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Tutorial

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DID YOU KNOW? A QUESTION AND ANSWER DIALOGUE FOR THE OROFACIAL MYOLOGIST

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ABSTRACT

This article addresses selected concepts and procedures related to orofacial myology in a question and answer format. Topics include tongue-tip placement for swallowing; a masseter-contraction swallow; temporary anchorage devices utilized in orthodontic treatment; relapse following orthodontic treatment; some advantages and disadvantages of fixed and removable orthodontic appliances; the extraction of teeth in orthodontic treatment; posterior and anterior crossbite considerations; and the importance of recasting the emphasis and focus of myofunctional therapy to ***orofacial rest posture therapy***. In addition, this article promotes projects that orofacial myologists and orthodontists can mutually undertake to assist in advancing the data base regarding orofacial myofunctional disorders, thereby serving to enhance the reputation and value of orofacial myofunctional therapy within the dental profession.

KEY WORDS: orofacial myofunctional therapy; orofacial myology; tongue-tip elevation to rugae; masseter contractions; the spot, swallowing therapy; fixed and removable orthodontic appliances; extraction of teeth; dental and skeletal crossbites; interdisciplinary projects.

INTRODUCTION

The purpose of this article is to address and answer questions related to selected concepts and procedures of interest to the orofacial myologist. It is hoped that the information presented will serve to enhance and support the clinical activities of orofacial myofunctional clinicians. *The discussions provided in this article are the opinions of the authors and therefore may not represent the views of all members of the IAOM.*

QUESTION: ***Should every individual be taught to make a tongue-tip contact against 'the spot' during the initiation of a swallow?***

ANSWER: Teaching individuals to make a tongue-tip contact against the *"spot"* is a logical and time-honored therapy technique (Hanson and Mason, 2003). The *"spot"* is the shorthand word of the orofacial myologist to describe the maxillary anterior alveolus at the area of the hard palatal rugae (also known as the *palatal fingerprints*). Touching the tongue-tip against the spot results in a tactile feedback sensation that can facilitate learning and habituate a correct swallow pattern. Individuals learn oral performance skills faster when there is tactile feedback, as opposed to kinesthetic or proprioceptive feedback (Grossman and Hattis, 1967).

Did you know? Knowing that a tongue-tip down position usually matures into a tongue-tip-up against the "spot" position with age, the orofacial myologist may be surprised to learn that not all normal individuals with normal dental arches naturally elevate the tongue-tip to the "spot" for the initiation of a swallow or for resting posture. For some normal individuals, the tongue-tip does not elevate for a swallow, even as the mid-portion and back of the tongue elevates. A tongue-tip down rest and swallow pattern can be considered as an economical pattern for the tongue-tip. Others may make a contact against the lower incisors in the initiation phase of a swallow (Mason, 2007). These differences should not be considered abnormal behaviors. A contact relationship of tongue-tip with lower incisors during a swallow will **not** result in flaring of the lower incisors. The duration of contact of the

tongue-tip against the teeth during a swallow is fleeting, and swallow pressures do not add up or compound over time.

Even though a low tongue-tip rest or functional position for swallowing may be a normal variation, a tongue-tip down posture and behavior may be related to abnormalities such as ankyloglossia, large mandibular tori, syndromes with structural or functional features, a history of nasal airway problems, or other conditions that can affect the orofacial complex and hamper the ability of some individuals to elevate the tongue-tip. A thorough examination should reveal whether or not patients are able to elevate the tongue-tip.

When all of the previous information is considered, the time-honored method of teaching a correct swallow should begin with redirecting the tongue-tip to a better location. With appreciation for individual differences and therapeutic needs, what better choice is there than to elevate the tongue-tip to the rugae area?

QUESTION: ***Is it necessary to teach masseter muscle contractions (closed-teeth contacts) in swallowing therapy?***

ANSWER: Teaching individuals who exhibit difficulty with swallowing to achieve masseter contractions during a swallow makes sense for a variety of reasons. There are various patterns of swallowing: food-consumption swallowing, saliva swallowing, sip swallowing, and sequential liquid drinking swallowing ("chug-a-lugging"). The reason that the teeth are brought together firmly during some swallowing is to bring momentary stability to the oral cavity so that the peristaltic motion of the tongue can easily move the bolus in a posterior direction. A closed-teeth swallowing pattern stabilizes the oral cavity, and this stability can be accomplished swiftly as it falls into the rhythm of the masticatory process. This therapy activity of bringing the teeth together is not required, but can aid in the voluntary control of a swallow during the teaching and habituation phases. Learning to take sips and not protrude or lateralize the mandible is also facilitated with a teeth-together swallow.

Did you know? As mentioned, not all individuals swallow by closing the bite with masseter muscle contractions. The range of normal for swallowing certainly includes a lack of masseter contraction with teeth apart as a characteristic of normal swallows. This includes normal individuals performing swallows of a bolus of food or liquid.

