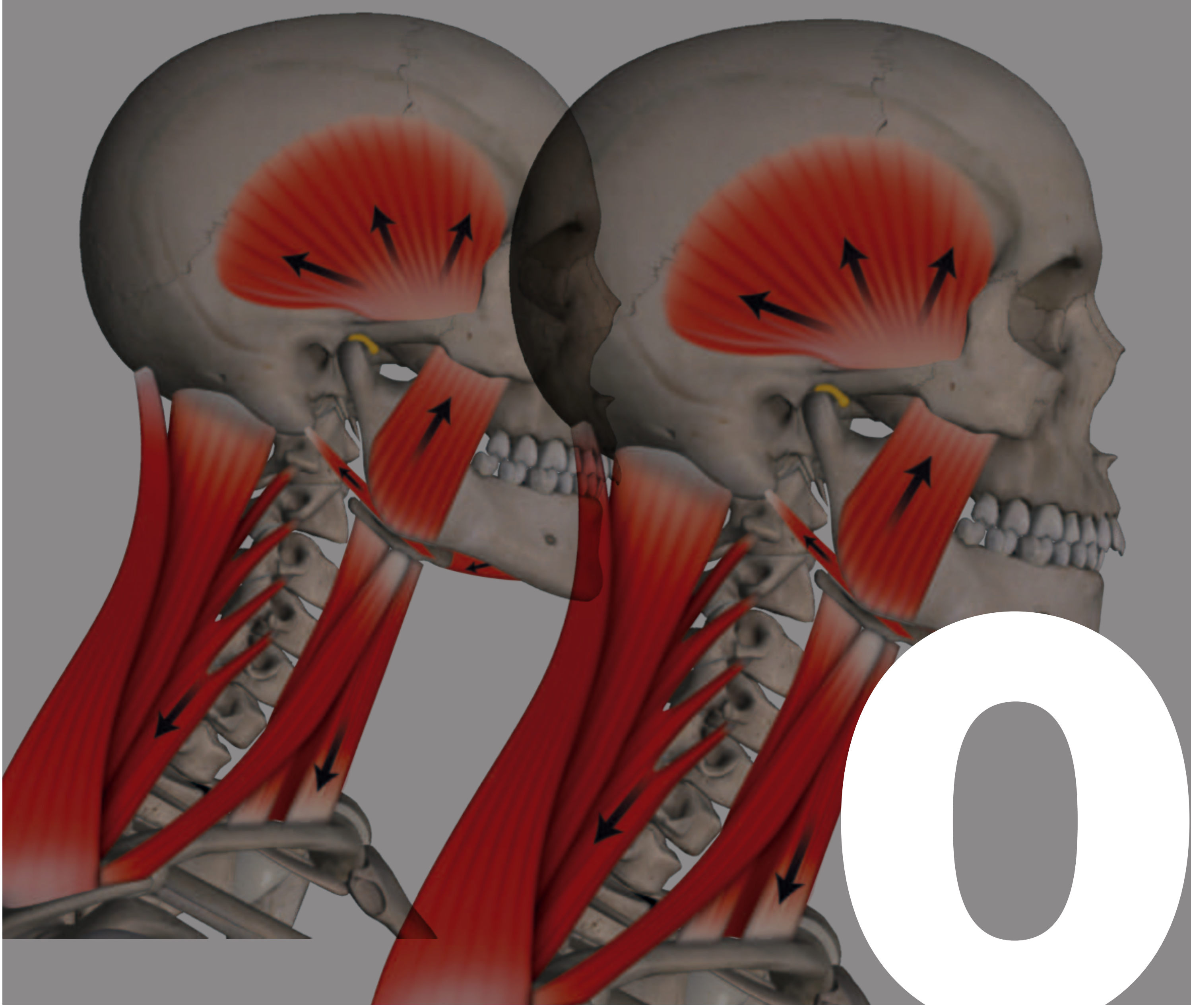
For a long time, people thought that teeth only served for chewing, smiling and enriching dentists. Dental occlusal relationships determine the position of the jaw, which in turn, through levator and depressor muscle activity, strongly influences the position of the head, which in turn affects muscle tone and the position of the cervical vertebrae, shoulder girdle, and pelvis. It is a truly never-ending story that involves the whole body and is worth studying!



Relationship between dental occlusion and posture

- **Dental occlusion and posture: myth or science?**
- **Evidence-Based Dentistry and Clinical Evidence-Based Dentistry**
- **Neurophysiological aspects of Postural Syndrome**
- **Problems related to postural dysfunction**

1

Dental occlusion and posture: myth or science?

Florence Peterson Kendall defined posture as *"the positions of all joints in the body at a certain time"* (Kendall & Kendall, 1985). Silvano Boccardi understood it as *"any position, defined by the relationships established between the various body segments, which we can assume."* Body posture may be defined, in a more explicit way, as an ideal state of muscular and skeletal balance that the subject, conditioned by numerous structural, metabolic, and psychological factors, assumes at an individual and subjective level. However, in addition to all the various definitions, what is really meant by the term "posture"? Posture is the somatic expression of our body. It is the ability of the human body to assume and change the structure of our various planes and segments on a three-dimensional level in relation to our own internal and the external environment.

In 1977, Gelb introduced the concept of "segmental interchange", confirming the presence of close links between the stomatognathic system and posture, both at a static and dynamic level, with interactions at different cranio-cervical-vertebral levels, and also spoke about **osteopathy** and **Craniomandibular Syndrome** (Gelb 1985). In 1977, Fryman and Lay claimed the role of cranial osteopathy in relation to temporomandibular disorders, asserting that, by virtue of the close relationship between structure and function, the individual should be considered a unified dynamic being (Fryman & Lay 1977). In the nineties, Smith, de Wijer, Dvorak and Wälchli found out more about the relationship between the temporomandibular (TMJ) functional disorders and the body's musculoskeletal system (Smith 1993, de Wijer et al.1996, Dvorak & Walchili 1997). In 1993, Lotzmann and Steinberg demonstrated that changes in body posture occur after the removal of dental precontacts (Lotzmann & Steinberg in 1993).

Thus, despite that our knowledge about how posture is linked to dental occlusion and temporomandibular disorders dates back to several decades ago, in dentistry today there are still significant doubts about the correlations.

The reasons for this are many and complex. First of all, a part of the dental world has focused its clinical, professional and research efforts exclusively within the oral cavity, neglecting the human being as a complex unitary system. In fact, the attention seems to be more and more exclusively focused on improving intraoral tissue therapy techniques and knowledge, forgetting that teeth are set in the jaw bones, particularly in the mandible, and the latter is part of the skull, which is placed on the neck, which in turn is connected to the shoulders and the rest of the body. In addition, the subject of posture, precisely because of the multiplicity of the areas involved, has a remarkable complexity that requires detailed knowledge of anatomy and physiology. Again, because of the close interconnections between the various anatomical areas, care of the Postural Syndrome requires collaboration between several professionals, a condition that is often difficult to achieve. The human postural system is extraordinarily complex and, to work, it needs series of information that are continuously detected by the ocular, joint, muscle and the podalic pressure receptors, in addition to the vestibular system and the stomatognathic system.

The signals, originating in the receptors themselves, travel through our nerve fibers to the central processor, which is represented by the nervous system and its effectors, the muscles, which, in turn, receive an input from the central processor. The central nervous system receives information from different types of receptors in order to know the position of the skull onto the trunk. The signals coming from the stomatognathic system originate from the periodontal receptors; when there is contact between the teeth, which occurs physiologically during swallowing and chewing, through the trigeminal system, periodontal receptors send information on the relationship between the mandible and maxilla and between the mandible, the hyoid bone, and the cervical spine. Periodontal receptors are able to record forces exerted on the teeth in both vertical and horizontal directions with a pressure threshold of approximately 15 grams, and are sensitive to movements of about 23 microns (Pelosi 2008). All this information reaches the complex nuclei of the trigeminal nerve: the convergence of this proprioceptive information in the motor centers and in the relative spinal circuits, allows a series of reflex controls on the posture of the stomatognathic system and those of the whole body. The moment when two or more (articular, muscular, vestibular, visual, periodontal) receptors do not send correct information, some postural imbalances appear. From the dentistry's point of view, it is advisable, whenever postural problems are encountered in patients, e.g., when the position of the head, shoulders or pelvis are not perfectly balanced, to carefully examine the stomatognathic system, which is fundamental in the musculoskeletal and neurological organization of the whole body (Cuccia & Caradonna 2009). The strict anatomical, functional and neurological connections that exist between the stomatognathic system (Munhoz & Marques 2005), in fact, make dental occlusion a key factor in the management of the overall health of patients.

To date, it is recognized that problems involving dental occlusion can cause musculoskeletal disorders that lead to diseases descending down the spinal tract (Korbmacher et al. 2004) through a defined "muscle chain" pattern. Myofascial structures involved in the postural system, in fact, are organized and operate following a scheme for which changes in a given muscle segment lead to shortening or lengthening in the adjacent muscles (Munhoz et al. 2005).

The position of the mandible, which is determined by occlusion, is critical in balancing the human postural system as it influences it and in turn is influenced by it (Sakaguchi et al. 2007, Baldini et al. 2013). The lateral deflection and/or retraction of the jaw, with consequent muscle and joint problems, which takes place, for example, in the case of crossbites, deep bites, Class II malocclusion, Class III malocclusion, atypical swallowing, malposition of the tongue, open bites that lack incisal and canine guides, asymmetric tooth loss, anatomically incorrect fillings and/or prosthetics, all create dysfunctions in the stomatognathic system that have been related to changes in the cervical spine, in the sacroiliac joints (Fink et al. 2003) and to a change in the distribution of the body weight at the level of the feet (Yoshino et al. 2003) FIGS. 1, 2.

Mandibular deviation induces unilateral excess of tension in the masticatory muscles on the side of the deviation (Wakano et al. 2011). These muscles are also involved in maintaining head stability (Urbanowicz 1991 Wakano et al. 2011). A muscle imbalance in the mandible alters, therefore, the position of the head (Pradham et al. 2001), causing a compensation phenomenon (Silvestrini-Biavati et al. 2013) that modifies the posture and the individual's overall balance (Wakano et al. 2011, Baldini et al. 2013).

1 _ When the posture is equilibrated, the pendulum for the center of gravity falls directly between the two feet and the body weight is evenly distributed to each side.

2 _ When the posture is not equilibrated, the pendulum of the center of gravity shifts to one side or the other and the body weight is asymmetrically distributed to each side.

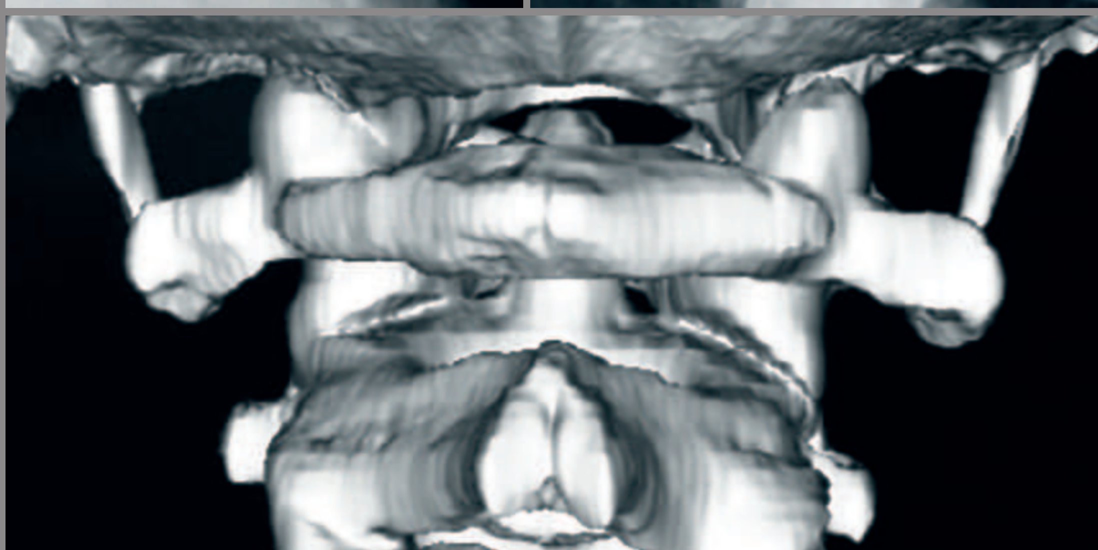
The head appears like it's been moved forward and tilted, in the front plane on the side of the contracture.
The mandibular imbalance caused by TMJ dysfunction causes the first cervical vertebra (C1) to flex and move anteriorly, which causes a hyperlordosis in other cervical vertebrae (C2-C7). Radiographic image analysis show twisting and subluxations of the cervical vertebrae in symptomatic dysfunctional patients demonstrating an influential relationship between the mandibular position, the condyle, the articular disc (meniscus) and the position of the cervical vertebrae, particularly the first vertebra (de Farias Neto et al. 2010) FIGS. 3-7.
The position of the mandible is, in turn, greatly influenced by the position of the head (Woda et al., 2001, Strini et al. 2009). An anterior positioning of the head in the sagittal plane causes, in fact, an excessive contraction of the chewing muscles resulting in dislocation of the jaw upwards and backwards and a reduction of the physiological joint space (Gonzales & Manns 1996, Strini et al. 2009). These conditions, passing through the muscle chains in the neck, are transmitted to the shoulder and the scapula, which respectively appear raised and detached from the rib cage FIGS. 8, 9. The imbalance between both sides of the body is reflected, then, to the spine and the pelvis and, in particular, to the Psoas Major muscle which, by contracting, determines the elevation of the pelvis with posteroanterior rotation and "shortening" of the same side lower limb. In fact, it was observed that the apparent asymmetry of the lower limbs caused by pelvis misalignment originates lower back (lumbosacral) pain (Sahar et al. 2010).
The receptors in the periodontal ligament can detect the slightest variation during intercuspation and even a small variation in occlusal height, as in the case of incongruous restorations, can cause dysfunction. When the stomatognathic system is not in an occlusal condition of balance, the activity of the chewing muscles increases, causing a pathological state of contracture. An alteration of the chewing muscle tension can also occur gradually over time, if physiological occlusal wear does not occur harmoniously. Fillings or prosthetics made of different materials will have different abrasion indices between them. This means that, over the years, restorative materials and natural teeth can wear down differently, creating sensory imbalance that creates muscle imbalance.
The patient who presents a disturbance in the balance of the body's muscle chains, with alterations of the neuromuscular system and spinal alignment, often has symptoms such as headaches, visual disturbances, dizziness, stiff neck, back and limb pain. Unfortunately, in the dental profession, many of these problems are not recognized as symptoms arising from an occlusal-postural disorder, as well as the multiple factors that contribute to tension and muscle pain.
Dentists usually have few opportunities to exchange opinions with other therapists involved in treating patients who have postural symptoms (orthopedic doctors, ENT physicians, ophthalmologists, neurologists, rheumatologists, physiotherapists, osteopaths, chiropractors) who, in turn, often have no experience in the diagnosis and treatment of these problems. However, the treatment of these patients frequently requires the collaboration of other doctors having different expertise in order to identify or rule out pathologies that fall outside dental expertise and address all the issues related to the Postural Syndrome by working as a team.

3, 4 _ Lateral cephalometric X-rays from the same patient taken at less than five minutes from each other. The X-ray on the left (Fig. 3) shows a patient in normal occlusion. Note the cervical hyperlordosis, the reduced oropharyngeal airspace and the position of the hyoid bone. The patient has difficulty with breathing.
The radiograph on the right (Fig. 4) was performed after placing a diagnostic jig that, by raising the vertical dimension, advanced the mandible.
The patient was asked to walk for a few minutes with the jig in order to reset her posture. Note the reduction in the hyperlordosis of the cervical vertebrae and the increased oropharyngeal airspace caused by the hyoid bone that moved up into a higher position.

5 _ Lateral cervical spine X-ray, with evident alteration of physiological lordosis in a patient with severe occlusal and postural problems.

6 _ Posterior anterior cervical spine X-ray of the patient in the previous image.
It highlights the misaligned and altered shape of the vertebrae. The problems are particularly evident, when looking at the alignment of the spinal processes.

7 _ The CT scan shows a severe lateral flexion of the first cervical vertebra (C1).



It is, therefore, up to the dentist to take into primary consideration the patient's occlusal equilibrium, during both the diagnostic and therapeutic phases, in the light of current research and clinical knowledge. The objective of the treatment should be on conserving the occlusal balance, when the patient is asymptomatic or recovering it in case of overt pathology. All this is of particular importance, especially during the treatment of parafunctional patients or patients with occlusal imbalances, which now account for the majority of patients in a dental practice. In these cases, it is essential to perform a correct diagnosis in order to develop the most predictable treatment plan possible.

