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CASE REPORT

Clear Interceptive Orthodontics & Body Posture

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ABSTRACT

In this case report paper, we present two clinical cases that illustrate the close clinical relationship between body posture, and stomatognathic functional occlusion.

We also explain how we resolve the complete postural problem, by neuromuscularly reprogramming the stomatognathic system, influencing on mandibular dynamics, and treating malocclusion with clear interceptive orthodontics.

At the same time, we present the basic principles existing between Posturology, Dynamic Occlusion and Clear Interceptive Orthodontics.

Keywords: Clear interceptive orthodontics, occlusion, posturology, mandibular dynamics, postural tonic system, body posture, malocclusion, orthopaedic.

Introduction

In our extensive clinical experience treating patients of all ages, especially growing children, with postural problems related to mandibular dynamic disorders and developing malocclusions, we have observed a close and intimate relationship between the neuromuscular reprogramming of the stomatognathic system, the correction of posture along the entire body axial axis, and the treatment of malocclusion with interceptive clear orthodontics. Therefore, we present two clinical cases to illustrate in this regard.

Traditionally, the sciences that study the morphological body variables of the different parts of the organism, such as anthropometry or cephalometry, have done so from the static point of view. Kinesiology, however, does it from a dynamic point of view, and is defined as the kineanthropometric science that studies the balance and work of biokinematic chains, from a psychosomatic, biochemical and morphological point of view, in relation to habits , attitudes and movements.[1]

On the other hand, Posturology is the science that studies the postural tonic system, its regulation, alterations and treatment. This science has a marked multidisciplinary and interdisciplinary nature, which is why, in recent years, a large number of publications have been made in this field, including dentistry. It is clear that the stomatognathic system participates in the regulation of the postural tonic system, although this statement is not without controversy. There are one paper,[1] that studied the relationship between unilateral posterior crossbite and leg inequality in adolescents with a mean age of twelve years. The authors did not find an association, but without being able to exclude that the unilateral crossbite could be a risk factor for the existence of an inequality between the legs in later ages, since the sample only included adolescents. In contrast, others studies,[2] found a higher incidence of orthopedic anomalies in the frontal plane (obliqueness of the shoulder and pelvis, scoliosis, difference in the length of the legs) in the crossbite group studied, with respect to the group without crossbite, which suggests a possible union between the occlusion and the locomotor orthopedic system in the frontal plane.

Body Posture

The starting point for studying the body motion should be the study of body balance while standing.

Postural balance is defined as the balance existing between the different structures that make up the human body and that allow it to remain straight. An alteration at any level will affect the rest of the body.[3]

We would define **posture** as "the total of positions assumed by the body, determining the three-dimensional relationship between its different parts or segments that make it up." It could be said that it is an *"equilibrium balance"* to optimize the relationship between the individual and his ecosystem to the maximum. It is the physical balance with which the subject unconsciously adopts an ideal posture, in relation to his environment and the ability to program ***sequentially*** in the **4 D (Fourth Dimension)** the movements that his brain projects to execute.

Each activity carried out by the human is an individual fact and to fulfill them, each subject learns and develops a certain stereotype.[4]

The ***"efficient posture"*** is one that requires the minimum effort, and arises from a correct joint alignment and from each of the biokinematic chains that make up the system and is characterized by the absence of muscular fatigue and accumulation of residual tension, pain or feeling of body discomfort.[5]

Postural Tonic System (PTS)

The postural tonic system is a very complex set of interactions between ***"afferents and efferents"*** given by various postural receptors, which are modulated directly and indirectly by the Central Nervous System (CNS), at the cortico-spinal level and through the neuro-sensitive reflex system.[4.5]

There are several primary postural receptors with exteroceptive and proprioceptive functions that inform the Central Nervous System of their condition.

In conclusion, the PTS is a system of interrelated structures to optimize the posture and movements that the subject must do to perform the body activities that life ecosystem demands[6].

Postural Tonic System Organs

The organs of the PTS have primary postural receptors with exteroceptive and proprioceptive functions, which inform the CNS about the state of equilibrium and induce a specific postural response for a given moment, modifying the state of the muscular biokinematic chains and consequently the osteoarticular balance.[4]

For this, the body uses:

1. **Extero-receptors**.- They are sensory receptors that capture the information that comes from the environment and send it to the PTS. The receptors are: the inner ear, the eyes, the plantar cutaneous surface and the stomatognathic system that we consider as a sensory receptor.[4]
    a. Inner ear.- The receptors of the inner ear report the movement and position of the head in relation to the center of gravity and the verticality of the human. The semicircular canals do not participate in the regulation of balance, this work is performed by the saccule and utricle, which are sensitive to gravity and linear acceleration.[4]
    b. Eyes.- The retina allows postural stability for anteroposterior movement, thanks to peripheral vision. On the opposite site, for the right-left movement, the central vision is preponderant. Visual input is active when the visual environment is close. Thanks to the frontal position of the eyes in the human and the ocular convergence, stereoscopic vision is possible, transcendental, as defined by Ramón y Cajal, for skill in manual ability.[4]
    c. Foot.- The plantar receptors allow to place the weight of the body mass in relation to the environment, thanks to the measurement of the pressure at the level of the plantar skin surface, which represents a constant interface between the environment and the PTS. The skin of the soles of the feet has so many receptors and a very high sensitivity (a baropressor perceives the pressure of up to 0.3 gr.)[7,8,9]
    d. Stomatognathic system.- The sensitivity that the human has at the level of the dental joint (Occlusion) and that is collected by the dental and periodontal receptors, informs the CNS in an extremely fine way about the stability and dynamics of the jaw, which is fundamental in functions of chewing, swallowing, phonation, breathing in situations of vital need, but also in situations in which the human has to defend himself against environmental aggressions (flight, fight, etc.) or to achieve complex objectives in physical-sports activities. In these situations, the mandible must be finely stabilized, without interference with occlusion, so the CNS receives the necessary information to deal with complex body actions with precision.[9, 11]
2. **Endo-receptors.-** They inform the PTS of what happens within the subject. They allow the system to analyze in which position the individual remains and the situation of their bones, ligaments, muscles and organs in relation to balance. They report in a precise way the position of the cephalic exoceptors (inner ear, eye and occlusion) in correlation with the skeletal, foot and manual exoreceptors.

They are divided into two broad categories:

- Proprioceptive receptors.
- Visceroceptive receptors, which are located in the hollow organs (viscera).

The ocular-motor way makes possible to compare the information received by the retina and the ocular position with the information of the rest of the body provided by the inner ear, thanks to the ocular-motor muscles that ensure the motor skills of the eyeball.

The purpose of **the spinal way** is to inform the PTS of the position of each vertebra and the tension of each muscle related to the spine.

The foot proprioceptive way, thanks to the control of the stretching of the foot and knee muscles, informs and positions the body in relation to the foot.

The spinal entry and the foot proprioceptive entry form a functional continuity.[12, 13, 14]

There is an extensive proprioceptive chain that encompasses and coordinates the cephalic receptors with the foot receptors and in fact allows the eyes to be placed in relation to a fixed receptor that is the foot. This allows a coding of the space-temporal-cephalic information, from head to toe.[15]

Posturology

Posturology is a medical speciality that studies and integrates the postural system. Pierre Marie Gagey,[15] created this medical speciality, in France, more than 75 years ago. Posturology is known in our country for its excellent results in the treatment of vertigo, headaches, cervical pain or low back pain, herniated discs, knee pain, as well as in the prevention of malocclusions and reading problems and poor school results due to dysfunctions in ocular focus.

Posturology is based on the concept of "body scheme" that is defined as the capacity (finally unconscious but initially learned through conscious efforts) that each human acquires and uses to perform the functions of subsistence and relationship with the environment in which they are unwrap. In essence, it is the automatic and instantaneous application of knowledge of the functional response capacity of each part of the body, originated in the perception of a given stimulus.[15,16]

The body scheme is a slow and gradual acquisition. It develops from before birth, increases significantly from this to the third year of life, and continues in permanent adaptive evolution throughout the individual's growth process. It is structured on the basis of developing and maturing neurological components and is fundamentally linked to exteroceptive, proprioceptive and visceroceptive perceptions that allow establishing awareness of the total spatial location, capacity and functioning of a certain part of the body, initial awareness of the magnitude of the effort required to perform a certain action, and awareness of the position of the body and its parts in space during this action.

These unconscious abilities begin during intrauterine life, and are consciously developed during the first months of extrauterine life. They are becoming increasingly easy and unconscious by the continuous and effective repetition of each act, until the automation of the response to the specific stimulus is reached.

The body scheme evolves as the neuro-muscular-skeletal system develops and grow, and is intimately linked to the process of body erection that innately leads the human from the earliest childhood through the stages of crawling, first steps, up to the total mastery of gait and spatial orientation, which are supported by the axial axis that is located in the vertebral column and in the total skeleton.[17]