An important clinical perspective regarding the decision to teach a masseter contraction/teeth-together swallow should include the recognition that many children have a small oral isthmus area. The oral isthmus is bounded superiorly by the soft palate, inferiorly by the base of the tongue, and laterally by the faucial pillars, or faucial tonsils when present. The oral isthmus area can be reduced in size by a long soft palate, large faucial tonsils, or a high-riding posterior tongue associated with a short ramus of the mandible. With normal growth, the area of the oral isthmus enlarges due to the vertical growth of the mandibular ramus, the lengthening of the pharyngeal tube, the dropping down of the base of the tongue and hyoid bone, and involution of the faucial tonsils and adenoid mass.

A child with a size reduction of the oral isthmus is not usually a good candidate to utilize a closed-teeth swallow because this serves to further restrict the size of the isthmus. For some children, swallowing with a tongue forward gesture while a bolus of food passes through the oral isthmus may be the best way to swallow under the circumstances. Thrusting as a way of enlarging the oral isthmus has a purpose parallel to the thrusting seen in some patients with temporomandibular joint (TMJ) problems who use a forward tongue thrust as a mechanism to protect the temporomandibular joints.

A thorough oral examination can identify children whose treatment for tongue thrust swallows should be deferred, or who should not be taught a teeth-together swallow in light of the reduced dimensions of the oral isthmus. Patients with temporomandibular dysfunction (TMD) symptoms are also questionable candidates for masseter exercises. In our view, teaching a masseter contraction swallow is contraindicated for TMD patients. The fact that not all individuals contract the masseters during swallowing should not diminish the therapeutic value of continuing to teach this concept as a part of therapy. As used with patients with orofacial myofunctional problems, the masseter contraction (closed-teeth)

technique remains a useful staple of the myofunctional clinician.

QUESTION: ***Many orthodontists are reporting the use of TAD's in their clinical procedures. What does this mean?***

ANSWER: A temporary (bone-supported) anchorage device (TAD) is now used by many orthodontists. These devices are referred to as miniscrews, micro-implants, anchor screws, miniplates, or by other terms introduced into the scientific literature by various authors. The TAD is inserted into the maxilla or mandible (mostly the maxilla) as a means of achieving orthodontic anchorage for bodily movement of selected teeth. They are removed after biomechanical therapy.

Did you know? A miniscrew placed high in the maxillary cortical bone above a molar can be used to intrude a molar with a spring or elastic attached between the tooth and the screw, or can be used as an alternate to headgear to retract anterior teeth. The various placement options for the miniscrew provide many more treatment advantages than available with typical elastic wear or headgear.

QUESTION: ***What points are important for the orofacial myologist to consider when discussing why teeth relapse following orthodontic treatment?***

ANSWER: I*t is not recommended that you tell an orthodontist why you think a specific patient is exhibiting relapse following orthodontics*. It is appropriate, however, to report your findings of the factors you have identified, the correction of which would create or recapture an oral environment compatible with stability of the dentition. The orofacial myologist evaluates patients with a different protocol of examination than evaluation protocols used in dentistry. A major difference between dental treatment (especially orthodontics), and an orofacial myologist's treatment is that those in dentistry evaluate and treat to *teeth-together* relationships, whereas the orofacial myologist is concerned with *teeth-apart* postures and behaviors that are not compatible with dental stability (Mason, 2005). This distinction between dentists/orthodontists and orofacial myologists should be a key marketing tool to describe the value of your services. Identifying the 'causes' of relapse, however, should be carefully stated, or in most cases, avoided by orofacial myologists.

Did you know? There are many factors besides tongue posture or function that can account for orthodontic relapse. Let's appreciate these factors by first explaining why retention is necessary following orthodontics. Retention is necessary for three primary reasons, the second of which is specific to the work of the orofacial myologist: (1) the gingival and periodontal tissues are affected by orthodontic tooth movement and require time for reorganization after the orthodontic appliances are removed; (2) the teeth may be in an inherently unstable position after treatment, so that habitual soft tissue pressures constantly produce a relapse tendency; and (3) changes produced by growth may alter the orthodontic treatment result (Proffit and Fields, 2000).

A significant patient sample linked to relapse following orthodontics involves patients with skeletal malocclusions. Those who have declined surgery and are being treated by orthodontics alone rather than agreeing to orthodontics and surgical jaw repositioning are more susceptible to relapse in retention. The decision for surgery or not, after all, resides with the patient. The orthodontist, under these circumstances, will present two treatment plans: 1) an ideal plan involving a combination of orthodontics and jaw surgery; and 2) a "practical" or "compromised" plan that can likely improve the bite, but with a greater possibility of relapse if the dentition is not ideally situated over the alveolar bone in which it resides. An example is a mild or moderate Class III skeletal malocclusion with mandibular prognathism. To bring the bite together by orthodontics alone, Class III elastics would be used, but as well, the lower incisors would have some lingual crown tilt while upper incisors would be flared forward to some degree to maintain a contact relationship with lower incisors. These final positions of the incisors are not likely to be stable. Some relapse will likely occur if the patient does not cooperate well with the longer period of retention that would be required following active orthodontics. Also, additional post-pubertal mandibular growth, which can be seen well into the twenties in some

individuals, can further contribute to negative changes in the bite.