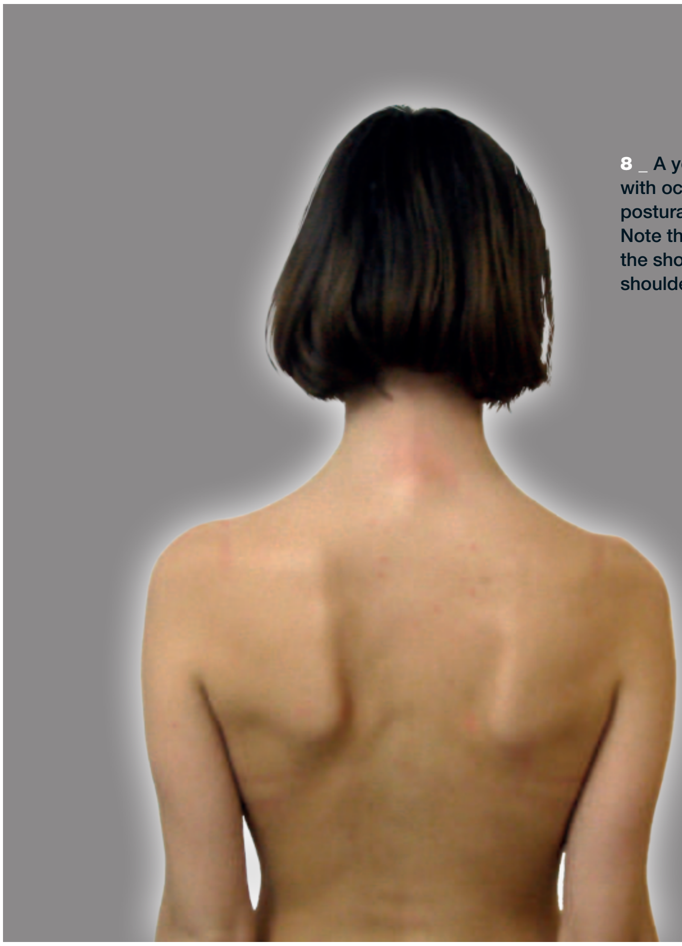
To better understand the concept "occlusion-posture", let's try and imagine the pelvis as the surface of a table on which we stack 33 glasses, one on top of another, the vertebrae, and, on top of that a big vase, the head. The pelvic position (table top) and the head (vase), then play a fundamental role on the position and balance of the vertebrae (glasses). The head, in fact, is kept in balance on the cervical vertebrae by the shoulder girdle and jaw depressor and levator muscles. These muscle groups must be in balance with each other to allow a balanced position of the head on the cervical vertebrae FIG. 10.

The mandibular position is determined by occlusion, that is, by teeth, how they fit together (interdental relationship) and by the condition of the TMJ, which connects the skull, with the lower jaw. The TMJ regulates the position of the jaw with respect to the skull and also has a close relationship with the ear. A malocclusion, or a damaged Temporomandibular Joint, causes, therefore, a mandibular imbalance and, consequently, creates tension in the muscle chains involved in the head posture. In particular, these muscle chains are made up of the chewing muscles, the neck muscles and the shoulder girdle muscles involving also the shoulder blades (descending problem). The jaw position and its balance, determines the position and balance of the head and the shoulder blades which, in turn, determine the position of the vertebrae and pelvis FIGS. 11-18. A forward posture of the head creates an increase in the tension of the depressor and levator muscles of the jaw, a decrease of the suboccipital space, resulting in neurovascular compression and tension, which produces headaches and dizziness, as well as an increase in the cervical-thoracic space with increased tension in the neck and scapular girdle FIGS. 19-25.

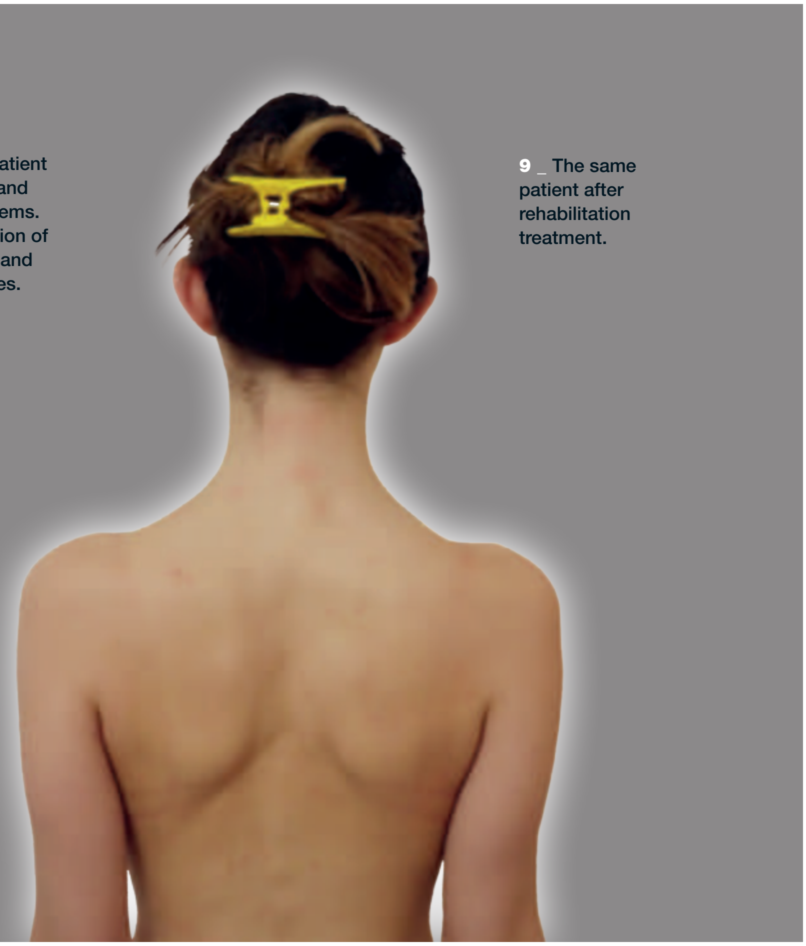
Pelvis imbalances, caused by muscular contractions or problems in the legs and feet, can affect the mandibular position and indirectly cause malocclusion (ascending problem). The pelvis is, together with the shoulder blades and the jaw, a very important part of the skeletal system for the balance and postural adaptations of our body FIG. 26.

A problem in one anatomical region affects all the other regions that will always adapt to find the most comfortable position to maintain postural equilibrium. The head, shoulders, shoulder blades, pelvis, vertebrae, legs and feet are all parts of our body that, combined, create our posture; a postural problem in any part of the body, therefore, will in turn cause an alteration in the adaptation of the other parts of the body.

In the light of the current scientific knowledge and clinical experience, it can



8 _ A young patient with occlusal and postural problems. Note the position of the shoulders and shoulder blades.



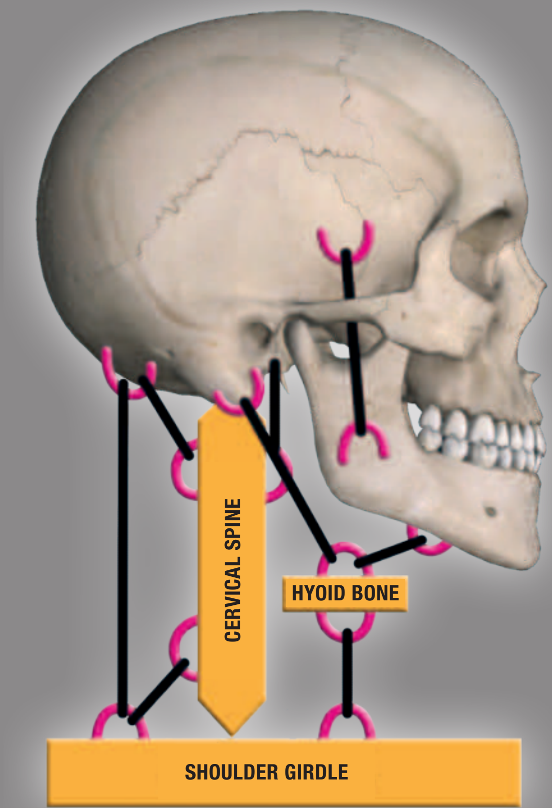
9 _ The same patient after rehabilitation treatment.

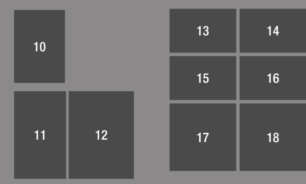
therefore be said that no region of the body is disconnected from the others and that a large number of pathological conditions can be traced to what we call Mandibular Postural Syndrome or simply, **Postural Syndrome**, because the jaw is always involved.

“Everyone has to take his or her body and use it as best they can. The best posture is the posture in which all the body segments are in equilibrium in the rest position and that of maximum stability, this is different for every individual.”

Metheny

An increase in tension in the shoulder girdle muscles and a consequent stiffness of the cervical spine (e.g., from a whiplash) can create tension even in the levator and depressor muscles of the jaw. Muscle disorder can also cause pathological tension in the TMJ, with condyle and meniscus dislocation.
TMJ conditions associated with forward head posture often begin at an early age, especially in Class II malocclusion without any symptoms, which, however, appear in adulthood (Rocabado et al. 1983). These cases defined as “asymptomatic”, at a subclinical level show signs of dysfunction or early lesions (Mongini 1983).

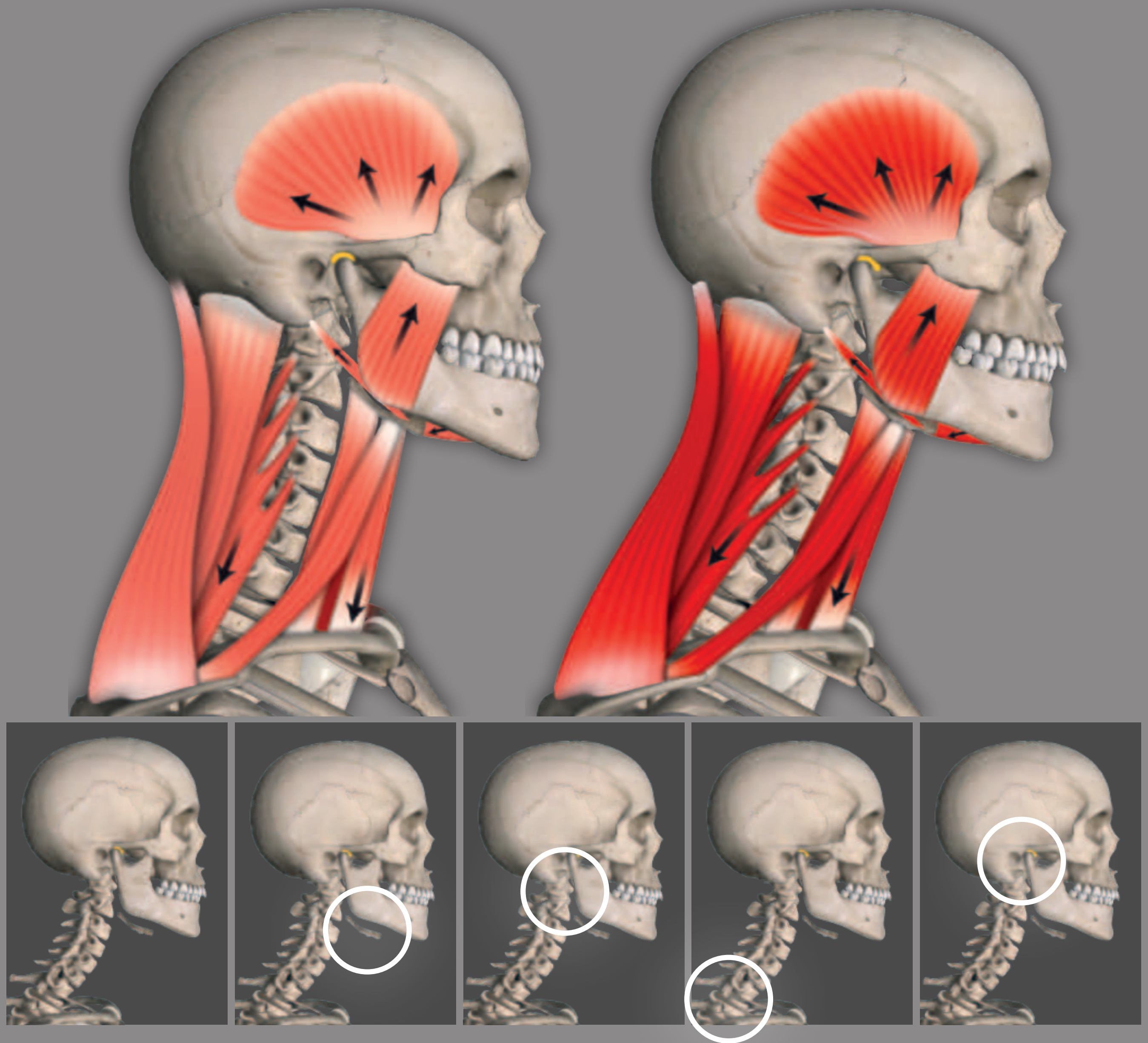


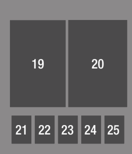


10 _ The head is held erect correctly on the cervical vertebrae, by the neck and shoulder girdle muscles in the back, and by the Subhyoid, Suprahyoid, masticatory and facial muscles, in the front. A well-balanced, orthostatic position of the head ensures a healthy Temporomandibular Joint, proper cranial-cervical-thoracic vertebral function and physiological occlusal stability. Good balance, proper muscle tone and mandible position play a key role in the postural balance of the head.

11, 12 _ An forward head posture can cause changes in the postural alignment of the whole body.

13-18 _ A deep bite causes forward head posture with a significant increase in muscle tension at the suboccipital and shoulder girdle level, with a decreased oropharyngeal airspace (Figs. 13, 15, 17). The images taken after orthodontic treatment show a significant change in the intermaxillary and occlusal relationships, head posture and an increase in the oropharyngeal airspace (Figs. 14, 16, 18).



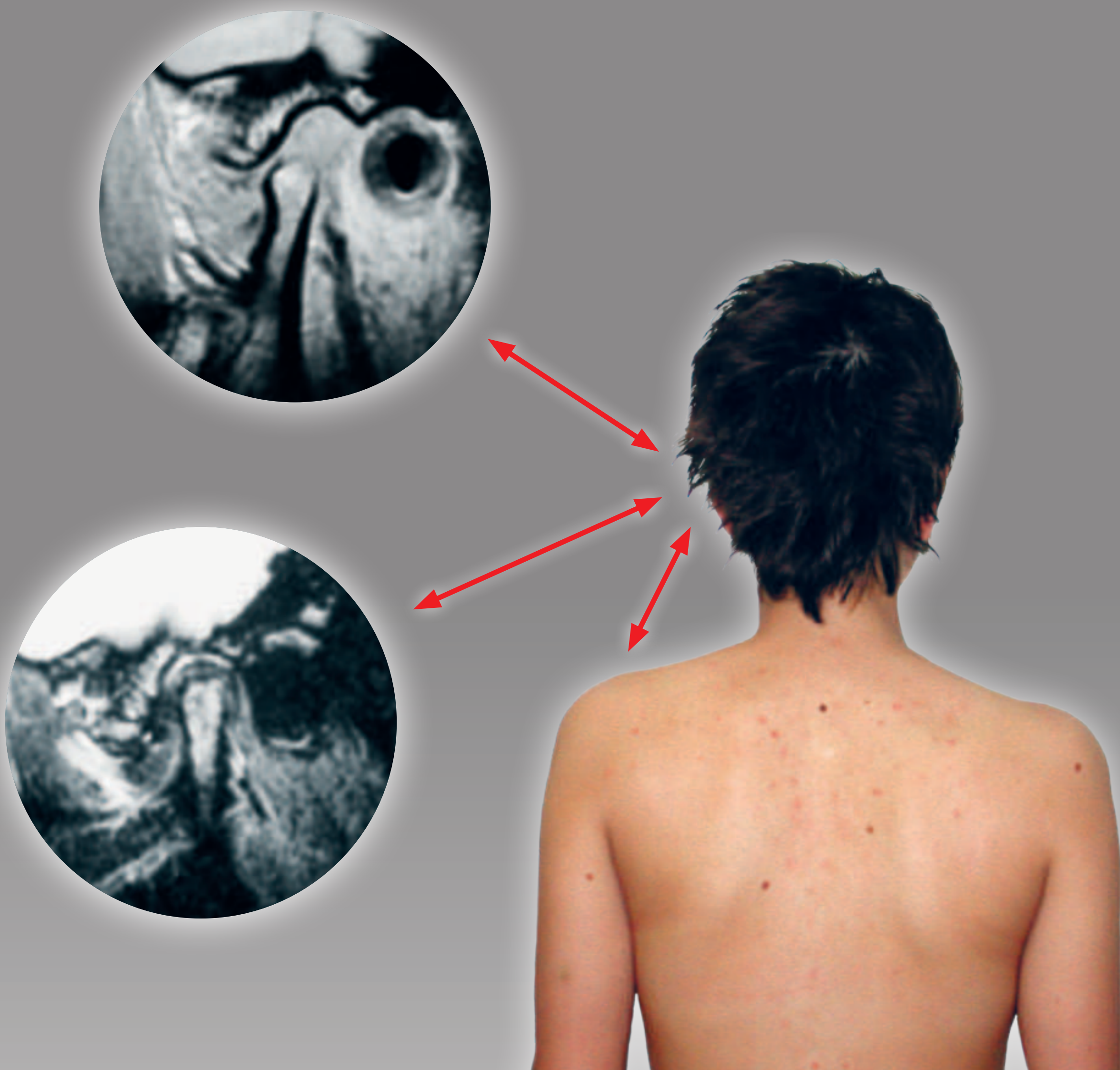


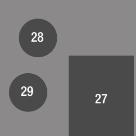
19-25 _ A forward head posture generates:
- increased tension in the Subhyoid and Suprahyoid muscles and, consequently, in the levator muscles of the jaw (Fig. 22);
- a decrease in the suboccipital space resulting in neurovascular compression, headaches and dizziness (Fig. 23);
- an increase in the cervical-thoracic space with obvious increased tension in the neck and shoulder girdle (Fig. 24);
- muscular disorders can also cause tension in the TMJ with condyle and meniscus dislocation (Fig. 25).

