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Functional Jaw Orthopedics . . .

Better Oral Neurophysiology Information Gives Better Clinical Results

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Introduction

The knowledge of basic oral neurophysiology provides better support for more successful clinical results. Just as computers widened the range of possibilities in many fields, oral neurophysiology opened doors to oral medicine. In this light we are led to reconsider our procedures and acquire more elements toward a more accurate diagnosis. This is highly significant for the future of dental health inasmuch as we are heading for new ideas and can modify old concepts.

As a simple example, when we have to do selective grinding or measure the vertical dimension, we ask the patient to close his eyes and keep his head and back relaxed on the chair, in the upright position [1]. This way the most relaxed position of the jaw is obtained. The position of the head is strongly related to the position of the jaw as it can even modify the masticatory force and rhythm. Therefore, if we keep our eyes closed, the anterior temporalis muscles do not contract and this allows a more relaxed position of the jaw [1]. The technique should be viewed by medicine as the resource that triggers the purpose of the treatment being conducted *by* and *in* the patient [2]. Clearly, it would be difficult to achieve our objective unless we are aware of two essential factors: the patient and the technique. Starting from this point, and according to our knowledge, solutions may be possible [2].

Early Orthodontics and Pedodontics

Considering any field of medicine, it is more desirable to master prevention or treatment at an early stage than to master late treatment. Therefore, our objective should be oral pediatrics in small children, rather than orthodontics in adolescents, inas-

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much as it is obviously much better to prevent problems in the early years. Any treatment in oral medicine must be faced as a neuro-occlusal rehabilitation [3], and prevention is based on the maintenance of the correct reflexes for better oral functions, mainly for the perfect distribution and architecture of masticatory cycles [4]. Besides selective grinding, Planas direct tracks on primary dentition, and masticatory orientation [5-6] in early treatment of bad occlusions, the best way is to choose functional orthopedic therapy (FOT). These techniques are effective in early stages of development, and they do not depend either on total or partial eruption of the permanent teeth, working also on primary or mixed dentition, for the very reason that dental support is not essential. Even though FOT does not exclude the possibility of extractions, it certainly reduces it [7].

The use of orthopedic appliances in early stages, if based on a good diagnosis, does not increase the duration of the treatment. On the contrary, it prevents the patient from presenting the problem at an age when the solutions are frequently more difficult, sometimes requiring more time with questionable results. The basic characteristics of FOT are especially important for cleft palate patients [7].

In early treatment, other orthodontic techniques merely control the phasic growth or, in a few cases, recuperate the harmonious growth; they do not have the resources to provide the same possibilities that we have in early orthodontic treatment by FOT. However, at present, fixed appliances and/or mechanical orthopedics (e.g., extraoral traction, chin-cups) are applied earlier, but the treatment will have the same duration. Thus, it takes longer to correct bad occlusion through these techniques than previously, and the need for extractions is still considerable. In our opinion these orthodontic techniques are useful for the adolescent period of development and we will be wasting time if we apply it in earlier stages.

Nowadays we know of nothing better than FOT for the early orthodontics-oral pediatrics care of phasic or harmonious growth and development. In the future, better techniques may be developed.

It must be stressed that oral neurophysiology is essential to achieve good clinical results, particularly if we are to use FOT.

The appliance is chosen, built, and used according to two fundamental principles in each step: neural excitation and change of posture [7-8]. Thus we shall mention a few details of oral neurophysiology.

Some Brief Considerations About Oral Neurophysiology

The structures responsible for the functions of chewing, swallowing, speech, and breathing are among the richest in neural terminations, and a good anatomical functional development re-

quires the correct performance of these structures. A functional orthopedic treatment is based fundamentally on correct neural stimulation. The most adequate pathways are chosen in each separate case according to the topography of the neural terminations, the capacity to adapt them slowly or quickly to stimuli, conduction velocity, and various types of neural receptors and conductors, thus obtaining better therapy results in the shortest possible time.

The structures upon which we work in orthodontics are some of the richest in motion. The coordination of these movements depends on the neuromuscular system and is charted through reflexes, which have the purpose of bringing the functional responses of which proprioceptive stimuli are very important.

