

Neurofunctional Reorganization in Myo-osteo-dentofacial Disorders: Complementary Roles of Orthodontics, Speech and Myofunctional Therapy

BEATRIZ A. E. PADOVAN

A system of therapy for improving nasal breathing, sucking ability, chewing, swallowing, speech and orofacial muscle function is described. The therapeutic exercises do not require conscious cooperation, so they can be used with very young or handicapped children. Novel strategies for helping children overcome damaging oral habits are detailed. Patterns of collaboration between therapist and orthodontist are described for specific malocclusions.

In Brazil, there is general agreement on the importance of corrective myofunctional therapy for patients with dentofacial abnormalities. The Padovan Neurofunctional Reorganization Method is based on the knowledge that muscles and nerves responsible for respiration, sucking, mastication and deglutition are the same ones responsible for speech and definition of the morphogenesis of the dental arches. If a muscle function is deviant, it is probable that pathological consequences will occur. The Padovan Method addresses all functions simultaneously. I developed this treatment approach while teaching post-graduate students of orthodontics at the University of Sao Paulo (1969 through 1975).

A combined approach to orthodontics, functional maxillary orthopedics and speech therapy must focus on the basic concepts that link these specialties and the way in which they interrelate. Cases treated with the Padovan Method and orthodontic appliances, a combined approach, demonstrate stable, long-lasting results.

Speech is an adaptive function which originated from the digestive and respiratory systems. The mechanisms used for eating and speaking are one and the same. Vegetative reflex functions are prelinguistic in that they prepare the phonatory organs by adapting them for the production of speech.

These same functions, adequately developed and maintaining correct patterns will influence beneficially the shape of the dental arches. The teeth are maintained in balance and harmony by two antagonistic muscular forces, an internal restraining force, the tongue, and an

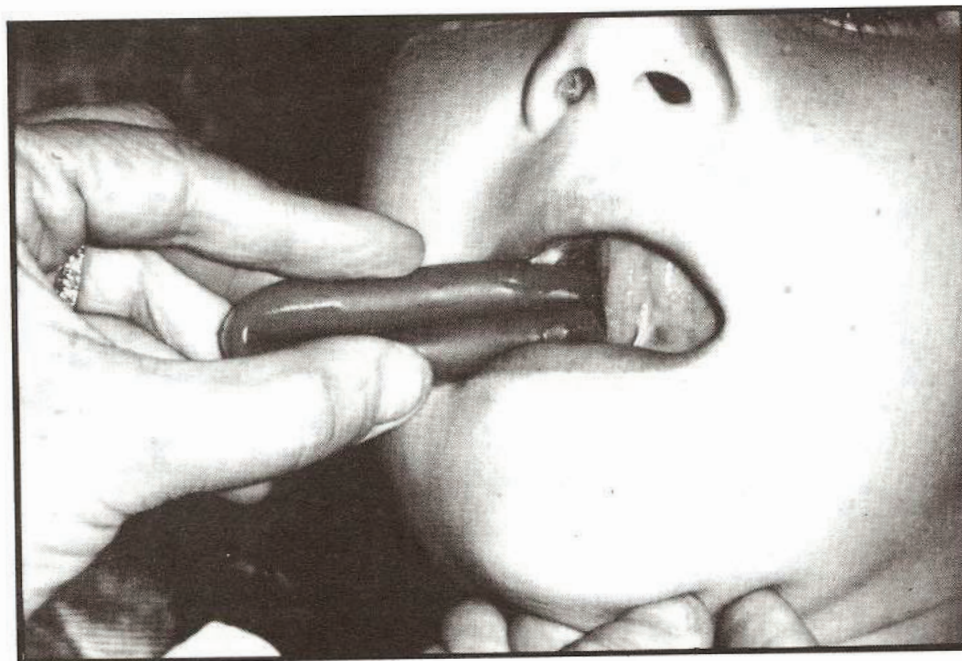
external force, the buccinator mechanism, lips and cheeks, which form the muscular band around the teeth. The molding effect of these forces is exerted both in repose and during function. At rest there should be a soft labial contact with the tip of the tongue against the incisal papilla and the dorsum of the tongue against the hard palate, supporting the palatal arch.

Negative oral habits, those considered as the functional etiology of some dentofacial deformities, are deviations of the vegetative reflex functions: respiration (mouthbreathing); sucking (of the fingers or a pacifier), mastication (bruxism, unilateral chewing, biting of objects); and deglutition (various types of disordered swallowing, i.e., tongue thrust).

The link between orthodontics and speech pathology is represented by the vegetative reflex functions. They are considered prelinguistic for speech and contribute orthodontically to the stability of the teeth in their axial angles of inclination.