26 _ In the skeletal system, the jaw is a key organ in the postural control of the human body along with the hyoid bone, the cervical vertebrae, in particular the atlas and axis, the shoulder blades, pelvis and feet. All these bony structures are intimately interconnected on a functional level with the muscular and fascial systems; the cranium and sacrum are intimately connected with the dural system. Every time the posture goes out of alignment in one specific area, it necessarily determines a new adaption process in all the other structures that have to compensate to generate a new equilibrium.

Evidence-Based Dentistry and Clinical Evidence-Based Dentistry

Much of the scientific literature, that hasn't demonstrated a relationship between occlusion and posture, is based on research using electromyography and/or stabilometry (Palla 2001, Perinetti et al. 2010, Manfredini et al. 2012) for the evaluation of this relationship. However, there are studies that challenge the validity of the results obtained using these methods (Klasser & Okeson 2006, Al-Saleh et al. 2012, Baldini et al. 2013) because they are not considered capable to show, in a clear and reproducible way, any relationship between occlusion and posture.
A literature review also highlights a lack of homogeneity in the investigative methods used and a shortage or absence of clinical documentation. In addition, all the therapeutic phases and medium- to long-term results are not always present. The complexity of the problem dictates an approach that requires multidisciplinary skills, since the systems involved are numerous (visual, vestibular, proprioceptive, occlusal, muscle, etc.).
The search for a simple direct cause-effect relationship between occlusion and posture can lead researchers to error by virtue of the complexity of the topic. In the current research methods there is, in a certain sense, an excessive thrust towards simplification, much needed in order to apply discoveries in a clinical setting, but that often translates into reductionism. Such reductionism leads researchers to conclusions consistent with the results obtained by the methods used for the study, but frequently these results stand apart from clinical evidence. In this context, Evidence-Based Medicine, or rather Evidence-Based Dentistry, has not led to evidence, nor to a method, neither in research nor in therapy. In the literature, in fact, there are scarce clinical trials involving patients with well-documented occlusion-postural problems, from diagnosis to treatment, and that have a follow-up in a distant future. To date, a standardized approach method for the diagnosis and treatment of patients suffering from **Postural Syndrome** to be used by the clinician has not yet been proposed.
A careful clinical analysis, supported by MRI of the Temporomandibular Joint, however, unequivocally demonstrates, **free from personal interpretations**, a close relationship between the position of the TMJ meniscus and the position of the ipsilateral shoulder blade. Research should not, therefore, be an activity in itself, too often based on the analysis of numbers, but should always aim to define the clinical evidence that comes from the "human" system. In this view, **Evidence-Based Dentistry** should be defined as **Clinical Evidence-Based Dentistry**, with dentistry and research based on clinical evidence.
Those colleagues who practice **Clinical Evidence-Based Dentistry**, exploiting the knowledge derived from research in order to apply it in their clinical practice, certainly had the opportunities to cure patients suffering from Temporomandibular Joint locking problems. These patients report pain, not only in the joint affected by the block, but also in their neck and shoulder girdle, where we always notice marked suboccipital muscle tension at the superior head of the Trapezius muscle and Levator Scapulae muscle.
This tension is always ipsilateral in the affected Temporomandibular Joint, when there is more joint disorder detectable in the magnetic resonance imaging (e.g., disc dislocation, arthropathy and effusion) FIGS. 27-29.





27 _ Young patient with acute closed lock of the right TMJ. There is contraction of the neck and shoulder girdle muscles ipsilateral to the affected TMJ. Note the shoulder and scapular angle are higher than the counter-side. The left shoulder blade is also more detached from the rib cage.

28 _ Left Temporomandibular Joint profile with open mouth. There is an apparent limit to the opening.

29 _ Left Temporomandibular Joint profile with the mouth closed in T2. Intrajoint effusion is present.

This clinical observation shows that the condition of the articular disc, and therefore that of the Lateral Pterygoid muscle directly connected to it, affect the neck and shoulder girdle muscles (especially the Sternocleidomastoid, Superior Trapezius and Levator Scapulae) FIGS. 30-32.

A careful primary evaluation of the patient suffering from this disease requires, therefore, not only an intraoral examination, but also an accurate assessment of the muscular condition, which is evident from the correlation between the articular meniscus, the Lateral Pterygoid muscle, the neck, and the shoulder girdle muscles.

Clinical Evidence-Based Dentistry arises from observation and is based on the combination of clinical experience and an interpretation of the scientific literature. Dedicated instrumental investigation is a fundamental requirement as well as an accurate, consistent, and rich clinical documentation of the initial case, the treatment of the diagnosed condition and the subsequent follow-up. Such documentation offers the possibility to monitor and evaluate results over time and therefore, to understand and judge the validity of the diagnosis and treatment performed.

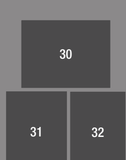
Only this method, which does not base its conclusions solely on data analysis, but focuses on the patient in a multidisciplinary diagnostic and therapeutic approach, can truly be called **“research”**.

Clinical Evidence-Based Dentistry
= Clinical Experience and Research.

Instrumental testing such as Magnetic Resonance Imaging (**MRI**), the gold standard for the study of the TMJ (Koh et al. 2013) and postural muscles, allow us to objectively clinically diagnose, offering an opportunity to see and evaluate intra-articular anatomical TMJ conditions such as the state and position of the meniscus, the condyle and the presence of any effusions. In addition, the MRI allows to assess, with well-defined images, the shape, contour, volume and trophism (thanks to T2-weighted MRI imaging with fat suppression) of the most important occlusal-postural muscles such as masticatory (Lateral Pterygoid, Masseter, Temporal), shoulder girdle and neck muscles (Trapezius, Levator Scapulae, Sternocleidomastoid) and pelvic girdle (Iliopsoas or Psoas Major).

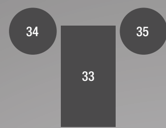
The study of the Trapezius and Psoas Major muscles is clinically very important for their role in body posture. A very important thing, detected on a large number of patients investigated with a postural MRI, is the very close and direct relationship between TMJ disease and the ipsilateral Superior Trapezius muscle tone of the same sided articulation that is mainly affected. The side mostly affected by the pathology, especially in terms of greater anterior disc dislocation and pain, shows a hypertonic homolateral Trapezius Superior muscle on the side of the most affected TMJ FIGS. 33-35.

These patients always present a condition marked by a lack of unilateral or bilateral posterior occlusal support, often originating from inappropriate prosthetics. We frequently find problems in patients with a deep bite (Class II), an open bite and postorthodontic cases, if the premolars were extracted or when the lateral-posterior contacts, the canine and incisal guidance are insufficient and unbalanced FIGS. 36-150.

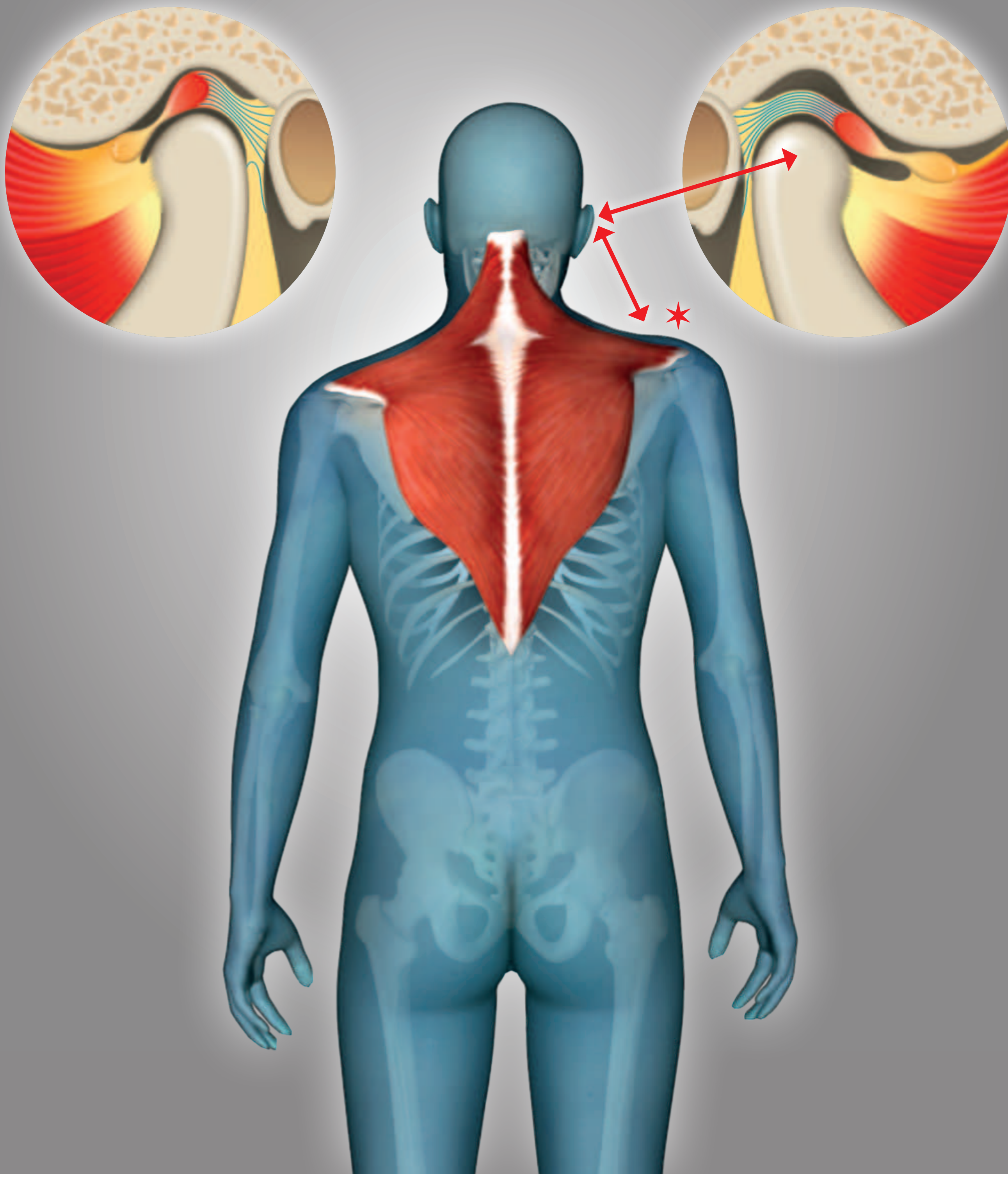


30 _ Young 20-year-old patient with severe TMJ pathology, more evident on the left. The patient complains of strong tension in her neck and shoulders, with pain in the region of her TMJ and between her shoulder blades. The images show a evident imbalance in her shoulder blades and shoulder level; the left shoulder appears higher than the right shoulder and the shoulder blade appears "glued" to the rib cage and immobile with respect to the right side.

31-32 _ The same patient before and after rehabilitation treatment with a repositioning EFP2 bite plane used for 1 year, together with physical therapy and occlusal balancing.

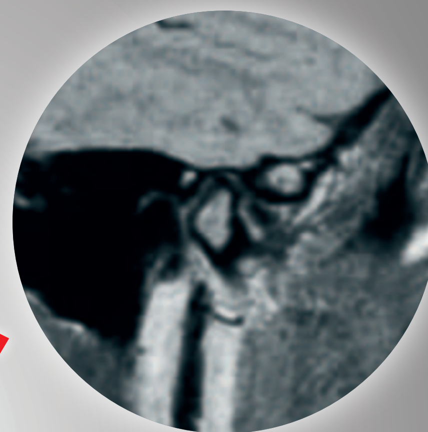


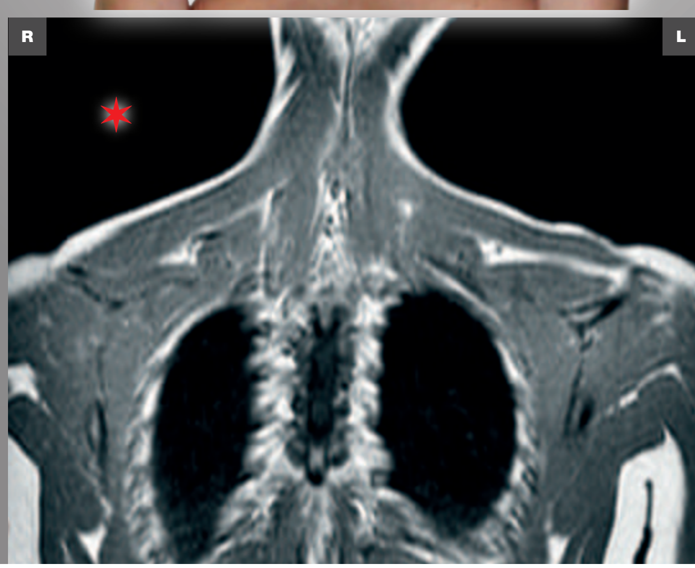
33-35 _ The side most affected by the disorder, especially in terms of greater anterior displacement of the disc and pain, shows a hypertonic Upper Trapezius muscle ipsilateral to the involved TMJ.

