

Tutorial

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Recognizing Tongue Related Malocclusions

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With the emphasis today on holistic approaches to health care, the dentist/orthodontist can benefit from an awareness of the causes of functional malocclusions. There can be little disagreement that tongue pressures during swallowing, speech, and resting position, may be a contributing factor to certain malocclusions.

This article is not intended to provide a comprehensive examination protocol but rather to raise the awareness of the dental community to tongue related malocclusions. Dentists and orthodontists may be in a position to see the beginning stages of many preventable problems. Early detection and intervention can be beneficial to the patient.

In an article in the *American Journal of Orthodontics*, Dr. Robert Ricketts stated, "If twenty years of orthodontic experience means anything, I can state with no reservation whatsoever that open-bite tongue problems constitute the most annoying situations I have ever experienced on a clinical level in preorthodontic and postorthodontic patients."¹

The tongue is a complex structure comprised of four intrinsic and four extrinsic muscles with their origins arising from such structures as the hyoid bone and the styloid process. These muscles afford the tongue the ability to protrude, elevate, contract, and expand and enable it to perform the incredibly fine motor movements required for

speech, chewing, and swallowing. Certain factors, such as a history of mouth breathing, improper infant feeding, and prolonged thumb-sucking, may result in a flaccid, weak tongue that may have a detrimental effect on cranio-facial growth and development.

According to Meredith, by age four, 60 percent of a child's craniofacial growth has taken place and by age twelve, 90 percent has occurred.² This may indicate that early detection and intervention could alleviate tongue related malocclusions and other oral myofunctional abnormalities.

A significant percentage of occlusal relapses which occur after dental intervention are related to orofacial muscle imbalance, abnormal swallow, and faulty articulation.³ This is especially significant to the orthodontist who demands a stable oral environment for long term stability of an orthodontic correction. It is both a personal and financial tragedy when a patient begins to relapse only shortly after appliances are removed.

Thus it is important for the dental professional to be alert to tongue and lip postures and movements which may have an adverse affect on the dentition. Identification of oral myofunctional disorders, with referral to an oral myologist for further evaluation and treatment, may halt a developing malocclusion in some cases and may hasten the orthodontic process or prevent relapse in other cases. Because of this, fundamental guidelines for the assessment of oral myofunctional problems and tongue related malocclusions may be of great value. Several texts are available (3,4,5) which give comprehensive information on diagnostic procedures used by the oral myologist. This article

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will discuss certain characteristics which the dentist should observe and evaluate to detect oral myofunctional disorders.

Before proceeding with the examination ensure that the patient is seated upright, not reclining in a dental chair. Studies have shown that modification of the natural head position can change muscle relationships in the head and neck. When supine, a patient's tongue assumes a more posterior position than when upright. To avoid this distortion, it is recommended that the patient's Frankfort plane (roughly a line from the alar of the nose to the tragus of the ear) be parallel to the floor.

When conducting the examination the overall facial appearance should be observed and any asymmetry noted. The resting posture of the tongue, lips, and mandible should be noted. All factors relating to the "long face syndrome" should be recorded such as: excessive anterior face height, lip incompetency, flaccid lips, pronounced philtrum (short upper lip), narrow nares, mentalis sulcus, or steep mandibular plane (over 30 degrees from Frankfort horizontal).

The examiner should also keep in mind these physiological conditions:

- a. Is the patient mouth breathing, lip-licking, or lip-biting?
- b. Are chapped lips present?
- c. Is there evidence of allergies, such as allergic "shiners" (fluid under the eyes) or nasal crack much like a scar across the bridge of the nose, indicating a pushing up on the nose, commonly referred to as the allergic salute?
- d. Is there drooling or excessive saliva accumulating in the patient's mouth during speech?
- e. Is there a persistent rash on the chin area?

Mouth breathers are often characterized by other findings, since abnormal breathing seems to have a bearing on general well being. Mouth breathers tend to be restless at night, tired in the morning, lethargic, poor students, and poor eaters due to a decreased sense of smell. They often have upper respiratory infections because the screening abilities of the nasal hairs and mucous membranes which capture germs and pollens are by-passed.⁶ Mouth breathers may develop posterior crossbites because the tongue is resting in the floor of the

oral cavity rather than in the roof of the mouth where it should be to promote lateral growth of the upper dental arch. The flaccid, low-lying tongue allows buccal pressures to constrict the upper arch and may cause the palate to develop a high, narrow, and arched construction. This may eventually infringe on the nasal cavity, contributing to further mouth breathing.⁷ Most orthodontists agree that nasal breathing is a prerequisite to normal cranio-facial growth and development. The studies of Dr. Harvold document that changes in the physiological functioning of the upper respiratory tract lead to skeletal maladaptations.⁸

The patient should be observed during the act of deglutition. The most valid information comes from observing the patient swallowing liquid or saliva when the patient is not aware that he is being watched. This can be accomplished by giving the patient a glass of water and asking him questions about school or other activities. The patient may protrude his tongue to touch the glass, may inappropriately tense the circumoral musculature or the mentalis muscle, or may be seen pushing the tongue against or between the upper and lower teeth.