Some other specific factors that can account for relapse following orthodontics are: (1) poor resting relationship between the lower lip and upper incisors (the lower lip at rest should cover 2-3 mm of upper incisor teeth, whether or not there is lip competence (Vig and Cohen, 1979; Mason, 2008); (2) lower incisors moved too far forward with Class II elastic treatment (Proffit and Fields, 2000); (3) intercanine width expansion during treatment; (4) late growth into open bite (Proffit and Fields, 2000); (5) unresolved issues involving the airway (Franklin, 2008); and (6) lack of appliance compliance. Lack of patient cooperation during the retention stage of orthodontics can potentially compromise the orthodontic result. The orofacial myologist can be instrumental in encouraging the patient to adhere to the orthodontic retention guidelines prescribed by the orthodontist.

Another source of potential relapse is closing anterior open bites with vertical elastics while also extruding the lower incisors (Pepicelli, Woods, and Briggs, 2005). While these orthodontic maneuvers are often necessary procedures in orthodontics, they are sometimes undertaken without full appreciation for the effects of the opposing forces of the strap muscles of the neck that can serve to reopen the bite in retention. The current use of TAD's in the maxilla to intrude posterior maxillary teeth may help to reduce the impact of the strap muscles of the neck as a contributor to post treatment relapse with open bite correction.

Late growth vertically or (especially) horizontally can also contribute significantly to relapse following orthodontics. To evaluate this and other possible contributing factors, orthodontists use cephalometric films and dental casts to identify, through superimpositions, the nature and sources of relapse. Merely observing a patient in your office does not provide a valid cause-and-effect relationship about relapse, especially when a prominent tongue is noted which could be an *adaptation* to the result of the relapse. The tongue forward rest posture may be an example of tongue thrusting becoming an 'opportunistic' behavior; that is, filling the space created by other biological events rather than being the source of the problem. Thus, caution is urged for the orofacial myologist *not* to presume about the causes of relapse. Nonetheless, your thoughts about how you may be able to stabilize the dentition for a given patient are valuable. It is strongly recommended that you find out all you can from the treating dentist about the original problem list, especially with regard to whether there was a skeletal malocclusion treated without surgery, or whether teeth were extracted or not.

If a patient's freeway space is *habitually* open beyond the normal range, you have a strong basis for discussing this posture with your dental referral sources since an open freeway space beyond the normal 2-3 mm range posteriorly, or 5-6 mm anteriorly, becomes a significant factor that can lead to dental relapse (Mason, 2005). If the airway is clear, orofacial myologists can focus therapy to establish a normal vertical dimension as an important way to prevent further relapse or to recapture a normal oral environment at rest. This would logically also include therapy to eliminate a forward, interdental rest posture of the tongue.

QUESTION: ***What are the advantages and disadvantages of fixed and removable appliances in orthodontics?***

ANSWER: Contemporary orthodontic treatment involves the use of fixed and removable appliance systems. In traditional orthodontic care, removable appliances play a supporting role in comprehensive treatment. They are useful for the preliminary treatment with preadolescents or for adjunctive treatments for adults, and are employed routinely in retention (Proffit and Fields, 2000). A variety of functional appliances continues to be indicated for selective growth modification efforts.

Over the past ten years, the advent of the *Invisalign*® system of removable appliances has provided an alternative to traditional braces for many adults, and recently also for adolescent patients. The *Invisalign*® and other competing systems employ a series of removable appliances called "aligners" which are constructed from dental casts; each aligner is modified slightly to facilitate movement of a particular tooth or teeth. There may be as few as 3 aligners to as many as 20 sets involved,

depending upon the system. The *Invisalign*® aligners were originally intended for use only by orthodontists, although they are now marketed and used by many in general and pediatric dentistry. The treatment costs vary; they may parallel or even surpass the fees for conventional fixed orthodontic treatment.

Did you know? Removable appliances have three primary advantages: (1) they can be removed easily by the patient (this advantage is especially attractive to patients in social situations, and also, oral hygiene measures become easier with the appliances removed); (2) the appliances can be constructed in the laboratory rather than in the mouth at chair side; and (3) some types of growth guidance treatments can be carried out with removable appliances more easily than with fixed appliances.

There are also some obvious disadvantages to removable appliances: (1) the appliances can only work when patients wear them, so patient compliance is a recurring issue (the orofacial myologist may assist in motivating and supporting the patient to become more compliant); (2) the appliances present problems in applying the two-point contacts on teeth that are necessary to produce complex tooth movements, so the appliance itself may limit the possibilities for treatment (Proffit and Fields, 2000). Because of these limitations, current comprehensive orthodontic treatment is dominated by fixed, non-removable appliances.

