was based on the negative experiences with passive stretching.

Treatment should be focused on symmetric motor development and incremental active range of motion of the cervical spine. Passive manipulations or/and manual stretching in order to increase range of motion are obsolete, especially when pain is provoked, because it may cause micro-traumata in the soft tissues, eventually leading towards more fibrosis and consequent decrease in range of motion. Therefore longstanding stretching with a low intensity without provoking pain is indicated to influence collagen structures and thereby range of motion.[64,65]
Physical therapy contains extensive specific handling, positional advices and intensive correcting exercises regarding range of motion and movements towards symmetry, whereas passive manipulations, which provoke discomfort of the child, should be avoided.

Orthotic device; helmet treatment and dynamic orthotic cranioplasty

The natural history of the misshaped neonatal head is unknown, but in observing the heads of the adult population, it is obvious one could deduce a natural remodeling process.[66] DP may be treated with an orthotic device or the natural correcting growth may be expected.[5,40,42,47,53]
The effort of an orthotic device is to use the remaining skull growth to redirect head shape, by allowing enough space in the helmet at the flattened areas. A molding helmet (Figure 2) is worn15-22 hours per day and, after improvement following 3-4 months of therapy, it is worn only at night.[36] Helmet treatment is generally recommended between 6-18 months of age.[44] Some authors mentioned the use of Dynamic Orthotic Cranioplasty (DOC)[30,36,38,48-52], by application of a dynamic band, which mildly pressures to the apexes of the frontal and occipital prominences, while creating voids over the adjacent areas so that growth of the normal areas is held constant. This treatment starts at 3-4 months of age.[38] The reason to indicate helmet treatment or DOC seems to be subjective, because the measuring methods are different and not always clearly described. No strict indications for this treatment are found. A uniform, easy applicable, valid and reliable measuring-instrument does not exist.[6]
Two studies compared the influence of molding helmet and no-helmet periods on plagiocephaly.[5,36] However, the differences in rate of asymmetry of the skull between the two groups were very small.[36] Vles et al.[5] studied the effect of treatment of helmet vs. non-helmet in 105 infants with DP. The helmet treated group improved significantly better and faster, but were analyzed only by a subjective cosmetic outcome score. Loveday and Chalain[42] compared orthotic helmets and active counterpositioning. Nevertheless, the intervention periods of both were very different, probably based on a lack of clear indicators. So, conclusions are not possible. Other studies were not randomized nor controlled.[38,52,66]

Surgery

Surgical treatment of a remaining less contractile SCM is generally indicated at the age of 12 months or later. If, in spite of physical therapy, there is a progressive decrease in contractility or range of motion of the SCM, differential diagnostics and surgical intervention may be considered in an earlier stage. Surgical procedures vary from simple open myotomy to radical resections of the SCM. Intensive post-operative physical therapy including scar treatment and procedures to remain full range of motion of the neck and to regain muscle length are routine

for a period up to 4 months. At 2 years of age or older, surgical treatment is followed by an adjustable torticollis brace, to be worn for 3 months.[32] In rare cases, children may present with severe residual DP, which requires craniofacial surgery.[19,67] Craniosynostosis may be diagnosed by subsequently 3D-CT scanning and always requires craniofacial plastic surgery.[45]

Fig 2.
Remodeling helmet
(Erasmus MC Rotterdam)

