

IS THERE A RELATIONSHIP BETWEEN BODY POSTURE AND TONGUE POSTURE? GLOSSO-POSTURAL SYNDROME BETWEEN MYTH AND REALITY

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ABSTRACT

Introduction: Dysfunctional swallowing has been addressed by specialists of different extraction for over a quarter of a century: several publications describe the usefulness of myofunctional therapy and the negative effects of swallowing disorders at various functional domain such as: orthodontics, speech production, oto-rhino-laryngological, pediatric growth and development.

Materials and methods: A total of 384 subjects in adolescence (198 males and 186 females, mean age 13.3 years, SD 2.1 years) underwent a stabilometric and postural examination, in order to identify the postural characteristics of the patient with dysfunctional swallowing. All participants completed the protocol assessment that included a dental occlusion evaluation and a swallowing function test with Payne technique. The aim of the present observational study is to verify the relationship between swallowing and posture in a population of adolescents and to describe the postural characteristics of the subjects with dysfunctional swallowing.

Results: The results suggest a significant correlation between tongue position and body posture. This observational study allowed to define a specific nosography to describe the types of postural imbalance in individuals with dysfunctional deglutition, called Glosso-Postural Syndrome.

Conclusion: Despite numerous publications where a relationship between lingual dysfunction and body posture is affirmed, the terms of this relationship and the types of postural imbalance were not accurately described. We therefore consider it appropriate to define a specific nosography to describe the types of postural imbalance in individuals with dysfunctional deglutition. We called this nosographic entity Glosso-Postural Syndrome. The most important traits of type I and type II glosso-postural syndrome are described.

Keywords: Dysfunctional swallowing, postural imbalance, glosso-postural syndrome, myofunctional therapy, malocclusion, temporomandibular disorders.

DOI: 10.19193/0393-6384_2019_4_296

Received November 30, 2018; Accepted February 20, 2019

Introduction

"Progress is the recognition of an error. The progress of science is immense, therefore, even the errors are many. Progress proves that an error is replaced by another error. Our hope is that the errors will be less and less and that, gradually, we will come to the truth".

(Marcel Pagnol)

Dysfunctional swallowing has been addressed by specialists of different extraction for over a quarter of a century: several books describe the negative effects of swallowing disorders at various

functional domain such as: orthodontics, speech production, oto-rhino-laryngological, pediatric growth and development^(1, 2, 3, 4, 5, 6, 7, 8, 9).

Also, in the indexed literature there are numerous articles on the nefarious role of dysfunctional deglutition, and on the usefulness of myofunctional therapy, in case of temporomandibular (TMJ) disorders, malocclusion, daytime and nighttime breathing disorders, nighttime snoring, sleep apnea syndrome and OSAS (Obstructive Sleep Apnea Syndrome), otological symptoms^(10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26). Conversely, it is more difficult to find studies that contest these arguments⁽¹³⁾.

Generally speaking, the morphogenetic role of the tongue, able to shape the arches and influence the development of the maxillary complex, is paramount in the evolutionary phase. In the subsequent phases, it is not uncommon for the tongue to behave rather like a sort of natural orthodontic bite, assuming a balancing and compensating role. Especially in adulthood, the tongue is able to assume a compensatory role, compared to open bites, edentulism, malocclusion or lack of harmony between the occlusal plane and the vertebral sagittal plane. In that regards, just as a lingual dysfunction can be considered a cause of malocclusion, or may cause recurrent orthodontic instability (Figures 1 and 2), in malocclusion the tongue can act to stabilize the occlusion and thus to behave in an atypical but compensatory way. The lingual edges festooned by the dental impressions (festooned or scalloped tongue) and the alterations of the lingual mucosa testify to the continuous and non-physiological pushing or rubbing of the tongue against the teeth (Figure 3).



Fig. 1: Reduced palatal width, marked class III with a tendency to reverse bite by a low tongue posture pressuring on the lower incisors.



Fig. 2: clinical case of malocclusion and disfunctional swallowing.

These aspects lead back to the relationship between structure and function, which in the opinion of this author cannot be considered a simple linear cause-effect relationship, but rather a complex circular relationship within a non-linear dynamic system (Figure 4).