Researchers, since the early 1900's, have noticed that relapses sometimes occur in orthodontically treated cases. Angle (1907) noticed that habitual resting of the tongue between the teeth led to difficulty in completing orthodontic treatment. Other authors have shown interest in this subject. Straub, in the United States, and Cauhepe, in France, drew greater attention to this matter in the 1960s. Many methods have been developed and published since, which are specifically for the reeducation of tongue thrust swallowing. It is surprising, however, that many of these programs are recommended for children over the age of seven, when patient cooperation is possible. A seven year old who is tongue thrusting would certainly have developed dentofacial deformity, or malocclusion, by this point. Why not administer preventative therapy?

What about children with other pathologies, like Down Syndrome, cerebral palsy and developmental disabilities, who exhibit atypical deglutition and other disordered vegetative reflex functions? Some of these children are unable to blow or suck, have difficulty chewing, disordered speech and various types of malocclusion. These children would have great difficulty

*Figure 3*

orthodontist immediately. Sucking exercises may be done prior to appliance therapy. Mastication exercises may be added after orthodontic treatment has commenced.

Open bite cases are candidates for mastication exercises. Unoccluded teeth require stimulation as they get little or none during function. The tubing is adapted to contact the teeth.

Mastication exercises may be conducted in cases of mixed dentition. In cases of missing permanent teeth, however, prosthetic devices should be in place before mastication exercises are assigned. Otherwise, neighboring teeth may incline toward the open space. If this occurs, suction must be intensified. Since suction and mastication share common musculature, one type of exercise will benefit both functions.

DEGLUTITION

The "Reflexive Swallowing Exercise" stimulates the supra (upper) and infra (lower) hyoid muscles and those of the posterior tongue. At the moment of deglutition, the supra and infra hyoid muscles elevate the hyoid. Water is injected into the patient's mouth, while the tongue is held and pushed posteriorly with a tongue depressor (Figure 4). The patient is asked to gargle quickly (to move the water into position where it will trigger the swallow reflex), then to swallow. The exercise is repeated many times during the session. The patient becomes capable of pulling the tongue back without the aid of the tongue depressor and triggering the swallow reflex. From that moment, the position of the patient's tongue tip becomes irrelevant to the initiation of the swallow. Next, correct

tip positioning (on the incisal papilla) is addressed. With this exercise, the mechanics of normal deglutition are quickly established.

The "Reflexive Swallowing Exercise" is done initially with the patient leaning back in a chair. Soon the patient practices in an upright, sitting position. It is an important exercise for those who project their heads forward to swallow.

Another important swallowing exercise utilizes the pacifier which is connected to a catheter (Fig. 5). The pacifier is placed under the tongue to prevent tongue thrusting. The catheter is placed on the tongue. The patient is required to sequentially suck and swallow.

This exercise to strengthen the buccofacial musculature improves proprioception of the tongue as well as propulsion and retraction of the tongue. An orthodontic elastic is placed around the tongue. The patient begins retracting the tongue, sliding the elastic forward until it comes off. If the patient needs assistance initially to establish this movement pattern; a straw can be placed under the elastic, bent and pulled gently forward by the clinician, to aid in the transit of the elastic.

Harmful sucking or chewing habits result when normal function has not developed at the appropriate ages. Therefore, to eliminate these habits, it is beneficial to focus on those functions which failed to mature properly. More sucking exercises will be assigned to the patient who sucks a finger or pacifier, exercises for mastication will be stressed with patients with chewing habits (e.g. bruxing, finger nail biting).

With digit or pacifier sucking habits, the mother can assist in carrying out assigned exercises. She is directed

to require prolonged and vigorous sucking of the orthodontic pacifier for five minutes, before the child is allowed unrestricted self-initiated digit or pacifier sucking. The mother should sit with the child's head in her lap while she exerts gentle resistance on the orthodontic pacifier being sucked by the child. During this period she should, sing songs, or tell a story to provide a comfortable environment for completion of the exercise.

The following story provides an example of the effectiveness of this procedure in eliminating negative sucking habits. A six year old boy continued to suck a baby bottle and use a pacifier and took six months for this child to learn to suck an orthodontic pacifier. When the child could do this effectively, the home program was assigned. The mother required five minutes of active sucking on the orthodontic pacifier before the baby bottle was made available. The boy was able to have his own pacifier whenever he wanted it. After three months on the program, the boy came home from school one day and announced, "I'm already grown up and I don't need a bottle any more." "Okay," replied his mother. When he came to the therapy session and explained, "I've already stopped the bottle." I congratulated him. "Whenever you want to exchange your pacifier for mine, let me know." I explained that his round pacifier resulted in an openbite. My pacifier, with which he was already familiar, did not. In two months, he was back in the office and ready to exchange pacifiers. He put his pacifier on the table and proceeded into the session. However, before he left the office, he asked to suck the pacifier one last time. When told he could take the pacifier with him, he refused but asked to keep its cord which he was used to rub on his nose while sucking. This he attached to the orthodontic pacifier. He was instructed to use the pacifier as often as wished, but to suck it vigorously while