A brief review of removable appliance systems to correct malocclusions: One of the first removable appliances used in orthodontics was developed by George Crozat in the early 1900's. The appliance was fabricated out of precious metals. Clasps were constructed for the molars and heavy gold wire was used for the framework. Lighter gold wires were used as finger springs to move teeth. With the development of refinements with fixed appliances, interest in the Crozat waned. In the 1960's, there was a wave of enthusiasm among some for the Begg appliance system. This system utilized a variety of creative springs attached to a removable acrylic appliance. Raymond Begg's system was more efficient than the edgewise fixed appliance system of that time (Proffit and Fields, 2000). The Begg appliance fell out of use in orthodontics because of the extended treatment time involved and the inability to selectively derotate, extrude, or intrude teeth.

The most current palatal/lingual fixed appliance, the ALF (Advanced Lightwire Functional) appliance, was developed by general dentist Darick Nordstrom in the early 1980's. The ALF is advertised by its advocates as being an orthopedic/orthodontic appliance that integrates cranial, structural, body, and nutritional concepts. This light wire appliance is purported to influence the skull bones and teeth and can correct structural distortions of the skull and correct alignment of upper and lower teeth. Advocates contend that the correction of malpositions of the teeth with the ALF can also positively affect the upper neck, shoulders, lower back, as well as other functions. While these claims for the ALF remain controversial, the ALF is an appliance system used primarily by non-orthodontists that has utility for a variety of orthodontic conditions.

Current orthodontic practices: Contemporary treatment in orthodontics involves fixed attachments for all teeth using an edgewise appliance characterized by bracket slots that are torqued, offset and angulated, which reduce the need for routine first, second, and third order bends in archwires. Fixed orthodontic treatment provides a highly controlled system for moving teeth forward, back, up, or down. Advances over time with the progression of improvements of the edgewise appliance include automatic rotational control, alterations in bracket slot dimensions, straight-wire prescriptions, self-ligating brackets, lingual appliances, and clear or tooth-colored appliances (Proffit and Fields, 2000). With fixed appliances, the entire dental arch can also be moved mesially (toward the midline) or distally (toward the back of the dental arch) with the use of elastics or other orthopedic means. The concept of “anchorage” takes on a variety of meanings and opportunities with fixed appliances in place, since quadrants of teeth can be used to anchor the front or back of the dentition when specific movements are needed. The corrections of rotations, vertical discrepancies and the opportunity to build in selected angulations for individual tooth movements are also easily controlled with fixed appliances.

QUESTION: ***What is the basis of the controversy about extracting teeth in orthodontic treatment?***

ANSWER: It can be very confusing to orofacial myologists to hear claims by some in dentistry that extractions are never indicated. Over the past several years, many non-orthodontists have claimed that extracting teeth as part of orthodontic treatment results in compromising a patient's genetic potential for growth of the jaws. They further maintain that retraction of anterior teeth following extractions results in the skull being "jammed" as the contents of the skull become compressed, creating neurologic and structural problems (International Center for Nutritional Research, 2009). There is also the claim by some non-orthodontists that extracting maxillary teeth for orthodontic treatment purposes serves to compromise the size of the oral cavity, forcing the tongue to be displaced posteriorly and creating a risk of sleep apnea from airway interference.

The extraction of selected teeth for orthodontic treatment purposes has been practiced successfully for 100 years without the negative effects claimed by some outside of the orthodontic community. In fact, expansion of the dental arches without extractions can produce a very unstable long-term orthodontic result (Proffit, Fields & Sarver, 2006). It is hoped that every orofacial myologist knows that extracting teeth for orthodontic treatment purposes is appropriate under a variety of circumstances. Certainly, extractions should be determined on an individual basis. If a patient shows incisor protrusions to the extent that the lips cannot be closed without muscle strain, extractions will likely be indicated. In instances where there are missing teeth, supernumerary teeth, or ankylosed primary molars with no permanent successors, extraction of such teeth with small roots may be indicated and the resultant spaces are then closed by orthodontic means, dental implants, or by fixed or removable prosthetic appliances.

Did you know? The consideration for extractions should always be made with regard to the impact on the profile. The anterior dentition influences the profile. The projection forward of anterior teeth provides support for the lips and determines lip posture and position. While there may be instances where extractions have been imprudently recommended by orthodontists and non-orthodontists without due regard for the impact of extractions on the facial profile, orofacial myologists should resist reaching the inappropriate conclusion that extractions for orthodontic treatment are always contraindicated.