Fig. 3: The lingual edges festooned by the dental impressions (festooned or scalloped tongue) and the alterations of the lingual mucosa testify to the continuous and non-physiological pushing or rubbing of the tongue against the teeth.

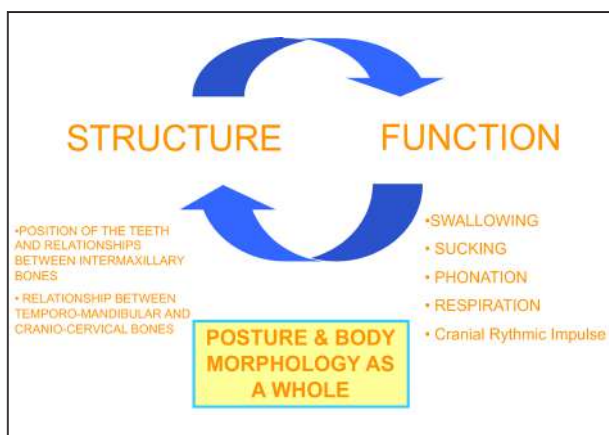


Fig. 4: The tongue is a wonderful example of the intimate and mutual interrelationship between structure and function.

The age-old controversies whether or not the orofacial muscles affect the teeth, or rather the teeth affect the muscular function, can be settled by making a differential diagnosis through muscle tests, study of swallowing mechanics and examination of the occlusion^(27, 28). The relationship between lingual dysfunction and postural problems has been explored often as well^(1, 2, 29, 6, 30, 31, 32, 33, 34, 8, 9, 35, 36, 37).

For some authoritative authors the relationship between lingual dysfunction and postural alteration is considered obvious:

"The balance of stomatognathic musculo-aponeurotic chain is incorporated into the universal muscular body. In swallowing disorders the tip of the tongue can orient and push against the upper or lower teeth or between them. It is obvious that these thrusts will lead to alterations of the spatial arrangement of the teeth and jaw bones, because the

balance of forces of the splanchnic conformers will be broken, and this will have negative reflections on the global body posture"⁽¹⁾.

For other authors, even in this case orthodontists, this relationship was confirmed by the daily exercise of one's profession:

"In the daily exercise of my profession, evaluating for years each patient from an orthodontic, gnathological, postural, functional point of view, I realized that in all cases of lingual dysfunction, whatever the cause, by resuming the tongue a more physiological position (pointing upwards in the direction of the retro-incisional papilla, and back of the tongue on the palate), an immediate change in the best was obtained of the whole postural attitude, starting from the head, down the vertebral column, up to the pelvis and feet"⁽³²⁾.

Despite numerous publications where a relationship between lingual dysfunction and body posture is affirmed, the terms of this relationship and the types of postural imbalance were not accurately described.

For this reason, a total of 384 subjects in adolescence (198 males and 186 females, mean age 13.3 years, SD 2.1 years) underwent a stabilometric and postural examination, in order to identify the postural characteristics of the patient with dysfunctional swallowing. All participants completed the protocol assessment that included a dental occlusion evaluation and a swallowing function test with Payne technique. The aim of the present observational study is to verify the relationship between swallowing and posture in a population of adolescents and to describe the postural characteristics of the subjects with dysfunctional swallowing. The results suggest a significant correlation between tongue position and body posture. This observational study allowed to define a specific nosography to describe the types of postural imbalance in individuals with dysfunctional deglutition. We called this nosographic entity Glosso-Postural Syndrome⁽³⁸⁾.

Why choosing the term "syndrome"?

In medical language the term syndrome indicates a set of signs, symptoms, functional or biochemical alterations, more or less characteristic, however, without a precise reference to its causes and to the etiopathogenetic mechanism (development of an abnormal or atypical condition). Therefore, a syndrome can be the expression of a specific disease or of diseases having completely different origins. The term syndrome is mostly followed by

appropriate specifications that describe the site, nature, character or cause of the disorders, such as: anxiety-depression syndrome, Irritable Bowel Syndrome, Vertiginous syndrome, Pre-Menstrual Syndrome (PMS) and others.

This set of signs and symptoms form an entity recognizable by their constant reciprocal association or by often having a common cause and in the Glosso-Postural syndrome, both these aspects are recognized.