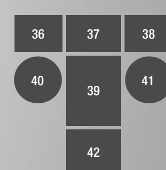




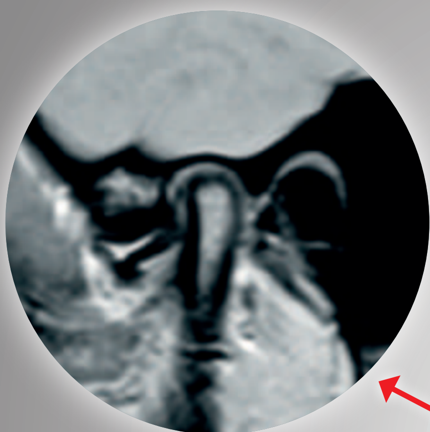


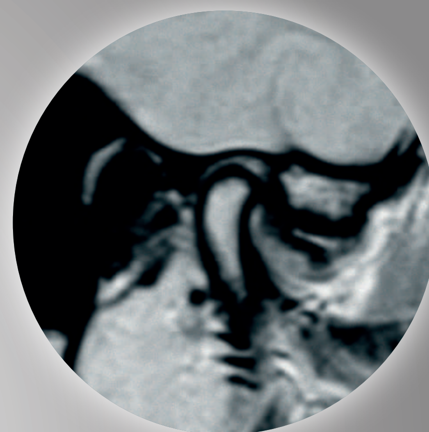


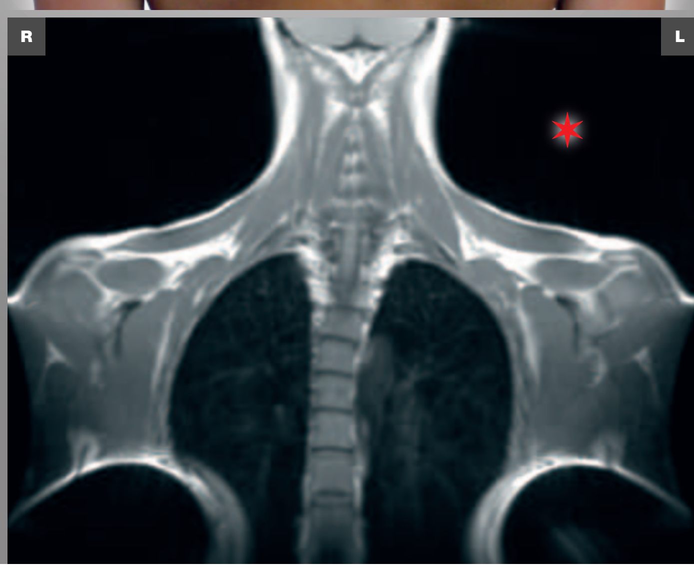


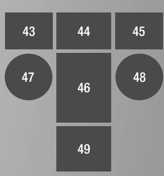


36-42 _ Adult patient with advanced degenerative symptoms of both TMJs and more evident painful symptoms on the right. The right joint seems to be more affected by the degenerative process (Fig. 41). She shows a contraction of the neck and shoulder girdle muscles ipsilateral (same side) as the TMJ most affected by the disorder. Note the right shoulder height and scapular angle are higher compared to the contralateral side. Also in this case, the right or left scapulae appear more detached from the rib cage.

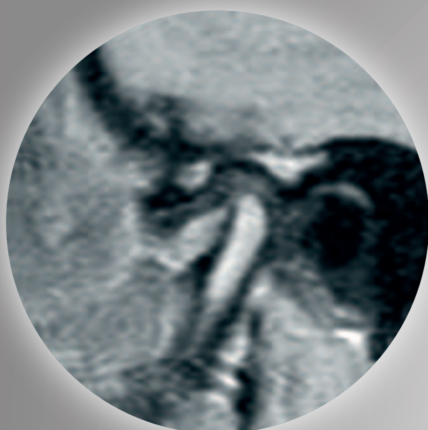


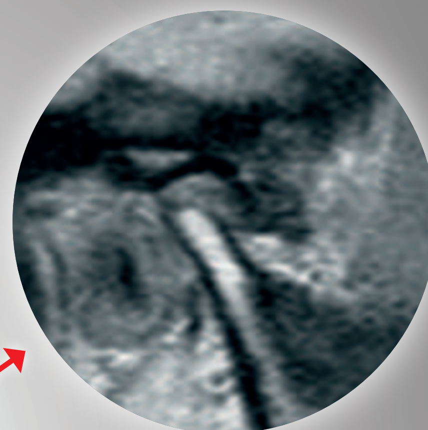


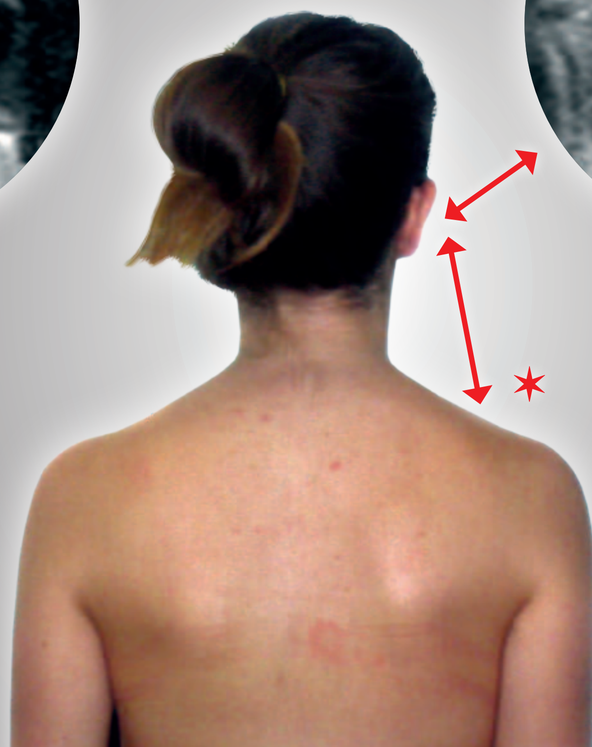




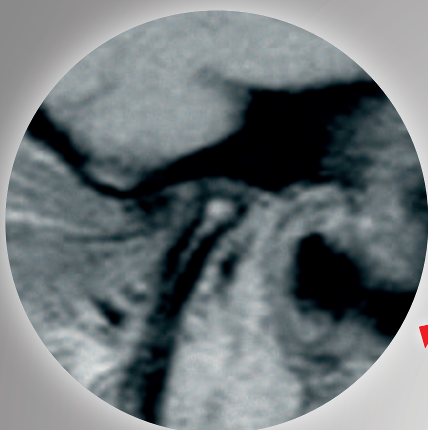
43-49 _ A young patient (24 years old) with an anterolateral displaced meniscus of both TMJs. The patient reports pain in the left joint and shoulder girdle. The MRI shows a more severe condition in the left joint, because the meniscus is not recaptured when opening and shows effusion in the anterior superior compartment (Fig. 47). The left shoulder is higher than the contralateral side and the MRI of the shoulder girdle highlights a contracted left Upper Trapezius with a muscle belly with greater diameter compared to the right Trapezius.

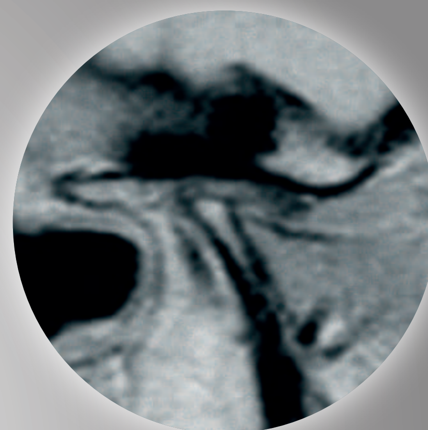


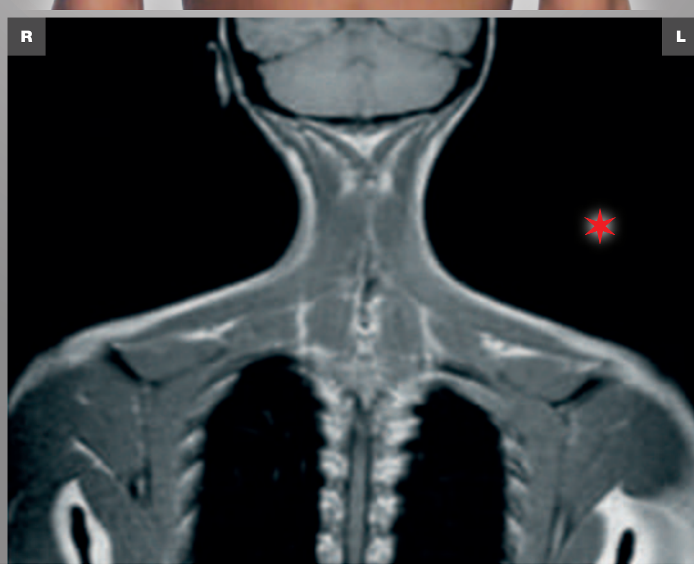


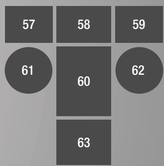


50-56 _ A young patient (22 years old) with degenerative condition in the TMJ on both sides and more obvious pain on the right. The right joint seems more involved in the degenerative process (Fig. 55). It shows a contraction of neck and shoulder girdle muscles on the same side (ipsilateral) as the TMJ most affected by the disorder. Note the right shoulder and scapular angle are higher than the contralateral side. In addition, the right scapula appears more detached from the rib cage.

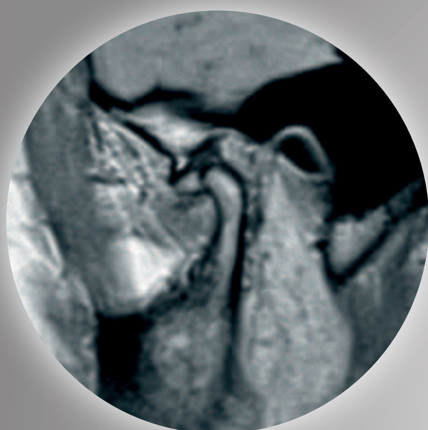


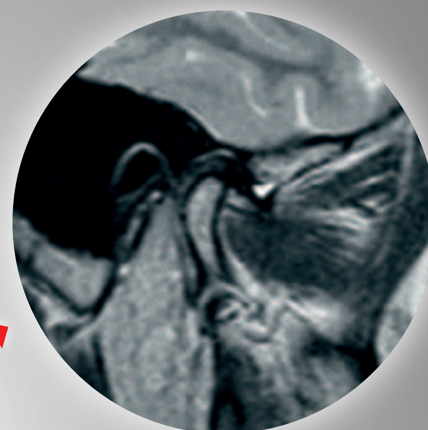


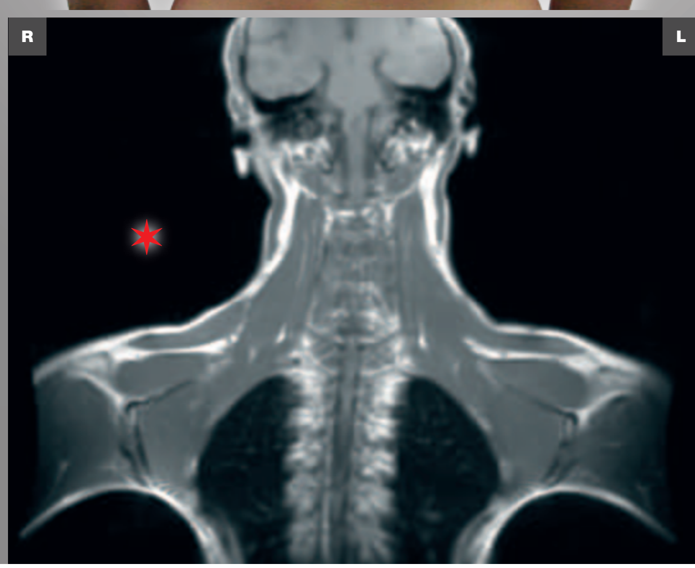


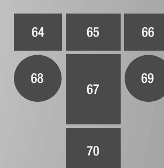


57-63 _ A 24-year-old patient. The MRI of the TMJ shows bilateral chronic degenerative arthropathy, more severe on the left, with remodeling of joint surfaces (condyle-fossa), disc dystrophy and displacement without reduction on the right and left. The patient complains from constant pain in the left TMJ, in the suboccipital region and left shoulder girdle. The left shoulder appears contracted and lowered compared to the contralateral side.

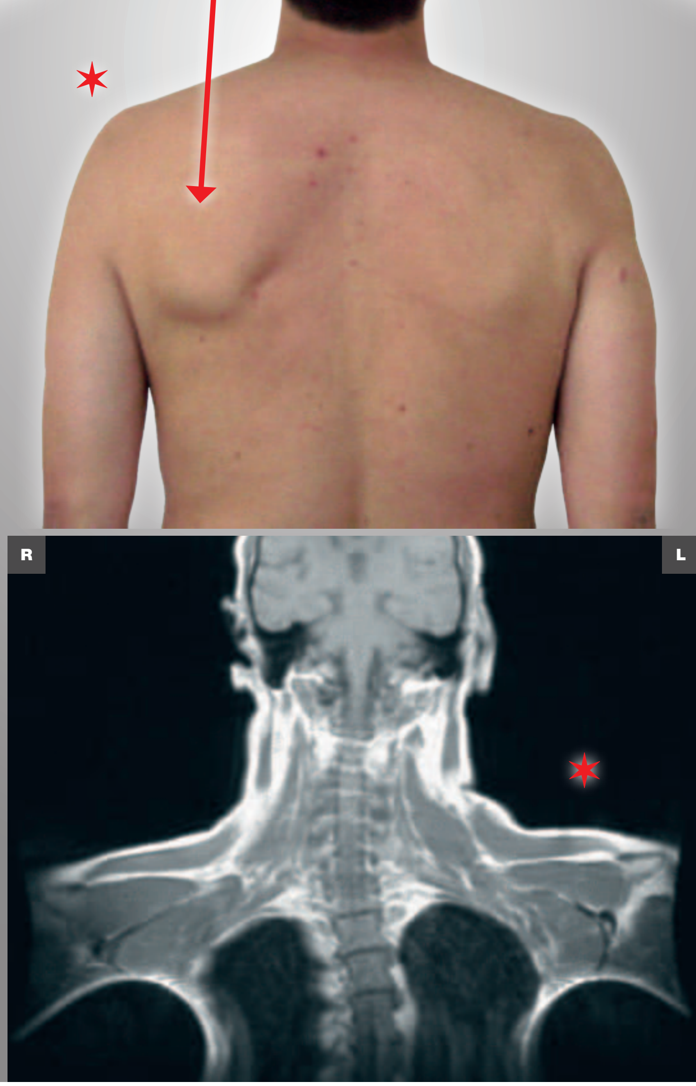


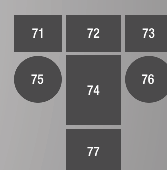




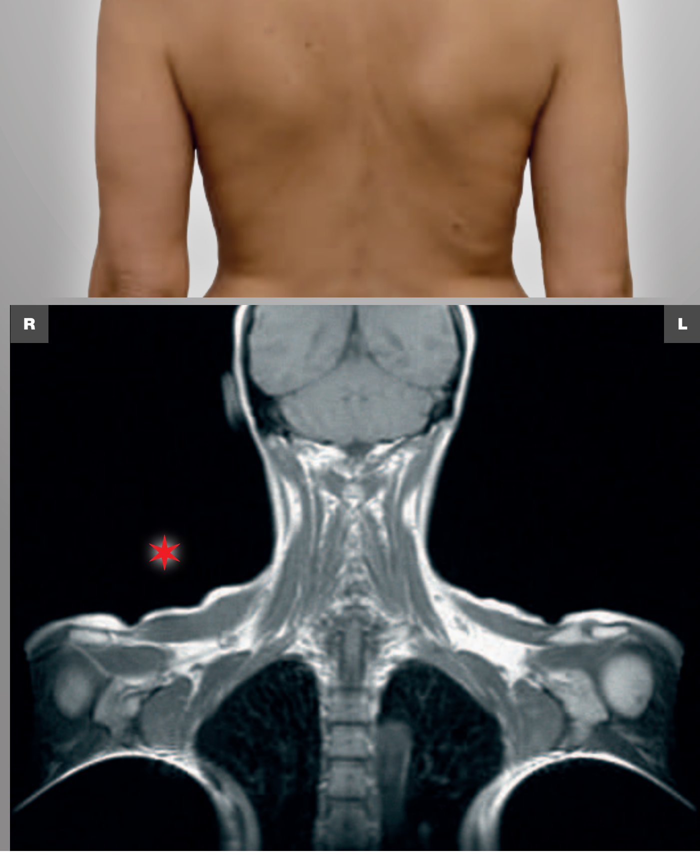


64-70 _ A 25-year-old patient. The MRI of the TMJs shows anterolateral displacement of both menisci, more severe on the right side where we can see effusion in the anterior superior compartment (Fig. 69). The right Upper Trapezius muscle appears shortened compared to the contralateral side. Upon clinical examination, the right shoulder appears contracted and raised compared to the contralateral side and the rigth shoulder blade is detached from the rib cage. The patient reports tension and pain in the suboccipital region and right shoulder girdle.

