Helmet modification for soft-band bone-anchored hearing aid use during cranial orthosis

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OBJECTIVE

To describe the minimal alterations necessary to allow for effective aural rehabilitation during a therapeutic course of cranial orthosis.

INTRODUCTION

Cranial orthosis is a commonly utilized treatment modality for moderate to severe deformational plagiocephaly that may also be used to assist in cranial vault molding following endoscopic craniosynostosis repair. Custom-fit helmets are typically worn for 23 hours a day for a treatment duration of several months.¹ Many children with plagiocephaly or craniosynostosis also suffer from some degree of hearing loss.²,³ For those infants who require amplification, conventional hearing aids are not an option so long as the cranial molding helmet remains in place. Use of a soft-band bone-anchored hearing aid (baha) is also prohibitive given the design of most cranial orthosis helmets. We describe a case of a child with deformational plagiocephaly and mixed hearing loss who required both cranial orthosis and baha amplification. A standard orthosis helmet was modified to allow for both effective cranial vault molding and optimal positioning of a soft-band baha. Within this report we explain the minimal alterations necessary to allow for effective aural rehabilitation during a therapeutic course of cranial orthosis.

CASE PRESENTATION

LD was a full term infant born with multiple anomalies who was ultimately diagnosed with CHARGE syndrome. Auditory brainstem response testing was performed after he failed his newborn hearing screen. A unilateral profound sensorineural loss and a contralateral moderate conductive loss were identified. LD was subsequently fit with a baha soft-band device to simultaneously address ipsilateral conductive hearing loss and contralateral single-sided deafness. At approximately 9 months of age he was referred to a craniofacial team for worsening deformational plagiocephaly in spite of regular physical therapy for congenital muscular torticollis. He was fit for a remolding helmet, however the shape and configuration of the device precluded use of the hearing aid. In an effort to accommodate the baha soft-band device, custom modification of the fiberglass helmet was required.

Construction of the remolding helmet:

Using a FDA approved remolding orthosis and scanning technology (Orthomerica, Orlando, FL) the remolding bands were fabricated over positive computer aided design/computer aided manufacture. A plaster model of the ideal, corrected head shape was created on the positive mold for the goal of improving symmetry. The helmet was then fabricated over the corrected positive mold.

DISCUSSION

Deformational plagiocephaly has become a common problem over the last decade following implementation of the “Back to Sleep” campaign aimed at reducing the rate of sudden infant deaths.¹ Rates of plagiocephaly are especially high in children with prematurity, torticollis, and limitations in mobility. Therefore, the population of those at risk for plagiocephaly overlaps with many of the groups at greatest risk for hearing loss and speech delay. Similarly children with craniosynostosis have a higher rate of hearing loss than the general population, especially those infants with craniofacial conditions that are associated with middle ear dysfunction.²,³ It would stand to reason that treatments such as cranial orthosis should not prohibit access to amplification, however the shape and configuration of therapeutic helmets do not easily allow for the simultaneous use of either conventional hearing aids or baha soft-band devices. This is concerning as typical helmet usage calls for wearing the brace for 23 hours a day.¹ Current Department of Public Health mandates seek to address hearing loss by the age of 6 months, however at 6 months of age, infants with plagiocephaly are just initiating cranial orthosis, with months of therapy ahead of them. Rather than forcing parents and providers to choose between access to sound or a normal head shape, minor helmet modifications described in this report are all that are necessary to allow for simultaneous treatment of plagiocephaly and hearing loss during infancy.

REFERENCES