At the postural, osteopathic and musculoskeletal levels, the clinical signs that distinguish the Glosso-Postural syndrome are those specified in the following sections. In addition to these clinical signs, we can find a considerable number of symptoms and signs associated with other levels: orthodontic, occlusal, gnathological, otorhinolaryngological (oral breathing, adenotonsillary hypertrophy, recurrent otitis etc.), speech and swallowing, ophthalmological, pediatric, or pertinent to the internist⁽⁹⁾.

General considerations on the relationship between posture and tongue functions

Each individual develops a model of swallowing that constitutes an engram resulting from the phylogenetic, ontogenetic, and environmental information received. The deglutitory pattern can both stimulate and inhibit stomatognathic functions. In dysfunctional swallowing the tip of the tongue has a low and anteriorized position, and instead of pointing upwards in the direction of the back area of the retro-incisional papilla (also called the Spot), it can push against the upper or lower teeth, or interpose between them.

This lower and anteriorized position by the tongue, by virtue of abnormal thrusts during the swallowing that are repeated above twelve hundred times a day, can cause alterations of the spatial arrangement of the teeth and the maxillary bones and have negative reflections on the general posture of the individual.

Just as the occlusion and balance of the stomatognathic system can be considered as woven with the general postural equilibrium, so the lingual functions are intertwined with the body equilibrium as a whole.

Professional experience suggests that the tongue is a wonderful example of the intimate and mutual interrelationship between structure and function (Fig.4). The posture and morphology of the body as a whole also represent the outcome of this mutual relationship, at the buccal level, between the

structural components (position of the teeth, occlusion and inter-axial bone ratios, temporal-mandibular and cranio-cervical bone relationships) and the functional components (swallowing, sucking, phonation, breathing, rhythmic cranial impulse).

First of all, remaining in the oral-cranial-cervical district, the lingual functions and these parameters: morpho-postural, inter-axial, temporo-mandibular and cranio-cervical represent the variables of a reciprocal regulatory system⁽³²⁾.

Thanks to its particular innervation and motility, the tongue is able to occupy the spaces that are left available, to adapt to narrow spaces, compensating the reduction of its transverse diameter with an increase of the longitudinal one, to fill edentulous spaces, to work in torsion along its major axis, adapting itself to developmental asymmetries of the palate.

The tongue is thus in reciprocal relation with the position of the teeth and the intermaxillary ratios.

For the force with which the tongue pushes against the teeth and / or jaw bones and for the number of swallowing acts in a day (above twelve hundred swallows a day) we realize that the total thrust exerted by the tongue in the 24 hours is enormous. For these reasons the tongue can be considered a natural dento-facial orthopedic device, for better or for worse⁽³⁹⁾. Swallowing is also related to the effectiveness or incompetence of the labial seal and therefore to the predisposition to a nasal or oral respiration. It is well known that a tongue with a low posture promotes oral breathing and may be related to hypertrophy of the adenoids and tonsils, with possible changes in the patency of the upper airways. A saying goes: "Those who swallow badly breathe worse".

At the embryological, biomechanical, neurological and muscular-fascial levels, the tongue is related to the occipito-atlantoid hinge.

Moreover, at the embryological level, the development of the branchial arches of the maxillary bone and of the jaw, through the anterior migration of the suboccipital somites, gives rise to the tongue. From this perspective, therefore, the tongue can be considered the rostral extension of the cervical spine.

At the neurological level, the hypoglossal nerve, which innervates the intrinsic and extrinsic muscles of the tongue, is in connection with the anterior branches of C1, C2 and C3 coming to constitute the loop of the hypoglossal: for these aspects neuro-anatomical, as well as embryological, there is a form of functional synergy with the cervical plexus.

At the biomechanical and muscular-fascial levels, the tongue is strongly related to the occipito-atlantoid articulation and consequently, at the clinical level, it is related with head and neck posture.

Ultimately, a high tongue with the apex in contact with the back area of the retro-incisive papilla promotes the creation of a physiological cervical lordosis due to its muscular traction on the atlas. It is worth pointing out that a cervical rectification is the condition, radiologically verifiable, that ties the great part of the cervicgia (neck pain) and of the oro-cranio-cervical problems.

Later on, the occipital-atlas relationship, conditioned by the strain of the lingual muscles, becomes altered in case of swallowing disorders. Therefore, the posture of the tongue conditions the posture of the cervical spine, but this mechanism must be seen in its entirety, as it triggers adaptations and compensations on the locomotor apparatus as a whole, all the way to the plantar support.