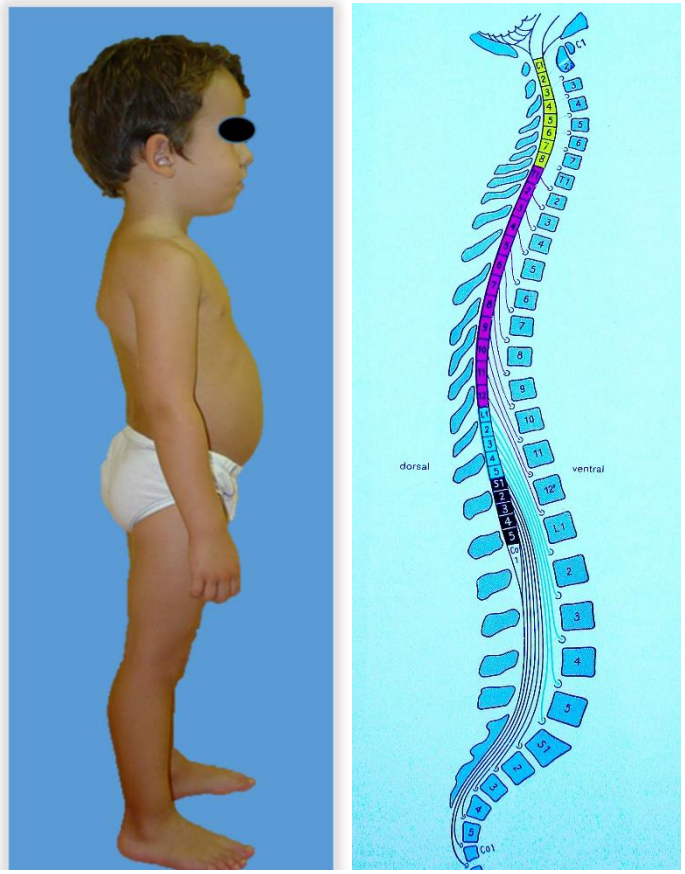


Fig. 1: axial shaft

Therefore, posturology is a medical speciality that is based on the diagnostic aspects to integrate other therapeutic disciplines, in order to act in a coordinated way to achieve the body balance of the human at each stage of development of his life, with the aim of achieving an adequate adaptation to the environment that surrounds it.

Therefore, it integrates pediatrics, stomatology, pediatric dentistry, orthodontics, sports medicine, traumatology, rheumatology, otorhinolaryngology, ophthalmology, podiatry, speech therapy, kinesiology, physiotherapy, psychology, etc.[11,18,19]

Postural Imbalances

We can classify the disorders at the level of postural balance as:[20,21,22]

- Ascending disorders.- when the problem is at a lower level and affects the upper section of the PTS.
- Descending disorders.- the problem is located in the cephalic section of the PTS and affects the lower section.
- Mixed disorders.

Ascending Disorders

Any disorder or pathology at a lower level will have an impact on the other higher elements of the Postural Tonic System (PTS).[19, 21]

Descending Disorders

Any disorder at the level of the upper elements of the PTS will cause postural changes to the lower elements.

In this way, problems in the **balance organ** of the inner ear, in **ocular convergence**, or in the **stomatognathic system**, will lead to imbalances in the lower structures of the PTS.[19,22,23]

Depending on how the cephalic pole or craniofacial complex is located, this will balance the rest of the body and the breech pole at the opposite end.

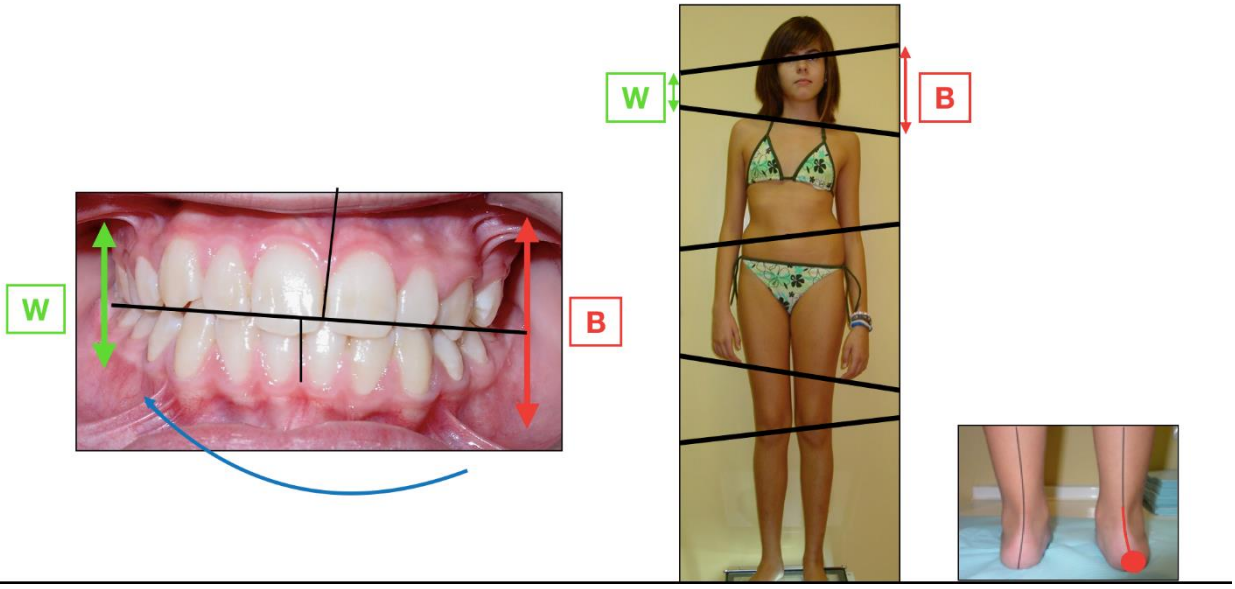


Fig. 2: Representative picture of postural imbalances at the maxillary and mandibular processes (A), Body ventral view (B), Hindfoot (C).

Craniofacial Postural Balance

When the head through its occipito-atloid joint is in balance, the cervical spine, the jaws, the musculature and the hyoid and all related structures, are kept in a balance of forces. Therefore, the entire axial axis is also in equilibrium. [22, 24]

Postural Imbalance In Class II

When the subject hyper-extends his head, the Frankfurt plane is no longer horizontal. Tension increases in the dorsal muscle chains and the ventral ones are hyperextended, thus contracting the supra and infrahyoid muscles.

