Int. J. Oral Maxillofac. Surg. 2014; 43: 1171–1175
http://dx.doi.org/10.1016/j.ijom.2014.05.011, available online at http://www.sciencedirect.com

International Journal of Oral & Maxillofacial Surgery

Clinical Study
Craniofacial Surgery

Preclinical pathways to treatment in infants with positional cranial deformity

S. Kluba[a], J. Lypke[a], W. Kraut[a], M. Krimmel[a], K. Haas-Lude[b], S. Reinert[a]
[a]Department of Oral and Maxillofacial Surgery, University Hospital Tübingen, Germany; [b]University Children's Hospital, Department of Paediatric Neurology, Tübingen, Germany

S. Kluba, J. Lypke, W. Kraut, M. Krimmel, K. Haas-Lude, S. Reinert: Preclinical pathways to treatment in infants with positional cranial deformity. Int. J. Oral Maxillofac. Surg. 2014; 43: 1171–1175.

Abstract. Positional plagiocephaly in infants is frequent. As well as positioning, physiotherapy, and osteopathy, helmet therapy is an effective treatment option. The outcome also depends on the timely initiation of treatment. We investigated the preclinical pathways to treatment. Parents of 218 affected children were interviewed. Data were collected regarding detection and the treatments used prior to the first craniofacial consultation at the study clinic in Germany. Descriptive and statistical analyses were performed. For 78.4% of the children, the cranial deformities were first detected at ≤4 months of age. One hundred and twenty-two children received helmet therapy. Parents consulted the paediatrician with a mean latency of 0.4 months; 3.3 months passed until the first craniofacial consultation. Approximately 90% were treated with repositioning and 75.2% received additional physiotherapy or osteopathy prior to presentation. Children treated with physiotherapy/osteopathy presented significantly later ($P = 0.023$). The time lapse to craniofacial consultation was not significantly different between children with and without later helmet therapy. We identified a relevant delay between the detection of positional cranial deformity and consultation with a craniofacial specialist. For affected children, this may potentially compromise the outcome of helmet therapy. Early referral to a specialist and if necessary the simultaneous application of different treatments should be preferred.

Keywords: positional plagiocephaly; brachycephaly; helmet therapy; treatment pathways; treatment delay.

Accepted for publication 14 May 2014
Available online 15 July 2014

Positional skull deformities (plagiocephaly and brachycephaly) have increasingly become a focus of medical interest over the last two decades. As a result of clinical demand we established a specialist clinic a few years ago.

Typical clinical signs are a parallelogram-style sloping head shape (plagiocephaly) or an abnormal head width to head length ratio (brachycephaly). A combination of both types is common. Skull deformities resulting from premature closure of the cranial sutures (craniosynostosis), especially lambdoid suture synostosis, can appear to be clinically very similar. They can be distinguished from one another by cranial suture ultrasound,[1] and are usually treated surgically.

The treatment of plagiocephaly and brachycephaly is usually interdisciplinary and interprofessional. The therapeutic spectrum ranges from waiting for a spontaneous improvement and positioning methods, to physiotherapy and osteopathy, and then to the much-discussed helmet therapy. Helmet therapy regulates the head shape by controlling growth in