Hence, dysfunctional swallowing is correlated not only with posture and oro-cranial-cervical morphology, but also with the general posture of the subject.

The tongue is able to disrupt postural balance thanks to its connections with anatomical structures of paramount importance:

- anteriorly: through the hyoid bone it takes part in the muscle-aponeurotic complex that involves the entire musculoskeletal system (lingual chain);
- posteriorly: in particular, through the glosso-pharyngeal muscles and the medial constrictor of the pharynx, it influences the balance of the cervical spine;
- at the level of the skull: through the action of the styloglossus and styloid muscles;
- at the level of the jaw: both by direct thrust on the dental elements and by the action of the genio-glossus, the geniohyoid and the milohyoid.

Conversely, if it is true that the swallowing function is able to condition posture, the opposite can also be true. The correct postural alignment is important in the normal processes of swallowing and food intake: this aspect is particularly striking in neurological diseases⁽⁴⁰⁾ or in alterations related to age^(41,42).

Tongue and posture: the osteopathic approach

At the osteopathic level, the tongue is a key organ.

To fully understand the ability of the tongue to condition the body posture it is necessary to recall its relationship with the cranio-sacral system

and dural core-link, which, at the osteopathic level, represent aspects of primary importance. At the cranial level, in dysfunctional deglutition, the harmonizing function performed by the tongue on the cranio-sacral rhythm and to promote cranial motility is diminished. In physiological conditions, this occurs through the traction operated on the base of the skull by the contraction of the styloglossus muscle (flexion of the posterior sphere), and by the pressure exerted by the tip of the tongue on the retro-incisal papilla (a sort of "pumping" of the sella turcica of the sphenoid, which houses the pituitary gland).

By being inserted at the root of the tongue and the styloid process of the temporal bone, during the correct swallowing, the styloglossus pulls the base of the tongue up and back, compressing the tongue against the palate with a direct action on the cranial base and the maxillary complex.

During correct swallowing, the contraction strain of the styloglossus on the posterior cranial sphere allows a physiological cranial mobility and harmonizes the cranio-sacral relations through the dural pathway.

At the same time, the tip of the tongue presses against the anterior palate, transmitting a force, through the vomer, to the rostrum of the sphenoid. This weak force, nevertheless, allows a slight mobilization of the sphenoid, of great importance to activate the spheno-basilar synchondrosis and promote a physiological rhythmic cranial impulse^(43, 44, 45, 46).

At the functional level, by virtue of the predominantly transversal arrangement of its fibers, the tongue can be considered a diaphragm that connects the anterior and posterior muscle chains⁽⁴⁷⁾.

The physiological deglutition and the correct posture of the tongue favor a good balance of the muscular tone of these chains. In the absence of this balance, or when it's perturbed, the sucking of the thumb can be interpreted as an attempt by the child to rebalance the posterior cervical tensions and to stimulate the cranial rhythmic impulse.

The tongue is a diaphragmatic structure, akin to the diaphragm, the pelvis or the upper thoracic egress, which can assume a compensatory and balancing role at a morphological and postural level, especially in adulthood. According to the classical principles of osteopathy, the various body diaphragms must be in balance and in harmony, in their mutual relationship, to ensure a good postural setting.

Each physiological deglutition tends to re-harmonize the cranio-cervico-facial muscular tension balance and therefore the body's overall postural balance.

A lingual chain is defined as the muscle-fascial structures connecting the tongue to the whole organism, on a functional level^(48, 49, 50).

Swallowing and posture: neurophysiological and energetic aspects

To better understand the role of swallowing at the level of the whole body it is necessary to recall, albeit briefly, some neurophysiological and energetic aspects. The pressure of the tongue on the retro-incisal spot during physiological deglutition has important neurophysiological implications, as documented in the scientific literature. Of particular relevance is the study that highlighted the presence of as many as five types of exteroceptors in the square centimeter of the palate corresponding to the lingual spot⁽⁵¹⁾.

In addition, other scholars documented that the elevation of the tongue activates a greater total volume of the cerebral cortex than swallowing, with significantly greater activation in the cingulate gyrus, supplementary motor area, pre-central and post-central gyre, pre-motor cortex, putamen and thalamus⁽⁵²⁾.

