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An Update on Orofacial Myofunctional Disorders: More than Tongue Thrust

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When you think of orofacial myofunctional disorders (OMDs), the term *tongue thrust* comes to mind. All of us started out in life with a tongue thrust swallow. By age 6 to 8 years, most of us transitioned out of tongue thrusting into a correct resting tongue posture and swallowing pattern. For those that do not make the transition, thrusting of the tongue becomes the most recognized and discussed component of orofacial myofunctional disorders. You may be surprised to learn that a tongue thrust swallow is probably the least likely OMD to influence or cause changes in tooth position.

The purpose of this article is to review the state-of-the-art of orofacial myofunctional disorders, and to recommend changes in perspectives and terminology that are compatible with accepted dental science.

What Are OMDs?

Orofacial myofunctional disorders include thumb, lip, tongue, and finger sucking habits; a mouth-open lips-apart posture; a forward interdental rest posture of the tongue; a forward rest position of the tongue against the maxillary incisors; a lateral, posterior interdental tongue rest posture; and thrusting of the tongue in speaking and swallowing. These abnormal habit patterns, functional activities, and postures can open the dental bite beyond the normal rest position. This leads to a disruption of dental development in children and over-eruption of selected teeth in adults.

Over time, dental malocclusion, cosmetic problems, and even changes in jaw growth and position are observed in some patients with OMDs. Examples of changes than can result from a chronic open mouth rest posture include an increased vertical height of the face, a retruded chin, a downward and backward growth of the lower face (rather than downward and forward), and flaccid lips (Proffit, 1986).

Is There Commonality among OMDs?

As you read this, it is expected that your lips are closed but your teeth do not touch; that is, your normal dental rest position is characterized by a small open space between upper and lower teeth. This normal resting space is referred to as the dental *freeway space*, or inter-occlusal space. It measures 2-3 mm at the molars, and 4-6 mm at the incisors (Sicher and DuBrul, 1970).

The common denominator of orofacial myofunctional disorders is that all OMDs result in a change in the vertical dimension, or freeway space. The OMD, whether digit habit or altered oral posture, causes the mandible to hinge open slightly, while also increasing the resting inter-occlusal space between the upper and lower jaws and teeth. Only a slight increase in resting freeway space for hours per day is needed to initiate continued and unwanted vertical tooth eruption (Mason, 1988).

Conversely, some patients have a habit pattern of clenching that involves keeping teeth together, or bite closed, for hours per day. Closure of the normal freeway space for extended periods can lead to dental trauma and dysfunction of the temporomandibular joint apparatus (Sicher and DuBrul, 1970). Altogether, a disruption of the normal resting dental freeway space, either too far open, or closed, leads to negative consequences in dental eruption and the position of teeth.

What Can Orofacial Myofunctional Therapy Do about Freeway Space Variations?

A primary goal of orofacial myofunctional therapy (OMT) is to recapture a normal freeway space dimension by eliminating deleterious sucking habits, retro-positioning a forward interdental tongue posture, teaching a closed lips nasal breathing posture, retraining and eliminating a tongue thrust, or normalizing (opening) a closed dental rest posture. A variety of exercises is involved which are based on individual evaluation and treatment protocols.

A key challenge in the evaluation process is to identify the multifactoral causes of the OMD; the primary factor being nasal airway interference linked to structural issues such as enlarged tonsils. Other causative factors include unresolved sucking habits, and airborne issues associated with allergies. Most often, a team approach to diagnosis and management of OMDs, involving dentists, orthodontists, allergists, or ENT physicians, will be needed.

How Does Orofacial Myofunctional Therapy (OMT) Differ from Dental Treatment?

While the theoretical tenets of OMDs are derived from dental science, OMT is not dental treatment. *Dentists and orthodontists are concerned with teeth-together relationships, while orofacial myofunctional therapists are concerned with teeth-apart postures and behaviors***.** This distinguishes the muscle retraining work of the OMT from the dental-occlusal and jaw manipulations of dental/orthodontic providers. It also highlights how therapy procedures can aid in the creation or restoration of an oral environment wherein normal processes of dental development can occur (Mason, 2005).

What Has Changed Regarding OMDs?

The reader may have been exposed to some misconceptions about OMDs that have been perpetuated over the past 50 years. Some examples of inaccurate perceptions are:

- *Tongue thrusting is a primary cause of dental malocclusion*. Actually, thrusting is an adaptation to rather than a cause of malocclusion (Proffit, 1973).
- *People swallow 2,000 times per day*. Actually, the mean number of swallows per day for adults is 585, while for children, the range is from 800 to 1,000 (Flanagan, 1964; Lear, Flanagan, and Moorrees, 1965).
- *A tongue thrust swallow represents an excessive* pressure (1-7 pounds per swallow). Swallow pressures average @ 50 grams/cm2 (Proffit, 1973). You will recall that there are 454 grams in a pound.
- *The pressures generated by swallows add up.* This is incorrect; they do not.
- *A tongue thrust represents an orofacial "muscle imbalance."* No one ever demonstrates muscle balance between the tongue and lips, so the notion of a patient having muscle "imbalance" as a reason for initiating therapy is misleading and incorrect.