One of the primary purposes of the tongue is to maintain the airway for breathing. The view that maxillary extractions inhibit the tongue space and push the tongue posteriorly ignores the adaptive capacity of the tongue to respond to changes in the size of the oral cavity from growth and development, extractions, or from surgical jaw manipulations. An eloquent case in point is the individual with mandibular prognathism who also has a clinically-large appearance of the tongue. Following mandibular setback surgery, the tongue appears smaller as viewed by intraoral inspection. What has transpired is that the tongue, mandible, hyoid, and cervical muscles have adapted to their altered spatial and functional environment (Wickwire et al, 1972).

A patient with severe maxillary protrusion who has had maxillary bicuspids extracted undergoes a similar process of muscular adaptation. As the maxillary anterior teeth are retracted, the tongue and surrounding musculature adapt to the new environment in all planes of space. The airway remains protected.

Orofacial myologists must be wary of embracing the views of those who recommend extractions in **all** patients, or in **no** patients. Every patient should be considered individually, and extraction of teeth will be appropriate for some and contraindicated for others.

QUESTION: ***What should the orofacial myologist know about posterior dental crossbites?***

ANSWER: A crossbite occurs when a maxillary tooth does not exhibit overjet and overbite in relationship to an opposing lower tooth or teeth. The concepts of overbite and overjet are applicable around the entire dental arches. The maxillary tooth/teeth may be positioned toward the palate, or mandibular tooth/teeth may be positioned toward the cheeks or lips. A posterior crossbite may appear as a dental deviation alone,

or may be the result of a jaw discrepancy such as mandibular prognathism, or narrowing of the maxillary arch. Such crossbites may be described as 'skeletal crossbites;' deviations in the position of a jaw or jaws associated with a skeletal deformity.

A common crossbite situation seen with patients who exhibit orofacial myofunctional disorders is a posterior crossbite associated with a high, narrow hard palate. In such instances, the crossbite can be linked to the disorder by restricting the space for the tongue at rest and during swallowing. Although expansion of the maxillary arch can result in correction of a posterior crossbite and an increase in nasal cross sectional area, the improved breathing effects are short-lived in many patients as the mucous membranes adapt to changes in architecture of the nasal cavity. Palatal expansion will also require a period of retention, which has the potential of using up a child's cooperation early on when additional orthodontic treatment may be required later.

The patient with a myofunctional disorder and a posterior crossbite extending over a quadrant (or more) of the dental arch presents a different set of standards and treatment decisions than the normal conditions to be discussed below. Where there is a posterior crossbite in a child with a myofunctional disorder, whether dental or skeletal, **the crossbite is indicated for correction, and treatment should be accomplished prior to the initiation of myofunctional therapy to modify tongue rest and functional patterns.** The reason for this is that the 'house' that the tongue resides in should be normalized prior to retraining the tongue to function and rest properly in the physical space available to it (Franklin, 2008).

The posterior crossbites associated with myofunctional disorders have a common link to a retained sucking habit or airway issue such as enlarged tonsils and/or adenoids, allergic rhinitis, nasal deformities, or other physical causes. **In all cases of posterior crossbite with an accompanying orofacial myofunctional disorder, patients should be evaluated and treated (if indicated) by an ENT specialist and an allergy specialist prior to initiating therapy**. **Whenever possible, the crossbite should be corrected prior to myofunctional therapy** (Franklin, 2008). The chances for successful treatment of tongue and lip postures and functions are destined to failure without first treating the underlying physical problems (Franklin, 2008). The exception is elimination of a retained sucking habit in a young child. As is well known, the cessation of sucking can often result in some spontaneous resolution of a developing posterior crossbite or anterior open bite. As the freeway space is normalized, normal processes of dental growth and development are facilitated (Mason, 2009).

The clinical perspective offered about the condition of crossbite is that where there is a posterior crossbite and an accompanying orofacial myofunctional disorder: (1) the airway and allergy status of the patient should be evaluated and treated successfully; (2) the crossbite should be corrected by the dental specialist; and finally, (3) the myofunctional disorder should be corrected.

Current orthodontic treatment perspectives regarding posterior crossbite correction

Skeletal posterior crossbites related to a narrow maxilla or excessively wide mandible in adolescents and late mixed and early permanent dentition are usually treated with heavy forces to open the midpalatal suture and widen the maxilla. By contrast, dental crossbites in these same groups are usually treated by moving teeth with lighter forces. In the early mixed dentition, however, even modest forces will lead to both dental and skeletal changes (Ngan and Fields, 1995). For this reason, heavy-force palatal expansion with a jackscrew appliance is reserved for adolescents; that is, heavy forces and rapid palatal expansion are not indicated in the primary or early mixed dentition (Proffit and Fields, 2000).

A posterior crossbite in children may appear to be unilateral, but closer evaluation may reveal that that there is a bilateral constriction of the maxillary arch with a shift of the mandible to one side on closure (Proffit and Fields, 2000). A lateral ***functional shift*** is associated with a canine crossbite, or some other canine interference where a lower canine is a bit too facial, or an upper canine a little palatal but not quite in crossbite; perhaps end-to-end. The term ***functional shift*** (also called a ***mandibular shift)*** simply denotes, almost without exception where

there is a shift laterally on bite closure, that it is the canines that are causing the shift to one side since they have elevated cusps.