From this data we can surmise how important it is, at a neurophysiological level, the movement of elevation of the tongue to stimulate the lingual spot, and how much information coming from this area can influence the central regulation mechanisms of muscle tone and posture.

So far it seems that we have not considered enough the fundamental role of information coming from this area in the mechanisms of central postural regulation.

To understand how incorrect swallowing can produce important postural and functional abnormalities, it is also necessary to mention the energetic and psycho-emotional aspect.

The retro-incisal papilla is a formidable energy point, to the point that patients with atypical deglutition are also energetically very deficient. Applied kinesiology allows an easily verification of this condition.

The tongue connects the Conception Vessel Meridian with the Governing Vessel Meridian. The correct high position of the tongue, with the apex between the retro-incisal papilla and the first palatine ruga, guarantees an optimal energetic balance of the body.

Evidently this is also due to the quality of breathing. Physiology requires a high rest tongue position on the retro-incisal spot. Just try to breathe

with your tongue resting high and with your tongue resting low to appreciate the difference in quality of these two breathing modes. Breathing with the tongue up facilitates an optimal cerebral oxygenation with consequent optimization of all the bodily functions. A low tongue position never guarantees the same breathing quality, especially when it's involved in oral breathing.

At the psycho-emotional level, the lingual chain is the physiological chain of the primary, primordial rhythm, already present from the thirteenth week of intrauterine life. It is the chain of suction and various biological rhythms (cranial rhythmic impulse, swallowing of amniotic fluid, swallowing of saliva, etc.). It is located in the antero-medial region of the body, par excellence the body's region of affectivity and orality^(53, 48).

The lingual chain

A lingual chain refers to the set of muscles and aponeuroses which, starting from the apex of the tongue, are placed topographically in the antero-medial region of the body in a longitudinal sequence. Originally described as a AM - Antero-Medial chain⁽⁵³⁾, this chain was not directly related to the tongue until later⁽⁴⁸⁾ (Fig. 5).

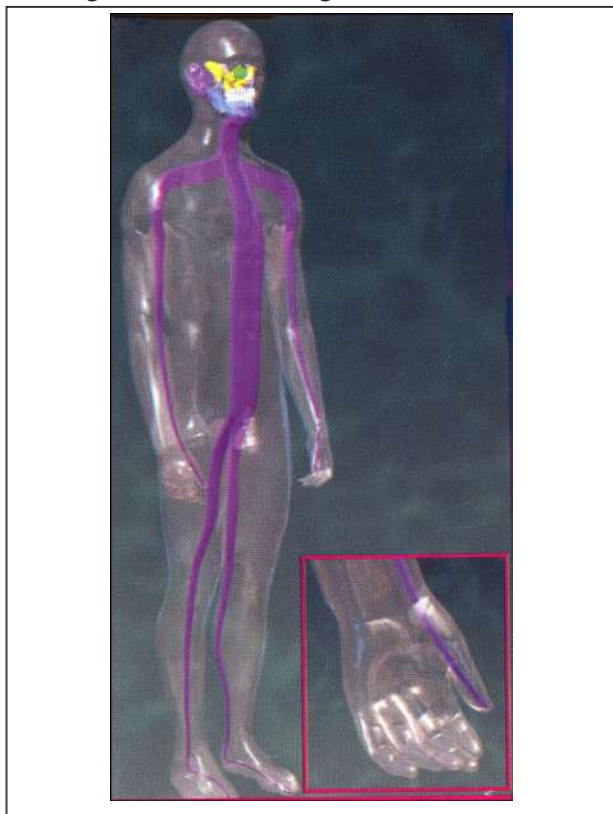


Fig. 5: The lingual chain⁽⁵⁰⁾.

At a biomechanical level, this chain controls the anterior gravity line described by Littlejohn, stretched between the pubic symphysis and the chin symphysis.

The lingual chain represents a functional unit at the motor and postural levels; anatomically, it is made up of a very rich network of muscles and aponeurosis which underscores its importance at the postural level.