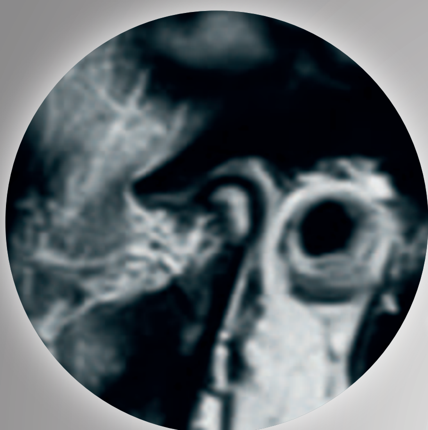


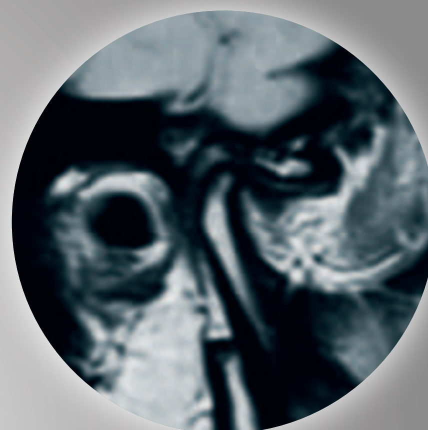


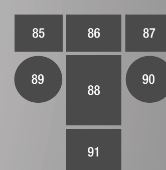
71-77 _ A 42-year-old patient. The MRI of the TMJs shows anterolateral displacement of both menisci, more severe on the left side where the patient feels pain at rest and when chewing. The left Upper Trapezius muscle appears very shortened compared to the contralateral side. Upon clinical examination, the left shoulder appears contracted and raised compared to the contralateral side and the shoulder blade is clearly separated from the rib cage. The patient reports tension and pain in the suboccipital region and the left shoulder girdle.

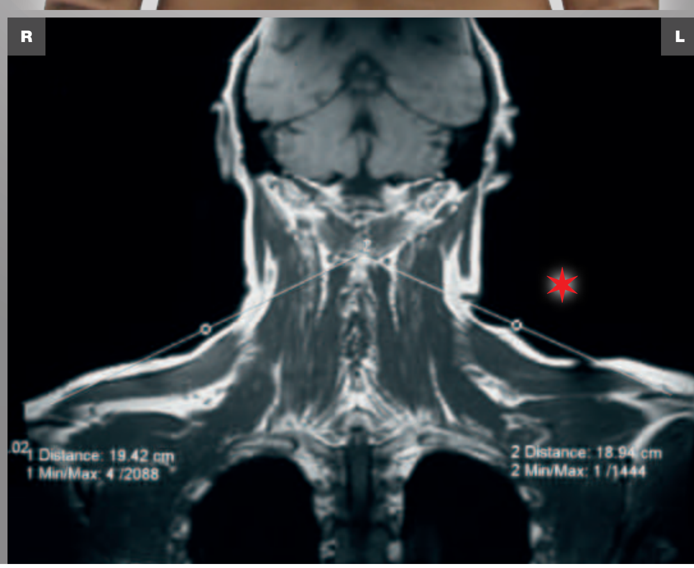


78-84 _ A 55-year-old patient. The MRI of the TMJs shows anterolateral dislocation of both menisci, more severe on the right where the patient feels pain at rest and during mastication (Fig. 83). The right Upper Trapezius muscle appears hypertonic compared to the contralateral side. Upon clinical examination, the right shoulder blade appears obviously detached from the rib cage. The patient reports tension and pain in the suboccipital region and the shoulder girdle, more so on the right.

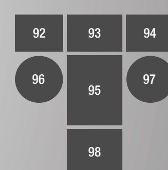


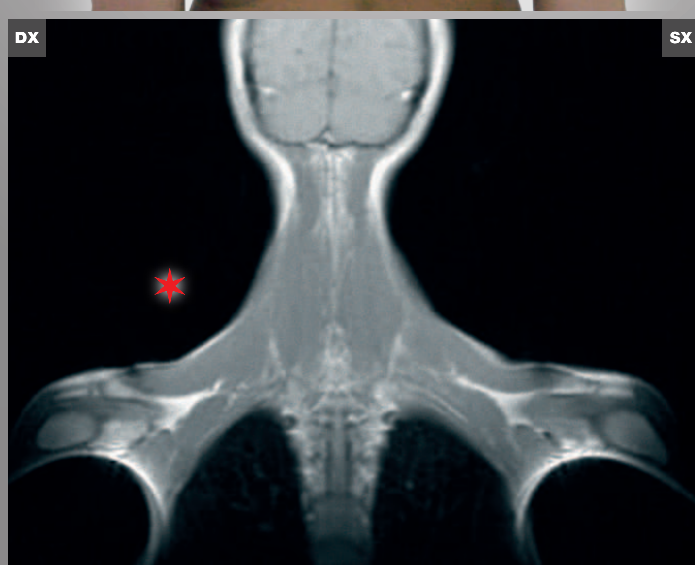




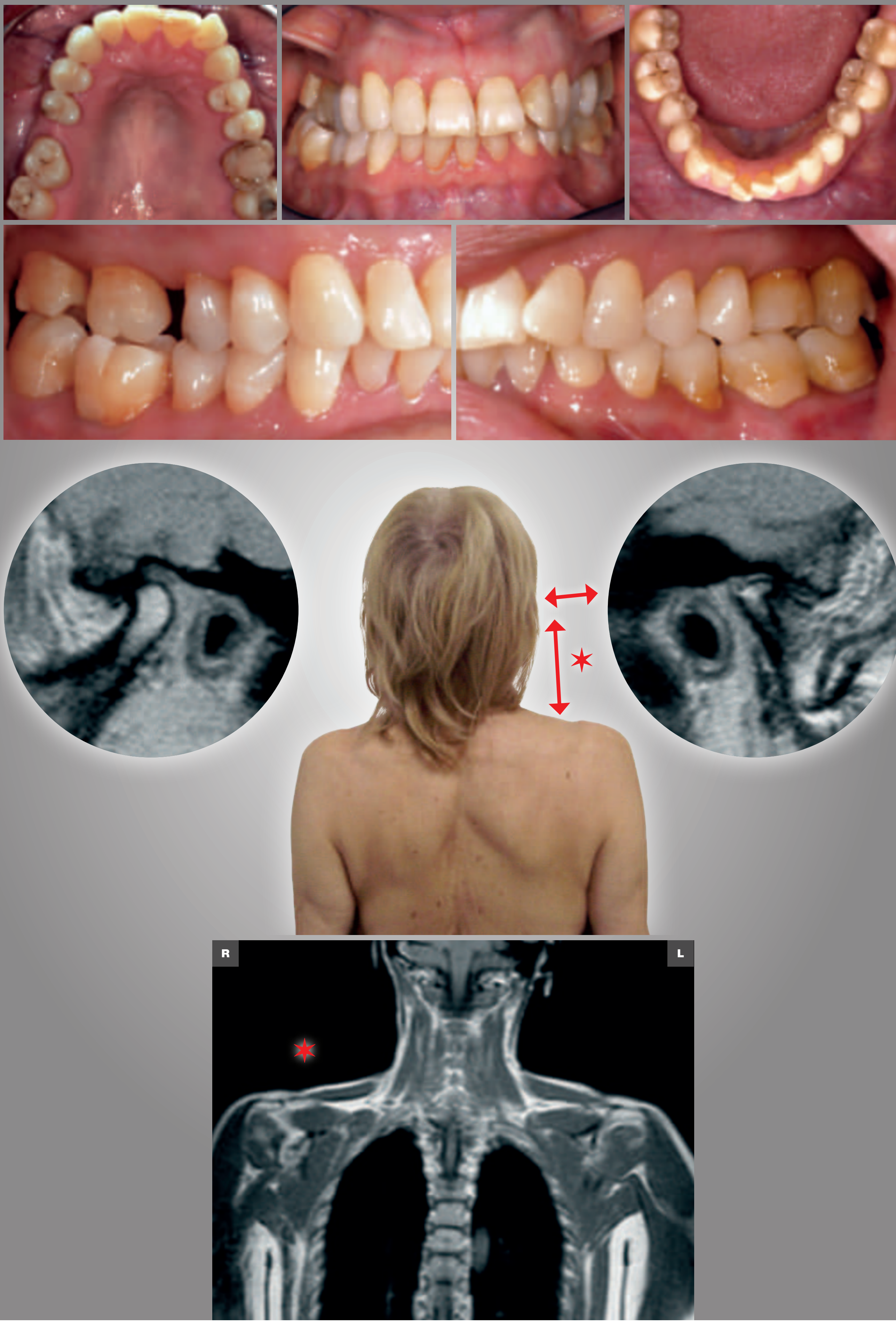


85-91 _ A 50-year-old patient. The MRI of the TMJs shows anterolateral displacement of both menisci, more severe on the left where the patient complains of pain at rest and during mastication. The left Upper Trapezius muscle appears very shortened and hypertonic compared to the contralateral side. Upon clinical examination, the left shoulder appears contracted and raised compared to the contralateral side and the shoulder blade is clearly detached from the rib cage. The patient reports tension and pain in the suboccipital region and shoulder girdle on the left.





92-98 _ A 40-year-old patient. The MRI of the TMJs shows anterolateral displacement of both menisci, more severe on the right where there is effusion in the anterior superior compartment (Fig. 97). The patient complains of severe pain on the right side when resting and during mastication. The right Upper Trapezius muscle appears shortened compared to the contralateral side, and upon clinical examination the right shoulder appears contracted and raised compared to the contralateral side. Her right shoulder blade appears obviously detached from the rib cage. The patient reports tension and pain in the suboccipital region and shoulder girdle on the right.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pag. 54-55

pag. 56-57

99-129 _ A 60-year-old patient. She suffers from recurrent headaches and tension in the cervical vertebrae and her shoulder girdle. From an orthodontic standpoint, the patient appears in a normal Class I skeletal occlusion with normal protrusion. During an occlusal evaluation there appears a modest contraction in the transverse diameter of the posterior region, with mild crowding in the two arches and mesial tipping of teeth number 17 and 18 following the loss of number 16. The patient was treated during the first phase of treatment with a modified advancement upper plate, with the intention to expand the upper arch a little. Then the patient was treated with a multi-bracket appliance to realign both arches. Initially the upper arch brackets were placed, while using a lower occlusal stabilization bite plane. The lower arch brackets were placed subsequently to finish the treatment.


R
L


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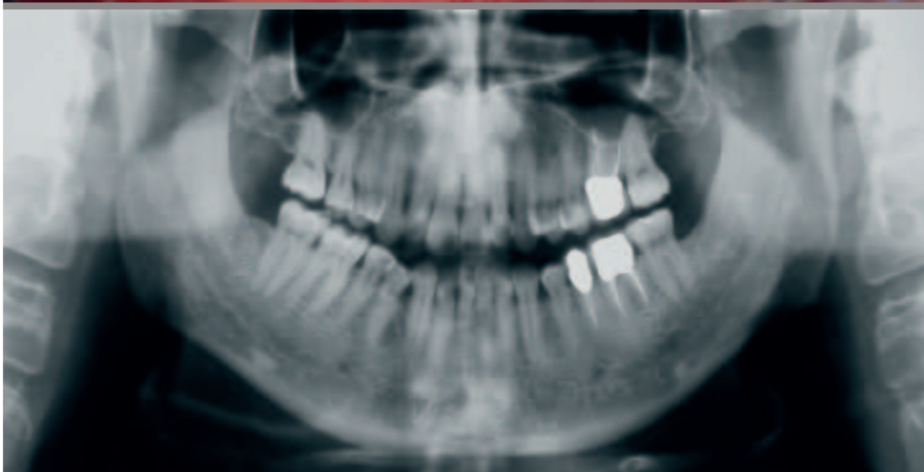
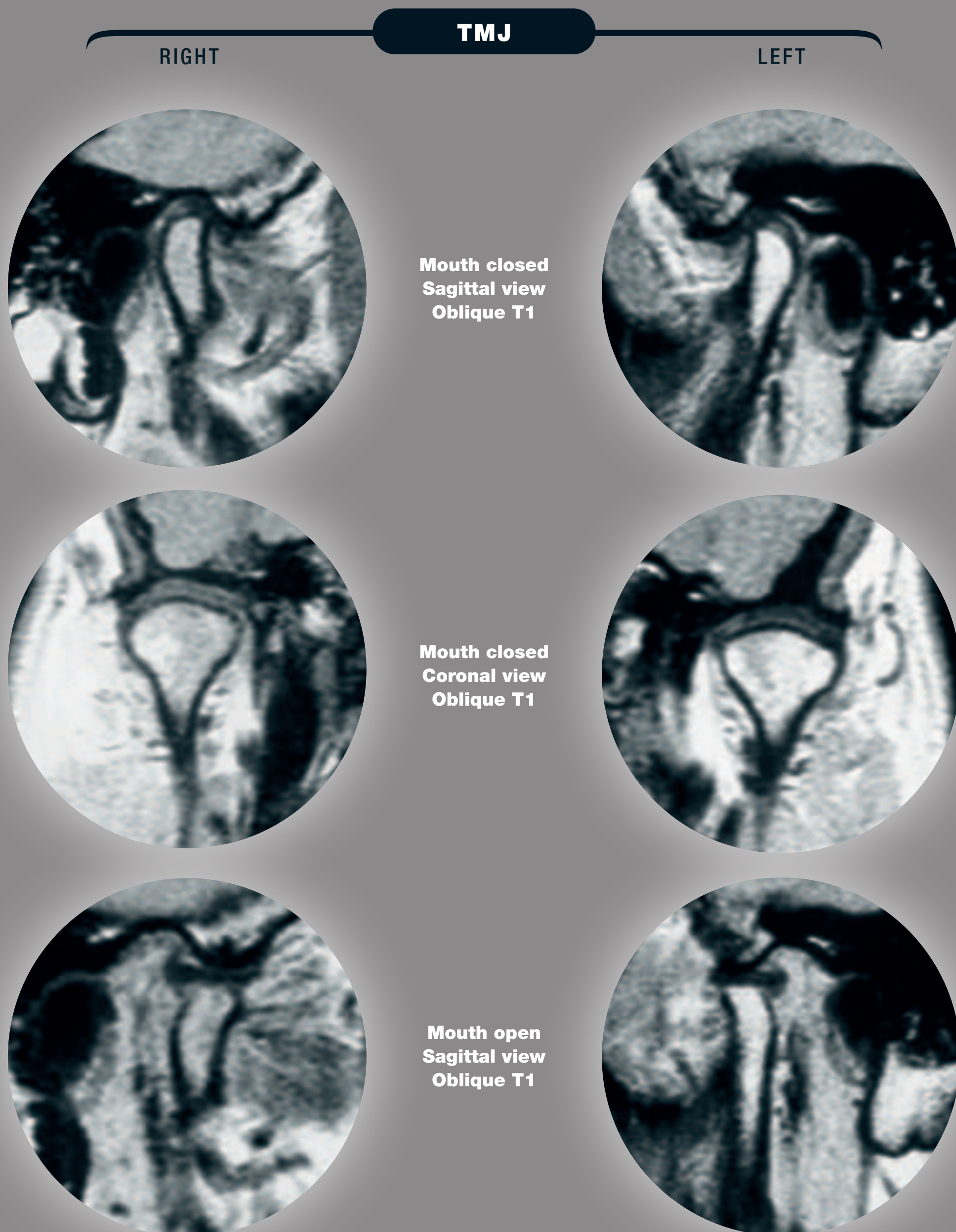
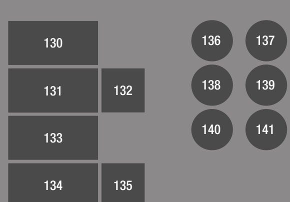
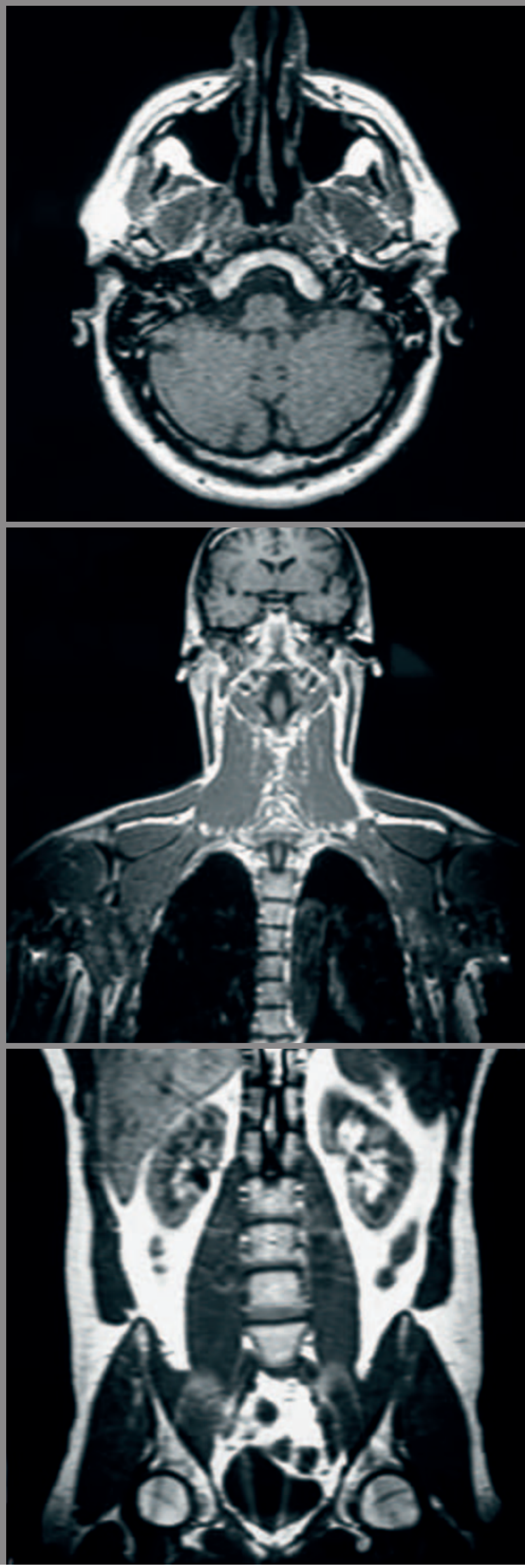






130-135 _ A 50-year-old male patient with skeletal and dental Class III malocclusion and anterior dentoalveolar open bite and bilateral posterior crossbite. The patient refused the two-step orthodontic-surgical therapy he was offered after reviewing his case. He then went through dental compensation orthodontic treatment using a fixed multi-bracket appliance, with a treatment goal to improve posterior support and lateral guidance.