As a consequence, cervical lordosis increases and the jaw tends to rotate.

To balance their center of gravity, the subject has to move his head forward, thereby increasing the tension of the dorsal muscles, and the jaw continues to rotate.

Respiratory problems of the upper tract are almost always associated (rhinitis, hypertrophic turbinates, adenoids, tonsils, etc.), which by forcing the patient to breathe through the mouth, the class II picture with a long face is even worse.

At the body level, the subject must change his posture to maintain balance, so lordosis and kyphosis increase and plantar support tends to the dig foot.[25,26,27]

Postural Imbalance In Class III

If in a subject, for a reason, the activity of the cervical muscles increases and the cervical spine becomes vertical, its normal lordosis disappearing, the tension of the infra and suprahyoid muscles increases. This leads to an increase in tension so that the subject tends to look downward and the plantar support is flat and the hindfoot is valgus.

This imbalance tends to cause cervical kyphosis and, in the long run, and due to the need to balance the center of gravity, a double curvature in the cervicals with cranial displacement in dorsal hyperextension.

The head moves back. At this time the plantar support tends to be cavus and the hindfoot varus.

Individuals with class III malocclusion associated with a horizontal pattern have lower angles for thoracic tilt, lordotic angle, and tilt of the pelvis. In contrast to the more vertical patients who present higher values.

Furthermore, the sagittal position of the jaw is also related to pelvic tilt. Subjects with a mesial mandible position presented lower pelvic angles, compared to those with a more posterior mandible.[26,28,29]

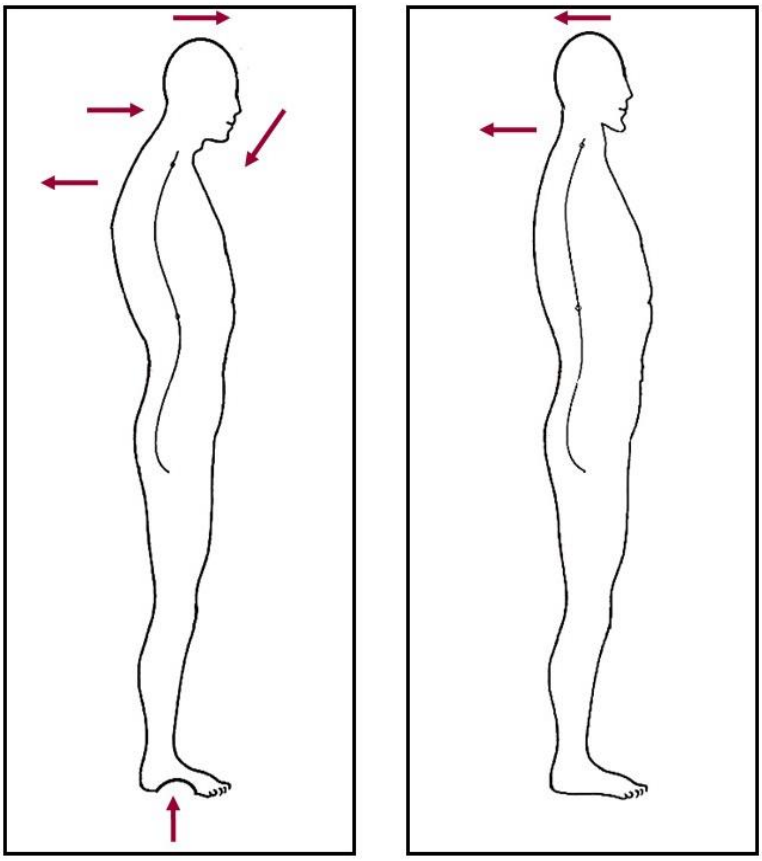


Fig. 3: Typical dorsal and craniofacial axis diagram of: (A) individual with skeletal class II; (B) individual with skeletal class III.[11]

Postural Imbalance In Crossbite

We cannot forget that the sagittal aspect is inseparable from the transversal and vertical aspects.

If, for simplicity, we represent the mouth as a box that has the tongue that occupies a vital space, each subject, according to his pattern, will have a flatter and wider box (brachycephalic) or more elongated and narrow (dolichofacial). In dolichofacial patients, oral breathing is usually associated, which aggravates the cleft palate.

As there is no normal transverse relationship between the arches (the lid in relation to the box), interferences in the static and dynamic occlusion originate, which little by little cause deviations that are initially functional, remain dental, dento-alveolar and later skeletal. These deviations in the mouth lead to inclinations and edges of the occlusal plane and to compensate, they end up leading to deviations of the face, neck, and the rest of the body until they cause changes in the supports of the feet.[30, 33]

On the other hand, there is a relationship between mandibular functional lateral deviations with the general muscular structure, especially with the ocular muscles. According to Monaco et al (2004), those subjects with mandibular deviation more frequently manifest ocular convergence problems.[26,31,32]

Clinical Cases

CASE 1

A 7-year-old patient, came to our office due to a severe occlusal instability, functional mandibular deviation to the right, with a right cross bite and scissor bite on the left side. After the oral, craniofacial and corporal clinical examination, we reached the clinical conclusion, pending to determine and study in depth with more diagnostic tests, that he possibly suffers from a descending posturological syndrome. Intraoral and body photographs are attached standing, frontal and lateral, in her usual postural position.