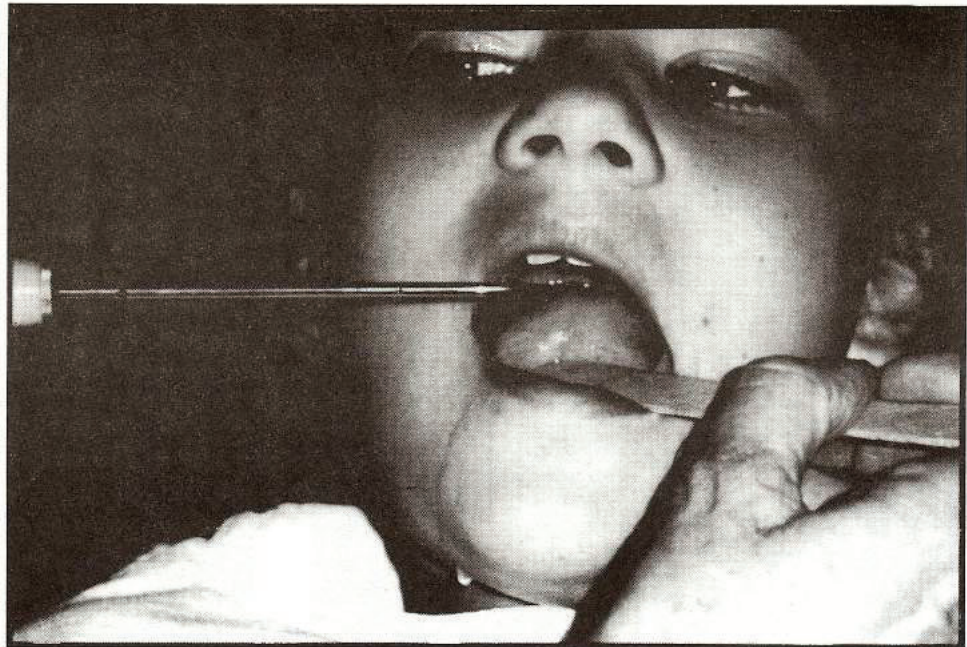


Figure 4

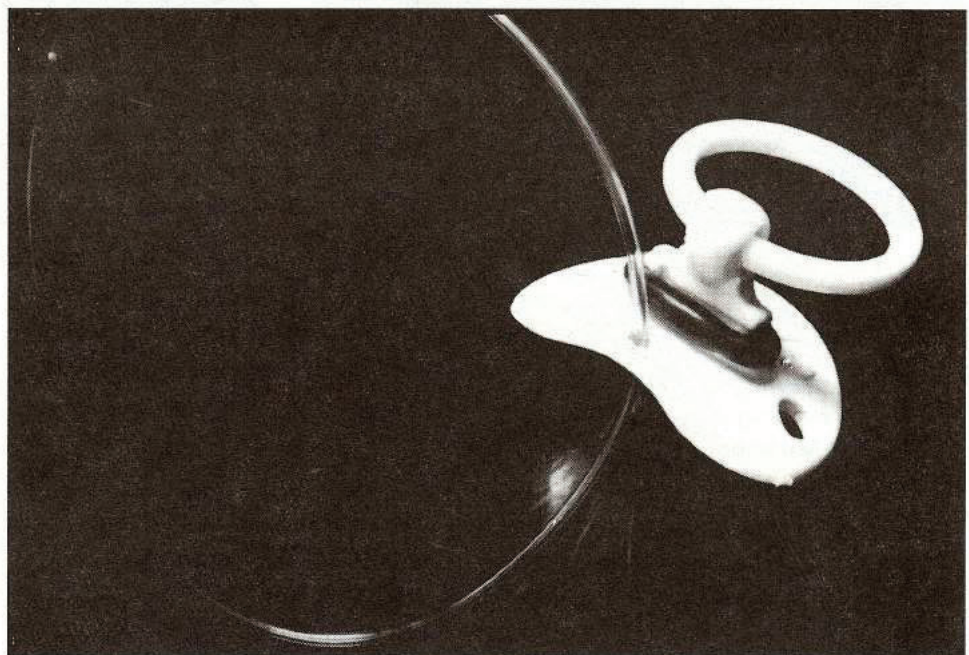
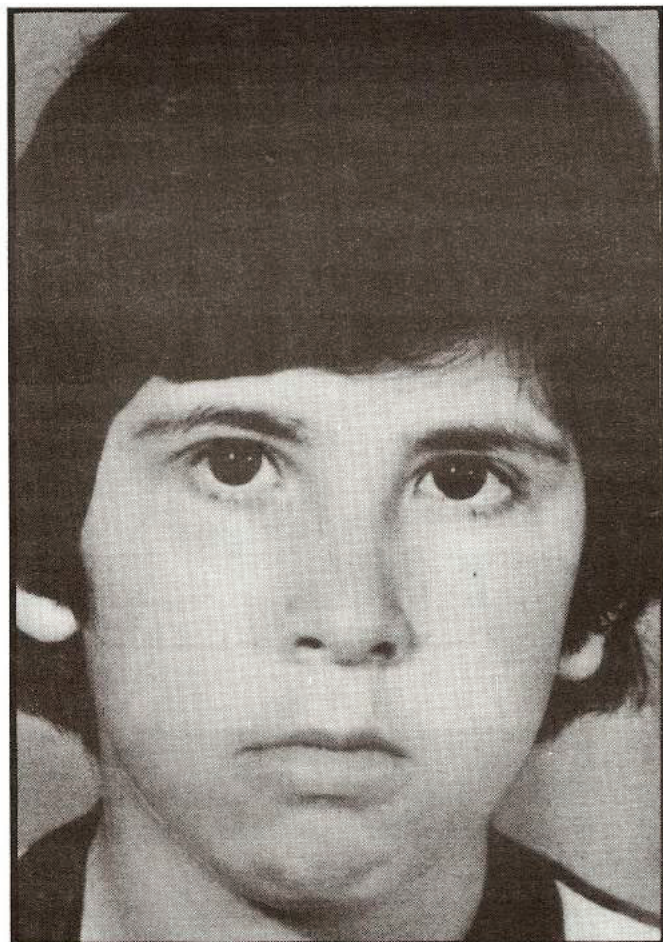