136-141 _ The MRI of the TMJs shows a modest anterior dislocation of both menisci with recapturing upon opening. The patient has a normal degree of articular opening.



142	
143	
144	

145	146
147	148
149	150

142-144 _ Postural MRI showing increased contraction in the Lateral Pterygoid and the Upper Trapezius on the right side. The Psoas on the right appears more contracted, notwithstanding the compensating scoliosis in the lumbar vertebrae.

145, 146 _ Before treatment was begun, the patient had bilaminate mucogingival surgery performed to cover the root surfaces.

147, 148 _ Orthodontic treatment steps (case donated by Dr. Irene Vanini).

149 _ Case finished.

150 _ Case after 5 years. A connective tissue graft was done on tooth 12.

Muscle contraction in the jaw-skull-neck-shoulder blades areas causes a further involvement of pelvic and lower limb muscles affecting all muscles, the following being more important clinically: Iliopsoas, Piriformis, Gluteus Maximus, Tensor Fasciae Latae, Femoral Quadriceps and Gemelli. At the level of the head-neck-shoulder-pelvis areas, in the absence of severe scoliotic curvature compensation, there is usually a compensatory postural stance on the side affected by the contraction of the Lateral Pterygoid, with an accompanying lateral deviation of the mandible and increased TMJ disorder. The following clinical pattern usually appears:

Lateral mandibular deviation to the left FIGS. 151, 152**:**

- head tilted forward and to the left;
- left shoulder higher than right shoulder;
- left shoulder blade higher than right shoulder blade and detached from the rib cage;
- pelvis rotated forward and upwards to the left;
- asymmetry of left leg in relation to the pelvic shift;
- left leg is rotated externally.

Lateral mandibular deviation to the right FIGS. 153, 154**:**

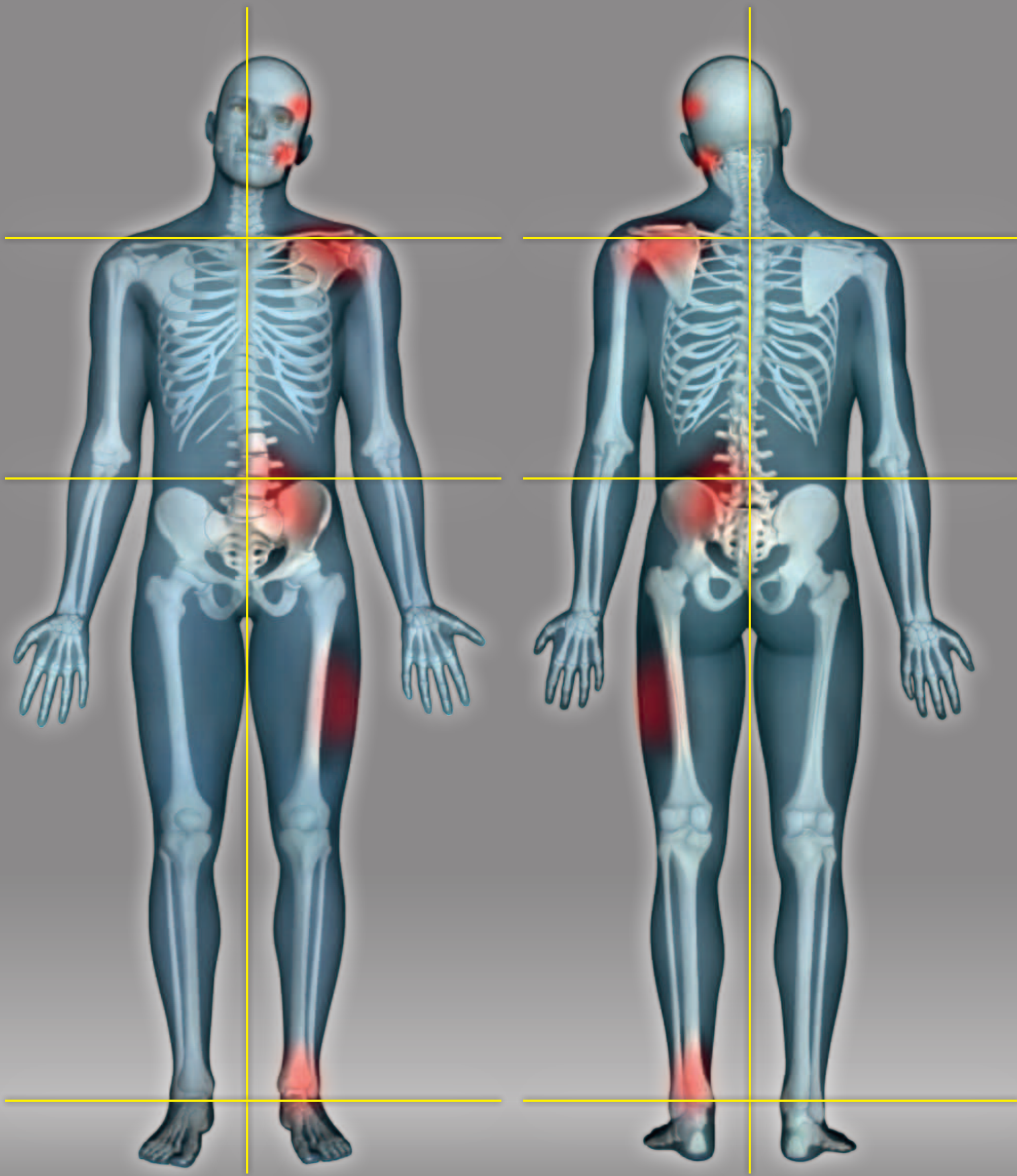
- head tilted forward and to the right;
- right shoulder higher than left shoulder;
- right shoulder blade higher than left shoulder blade and detached from the rib cage;
- pelvis rotated forward and upwards to the right;
- asymmetry of right leg in relation to pelvic shift;
- right leg is rotated externally.

It is recommended that every time patients show signs referable to postural problems, for example, misalignments of the position of the head, shoulders or pelvis, one has to carefully examine the stomatognathic system as it is fundamental in the musculoskeletal and neurological organization of the whole body (Cuccia & Caradonna 2009).
To date it is widely recognized that problems involving occlusion can cause musculoskeletal disorders, as myofascial structures involved in the postural system are organized and operate according to the muscle chain scheme: changes in a given muscle segment lead to a shortening or an elongation in the muscles following the chain (Munhoz & Marques 2009).
A disturbance in the balance of body muscle chains causes abnormalities in the neuromuscular system that modify the alignment of the spine and cause the patient's symptoms such as neck and shoulder girdle tension, headache, visual disturbances, dizziness, stiff neck, pain in the back and limbs.
The position of the mandible, affected by occlusion, is critical in balancing the human postural system as it affects it and is affected in turn (Sakaguchi et al. 2007, Baldini et al. 2013).

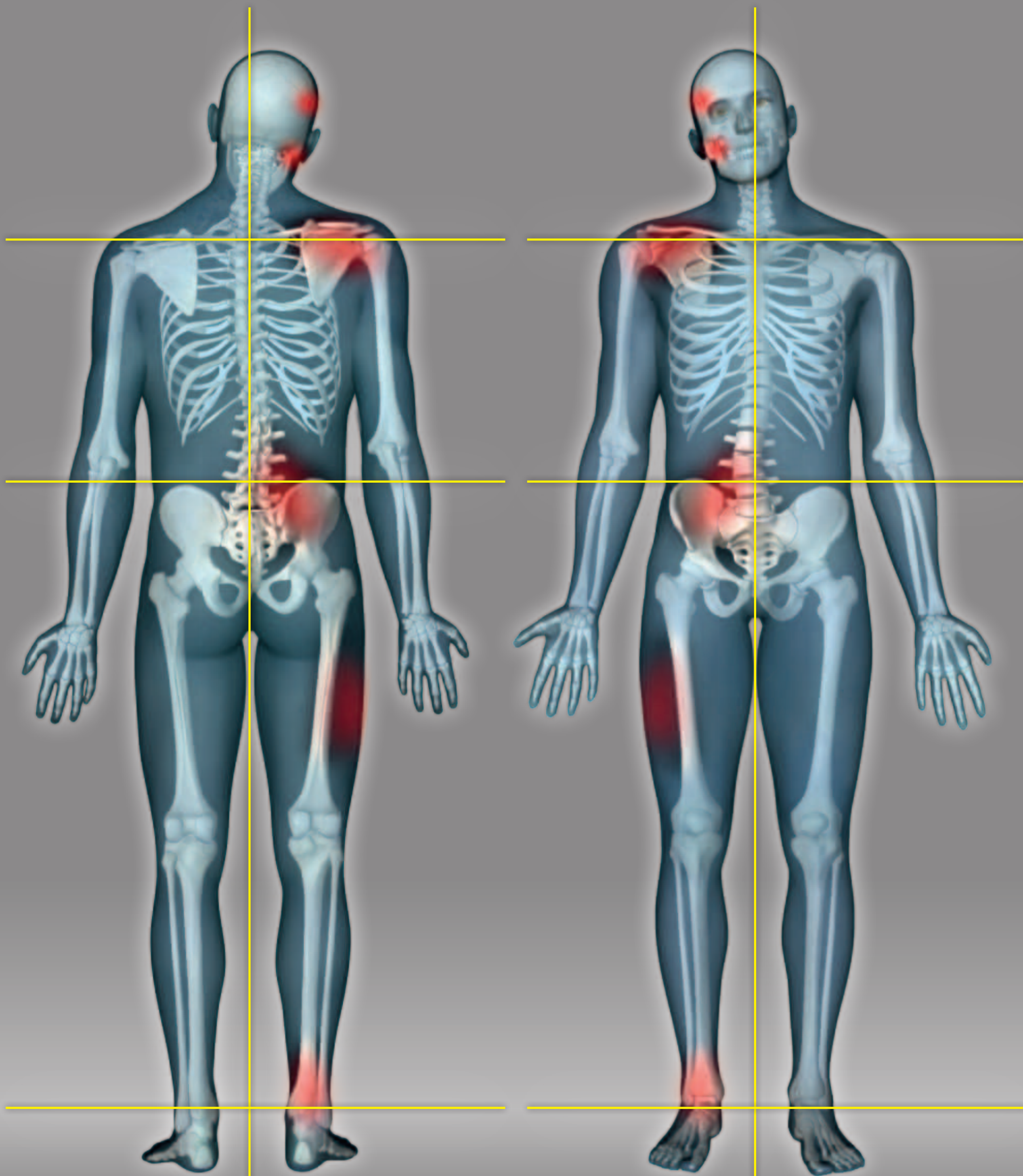
Osteopathy has studied and described front and back myofascial lines FIGS. 155, 156, which are the muscle chains primarily responsible for our body's postural balance that determines and balances loads and gravitational forces on the skeletal apparatus. The myofascial system is primarily responsible for maintaining the posture: it mainly consists of connective tissue, which is one of the four tissues that make up the human body and accounts for 16% of its weight.
The connective tissue presides over many functions among which it confers elasticity and density to tissues, it modulates and balances frictions and pressures between the body's moving segments and forms part of the immune system.
The connective tissue is morphologically

represented by different cell types (fibroblasts, macrophages, mast cells, plasma cells, white blood cells, undifferentiated cells, adipocytes, chondrocytes and osteocytes) embedded in a defined extracellular matrix (ECM), synthesized by the same connective tissue cells. Cells and matrix make up different types of connective tissue: proper connective tissue or connective fasciae (a band or sheet of connective tissue), elastic tissue, reticular tissue, mucous tissue, endothelial tissue, adipose tissue, cartilage tissue, bone tissue, blood and lymph.

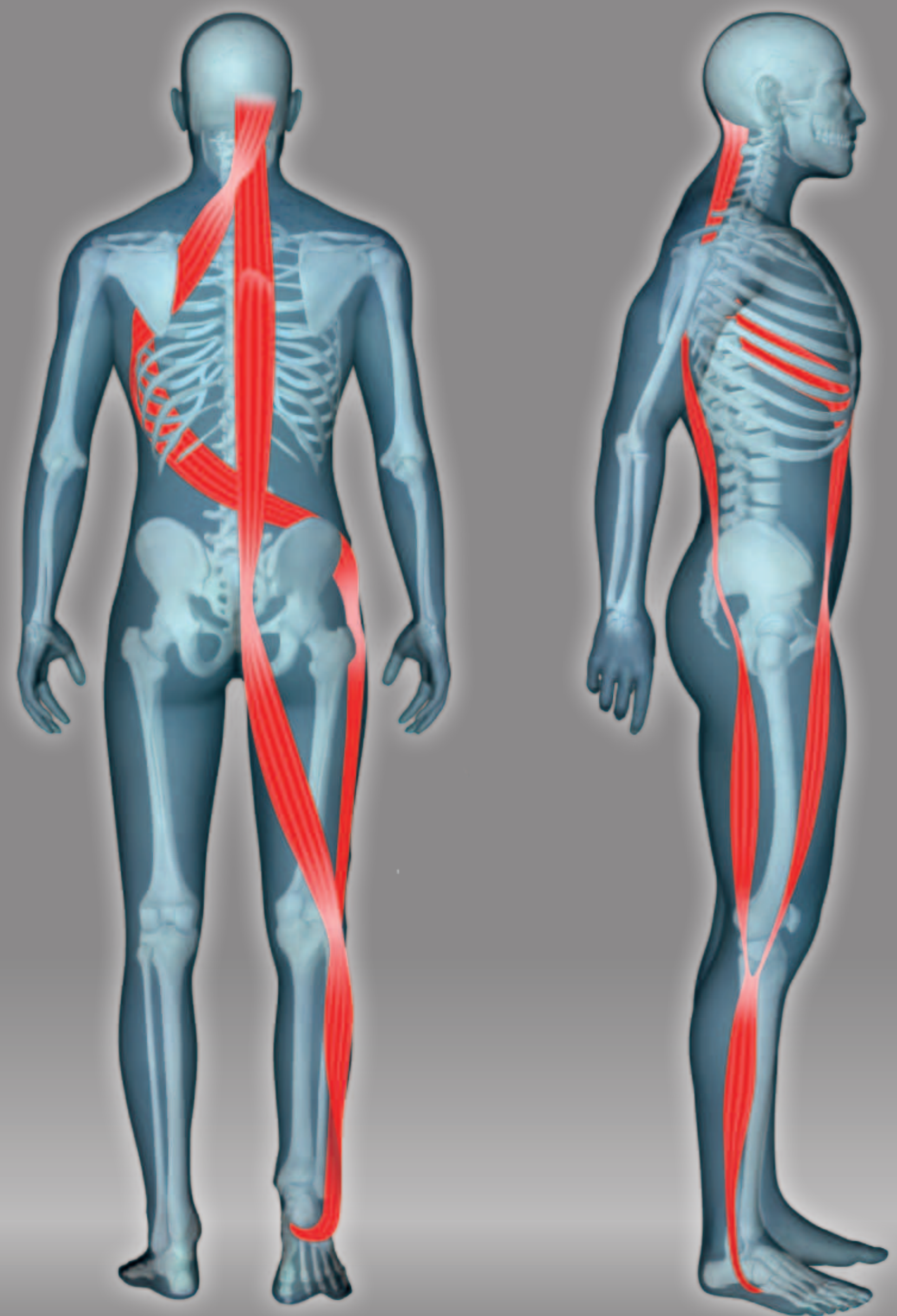
The **connective fascia** is a thin connective tissue web arranged to form continuous layers throughout the body supporting and organizing bones, muscles and all the organs that make up the human body.
All muscles with their fibers and muscle spindles are wrapped in the fascia that affects even the most microscopic structures such as fibers and myofibrils. The connective fascia is thus a sort of container that, without any interruptions connects all organs and systems of our body by linking all its parts, offering support and participating in movement, performing biomechanical and biochemical functions, modulating metabolic exchange, the action of nerves and lymphatic vessels.
The fascia includes proprioceptive receptors called Pacinian corpuscles, which respond to rapid changes in pressure and vibration and Ruffini organs, which respond to long-term pressure changes and lateral stretching. These receptors are well represented in the fasciae, tendons, ligaments and joint capsules. They respond to changes in pressure and tension, transmitting pain; they have important afferents and interconnections with the central nervous system and play an important role in managing and modulating muscle tension. The stimulation of Ruffini corpuscles and to a lesser extent, the Golgi organs, causes an increase of vagal activity that favors a relaxation in muscle tone and at a central level, reduces emotional reactivity and induces a feeling of relaxation.
The fascial tissue, through the stimuli it receives, is able to learn postural or movement patterns repeated constantly, by memorizing and stabilizing them in neural circuits. These postural schemes or movements, once learned and memorized, become automated processes that are activated without awareness (such as walking, cycling, swimming, etc.). Using the same mechanism, we learn and memorize attitudes and behaviors of defense and adaptation to injuries that our body puts in place to escape pain. As this pain-defense process continues over time, changes become more permanent and with time they get structured. This compensation ends up producing a permanent shortening and deviation and the tissue integrates this behavior in its memory and, in time, it becomes its own through constant repetitive movements. As a final result, we have an alteration of plasticity and lability of the connective tissue structure with the consequent formation of cords that make the tissue less elastic. In this protection mechanism, even muscles distant from the primary lesion are heavily involved in the defense process and the entire muscle system shortens because of pain. If this adaptive posture is maintained over time in order to adapt to a lesion, such adaptation can generate a deformation in the body that tends to stay even after the element that triggered the adaptation of defense has been removed.