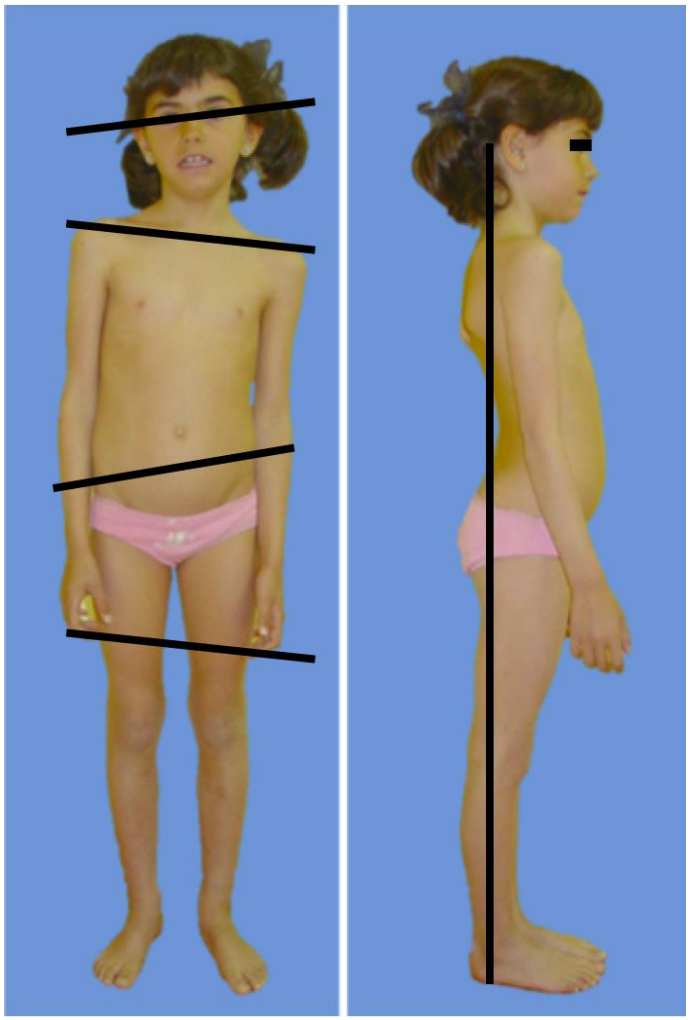
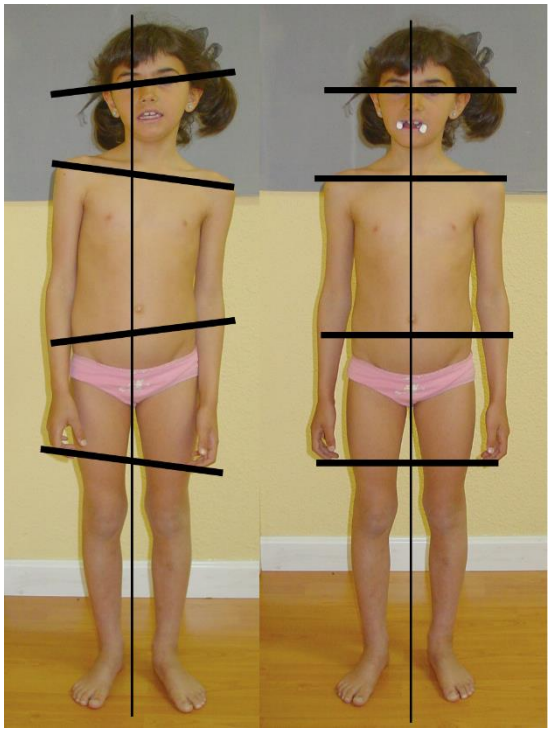


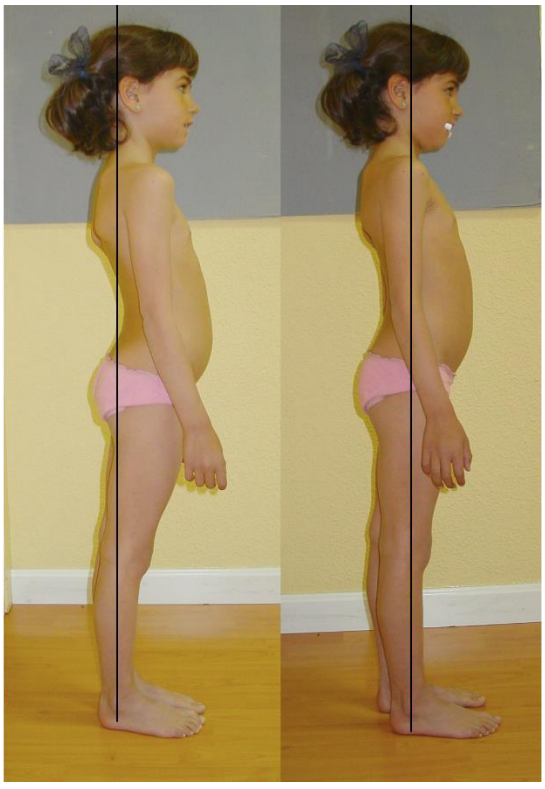
Fig. 4: Case 1. Frontal photo and postural profile. (26/04/2007).