There is no separate sensorial mechanism for posture and movement which defines these in terms of muscles and articulations. Movement could be explained as a series of postures. Posture would be the position assumed by the mandible in relation to the maxilla, with no dental contacts, conditioned by the equilibrium between the mandible elevator and depressor muscles, within an antagonistic tonus called posture, based on the monosynaptic, antigravity, myotatic stretch reflex, through only two neurons. The mandible assumes this position which confirms that the neuromuscular tonus is one of the main shapers of bone development. With the postural relation, equilibrated by the mandible antagonist muscles under isometric contraction, the functional orthopedic appliances modify these relations and condition new monosynaptic reflexes to substitute the pathological circuits (second principle of FOT = change of posture) [7-8]. This can be better understood in Angle's Class II and III cases; however, in Class I cases of anomaly there is also no correct postural relation, and clinically the appliance should modify this, seeking the incisive neural excitation and therefore forcing the mandible to assume a new position. The appliance should be a slightly more forward, trying to establish contact between the upper and lower anterior teeth within the convenient area.

Control of the Organism: Stimuli—Excitability

The CNS concentrates a greater number of receptors where more information is required. In order to be biologically receptive, this information will depend upon quality, intensity, time of action on the structures [9], and, finally, upon the structures themselves. The system produces either a quick or a slow response, which can last for some time or disappear.

By varying the pressure on a given oropharyngeal region, we can stimulate swallowing, retching, or vomiting. Therefore, similar stimulations (i.e., quality = pressure) on the same spot of application (e.g., soft palate, pos-

terior part of tongue, lateral parts of palatoglossal arch and posterior parts of pharynx), with different intensities (e.g., 3 to 6gr), and also considering the time pattern, give us different responses in opposite ways (i.e., swallowing vs. vomiting [1].

One practical application of this concept is, for instance, observed when impressions are taken. Moderate pressure must be applied when impression material is introduced in the mouth, and the professional in charge of such operation is recommended to stay still until it is finished. Moreover, lower temperature of the room, the material, and the mouth achieve a better inhibition of vomiting centers. Before taking impressions it is advisable to have the patient rinse his mouth with iced water, and even have one or two sips. Commonly, we are not even aware of this servomechanism [10-11]. The sensorial mechanism is a very little known reality, and it can help us or lead us to failure, or either delay or speed up the results desired.

Change of Posture

Change of posture is the supreme neural excitation we must stimulate, and that is why it becomes the second fundamental principle of FOT [7-8].

When we build an appliance to modify the posture (second fundamental principle of FOT), we alter the minimum vertical dimension and excite the depressors in a light way. These and the orbicularis are synergic, so much so that it is difficult to bite the teeth and press the lips tightly together at the same time. Keeping the mouth closed in the position determined by the appliance, the elevators are in full activity. Muscle spindles gather in a greater number in the elevators than in the depressors.

These receptors are very important for the control of the position and movement of neck, jaw, tongue, and TMJs [12-16].

Each time we vary the jaw posture we will be exerting a greater or smaller influence on the position of the tongue, the TMJs, and the head itself. Around the jaw posture, the CNS receives much more information from the increase of static sensitivity of the receivers than in the position of maximum intercuspidation [12].

Once more we have grounds to assure that the change of posture through functional orthopedic appliances is the supreme neural excitation to establish new neural circuits necessary to the acquisition of equilibrium in the stomatognathic system. The muscle spindles register movements less than 1mm [12]; thus, minimum variations are sufficient to excite this system, favorably or not. For example, placing telescopic tubes in a Bimler [3] that we have in the compound Planas indirect tracks or in the Planas equilibrator, augments, in millimeters, the movements of protusion and laterality; this is enough and necessary to be registered by the muscles and further excite the articulations regulating the Ben-

net movement and the Planas masticatory functional angle.

In the posture determined by the appliance the CNS receives much more information, in a manner more adequate, than in other sequences of posture, that is, than during any movement. We should, therefore, advise the client to remain as long as possible with the mouth closed, in the mandibular, lingual and labial postures determined by the appliance, in order to get the maximum benefit from the neurophysiological responses during the treatment.

When we change (second fundamental principle of FOT) we are aiming at an incisive proprioception excitation in order to capture greater stimuli of the lower incisors against the upper incisors.

The correct neuroexcitation is in direct relation to the right contact of lower with upper anterior teeth. In reference to the lower anterior teeth, if we divide the tooth into three parts, the ideal area is the incisal third of facial surface. A contact should be tried on the upper part of the superior third (Figs. 1, 2). Following the same reasoning, the ideal area of contact for the upper anterior teeth is the incisal third of the palatal surface. A contact should be tried in the middle of the this third (Figs. 1, 2).