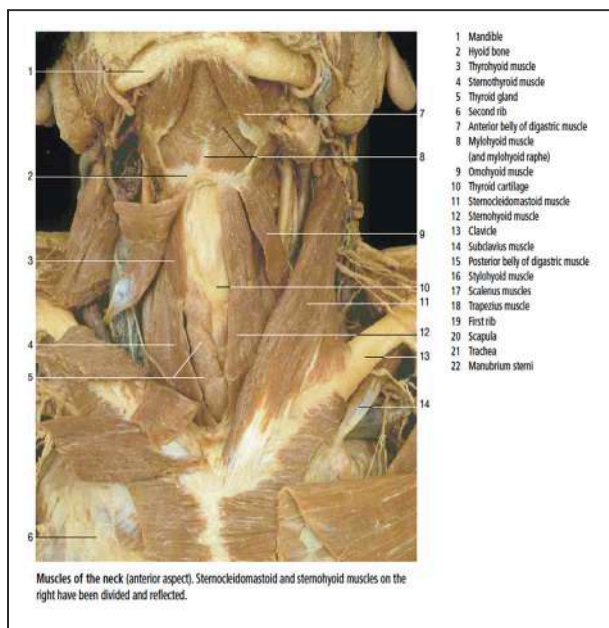


Fig. 6: Neck Dissection⁽⁶³⁾.

The hyo-glossus complex, by virtue of its links in all planes of space (cranial, caudal, ventral, dorsal levels) with other anatomical structures, represents the real "trait d'union" between oral functions and the postural functions of the body.

Being in a functional relationships with the maxillary complex and the jaw, the skull, the cervical vertebrae, the shoulder blades, the pharynx and the larynx, one can infer the strategic importance of the hyo-glossus complex on the overall postural system.

As a rule, a lingual dysfunction causes a fulcrum of rotation on the hyoid bone with consequent rotation and unbalance of the scapular girdle, followed by a compensatory reaction affecting the entire locomotor system.

The tongue and the hyoid bone, thanks to the superficial cervical aponeurosis, the main cervical aponeurosis, and the deep cervical aponeurosis, are able to radically condition the morphological and postural organization of the body as a whole (Fig. 6).

Theoretically, there is no part of the body that does not respond in some way to a modification of the

relationships between the hyo-glossus complex, and this not only true for the afore mentioned fascial concatenation, but also for proprioceptive control issues.

At the proprioceptive and postural levels, the hyoid bone was compared to a gyroscope in a guidance system^(50,4).

Being devoid of articulations with other bones (“floating” bone) and suspended “like a hammock” by various connective tissue, it can act as a gyroscope providing information to the brain about the balance of the body, through the neuromuscular spindles. The position of the hyoid, which should be strictly horizontal, is a reflection of the tensions of the muscles, of the aponeuroses and of the ligaments with which it is connected. A dislocation or a restriction of mobility of the hyoid bone, both active and passive, characterizes a tension of the fascial and visceral scaffold of the individual. The so-called tongue-mandible-hyoid system is a complex bio-mechanical system with functional connections that must be taken into account during clinical diagnosis and treatment⁽⁵⁴⁾.

Type 1 glosso-postural syndrome

It is by far the most frequent postural imbalance in subjects with dysfunctional deglutition (85% and more of the cases observed; Fig. 7).



Fig. 7: type 1 glosso-postural syndrome.

The fundamental characteristic of this imbalance is the anteriorization of the scapular plane with respect to the gluteus plane (Fig. 7A). A second occlusal class may be associated, but not necessarily:

this anteriorization may also be present in subjects with a dental class III malocclusion. At the neuromuscular level, this anterior projection of the scapular plane can be considered the outcome of the predominance of the antero-medial lingual chain with respect to the other kinetic chains.

In addition to the anterior scapulae, which in itself represents a significant postural problem, the type I glosso-postural syndromes are characterized by: increase of the physiological curves, abdominal protrusion with transverse abdominal muscle deficiency, pelvic anteversion, pronation of the foot and valgus presentation of the back of the foot (Fig. 8).



Fig. 8: Clinical case. Please note: pronation of the foot and valgus presentation of the back of the foot .

Asymmetries of the trunk may be present, as can be clearly seen in Figure 7 B and C. The anterior projection of the center of gravity has important consequences on postural as is causes tension at these levels: the cervico-dorsal and lumbo-sacral hinges, the trochanter, the femoral-patellar, the sural triceps of the calf (made of the gastrocnemius and the soleus) and the forefoot. In addition to atypical deglutition, which is one of the most frequent causes, also the anterior pathological scars and dental class II malocclusions are able to anteriorize the scapular plane.