Fig. 5: Case 1. Frontal intraoral photo. (26/04/2007).



Before After

Fig. 6: Case 1. Before & after (26/04/2007). Intraoral Neuromuscular Deprogramming with cotton rolls. Body frontal posture change.



Before After

Fig. 7: Case 1. Before & after (26/04/2007). Intraoral Neuromuscular Deprogramming with cotton rolls. Body posture and plantar support change.

Fig. 8: Case1. Frontal intraoral photo (17/05/2007). Treatment through composite ramps, and trimming of 63 & 73.

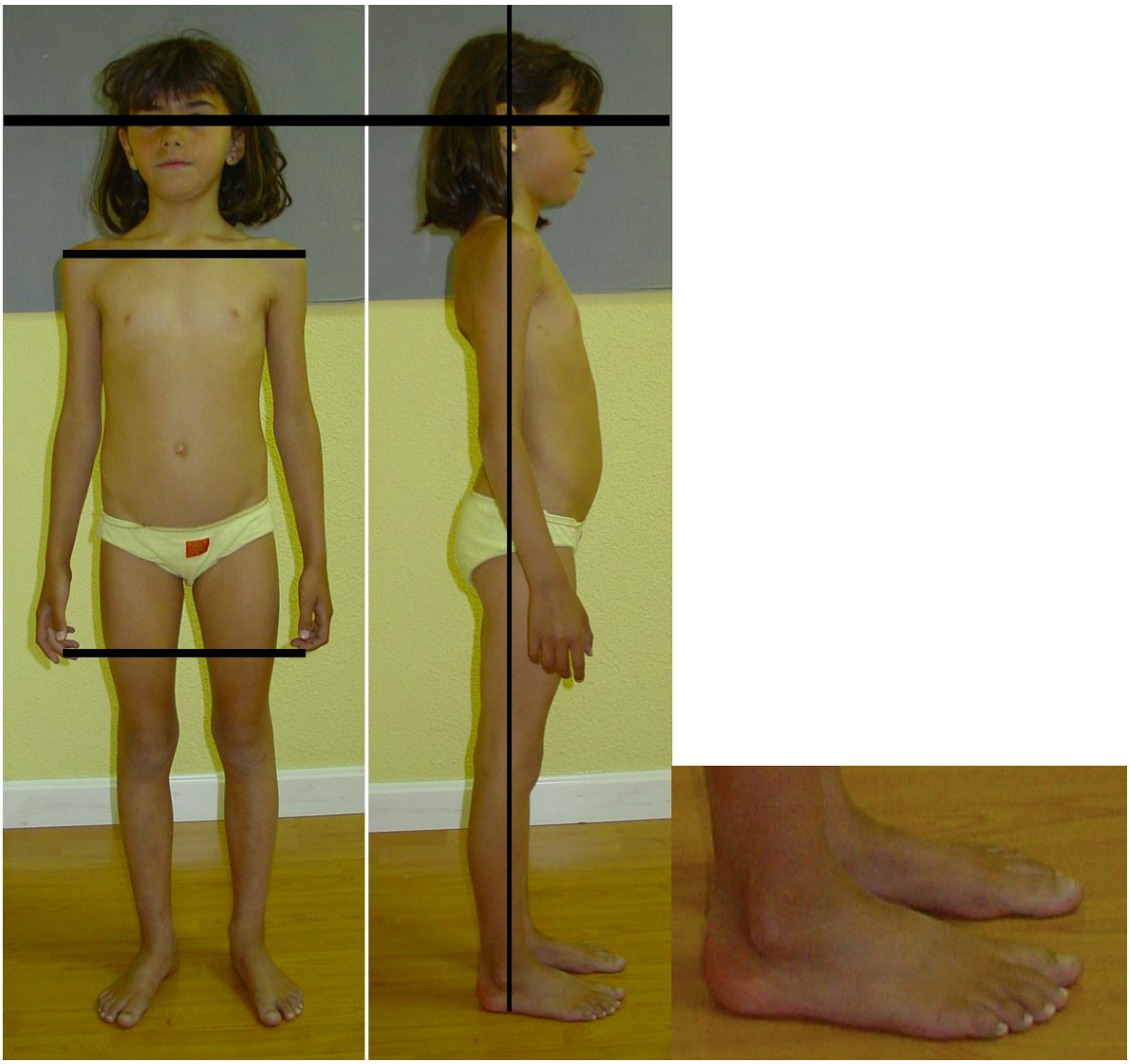


Fig. 9: Case 1. (17/05/2007). Body posture and plantar support change, after intraoral neuromuscular deprogramming, through composite ramps, and trimming of 63 & 73.