When we cannot accomplish tooth-to-tooth contact at the convenient area, it can be done by means of a lower frontal splint or an equiplan [2].

Force and Masticatory Rhythm

Mastication is the total sum of masticatory cycles necessary to reduce all food to a size and shape adequate to allow through successive swallowing and complete consumption [17].

Mastication appears in the human being only at 4 to 5 years old and the reflexes must be postontogenetically extremely coordinated. Our treatment aims to provide our patient with conditions of masticatory efficiency. Masticatory efficiency is adequate performance of masticatory cycles, offering compensatory physiological, not pathological, mechanisms. These physiological mechanisms result from the eruption and attrition patterns and from a sensorial mechanism adequate to each age, arranging the TMJ muscles and other structures of the stomatognathic system in a perfect functional adaptation.

When we think of extracting a tooth, we must bear in mind that masticatory forces depend upon periodontal sensorial mechanism and masticatory rhythm on the TMJ sensorial mechanism [1]. So we will change the entire environment which leads the mastication.

The saliva has a great influence on the masticatory force [1], so any alteration that is induced through medicines or any other way must be carefully considered to determine the efficacy.

The TMJ dysfunctions affect the masticatory rhythm. FOT is convenient for the treatment of

Fig. 1. Before placing the appliance.

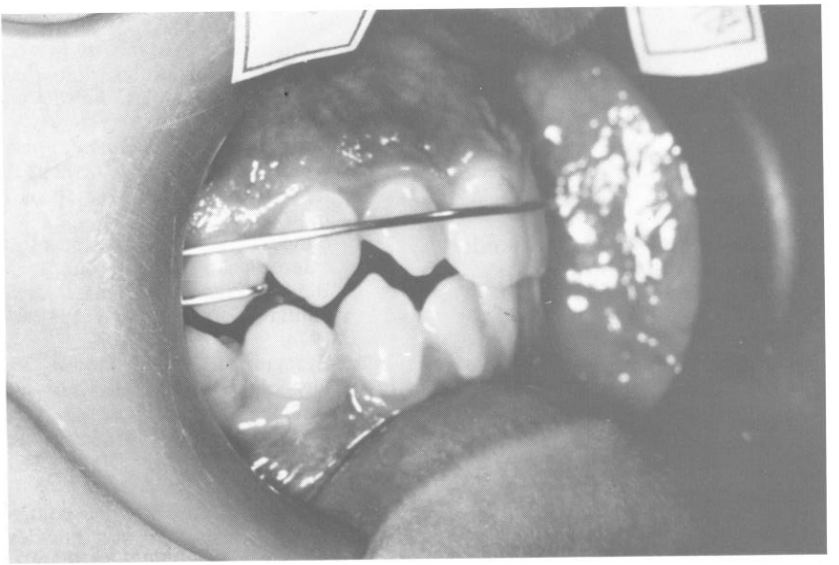

Fig. 2. The convenient area of contact of anterior teeth—upper—palatine face —central region of incisal third—lower—vestibular face—upper part of the incisal third.

such problems mainly because it changes the posture.

The Reflexes of Maximum Opening of Mouth

We know that between 7 and 8 years old the maximum opening of mouth is undergoing wider ranges and later, between 8 and 13 years of age the process stabilizes. After age 13 until 18 years of age the process is accelerated and the mouth reaches 40 to 50mm of maximum opening, even reaching 60mm in some cases. It is wiser to avoid long dental proceedings such as impacted third molars surgeries before the age of 18. In some cases it causes trismus, and the maximum opening of mouth could be reduced for life; perhaps because the reflexes have improper maturation.

Masticatory Status and Development

It is important to be alert to the great influence that masticatory status can have over the early stages of facial development. Some asymmetrical faces at these levels could be avoided if we use our techniques earlier.

Summary

(1) Understanding oral neurophysiology is essential for better clinical results.

(2) At present, FOT is the better orthodontic technique to employ in oral pediatric care of growth and development (i.e., early orthodontics).

(3) Stimuli-excitability is the key to practical application of oral neurophysiology.

(4) The earlier we can treat a malocclusion, the less risk we run of irreversible asymmetry of the early stages of facial development.

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"The manifestation of every person and the world in which we live is the minimum requirement of our existence, its major purpose and its only hope."

—Leo F. Buscaglia

Biff: "I just can't take hold, Mom, I can't take hold of some kind of life."

—Arthur Miller
Death of a Salesman