151, 152 _ Postural compensation due to lateral mandibular deviation to the left.



153, 154 _ Postural compensation due to lateral mandibular deviation to the right.



155, 156 _ The myofascial lines of the body are classified into anterior and posterior lines and extend from the head to the first toe of the foot.

Fascial memory must be taken into consideration when treating Postural Syndromes. Dentists need the help of a physician specializing in physical medicine, (physiatrist) and physical therapist in order to reprogram muscle memory.
If postural balance is lacking, to maintain balance, an abnormal effort must be made from the musculoskeletal system with a myofascial dysfunction, characterized by muscle hypertonia with an alteration in the extension and elasticity of muscle chains and with significant stress on the locomotor system. In the long run, all this can cause injury to the muscles (myalgia, muscle injury), to the osteoarticular tissue (chondropathies, arthritis, stress fractures), to tendons and ligaments (tendinitis, tendinosis) and the nervous system (compression of motor and sense fasciae).
The myofascial lines of our body are classified into front and back lines and extend from the head to the first toe (Myers 1997) **FIGS. 157-159**.
An occlusal imbalance that causes a lateral deviation of the mandible causes an imbalance in the pelvis to compensate due to the contraction of the Psoas Major homolateral on the side of the deviation. Body posture is the result of a very fine equilibrium that exists between all parts that make up the human body. As referred by Philipp Richter (Richter et al. 2008), the tensive and compressive forces play an important role in human physiology. The trunk of the human body is made up of two cavities (the thoracic and the abdominal cavities), which both exert an expansive force. The thoracic and abdominal cavities are both surrounded by muscles that exert an internal force to counteract the expansive forces and maintain the equilibrium. Under normal conditions the two forces neutralize one another. As mentioned above, many body fascia lines exist in the human body (myofascial lines, force lines, gravitational lines); for simplicity's sake, we will discuss only the most important ones in the translation of this text.

Anterior Fascial Line of the body

In normal physiologic conditions, the Anterior Fascial Line is parallel to the central gravitational line and runs from the chin symphysis to the pubic symphysis: mandible and pelvis have to be balanced and aligned with one another (Richter & Hebgen 2008) **FIGS. 160, 161**.
When the postural equilibrium is changed, the pressure in the trunk cavities gets adapted. The path of the Anterior Fascial Line depends on the condition of the pressure in the thoracic and abdominal cavities; when they are out of equilibrium, two different situations can occur:

- The Anterior Fascial Line falls in front of the pubic symphysis **FIG. 162**:
  - increased pressure in the abdominal cavity;
  - increase in the tension of the inguinal ligament with a risk of developing a hernia;
  - increase in the lordosis of the cervical segment of the spine;
  - the chin is pulled up and forward;
  - creates tension in the cervical-thoracic, thoracic-lumbar and the lumbar-sacral junctions;
  - the knee bends backwards (genu recurvatum);
  - increased susceptibility to ENT problems.
- The Anterior Fascial Line falls in the back of the pubic symphysis **FIG. 163**:
  - the abdominal pressure transfers to the back of the lower abdominal organs, on the aorta and on the iliac vessels;
  - the cervical part of the spine is stretched (reversing its natural curve) and the chin is pulled back;
  - thoracic kyphosis occurs (abnormally excessive convex curvature of the spine) with abnormal tension between the shoulder blades;
  - the shoulders come forward;
  - there is a tendency towards hyperlordosis in the lumbar region of the spine;

- flat chest;
- tendency to organ prolapse;
- tension in the area of the iliosacral articulation;
- knee flexing;
- tears to the Ischiocrural musculature;
- weight shifts to the heels.

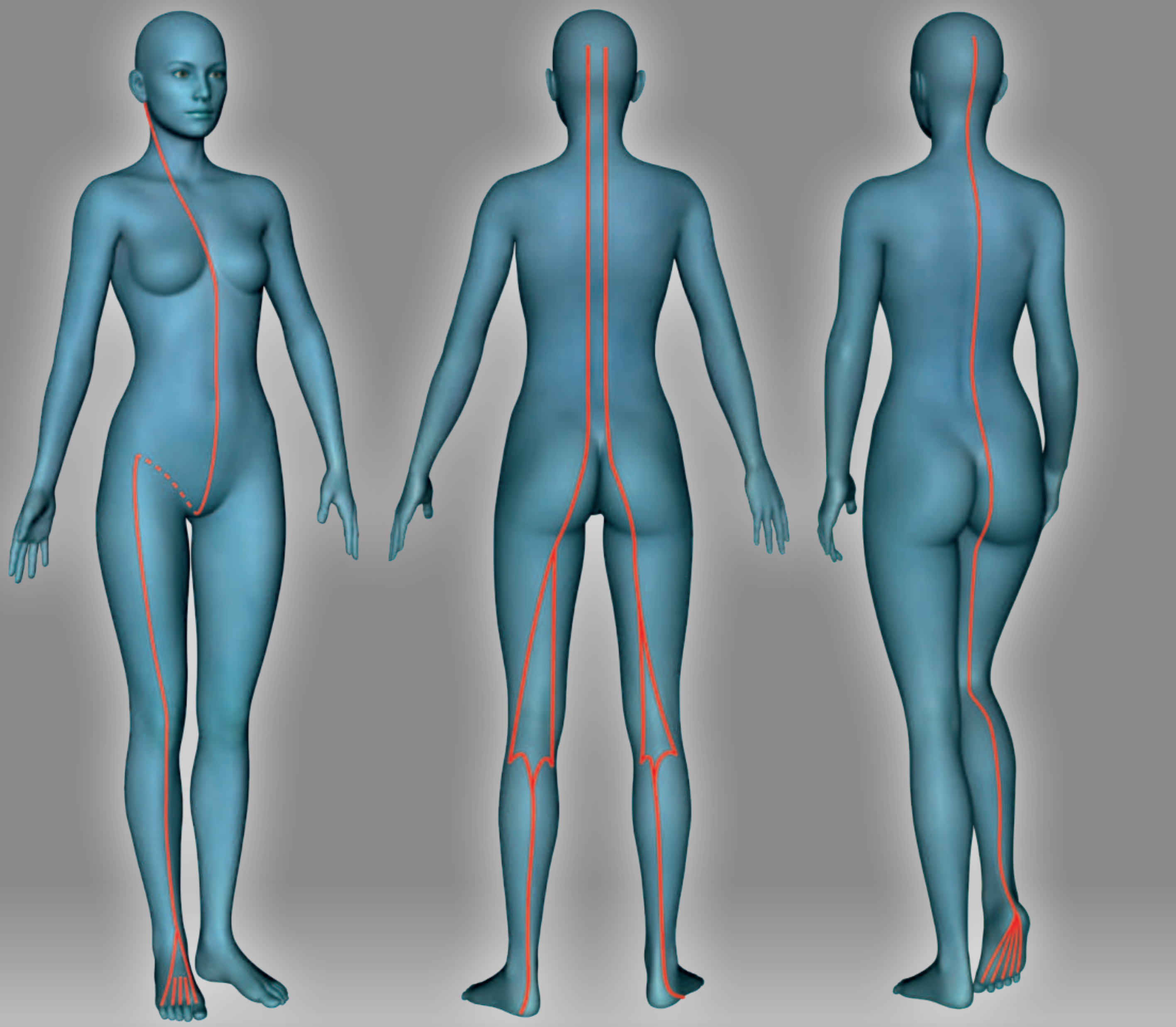
The Anterior Posterior Fascial Line of the body

This fascial line originates FIG. 164 from the opisthion (the middle point on the posterior margin of the foramen magnum, opposite to the basion) and runs through the front tubercle of the atlas, it then goes through the bodies of vertebrae T11 and T12 (which is where the Psoas Major originates and is fundamental in the postural control of the hips), then through the articular arches of L4 and L5 and finally through S1, where it terminates at the tip of the coccyx. This fascial line makes the entire spinal column a unit, giving T11 and T12 a key role in anteroposterior balancing and twisting of the trunk.
In general, a Class I skeletal relationship allows the Anterior Fascial Line to fall forward of the lateral sagittal plane. Class II skeletal relationships, both Division I and II, cause the line to fall forward of the side plane and the gravitational line to move forward as well. Patients with a Class III skeletal relationship cause the gravitational line to fall behind the side plane with obvious repercussions on the lateral body posture FIG. 165-167.
The Lateral Pterygoid muscle, with its complex trigeminal connections, takes on a directing role in managing our body postural balance by interacting and directly influencing the neck and shoulder girdle muscle tone. Clinical Evidence-Based Dentistry, supported by clinical symptomatology and MRI from a posture check-up, will clearly show the status and volume of the most important muscles at a postural level, demonstrating this close relationship and dependence between the articular disc and the Lateral Pterygoid - Upper Trapezius - Psoas Major muscles FIGS. 168-172. A mandibular deviation, in fact, induces an excess of ipsilateral tension in the masticatory muscles on the side of the deviation (Wakano et al. 2011). These muscles are also involved in maintaining head stability (Urbanowicz 1991, Wakano et al. 2011) and, therefore, mandibular muscular imbalances alter head posture (Pradham et al. 2001), creating compensation patterns (Silvestrini-Biavati et al. 2013) that change the person's posture and overall balance (Wakano et al. 2011, Baldini et al. 2013). The head is moved forward and tilted in the front plane on the side of the contracture.
Conversely, it has been shown that the position of the mandible is, in turn, greatly influenced by the position of the head (Woda et al. 2001, Strini et al. 2009).
A forward position of the head in the sagittal plane causes, in fact, an excessive contraction of the masticatory muscles resulting in dislocation of the jaw upwards and backwards with a reduction in the physiological articular space (Gonzales & Manns 1996, Strini et al. 2009). These conditions are transmitted through the muscle chains passing through the neck, the shoulder and the scapula, which appear raised in the horizontal plane with the shoulder blade often detached from the rib cage FIGS. 173, 174.
This imbalance of the upper areas (head and shoulder girdle) causes tension on the cervical and thoracic vertebrae. These tensions, in turn, cause vertebral twisting and subluxations.

To compensate for the imbalance, a response comes from the lumbar musculature, in particular the Psoas Major which, by contracting, rotates the pelvis upwards and forward on the same side of the mandibular deviation, thus resulting in a length discrepancy in the lower limbs. The end result is the creation of a precarious or pathological postural balance with all the symptomatic consequences FIGS. 175-186.
A study on laboratory rats conducted by D'Attilio and collaborators (D'Attilio et al. 2005) shows how, by modifying the occlusion with a bite plate, thus creating a lateromandibular deviation, a pelvis shift and a misalignment of the spinal column occurs. Similarly, when removing the occlusal bite plate, the spines and pelvises of 83% of the rats tested in the experiment returned to normal conditions.
When talking about the Lateral Pterygoid muscle, considering its intimate contact with the TMJ meniscus, it is as if we are talking about the TMJ itself, so we could almost identify and assimilate them as if they were a single organ or system.
It plays such an important role, that we could call it the "orchestra conductor" of all the muscle chains that govern the human body posture.
We must, therefore, acknowledge the importance and role of the TMJ, not only for our joints, but also for our posture!
This means that we should no longer consider occlusion and occlusal function only in mechanical terms, delegating its management to a cold articulator, but we must consider the mouth as part of our body, and that teeth are also needed for chewing!

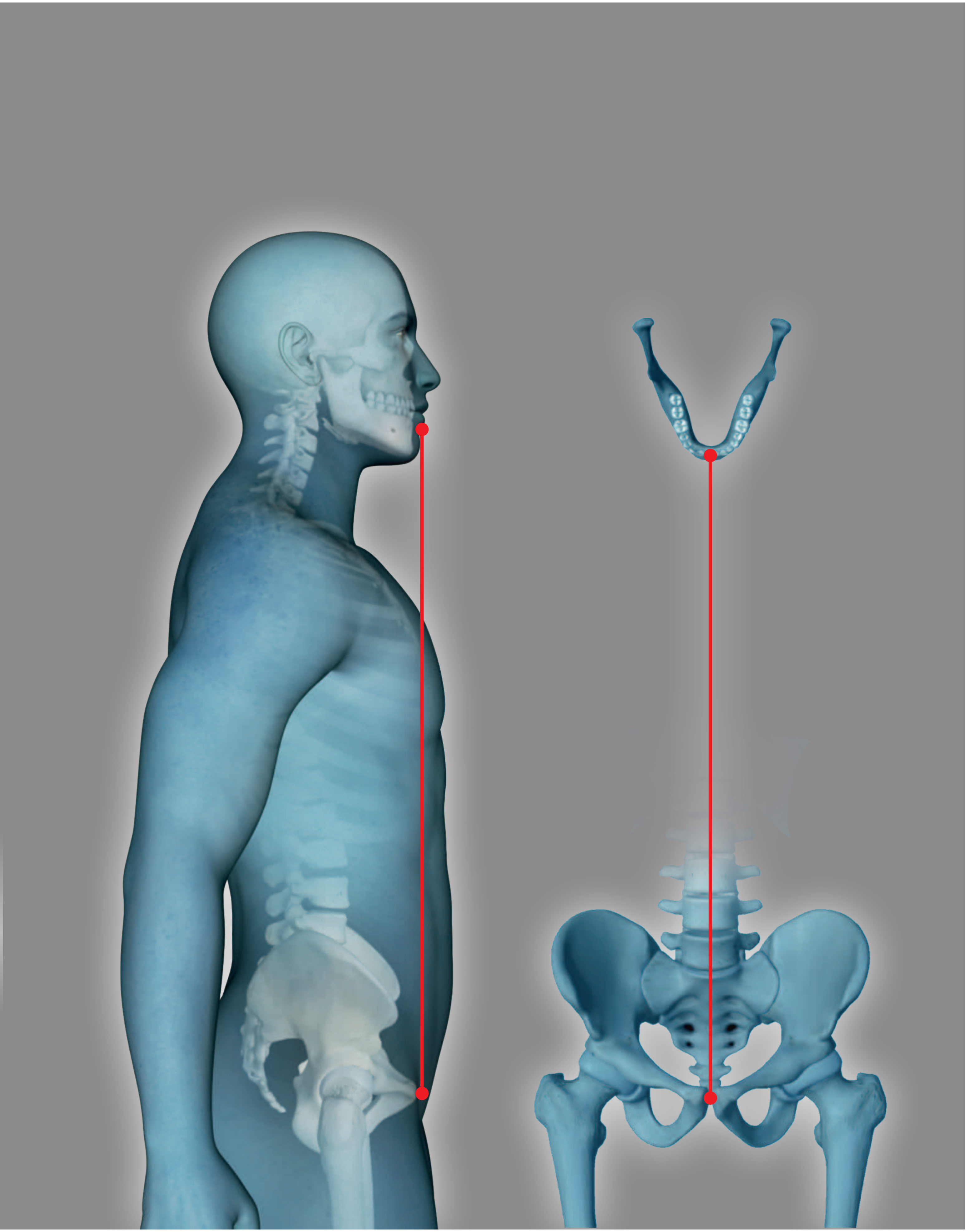
Neurophysiological aspects of Postural Syndrome

