Bahr & Gatto Presentation 1759

Mouth and Airway Development, Disorders, Assessment, and Treatment: Birth to Age 7

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Speech-Language pathologists, dental professionals, physicians (e.g., otolaryngologists), lactation professionals, and others around the world are generating a significant body of literature on the relatedness of mouth and airway development, function, disruptions, and disorders. Early assessment and intervention are suggested in the literature. Yet, there is a dearth of professional education and assessment/treatment protocols for children birth to 7-years of age.

This presentation reviews relevant literature on mouth and airway relationships as they impact feeding, motor-speech, and respiratory development/function in children birth to age 7. Suggestions will be made for next steps in professional education and systematic assessment/treatment protocols/practice.

Typical Mouth and Airway Development/Function supports the crucial life processes of *eating, drinking, speaking, and breathing.* This development begins in the first trimester of pregnancy from 5 mesodermal elevations. Approximately 50% of jaw and tongue growth occurs before birth, and the jaws are the gateway to the airway and mouth (Page, 2003).

Full-term babies typically have adequate structures for feeding, vocalizing, and breathing (Fayoux, Marciniak, Devisme, & Storme, 2008). Readiness to feed is based on functional maturity levels in suck/swallow processing and respiration (Lau, 2015). Significant jaw, lip, and tongue growth occurs during the first 2 years of life. By age 2, a child has adult-like feeding skills and is combining words in speech.

During the 2 to 7-year period, gradual mouth, face, and head growth continues with structures being shaped by breathing, eating, drinking, and speaking (Boyd, 2011; Morris, 2003). Craniofacial dimensions change at differing rates and ages (Jahanbin, Rashed, Yazdani, Sharhri, & Kianifar, 2013). The child has an adult-like vocal tract by age 4, the skull is essentially adult-sized by age 6, and 80 to 90% of jaw bone growth occurs by age 8 (Page, 2003).

Disruptions in Mouth and Airway Development/Function can begin in utero. These include cleft lip and/or palate in the first trimester of pregnancy; tethered oral tissues restricting tongue, lip, and cheek range of motion; and limited development of sucking pads near the end of gestation.

Post birth, mouth-breathing with a low resting tongue position often leads to a high, narrow palate; enlarged tonsils and adenoids; problems with tooth eruption and decay; cardiac problems; sleep disordered breathing, and tongue thrust swallow (Guilleminault & Huang, in press; Marangu, Jowi, Aswani, Wambani, & Nduati, 2014). Detrimental oral habits (e.g., thumb/digit sucking, etc.) also result in high, narrow palates; dental malocclusions; and narrowed airways (Dimberg, Lennartsson, Söderfeldt, & Bondemark, 2011; Heimer, Tornisiello Katz, & Rosenblatt, 2008). Additionally, delayed/disrupted feeding skills lead to problems with jaw, lip, and tongue development, as well as tooth eruption (Grace, Oddy, Bulsara, & Hands, 2017).

While mouth and airway disruptions result from genetic and environmental factors, epigenetic science also indicates the presence of genetic changes in oral and airway structures relative to changes in available foods and feeding practices (Boyd, 2011). And, the disruptions discussed here are reportedly on the rise.

Assessment of Disruptions in Mouth and Airway Development/Function facilitates appropriate treatment planning and intervention. Measurements identifying these disruptions provide the clinician with standardized documentation that can be communicated to other professionals, provide justification for therapeutic intervention, and provide a more appropriate standard of care.

Assessments evaluate structures and functional abilities. Common measurement protocols for children consist of Lingual Frenulum Protocols (Marchesan, 2012; Martinelli, Marchesan, & Berretin-Felix, 2012; Olivi, Signore, Olivi, & Genovese, 2012), oral mechanism examinations, Mallampati scores, Brodsky's tonsil assessment (Kumar et al. 2014), measurement of lip mobility and force (Sjogreen, Lohmander, & Kiliarids, 2011), as well as the assessment of feeding, swallowing, and motor-speech skills.

Additionally, parents and professionals use questionnaires and diaries to document problems in sleep patterns of children with airway concerns. Two simple questionnaires are the *BEARS* (**B**edtime problems, **E**xcessive daytime sleepiness, **A**wakenings during the night, **R**egularity and duration of sleep, **S**noring) and the *Pediatric Sleep Questionnaire* (Chervin, Hedger, Dillon, & Pituch, 2000).

Treatment of Disruptions in Mouth and Airway Development/Function follows a logical, hierarchical path. Problems with tethered oral tissues, upper airway patency, and/or velopharyngeal function disrupt the foundations for appropriate mouth and airway development and function (i.e., breathing, eating, drinking, swallowing, and speaking).

Appropriately trained speech-language pathologists (SLPs) can help identify structural and functional deficits and *team* with other professionals who treat these problems. Otolaryngologists, dentists, oral surgeons, and others perform surgical and/or other interventions (e.g., palatal expansion, myofunctional appliances, braces, etc.) to establish adequate orofacial, oronasal, and oropharyngeal structures ready for appropriate function (i.e., breathing, eating, drinking, swallowing, speaking).

Recently, researchers have established the importance of orofacial myofunctional re-education in addition to opening the airway via surgical or dental processes (Camacho, et al., 2015; Guilleminault & Huang, in press; Guilleminault & Sullivan, 2014). When the airway is opened without muscle re-education, airway patency is frequently re-compromised as the child ages.

Detrimental oral habits (e.g., long-term thumb, digit, and pacifier sucking) contribute to negative orofacial and oronasal structural differences in children. These must be remediated as part of dental work to avoid regression. Once airway patency is established and noxious habits are eliminated, treatment practices can focus on neuromuscular interventions (He, Stavropoulos, Hagberg, Hakeberg, & Mohlin, 2013). The establishment of nasal breathing is a crucial part of this process.

Tethered oral tissues (i.e., tongue, lip, and buccal ties) are also being revised by otolaryngologists, dentists, and other surgeons. Appropriately trained SLPs work with children before and after surgical intervention (Ferres-Amat, et al., 2016; Marchesan, 2012). Treatment involves working with these structures to attain functional movement for breathing, eating, drinking, swallowing, and speaking. This re-education usually involves *appropriate oral exercise* often prescribed by the surgeon and an orofacial myofunctional therapist. However, all treatments involve significant work with the *functions of breathing, feeding, eating, drinking, swallowing, and speaking* which SLPs are trained to do. SLP treatment sessions *focus on these functions* with exercise being an ancillary activity done daily at home by the client.

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