Children retain a flat posterior occlusal plane up to around age 13 years. By age 16, the Curve of Spee is well formed, becoming a characteristic feature of the adult dentition. During the time that the occlusal plane in children remains flat rather than curved downward toward the bicuspids as in the adult, there is no real opportunity for children to develop biting interferences except at the incisors, canines, or adult first molars.

A posterior crossbite in children with no myofunctional disorder and no functional shift is usually well tolerated and should not pose a functional problem. The opportunity for a problem to develop from a posterior crossbite increases as adult posterior teeth complete their eruption back to and including the second molars. All posterior teeth have cusps that can create interferences.

The treatment options for moderate posterior crossbites in children include: (1) removing the interferences on the primary canine cusps to eliminate a mandibular shift; (2) expansion of a constricted maxillary arch; and (3) repositioning of individual teeth to deal with intra-arch asymmetries (Proffit and Fields, 2000). Of the many treatment options for posterior crossbites, the preferred appliance in a preadolescent child is a fixed, adjustable lingual arch that requires little patient cooperation, such as the Quad-Helix®, or, alternately, the W-arch (also called a Porter appliance®). These appliances deliver proper force levels when opened 3 to 4 mm wider than their passive width and should be adjusted to this dimension prior to placement. Expansion should continue at a rate of 2 mm per month (1 mm on each side) until the crossbite is slightly overcorrected. Most posterior crossbites require 2 to 3 months of active treatment followed by 3 months of retention (with appliance left passively in place) for stability (Proffit and Fields, 2000).

Did you know? A posterior crossbite in children with no myofunctional disorder and without any functional problem does not need to be treated just because the crossbite is there. There is no valid evidence that the lack of early crossbite correction leads to TMJ problems later on, as previously claimed by some.

Crossbites caused by a functional shift of the mandible to one side during closure, however, should be treated as soon as they are discovered and are among the few conditions recommended for treatment in the primary dentition (Proffit and Fields, 2000). An uncorrected mandibular shift can produce undesirable soft tissue growth, dental compensations, and teeth abrasion of primary and permanent teeth.

Problems of canine interferences during biting that cause the mandible to shift laterally can be corrected easily by dental grinding/flattening (often referred to in dentistry as ***equilibration***) of the cusps of the primary canines. Later on, when full orthodontics is indicated around age 12, a posterior crossbite can be corrected along with the other components of the malocclusion. Even so, orthodontic opinions remain divided about the timing of crossbite corrections. Many orthodontists continue to advocate for early treatment, although there is no compelling evidence to show that arch expansion in the primary dentition will produce a more stable result than can be achieved at a later date (Kluemper, Beeman & Hicks, 2000).

The orofacial myofunctional clinician will routinely be exposed to posterior crossbites that are associated with a myofunctional disorder. What is seen in referred patients does not mirror the range of crossbites seen where no myofunctional disorder exists. While many dentists may express concern when there is a crossbite identified at any age, early treatment is no longer deemed a necessity for all. Many crossbites in children, and even adults, represent *conditions* rather than *problems.*

In summary, the indications for treating posterior crossbites differ significantly between patients with myofunctional disorders and those without**.** ***Children with myofunctional disorders are indicated for early treatment of a posterior crossbite.***

QUESTION: ***What should the orofacial myologist know about anterior dental crossbites?***

ANSWER: The anterior teeth in the primary dentition normally erupt vertically. If there is spacing between the primary incisors, this is considered a positive indication that the adult teeth may have enough room to erupt into a normal position. Since the six anterior adult teeth in each arch are wider than their primary counterparts, normal eruption of adult anterior teeth includes not only a vertical, but a forward path of eruption. The normal labial tilt of the incisal edges of anterior adult teeth increases the circumference of the dental arches. In addition, the increased prominence of anterior teeth in the adult dentition serves to fill out the soft tissue profile of the face to varying degrees as the anterior teeth provide more support for the lips. Dental crossbites can occur at any single tooth in the adult anterior dentition, or may involve multiple teeth. As an example, if a patient's upper incisors erupt vertically, creating an anterior crossbite and biting interferences, one of two events usually follow: 1) the patient may experience a loss of enamel from wear on the facial surfaces of upper incisors by contacts with the lingual surfaces of lower incisors; or 2) the patient may adapt by protruding the mandible slightly during biting to avoid incisor or canine interferences. An anterior shift of the mandible into an even greater anterior crossbite to avoid biting interferences is often referred to as a **pseudo-Class III**. It is not a true Class III jaw relationship, but an anterior functional adaptation to interferences.