0901-5027/01001171 + 05

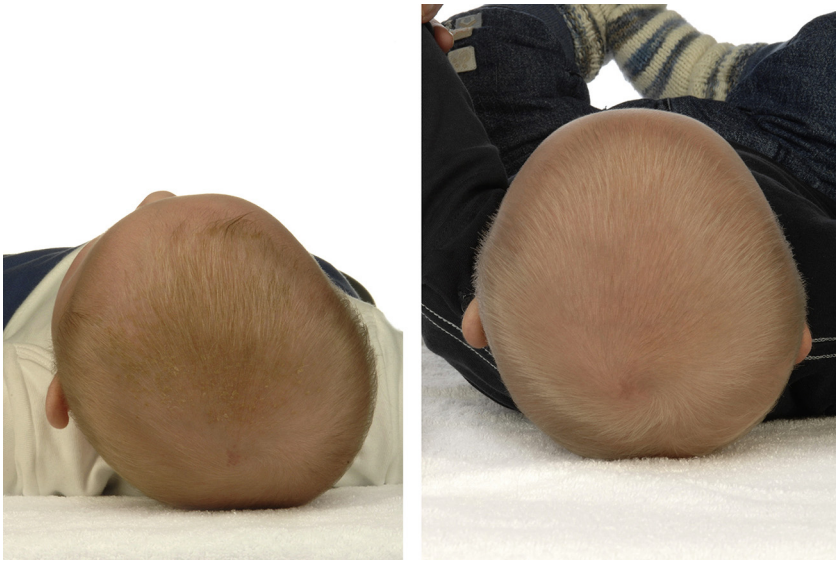

Fig. 1. Infant with positional plagiocephaly before and at the end of helmet therapy.

the deficient direction. The basic principle is the enormous growth potential of the skull, especially in the first year of life.[2] A harmonization, and ideally even complete normalization of the head shape, is achieved within a few weeks to several months (Fig. 1). It is a low-risk, non-invasive treatment; however it requires the helmet to be worn consistently for 23 h a day if possible (Fig. 2). The treatment has been investigated in numerous studies and its efficacy is evident.[3–13] However, because of growth dynamics, the outcome depends on the timely initiation of treatment.[6,14–16] Several studies have shown a significantly worse treatment outcome when the treatment is started after 6 months of age.[6,14,15]

Fig. 2. Child with a helmet.

While there is wide agreement on the question of the aetiology among experts, the long-term relevance of the problem and the corresponding therapeutic strategies, especially helmet treatment, are rated very differently. There is also disagreement regarding the financing of helmet therapy, which in Germany is not yet included on the health insurance companies' lists of services.

These controversies cause noticeable uncertainty for parents and persons responsible for the care and custody of the child. Parents are often confronted with conflicting opinions from different specialists. This can result in the parents being unable to cope with making a decision for or against a therapeutic treatment, as they no longer know what is best for their child.

In view of these facts and the time constraints for the most optimal helmet therapy result, the aim of this study was to examine causes of delay in patient referral to a skull deformity clinic. Prior to this study we were unaware of the exact preclinical pathways and how time-consuming they are objectively.

Materials and methods

The study was performed using a telephone survey of the parents or carers of affected children attending our clinic for positioning-related skull deformities. Clinical data were also included in the analyses. The data collection included only children with positional cranial deformities, with and without helmet treatment. Exclusion criteria were premature closure of the cranial sutures or unclear diagnosis. No child underwent surgery.

The diagnosis was normally made directly at first presentation to our clinic. Each child underwent an ultrasound examination prior to treatment in order to exclude a craniosynostosis. In cases with an indication for helmet therapy, individual helmets were made by Cranioform (Siegen, Germany) within 2 weeks. At the second appointment 2 weeks later, the fit of the helmet was checked and parents were instructed on the correct application and cleaning of the helmet.

Basic data including gender and the type and severity of the deformity were recorded for each patient. The head diameter, head length, and angles between the skull diagonals were measured at the first appointment in the clinic using a craniometer. To quantify the degree of severity of the deformity, the individual asymmetry index of the skull, according to Loveday and de Chalain,[17] was calculated using these data (cranial vault asymmetry index; CVAI in %). A value of 0% indicated a completely symmetrical head shape; values $>3.5\%$ were considered to be pathological. The head width to head length ratio (cranial index; CI in %) was also calculated for brachycephaly. A value of 85% was deemed to be normal and values $>93\%$ were considered to be very conspicuous; when the index is $>100\%$, the head is broader than long.

Using a questionnaire, standardized information about the initial recognition of the conspicuous head shape and the pathway to treatment was collected by telephone survey (Fig. 3). We wanted to identify the people involved, the methods that had been used, and the prior chronological patterns and courses of events. Depending on the question, single choice or categorized answers were possible.

Data evaluation was performed using IBM SPSS version 20.0 statistical software (IBM Corp., Armonk, NY, USA). The intervals between the various steps of the care pathways were also recorded from the collected data to quantify the time delays.

Statistical group comparisons were performed, as well as descriptive analyses. A level of significance of $\alpha = 5\%$ was assumed, and a P-value of <0.05 was defined as statistically significant. As the Shapiro–Wilk test did not always show a normal distribution, the Mann–Whitney U-test was used. For the same reason, the median value was also given in the