Figure 5

in his mouth or to put it away. The more he sucked, the more beneficial it would be for the buccofacial musculature. After two months, the boy self-limited his use of the pacifier to carrying-out his treatment exercises only.

In summary, each exercise addresses all functions. As the muscles are activated naturally, neurological memory is established. "And the sooner therapeutic measures are taken and the correct function is being used, the stronger its fixation in CNS will be, and the

*Figure 6a**Figure 6b*

later, the more difficult it will be to restore a normal function of chewing and swallowing." (Moyers, 1958). This is why working with patients as early as possible is preferable. Muscles constitute the best and safest constraining appliance for teeth. "No orthodontic correction can be adequately maintained unless optimal occlusion obtained at the end harmonizes with the patient's musculature."

We can see some results of this treatment in the following "before" and "after" photos: Figures 6a and 6b - here there had been great tension of the mentalis and the tension has completely disappeared after the treatment.

Figure 7a, 7b, 7c and 7d: Looking at this girl, we can see how her features have become softer. Even the chin has grown in a more forward position. The myofunctional treatment of this girl was done before the orthodontic appliance was placed into her mouth.

The Padovan program consists of two thirty to forty-five minute sessions per week depending on the age of the patient. When the patient is able to perform the exercises perfectly, a home program is established.

The philosophy of the Method is first, to consider the human being as a totality. The musculature is interlinked throughout the body. For example, we know that mouth breather presents postural alterations and may have a tendency toward flat feet and halux vagus. Therefore, in treatment, patients get exercises for the body as well as the mouth. Neurological Reorganization consists of recapitulation of the phases of normal neurological development: rolling, creeping, crawling, walking, and so on.

Second, the Method follows nature's direction. Body exercises consist of movements from the genetically programmed sequence of normal human development. Like the oral exercises, functions are established by training those functions. By following nature in our treatment, we have fewer opportunities to make mistakes.



Figure 7a



Figure 7b



Figure 7c



Figure 7d

Address correspondence to:

Beatriz Padovan
Rua Da Paz, 90
04713-000
Sao Paulo, Brasil

REFERENCES

- Angle, E.H.(1907) Treatment of malocclusion of the teeth; *Angle's System*. 7 ed. Philadelphia, S.S. White Dental. 106-110.
- Delacato, Carl H. (1966) *Neurological Organization and Reading*. Illinois, Charles C. Thomas Publisher.
- Garliner, D. (1971). *Myofunctional Therapy in Dental Practice*. New York, Bartel Dental Book Co. Inc.
- Hanson, M. L. (1967). Some suggestions for more effective therapy for tongue thrust. *Journal of Speech and Hearing Disorders*, XXXI(1): 75-79.
- LeWinn, Edward B.(1969). *Human Neurological Organization*. Illinois, Charles C. Thomas Publisher.
- Moyers, Robert E. (1958). *Handbook of Orthodontics*. Chicago, The Year Book Publishers, Inc.
- Straub, W.J.(1960/1961/1962) Malfunction of the tongue. *American Journal of Orthodontic*. 46(6):404-424, 47(8): 596-617, 48(7) 486-503.