Fig. 10: Case 1. (31/05/2007). Body posture and plantar support change, after intraoral neuromuscular deprogramming, through composite ramps, and trimming of 63 & 73.

11/09/2007 01/09/2009

Fig. 11: Case 1. Frontal intraoral photos. Evolution post-treatment.

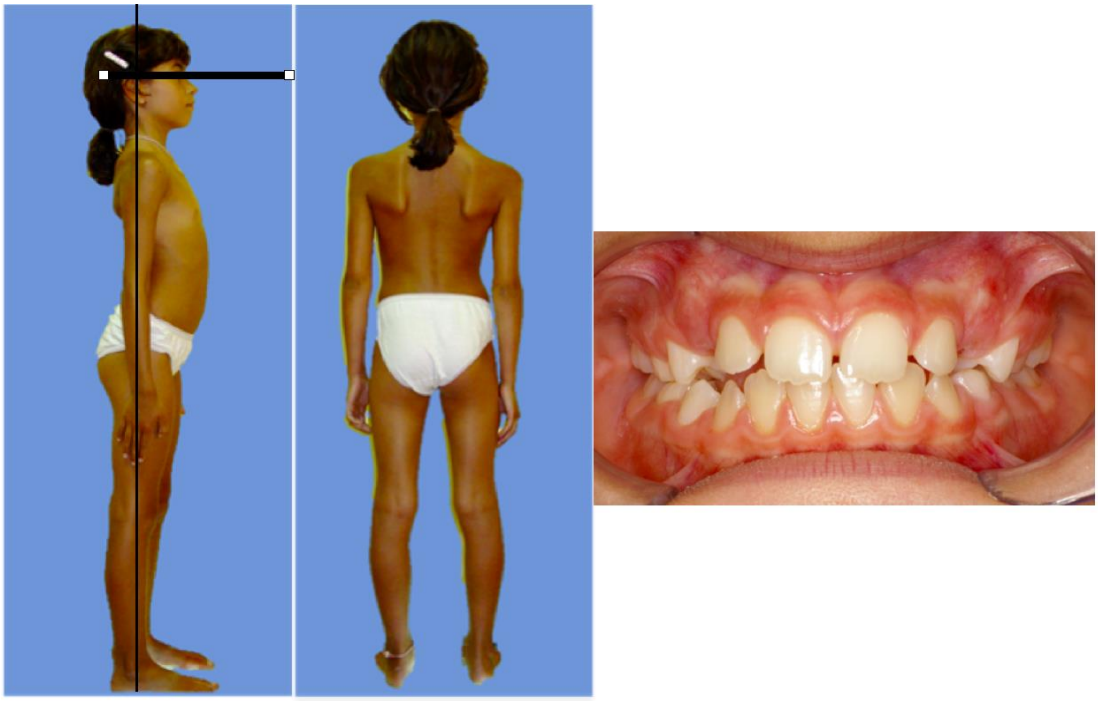


Fig. 12: Case 1. Final. Lateral postural profile & dorsal photos. Frontal intraoral photo. (06/04/2010).