The misperceptions listed above are the result of unsupported speculations and inadequate research among dental clinicians during the initial stages of interest in OMDs.

What Then Is the State-of-the-Art of OMDs?

Tongue Thrusting

Let's start with the truth about tongue thrusting, since this behavior has been inappropriately highlighted in the past. Here are some well-researched conclusions about swallowing and tongue thrusting revealed from the research of Proffit and colleagues (see References under Pressure Transducer Studies) using miniature pressure transducers placed in carrier appliances fit on the teeth and palate.

- *Children are either right-tongued or left-tongued in speaking and swallowing*. Typically, the back of the tongue only (not the tip) on one side contacts the maxillary posterior teeth, or supporting alveolar bone, during saliva swallowing. This posterior "sidedness" preference is noted in the production of sounds like /s/ that normally involve a movement or positional sensation with the tongue tip (i.e., the back of the tongue acts as a hinge to direct and stabilize the tongue tip to some arbitrary vertical position). Of interest—there is no correlation between tonguedness and handedness.
- *Children's saliva swallows are characterized by variability from one swallow to the next*.
- *There are as many as 10 transitional saliva swallow* ***patterns*** *from an infant swallow to an adult swallow.* Changes in saliva swallows are related to oropharyngeal development. Morphological influences that may account for transitional swallow stages in children include: (1) changes in the airway—size and growth of tonsils and adenoids; (2) differential growth of the tongue—the tongue grows faster than the mandible to which it is attached; (3) height of the mandibular ramus and posterior tongue; (4) length of the soft palate; (5) dental eruption and exfoliation; and (6) neuromotor maturation (Mason, 1988).
- *Adult saliva swallows are stable and highly predictable in pressure pattern and maxillary contact area.*
- *Horizontally-directed tongue pressures during saliva swallowing are insufficient in* ***force*** *and* ***duration*** *to displace teeth.* The amount of pressure against the upper incisors during a swallow for a tongue thruster is usually between 25-50 grams/cm2 (Proffit, 1973).
- *A tongue thrust definitely does not produce pounds of pressure against the teeth.*
- *Vertically directed tongue pressures during swallowing decrease with the magnitude of an open bite* (Wallen, 1974).
- *Tongue and lip pressures* ***never*** *balance during a swallow.* Tongue pressures are always several times higher (i.e., there is no muscle balance).
- *Tongue and lip pressures during swallowing do not correlate well with tooth position.* Many tongue thrusters have normal occlusion.
- *The* ***duration*** *of tongue and lip pressures during swallowing do not balance out over time*.
- *Orthognathic surgery patients adapt swallowing tongue pressures and contacts to pre-op levels within one year after surgery.* The tongue adapts to the environment in which it resides (Proffit et al studies, 1967-1978; see Pressure Transducer Studies in the Reference List)

Resting Posture of the Tongue

In addition to tongue thrusting, here are some conclusions, revealed from research, about the resting posture of the tongue.

- *In the horizontal plane,* ***resting*** *tongue and lip pressures do not balance out over time.* ***There is never any balance of tongue and lip muscles.***
- *When there is an anterior interdental rest posture of the tongue, for hours per day, dental eruption is disturbed and a process of differential dental eruption can be triggered* (Mason, 1988; Mason and Proffit, 1974; Proffit, 1986).
- *Differential dental eruption, resulting from an interdental tongue tip at rest with mandible hinged open, involves a combination of inhibiting anterior dental eruption while accelerating posterior eruption and vertical drift* (Proffit, 1986). Differential eruption is not solely a process of teeth eruption. Posterior teeth over-erupt and the alveolar bone follows along by a process of vertical drift. Teeth don't erupt vertically out of their sockets; rather, teeth and alveolar bone drift together (Enlow and Hans, 1996). At the same time, anterior teeth are kept from erupting by an interdental rest position of the tongue (Proffit, 1986).
- *It only takes @ 15 gr/cm2 of continuous interdental resting pressure to inhibit the eruption of anterior teeth, while for posterior teeth; the figure is @ 35 gr/cm2* (Proffit, 1986).
- *An anterior interdental rest posture of the tongue, or a rest position of the tongue tip against the maxillary incisors continuing for hours per day, can lead to an anterior open bite or incisor flaring, respectively.* ***Duration*** *of pressure is key*. Only light continuous postural or orthodontically applied forces, or intermittent orthodontically applied pressures are needed to move teeth (see References under Dental Equilibrium). Note: Intermittent orthodontic pressures, such as applied by waxing and waning force applications against a tooth or teeth with retainer springs, differ from the infrequent intermittent forces of tongue thrust swallows that have ***not*** been shown to result in movement of teeth. *Duration* is key, even for intermittent orthodontic force applications.

Why Then Do Teeth Remain in a Stable Position, Either in Normal Occlusion or Malocclusion?

The answer from dental science involves consideration of equilibrium theory (Proffit, 1978). Dental equilibrium is not the same as muscle balance.