Did you know? A dentist sorts out a pseudo-Class III from a true Class III jaw relationship with cephalometric data to evaluate the relative sizes of maxilla and mandible. A slightly retruded maxilla with a normal mandible can give the clinical appearance of a large mandible, leading to the clinical description of pseudo-prognathism. In addition, the dentist may evaluate for a pseudo-Class III dental situation by manipulating the mandible back into its full postero-superior position in the temporal fossae to determine whether the most retruded position of the mandible differs from that during biting. ***Manipulating the mandible in the examination process for any reason is not within the purview of the orofacial myofunctional clinician and should not be included in the evaluation process for orofacial myofunctional disorders.***

Dental correction is indicated for upright maxillary incisors where there is an anterior shift of the mandible, an anterior crossbite, or wear noted on the upper incisors. If the problem is related to upright maxillary incisors, flattening of the primary canine cusps may resolve the shift, or a mild equilibration of other anterior teeth may also resolve the developing problem. For anterior crossbites, a removable maxillary appliance with springs to tip the occlusal edges of the incisors forward may be indicated to correct the crossbite and eliminate an anterior shift during biting. Incorporating a biteplate in the appliance construction insures that no damage will occur to opposing teeth as the upper teeth edges are tipped forward and past their mandibular counterparts. The biteplate addition to the appliance can be achieved by adding acrylic over the occlusal surfaces of the primary molars; thus opening the bite during bite closure. In most cases, the flaring of upper anterior teeth with springs on a removable retainer should involve only a few months of treatment.

Children with upright maxillary incisors and an anterior functional shift, an anterior crossbite, or a pseudo-Class III relationship are likely to also exhibit a myofunctional disorder. As the mandible is repostured forward to avoid biting interferences, many children also are seen to protrude the tongue along with the mandible. Resting tongue posture is often interdental, which may serve as an important protective mechanism for the dentition. Lip posturing problems, lip incompetence, and distorted sibilant sound productions in speech may accompany the posture involved.

For whatever reasons that a myofunctional disorder may accompany an anterior crossbite, an anterior shift of the mandible, or a pseudo-Class III dental relationship, treatment is indicated. The same rules and timing established for posterior crossbite corrections would apply for anterior crossbites and functional shifts. ***The dentition and any airway issues should be evaluated and corrected prior to the initiation of myofunctional therapy.***

QUESTION: ***Why should tongue thrust therapy be recast as orofacial rest posture therapy?***

ANSWER: Until recently, orofacial myofunctional therapy focused on 'tongue thrusting' as a primary emphasis. It is now well known and accepted that 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 resting posture; and thrusting of the tongue in speaking and swallowing (Mason, 2008; 2009). 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.

Did you know? The common denominator of orofacial myofunctional disorders is that they all result in a change in the vertical dimension, or freeway space (Mason, 1988; 2005). The OMD, whether digit habit or altered oral posture, causes the mandible to hinge open slightly, while also increasing the inter-occlusal space between the 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, 2009).

Since thrusting of the tongue has been shown through research studies to represent an adaptation to a developing malocclusion rather than a cause (Proffit, Fields and Sarver, 2006), therapy should focus instead on the forward rest posture of the tongue that is linked to opening the freeway space and triggering the dental changes that can result in malocclusion. Even so, a tongue thrust should be corrected where there is an associated cosmetic problem or an accompanying tongue-tip forward rest posture.

Recasting therapy as ***orofacial rest posture therapy*** (Franklin, 2008) denotes an appropriate understanding and appreciation of contributions from dental science that document a link between malocclusions and oral habit patterns. Establishing normal rest postures of the tongue and lips should stand out as the focus of the modern orofacial myofunctional clinician. This focus is compatible with prevailing views in dental science (Proffit, Fields and Sarver, 2006). Of course, there are other patient problems that may not fall neatly into the orofacial rest posture therapy perspective, such as the reduction or elimination of drooling, and post-frenectomy treatment. Nonetheless, recasting tongue thrust therapy as ***orofacial rest posture therapy*** more clearly encompasses the work of the orofacial myologist, especially as treatment services are marketed to the public and referral sources.

QUESTION: ***Are there mutual clinical projects that orofacial myologists and orthodontists can undertake together that could advance the field of orofacial myology?***

ANSWER: Since the specialty area of orofacial myology has no university base, it rests with clinicians who provide services for orofacial myofunctional disorders to engage in research that can expand the data base in orofacial myology and provide validation for procedures used and advocated by orofacial myofunctional clinicians. Many research projects can be accomplished by mutual collaboration between orofacial myofunctional clinicians and interested dental referral sources.

Did you know? There are many basic questions regarding myofunctional disorders that remain unanswered. These include:

(1) How many individuals who tongue thrust also have an anterior, interdental rest posture of the tongue? This is an epidemiological study that has not been accomplished to date.

(2) Are there morphological differences between those with a tongue thrust and those thrusters who also have an anterior rest posture of the tongue? This project would necessitate the availability of the lateral cephalometric films for measurement and comparisons between groups. Such films are a routine part of an orthodontic workup. Suggested measurements would include the length of the mandibular ramus, comparisons of the occlusal, palatal, and sella-nasion

planes, and size of the adenoid mass (sparse, small, moderate or large).