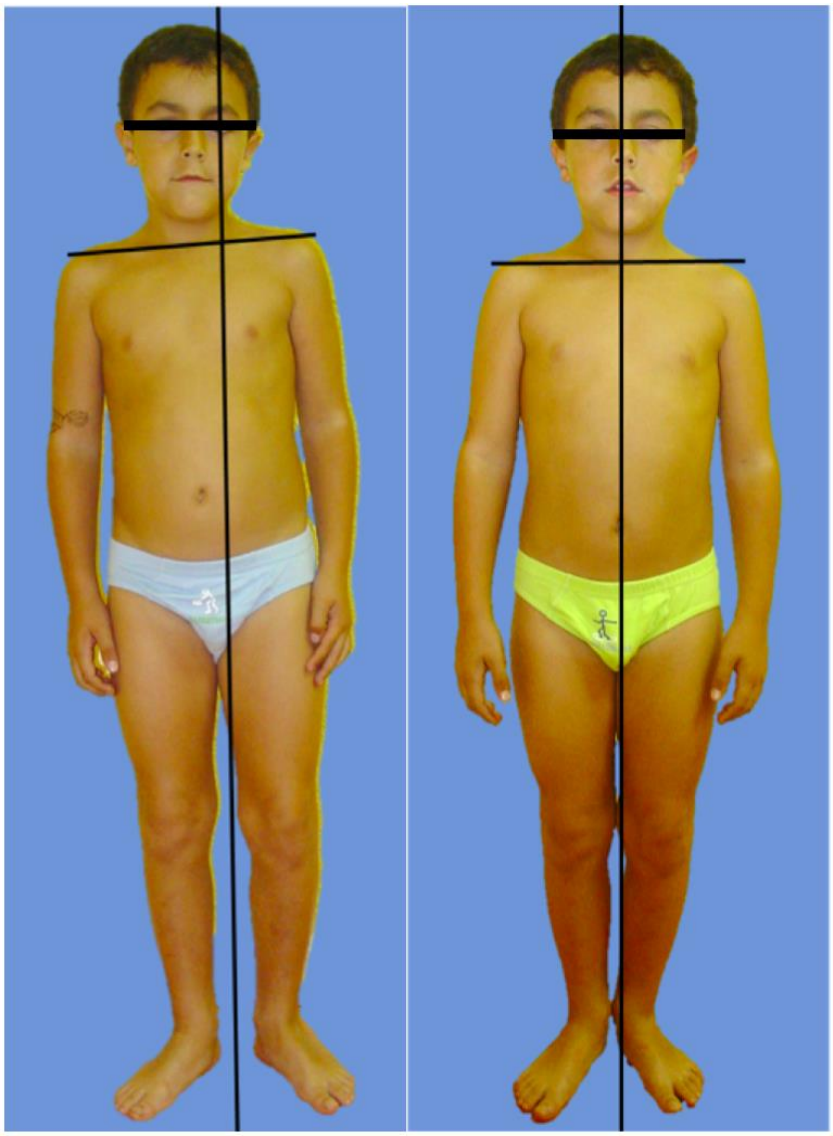
CASE 2

We present a case of early treatment, in which, after diagnosing in time the development of a functional crossbite, in a child at the beginning of mixed dentition, selective and progressive turbin trimmings sessions were carried out on deciduous dentition. We also help ourselves with inclined composite planes, to finish centering and balancing the dynamic occlusion. All of this had an impact on body posture, as we can see in the photographs.

Fig. 13: Case 2. (17/10/2006).Frontal intraoral photo in maximum intercuspation.

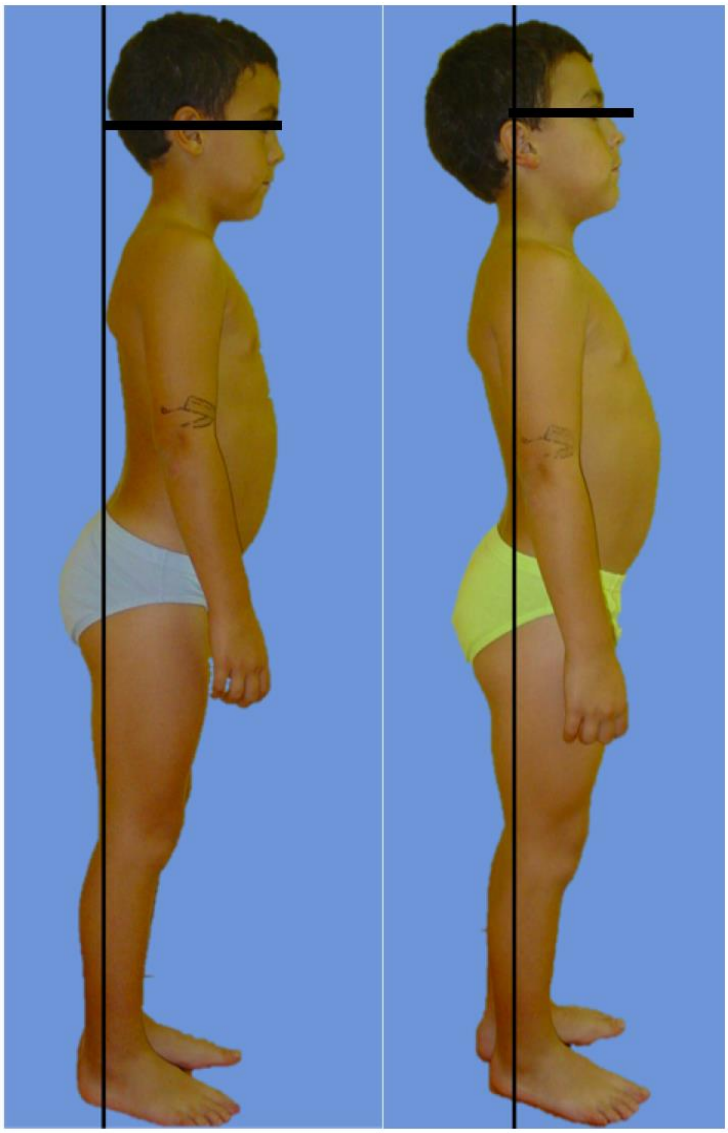
Fig. 15: Case 2. (17/10/2006). Frontal intraoral photo with Planas composite ramps in the left temporal canine and left temporal molars and turbin trimmings in the right temporal canine.

Fig. 16: Case 2. Frontal intraoral photo in maximum intercuspation. Two years post-treatment.



A (17/10/2006) B (30/10/2006)

Fig. 17: Case 2. Front postural photos before (A) and after (B) treatment.



A (17/10/2006) B (30/10/2006)

Fig. 18: Case 2. Lateral postural photos, before (A) and after (B) treatment.

Conclusions

In the clinical cases presented in this article:

1. There is a direct relationship between occlusion and body posture.

2. By neuromuscularly reprogramming the mandible, the body posture of the entire axial axis is corrected, as is the plantar support of the feet.

3. By treating patients with Clear Interceptive Orthodontics, we correct mandibular dynamics and progressively improve occlusion, while simultaneously promoting the eruptive development of the dental arches and jaws.

4. As a result of interceptive treatment, body posture is significantly and permanently corrected.

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