To study this postural imbalance, it’s helpful to refer to the anterior gravity line, as described by Littlejohn, placed on the sagittal plane between the pubic symphysis and the chin symphysis .

In the type I glosso-postural syndrome, this anterior line falls forward with respect to the pubic

symphysis: in fact the chin symphysis moves forward and the pubic symphysis shifts backward and downward.

In this condition, the abdominal pressure is exerted on the abdominal muscle wall and the anterior ligaments of the pelvis (especially the Poupard ligament), rather than on the bone structure of the pelvis, which is posed in anteversion.

Furthermore, an increasing dorsal kyphosis leads to an increase in intra-abdominal pressure, so that the abdominal muscles tend to yield to reduce the pressure.

This series of considerations helps us understanding why patients with type I glosso-postural syndrome typically have a protruded and lax abdomen (Fig. 7A, B), with predisposition to abdominal ptosis and inguinal hernia.

In these conditions, the synergistic-antagonistic relationship between the diaphragm and the abdominal transverse muscle is altered. It is easy to determine a high thorax hypo-mobility and a modification of the diaphragmatic kinetics, with predisposition to respiratory dysfunctions.

In this postural context, the "Upper Crossed Syndrome" and the "Lower Crossed Syndrome"^(55, 56, 57, 58, 59) are frequently reported, which over time may result in "Movement Impairment Syndromes"⁽⁶⁰⁾.

These crossed syndromes consist of a neuromuscular imbalance: the mutual relationship between synergistic and antagonistic muscles is permanently altered, at the level of the cervico-scapulo-thoracic and lumbo-pelvic district.

The neurophysiological explanation of these imbalances covers two levels:

- at the level of Sherrington's reciprocal innervation, whereby a hyperactive and tense muscle inhibits its antagonist;
- at the central control level, with an alteration of the motor and postural patterns: to a hyper-programmed muscle chain, whose activation is massive and the timing of activation is too early, corresponds a hypo-programmed antagonistic chain, whose activation is modest and the timing of activation is delayed.

The predominant tonic-postural muscles belong to the first category, tending to develop tension, shortening, and contracture; in the second category, usually we find muscles with a strong phasic reaction, which can easily develop into weakness and hypotonia.

Upper Crossed Neuromuscular Imbalance

This type of unbalance is characterized by (Fig. 9A):

- lower stabilizing muscles of the weaker scapular girdle (large dentate muscle and lower trapezius); stronger upper stabilizing muscles (scalene muscles, levator scapulae, upper trapezius insertions);
- weak inter-scapular musculature and strong pectoral musculature;
- weaker deep flexor muscles of the neck (long flexor of the neck, long flexor of the head, omohyoid and thyrohyoid); stronger neck extensors muscles (cervical para-vertebral, superior trapezius and levator scapula).

At the neuromuscular level, if the lower shoulder fixators are weak, the upper fixators will become overworked, shortened and restricted. The hyperactivity of the pectorals involves anteriorization and a rounding of the shoulders; the weakness of the deep neck flexors produces an increase in high cervical lordosis. Furthermore, there may be a shortening of the upper portion of the nuchal ligament, which tends to fix the high cervical spine in lordosis: on the whole, the neck tends to appear "recessed" and compressed (Fig. 7A).

In addition to dysfunctional motor and postural patterns, this superior crossed imbalance can influence and alter respiratory function and ribs-diaphragm dynamics.

Lower Crossed Neuromuscular Imbalance

The lower crossed imbalance involves the following muscle pairs (Fig. 9B):

- weak gluteus minimus muscle with hyperactive and tight hip flexor muscles;
- weak abdominal musculature with overactive and tight lumbar para-vertebral musculature;
- weak gluteus medius muscle with hyperactive and tight quadratus lumborum and tensor fascia lata muscles.

This neuromuscular imbalance implies a real "replacement" or switch of muscles in the motor patterns, both in the static and in the dynamic function.