Tooth position stability, or dental equilibrium, as well as the resting freeway space, involves a cortical control mechanism mediated by the maxillary and mandibular branches of the trigeminal (V) cranial nerve to and from the trigeminal nucleus in the pons. As well, a host of biochemical events surrounding the periodontal membrane space serve to monitor and also trigger changes in tooth positions from long periods of continuous or intermittent orthodontic force applications against the dentition (see Davidovitch et al. under Dental Equilibrium in the References).

If a normal occlusion is disturbed by an airway issue or habit pattern, the dental equilibrium is disrupted. This can lead to an altered occlusion, or malocclusion, and can remain stable in an altered state of equilibrium until the airway issue or habit pattern is addressed.

It is well-known and accepted in dental science that resting tongue pressures are important determinants of dental change and malocclusion, while tongue thrusting is not a primary cause. A tongue thrust, when accompanying a forward interdental tongue rest posture, can potentially exacerbate a developing malocclusion, but tongue thrusting alone is not linked to dental change (Proffit, 1986).

What's New with OMDs and OMT?

Orofacial myofunctional therapy procedures with OMDs are effective, consistent, and successful. As the discipline of orofacial myology grows and thrives, changes in terminology and perspectives are occurring to reflect the evolving state-of-the-art. Some selected changes are shared here:

- Therapy should be recast as *rest posture therapy*. This is a key recommendation! Even so, a tongue thrust should be corrected where there is an associated cosmetic problem or an accompanying interdental tongue tip forward rest posture.
- Be wary of labeling a patient as a *mouth breather*, especially in the absence of aerodynamic testing and verification. A lips-apart, mouth open rest posture is not necessarily mouth breathing.
- Highlight the concept of the *freeway space* in marketing your work with OMDs. This distinguishes you from orthodontists and dental treatment. Your work involves recapturing a normal dental freeway space.
- Working to achieve *lip competence* is an important aspect of OMT. In many instances, therapy to achieve a resting lip seal can obviate the need for tongue therapy and can also lead to a normal freeway space dimension.
- Remember that a tongue thrust and forward interdental rest posture of the tongue serve as clues that there is likely a retained sucking habit or unresolved airway issue. Refer for definitive evaluation of the airway as appropriate.
- Discontinue use of the term *muscle imbalance.* Instead, focus dialogue on *tongue rest* and *functional patterns.*
- Preface *tongue thrust* with an adjective—such as *transitional, obligatory, adaptive, neuromotor,* even *cosmetic*—whenever possible.
- Avoid saying *excessive pressure*. Actually, it would be wise to discontinue use of the term *pressure* to describe thrusting. Thrusting does not involve excessive pressures against the teeth.
- *Pattern* is a better term to use to describe a tongue thrust. Many orthodontists respond negatively to the historical (and inaccurate) focus and overemphasis on thrusting rather than resting tongue posture.

Overall, working with orofacial myofunctional disorders continues to offer a challenging and exciting area of clinical endeavor. The field is continuing to evolve, as evidenced from the terminology and conceptual emphases described in this update.

As a reminder to SLPs, orofacial myofunctional therapy is not speech therapy. OMT is therapy to correct muscle function problems which influence dental occlusion; facial shape; chewing; swallowing; and tongue, lip, and jaw resting posture. Not all people who have a tongue thrust have a speech problem and not all people who have a speech problem have a tongue thrust.

Those SLPs who have an interest in developing skills in the area of orofacial myofunctional disorders should enroll in appropriate courses offered before offering services with OMDs.

The Reference list that follows includes supporting data and discussions cited in this update. Included as well are recommended classic studies and reference texts that provide background information from dental science regarding OMDs, dental development, and orofacial growth and development. For those who have a specific interest in OMDs, the leading orthodontic text by Proffit, Sarver, and Fields (2006) is recommended. It is an excellent resource. The Hanson and Mason text (2003) is specific to OMDs.

About the Author

Robert M. "Bob" Mason is a speech-language pathologist, CCC-SLP, ASHA Fellow, and orthodontist. He is Professor of Orthodontics, Division of Plastic and Reconstructive Surgery, Department of Surgery, Duke University Medical Center , and maintains a private practice in orthodontics in Durham , NC .

Dr. Mason has considerable experience with orofacial myofunctional disorders. His article, coauthored by Dr. William R. Proffit on "The Tongue Thrust Controversy: Background and Recommendations" won the Editor's Award from the *Journal of Speech and Hearing Disorders* for the article of highest merit published in 1974. Dr. Mason chaired the two ASHA committees that wrote position statements concerning oral myofunctional disorders: "The Role of the Speech-Language Pathologist in Assessment and Management of Oral Myofunctional Disorders" (ASHA, 1991); and "Orofacial Myofunctional Disorders: Knowledge and Skills" (ASHA, 1993). Since then, he has published widely on OMDs, including co-authoring a text on orofacial myology with Dr. Marvin Hanson.

Dr. Mason is a Past-President of the American Cleft Palate-Craniofacial Association, and former Medical Director of and life member of the IAOM. He is a contributor the Neo-Health Services instructional classes and can be reached by email for questions, comments, or discussion at oitsbob@sc.rr.com.

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