

# PROCEEDINGS

## Improvements in oculomotor, auditory function and range of motion in a child with Down syndrome undergoing chiropractic care

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### **Introduction:**

A recent study suggests that manipulation delivered to the neuromusculoskeletal system may create central plastic changes in the auditory system.<sup>1</sup> The purpose of this paper is to present a case report of an infant with Down syndrome (DS), oculomotor, auditory and cervical range of motion deficiencies treated with chiropractic management.

Each year 3,000 – 5,000 children are born in the U.S. with Down syndrome. A 2002 study, “Prevalence of Down Syndrome Among Children and Adolescents in 10 Regions of the United States,” published in *Pediatrics*, found that the prevalence of DS among children and adolescents aged 0 to 19 was 1 in 971, or approximately 83,400 children and adolescents living with DS in the United States.

According to Sigfried Pueschel, M.D., Ph.D., M.P.H, 60-80% of children with DS have hearing deficits caused by sensorineural loss, conductive loss related to otitis media, or both. Small ear canals are often associated with this syndrome. Children with DS often have more eye problems than other children who do not have this chromosome disorder. For example, 3% of infants with DS have cataracts that are often surgically removed. Other eye problems such as cross-eye (strabismus), near-sightedness, far-sightedness and other eye conditions are frequently observed in children with Down syndrome.

Other common DS related issues include congenital heart disease, craniofacial changes, hypothyroidism, intestinal issues and skeletal changes. Complications associated with DS include immunologic concerns, leukemia, Alzheimer disease, seizure disorders, sleep apnea and skin disorders, which may require the attention of specialists in their respective fields. Children with DS commonly need to be evaluated by an ENT for hearing and vision tests which are recommended every 3-6 months until the age of 3 years old and then annually

thereafter. There is no treatment for DS, but management often involves either surgical correction of specific problems listed above, medication such as anti-seizure meds when necessary, and therapies such as physical therapy (to correct hypotonia) and speech therapy. Early intervention programs are often used with the goal of enhancing the development of infants and toddlers and helping families understand and meet the needs of their children.

### **Case Presentation:**

An 11-week-old male with DS, fluid in both ears, having failed all allopathic model auditory tests point and only able to track light and dark was presented to this office by his mother for chiropractic evaluation and care. His mother noted that he did not respond to her coming near him when crying and appeared completely unresponsive to sounds. The child was concurrently working with an ENT and audiologist, who prior to the initial office visit did not indicate any success from their interventions. The patient was delivered in an uncomplicated vaginal birth and has had difficulty swallowing/sucking, which the mother attributed to a larger tongue, associated with DS.

### **Methods:**

Treatment was performed by two doctors working together at a clinic in close communication regarding evaluation and treatment protocols. At the initial office visit the patient presented with a right head tilt, decreased cervical rotation and left medial canthus that is inferior and larger left as compared to the right side cranial measurement. The child had motion restriction in his left sacrum and was generally hypertonic.

Because atlanto axial instability is associated with 10-20% of individuals with DS, this area was addressed very cautiously while treating the child’s cervical spine.<sup>2</sup> Patient was treated with low-force, specific, full-spine and cranial chiropractic manipulative therapy.

Cranial chiropractic manipulative technique<sup>3</sup> was performed in areas of asymmetry that also had palpatory restriction. Treatment protocols involved some of the following protocols. On the side of the low canthus and larger cranial measurement, placing thumbs over coronal suture and gently separating utilizing five grams of pressure (Webster's Coronal Suture adjusting); gently flexing the occiput looking for hypertonicity of the tissue at the base of the occiput and complimentary movement of the sacrum; and rotating the sacrum and occiput in opposite directions, looking for restriction and holding position until it softens, laterally flexing occiput and sacrum unilaterally to both the right and left looking for restrictions and holding until the tension changes (Meningeal Release Technique, as taught by Dr. Jeanne Ohm). Treatment consisted of two visits the first week, then one visit per week for 3 weeks.

### Results:

Visit 1: Immediately post adjustment, patient showed improvement in focus and pupillary constriction and dilation (alternating mydriasis) slowed from every few seconds to more responsive to environment. He became attentive to the doctor's face and/or voice and overall hypertonicity decreased.

Visit 2: Patient's mother reported he had been calmer and slightly more responsive.

Visit 3: Mother reported he is cooing and more verbal, which was very unusual for him. Chiropractic evaluation found cervical range of motion, particularly rotation, had improved bilaterally. It was also noted during the examination and treatment that the child was smiling more.

Visit 4: Range of motion continued to improve along with increased responsiveness and visual tracking.

Visit 5: Allopathic visual retesting indicated tracking at age-appropriate levels at that point. Mother also reported he was beginning to consistently respond to loud noises, such as a door slamming, where prior to care he had no response. Also of significance, his cooing and smiling had notably increased.

### Discussion:

An infant's interpretation of the world is achieved via his senses. Decreased auditory and oculomotor function will change an infant's initial perception of the world as well as decreased stimulation of the highly innervated suboccipital muscles caused by aberrant/ restricted cervical motion. One study compared eye contact between 12 mothers and infant pairs, 5 of which were infants with DS, and noted delays in the establishment of eye contact of the children with DS.<sup>4</sup> The American Academy of Pediatrics Preventative Task Force July 2008 found that children who had auditory dysfunction often suffered from increased difficulty with verbal and nonverbal communication, increased behavioral problems and decreased psychosocial well-being, as well as lower educational attainment.

Conductive hearing loss can be caused by multiple reasons, including otitis media and fluids trapped behind the tympanic membrane from birth. The United States has 2 million

typanostomies performed yearly to treat this problem; these types of procedures increased by 35% over the decade from 1996 to 2006. Utilizing chiropractic conservative treatment<sup>5</sup> could not only be a cost-saving measure but can purportedly improve a child's visual and auditory function, affecting a child's righting mechanisms and their ability to physically relate to their world.

### Conclusion:

In this one case it appeared that chiropractic offered a possible therapeutic benefit for a child with DS who was suffering from vision, auditory and cervical spine asymmetrical function. With proper differential diagnosis and working in an interdisciplinary relationship, chiropractic could become a valuable partner in a team of healthcare practitioners treating children with this complex and diverse condition. Further research is needed to determine if other children may also benefit from specific chiropractic manipulative and cranial therapy, which may offer a viable option for improving multi-sensorial function in an infant with multiple issues.

### References:

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4. Berger J, Cunningham C, The development of eye contact between mothers Normal versus Down Syndrome infants. *Developmental Psychology* Sep 1981;17(5).
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