In order to produce the hip extension, the weakness of the gluteal muscles is compensated by the hyper-programming of the lumbar and ischiocrural muscles. In order to provide a good lateral lombopelvic stabilization, the weakness of the gluteus medius is compensated by the fascia lata and the quadratus lumborum. In the flexion of the trunk, the inefficiency of the abdominal wall is compensated by a strong and tight ileopsoas muscle.

At the postural level, the result of these neuromuscular imbalances is the anteversion of the pelvis with an increase in lumbar lordosis; in this context,

the shortened and restricted ischio-crural muscles can be considered as the expression of a compensatory mechanism to reduce or curb the tendency to the pelvic anteversion.

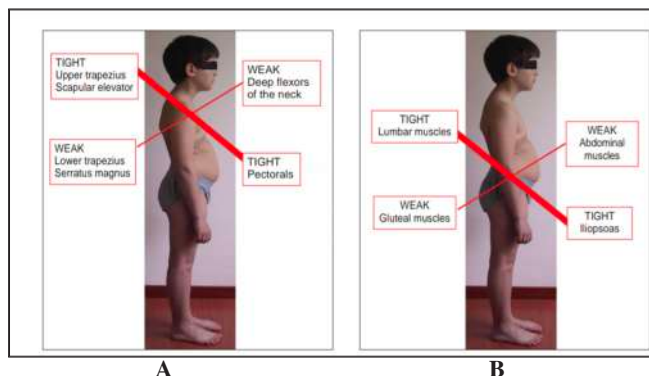


Fig. 9: A: Upper Crossed Neuromuscular Imbalance.
B: Lower Crossed Neuromuscular Imbalance.

Type 2 glosso-postural syndrome

Much less common than type I, the type II glosso-postural imbalance is characterized by an abnormal relationship between the skull and the trunk, which remains during adulthood if not treated (Fig. 10).

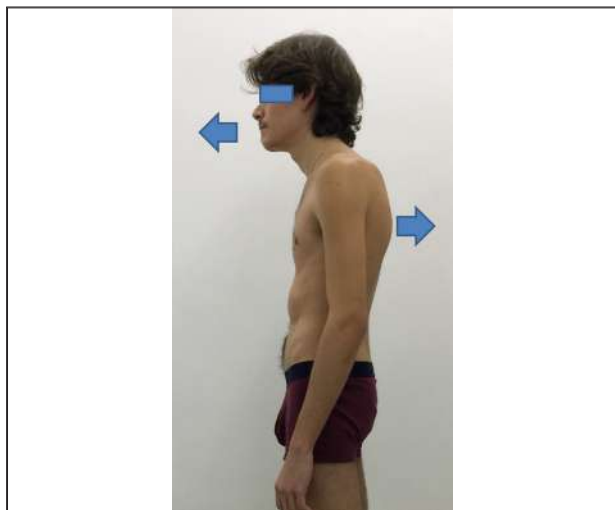


Fig. 10: type 2 glosso-postural syndrome.

The scapular plane is posteriorized, while the head is strongly anteriorized. This posture appears as the crystallization of the head protrusion movement, which is typically performed during dysfunctional swallowing.

The engram of this thrusting movement of the facial complex forward (a “chicken head” movement while swallowing), seems to be fixed in the posture adopted by these individuals and clearly visible on the sagittal plane. The tongue is mostly positioned low on the jaw, and the occipito-atlantoid hinge tends to flex.

Conversely, in the type I glosso-postural syndrome, the tongue is more frequently interposed anteriorly, between the teeth, with occipito-atlantoid extension.

In both cases, abnormal tongue behavior is usually associated with lip incompetence (lack of lip seal) and with a tendency to oral breathing.

As in the type I syndrome, in this case as well, the abnormal thrust of the tongue in a low and anteriorized position tends to create forces that, at the postural level, develop mainly on the sagittal plane. On the other hand, the tendency towards a vertebral axial self-straightening is missing, which corresponds to a diminished body height as a whole.

In both types, the posture of the patient with glosso-postural syndrome highlights the lack of the self-straightening reflex due to lacking of the thrust of the tongue on the retro-incisal spot.

Conclusion

In conclusion, the two glosso-postural entities described must not make us forget that postural system is a non-linear dynamic system. Therefore, in addition to incorrect swallowing and other factors that tend to disrupt the tonic-postural balance, other varieties of postural imbalance may also occur, including those of a scoliotic type.

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