If tongue thrust swallowing is suspected, the dentist can place lip retractors in the patient's mouth and ask him to bite his back teeth together and swallow. If this does not elicit a swallow, have the patient hold the lip retractors in place while squirting water into the corners of the mouth, and then ask him to swallow. Observe the swallow to see if the tongue is pressing against or through the dentition. Occasionally the patient will be unable to swallow with the retractors in place or he may make a herculean effort to close his lips during the swallow. To observe the swallowing pattern of patients with overbite or closed bite, the examiner can place two tongue depressors horizontally between the molars, have the patient bite down, and then elicit a swallow. This should allow the tongue and the tongue-thrust to be observed.

The appropriate size of the tongue is determined in relation to the size of the oral cavity it occupies, i.e., a large tongue in a large oral cavity is not considered too large. The exception to this is the new-born baby, when the oral cavity is one-

eighth of its eventual size but the tongue is already one-half of its adult size. This discrepancy is important since "infantile thrusting" is perfectly normal up to about the age of seven, when a more mature swallow should develop. Macroglossia, a tongue too large for the oral cavity, is rarely seen. This problem is correctable only through oral surgery; however, reducing the tongue's size to correct tongue-thrusting is not the total answer because the shortened tongue (form) may continue to thrust (function). Many patients appear to be macroglossic before therapy because of the low, forward resting posture of the tongue. After therapy or tonsil removal or palatal expansion, if indicated, the tongue fits nicely into the oral environment.

The lingual frenum should be observed in order to diagnose an ankylosed tongue (tongue-tie). This is accomplished by having the patient open the mouth completely, close by one-third and produce the sound "luh, luh, luh." The tongue tip should easily touch the alveolar ridge during this sound. If the patient is unable to do so, the tongue will either strike the dentition or protrude between the teeth on this sound and on all l's, t's, d's and n's. The examiner needs to distinguish between a weak tongue and a true tongue-tie. A classic clinical sign of the true tongue-tie is the "V" shape the tongue will exhibit when attempting to elevate the tip during "L" productions. A tongue-tie can be corrected with a frenectomy; however, short-term myofunctional therapy may be necessary afterwards to help strengthen the tongue and to correct maladapted speech habits.

With a speech sample elicited during a patient's check-up, an alert examiner can spot faulty articulation which may be associated with oral myofunctional disorders. This examination should begin with a few personal questions directed to the patient and designed to elicit spontaneous speech before attention is called to the articulation. Once the patient detects the examination, the real picture can be distorted. The most effective questions are "What are your hobbies?" and other questions which cannot be answered "Yes" or "No".

While the patient is speaking, the tongue should be carefully observed to see if it is showing

"too much". This skill can be developed by watching the speech of normal patients, and thereby becoming aware of abnormal movements of the tongue. If speech draws attention to itself instead of what the person is saying it is considered abnormal.

Diadochokinetic rate, i.e. rapid ballistic tongue movements, should be tested next by asking the patient to repeat "puh-tuh-kuh" rapidly ten times. This tests not only the capability of the tongue to articulate these sounds, but the ability to do so consistently at a rapid rate. Inability to consistently produce "puh-tuh-kuh" is an indication of a possible muscular deficit. The ability of the tongue to protrude, elevate, contract, expand, retract, and exhibit rapid ballistic movements is paramount to the incredible speed and precision required for good speech and swallowing.

The patient should be asked to produce the "l" sound with vowels, e.g., "lay, lee, lie, lo and lou." The examiner should observe if the tongue strikes the central incisors, protrudes through the anterior teeth or through the bi-cuspid area. The "l" sound should be produced with the tongue tip touching the alveolar ridge and the sides of the tongue within the dental arch. This test should be followed by eliciting the sentences, "I like to look at lights" and "He fell into the lake and yelled for help". If possible, the examiner should cover his own mouth in some way to prevent the patient from observing his words, because some patients will "model" an examiner.

The "t," "d," and "n" sounds should be examined in a similar fashion, i.e., ask for the production of "t" and "d" with the vowels and the sentences, "Did your dad drive today?" and "Teach me to tell time." The "n" sound is tested with the vowels and the sentence, "Now is not the time."

The patient should next be asked to produce the "th" sound, as in the sentence "It is not healthy to put your thumb in your mouth." This sound should be produced with the tongue tip contacting the lingual surface of the upper incisors or interdental, i.e., with the tongue tip protruding between the teeth. A person is not considered to be "tongue thrusting" if the tongue can be seen against or

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