Flow chart Therapeutic strategies

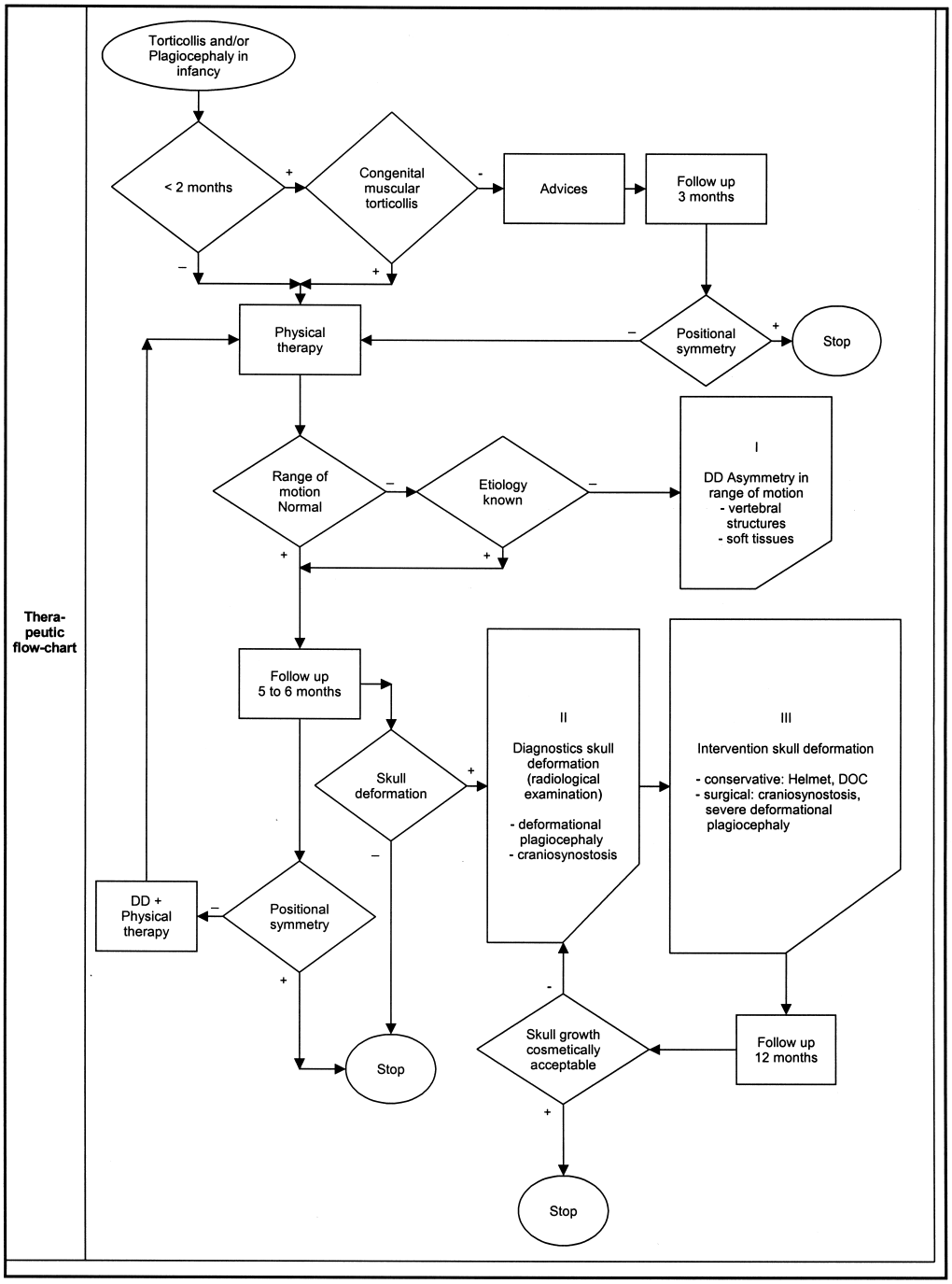
Based on best available evidence in current literature, different pathways in therapy of torticollis and plagiocephaly are presented in a flow chart. The algorithm (Figure 3) indicates the direction towards interventions and secondary differential diagnostics. The general view today is that postural and congenital muscular torticollis does need conservative intervention. The indication is related to age and range of motion.

In the first month, parents should be explained to prevent deformities and decrease in range of motion.[19] Evaluation of the asymmetry should be planned. If positional symmetry is reached at the age of ~3 months of age, intervention can be stopped. Asymmetry in position and movements, with decreased range of motion indicates physical therapy.[19] If the child, at the age of 6 months, will not reach a full symmetric motor development and range of motion, differential diagnostics and continuing physical therapy is best choice in intervention.[33,59-61]

Persisting severe deformation of the skull at the age of 5-6 months requires specific attention; differential diagnostics which indicate orthotic device or follow-up. However in the vast majority of cases a differential diagnosis is possible by means of clinical examination at an earlier follow-up (3-4 months of age). Radiological examination will help to identify the pathology. A delayed diagnosis could lead to a worsening of the prognosis.

At 12 months of age, there is a final follow up. When an obvious asymmetry in position and/or movements persists, possibly with any dysmorphism, diagnostics concerning possible vertebral column anomalies are indicated. Mainly cosmetic considerations will determine the outcome whether skull growth is acceptable or not.

Fig 3. Flow chart Therapeutic strategies in torticollis and plagiocephaly in infancy



Conclusions

Since no randomized clinical trials have been reported concerning therapeutic strategies and non-controlled studies have different views towards management on congenital muscular and positional torticollis and plagiocephaly, there is not only a great need for randomized controlled trials but also for a structured approach of this problem. A flow chart was designed based on best available evidence in literature regarding the therapeutic strategies in order to achieve uniformity in therapeutic thinking and performance.

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