(3) Can the freeway space be closed to a normal level and the tongue retracted by lip exercises only? Compare therapy treatment protocols on two groups, one subjected only to lip exercises, and another subjected only to tongue posture retraining. Measurements of the dental freeway space could be made before and after treatment.

(4) Is there a relationship between the vertical dimension and the length of time required for treatment? Rank-order patients with tongue thrust and/or an anterior rest posture into groups according to the millimeters of the vertical rest position measured at the incisors, and compare treatment results according to any vertical changes accomplished with your usual therapy.

(5) Is there a difference in the neurological developmental status between groups? Document oral diadochokinetic rates and movement patterns in two groups: tongue thrust only versus thrust with an anterior, interdental rest posture. **Clinical note:** many children, especially below the age of 7 years, use a "mandibular assist" in performing oral diadochokinetic tasks. In such instances, the assessment reflects the ability of the mandible to perform rapid vertical movements rather than the tongue. To eliminate this, instruct the patient to bite on a tongue blade inserted between back teeth on one side of the mouth. This task provides an effective way of eliminating movements of the mandible when evaluating the tongue.

(6) What about flaccid or hypotonic lips in patients needing jaw surgery? Since many patients who undergo maxillary osteotomy surgery had flaccid lips and lip incompetence prior to surgery, and often consent to surgery because of this complaint, myofunctional therapy is often needed following surgery. Unfortunately, surgeons are seldom aware of this problem or the benefit of myofunctional therapy in resolving this situation. There is an opportunity here for the orofacial myologist to offer to document lip competence or incompetence prior to and following surgery and to provide therapy with retained post-operative problems of lip incompetence.

A commitment by each clinician to actively engage in clinical documentation can serve to advance the data base and reputation of orofacial myofunctional therapy within the dental profession. The challenge is offered here for orofacial myofunctional therapists to collaborate in interdisciplinary projects that can result in increasing the impact and validity of this specialty area. Are you ready to participate?

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REFERENCES

Franklin, Honor, PhD. (2008). Personal communication, unpublished materials.

Grossman, R. & Hattis, B. (1967). Oral mucosal sensory innervation and sensory experience: a review. In Bosma, J. (Ed.), Symposium on Oral Sensation and Perception. Springfield, IL: Charles C. Thomas.

Hanson, M.L., & Mason, R.M. (2003). Orofacial Myology: International Perspectives. Springfield, IL: Charles C. Thomas.

International Center for Nutritional Research (2009). Website: www.ICNR.com.

Kluemper, G.T., Beeman, C.S., & Hicks, E.P. (2000). Early orthodontic treatment: what are the imperatives? Journal of the American Dental Association, 131, 613-620.

Mason, R.M. (1988) (Ed.) Orofacial Myology: Current trends. (Special Issue), International Journal of Orofacial Myology, 14, 1, March.

Mason, R.M. (2005). A retrospective and prospective view of orofacial myology. International Journal of Orofacial Myology, 31, 5-14.

Mason, R.M. (2007). Unpublished study of the position of the tongue-tip at rest and in swallowing in normal adults.

Mason, R.M. (2008). Improving the future of orofacial myofunctional therapy. Presentation at the International Association of Orofacial Myology, annual meeting, Philadelphia, PA.

Mason, R.M. (2009). An update on orofacial myofunctional disorders: more than tongue thrust. Invited article: www.SpeechPathology.com.

Ngan, P., & Fields, H.W., Jr. (1995). Orthodontic diagnosis and treatment planning in the primary dentition. Journal of Dentistry for Children, 62, 25-33.

Pepicelli, A., Woods, M., & Briggs, C. (2005). The mandibular muscles and their importance in orthodontics: a contemporary review. American Journal of Orthodontics and Dentofacial Orthopedics, 128, 6, 774-780.

Proffit, W.R. (1973). Muscle pressure and tooth position: a review of current research. Australian Orthodontist, 3, 104-108.

Proffit, W.R. (1978). Equilibrium theory revisited: factors influencing position of the teeth. Angle Orthodontist, 48, 175-186.

Proffit, W.R. & Fields, H.W., Jr. (2000). Contemporary Orthodontics. 3rd Edition. St. Louis: C.V. Mosby.

Proffit, W.R., Fields, H.W., Jr., & Sarver, D.M. (2006). Contemporary Orthodontics, St. Louis: C.V. Mosby.

Vig, P.S. & Cohen, B.D.S. (1979). Vertical growth of the lips: a serial cephalometric study. American Journal of Orthodontics, 75, 4, 405-415.

Wickwire, N.A., White, R.P., & Proffit, W.R. (1972). The effect of mandibular osteotomy on tongue position. Journal of Oral Surgery, 30, 184-192.