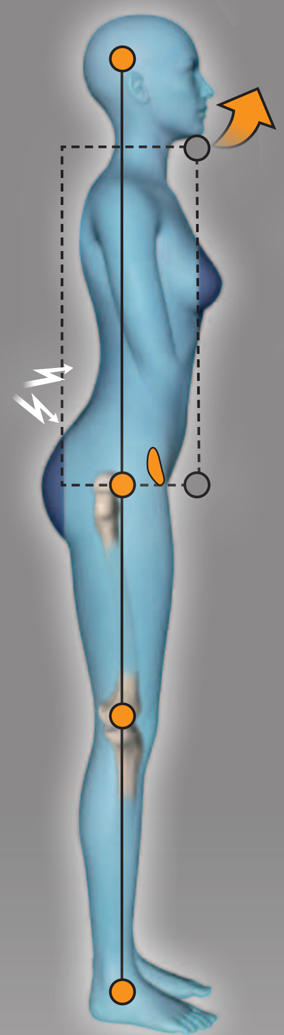
The anatomical and physiological aspects hitherto considered are still managed by the central nervous system that programs and controls postural balance. From this point of view, it is necessary to emphasize the importance of a functional approach, which recognizes the function of all processes and systems within the body, rather than focusing on the pathology in a single site, as in the case of a purely structural approach. The latter is indicated in cases of trauma or acute injuries, but when treating patients suffering from musculoskeletal chronic pain, such as those with Postural Syndrome, the functional approach certainly makes more sense. The musculoskeletal system and the central nervous system are distinguishable from an anatomical point of view, but are closely interdependent and cannot be considered separately during their function. For this reason, we prefer to use the term sensory motor system.
When treating postural cases, it is very important to embrace the concept according to which each change in one part of the system is reflected in compensations or adaptations in other areas within the same system, due to the attempt of the body to maintain homeostasis, or equilibrium. Each change generates a chain of events that has an impact over time even in areas far from area that caused them. Joint pathology, for example, originating from an occlusal problem, has effects on the muscle tones involved in stabilizing the involved joint. Muscle tone variations are the first response to nociception (response to certain harmful or potentially harmful stimuli)



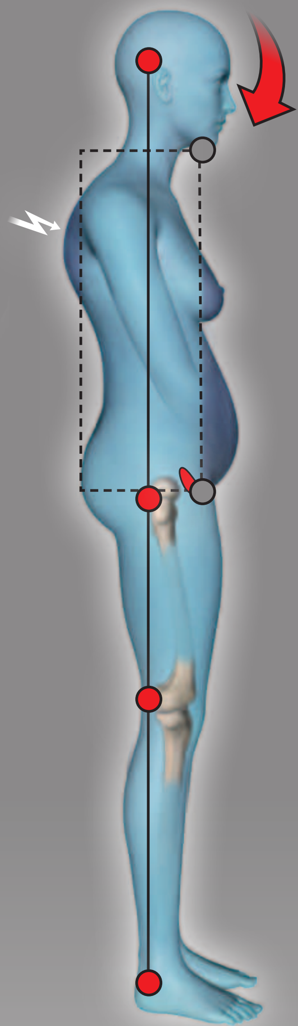
157-159 _ The anterior and posterior myofascial lines according to Myers.

160, 161 _ The anterior myofascial body line runs parallel to the gravitational center line from the chin symphysis to the pubic symphysis.

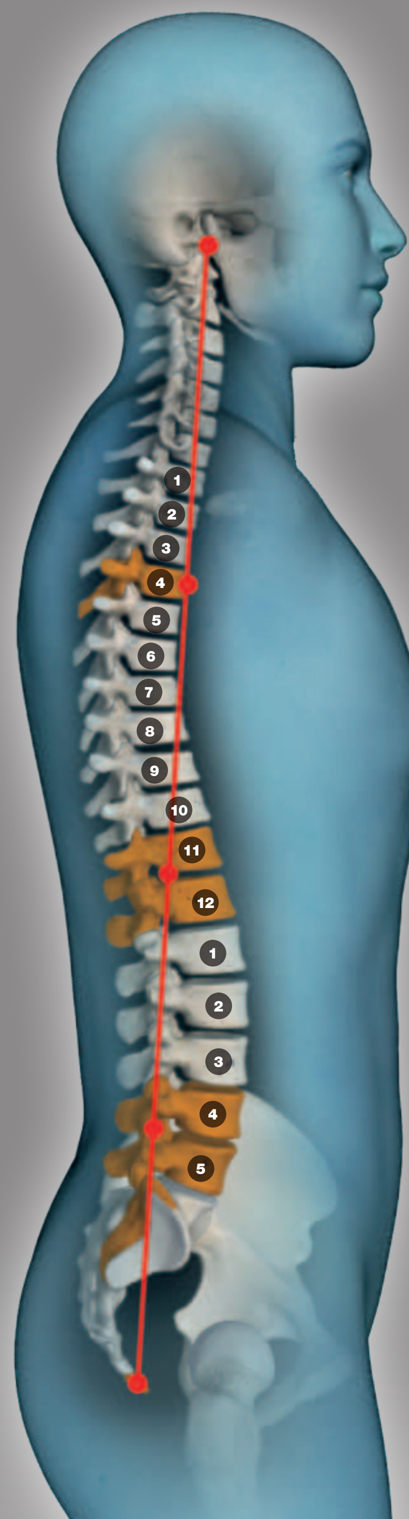




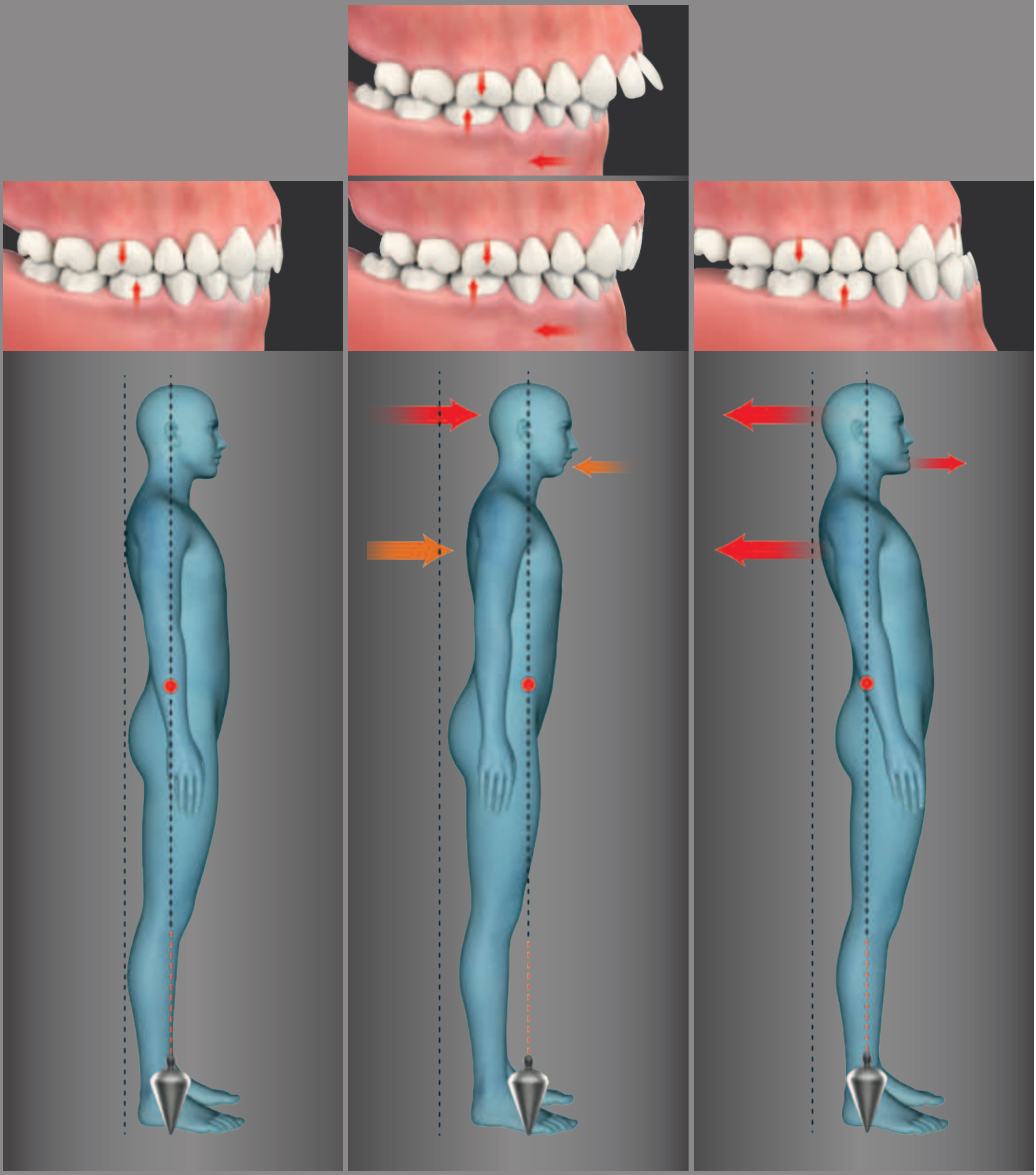
162 _ Effects on posture when the anterior line falls in front of the pubic symphysis.



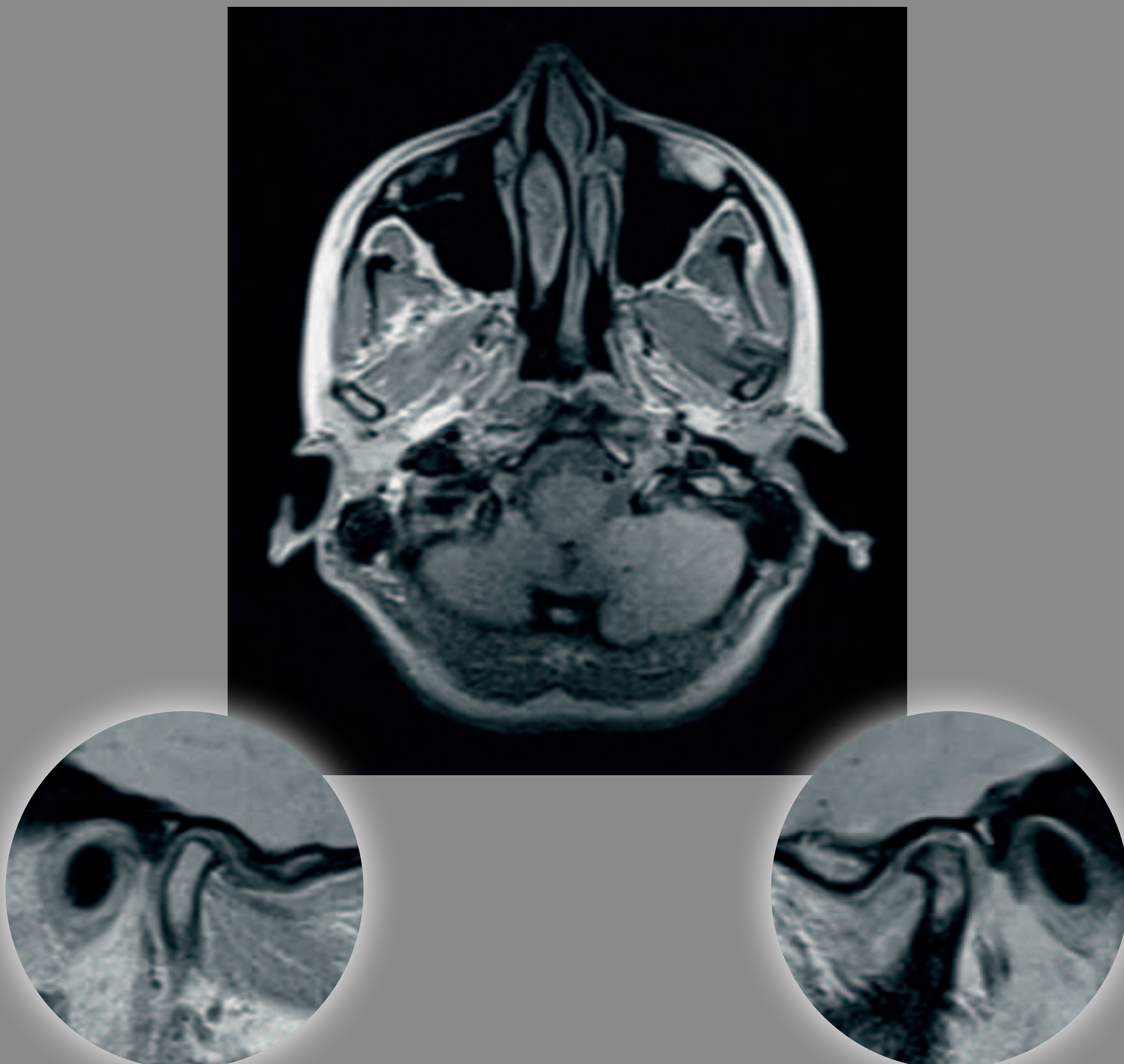
163 _ Effects on posture when the anterior line falls behind the pubic symphysis.



164 _ The anterior-posterior line of the body. Note the passage of the line from T11 and T12.



165-167 _ Influence of the intermaxillary relationships on the posture in the sagittal plane. Generally, maxillary Class I relationships are representative of a balanced posture (Fig. 165). The Class II skeletal relationship generates postural compensatory mechanisms leading to mandibular retraction, head advancement and, therefore, an advancement of the projection on the ground of the body mass center of gravity (Fig. 166). The Class III skeletal relationship causes a backward shift of the ground projection of the body's center of gravity (Fig. 167). These considerations represent only general terms, because there is an extreme variability of the consequences that the intermaxillary relationships create on the body posture.

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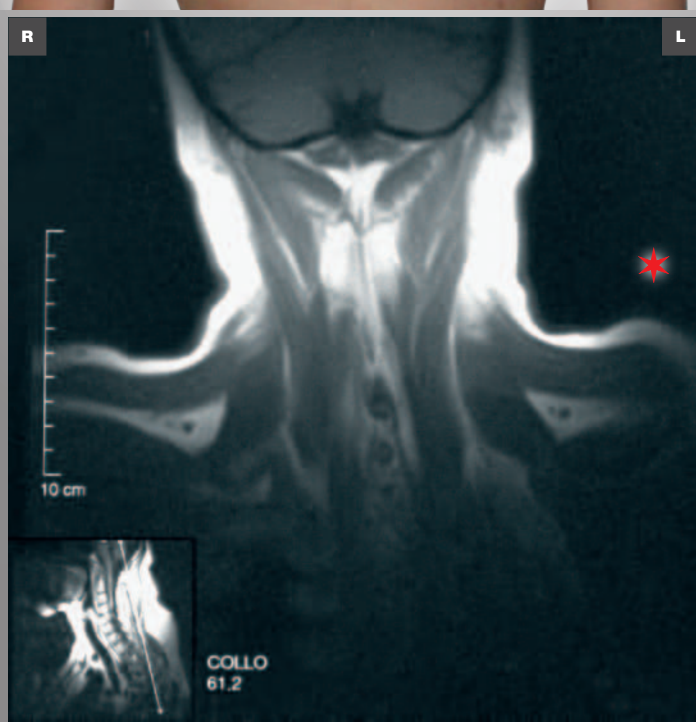
168-172 _ During a postural check-up the TMJs, the Pterygoid muscles, the Upper Trapezius and Psoas muscles are evaluated. It is possible to measure and then compare the belly size of the individual muscles in question when viewing the MRI.

173, 174 _ The hypertonic upper head of the Trapezius and the Levator muscle of the left scapula elevate the shoulder and the shoulder blade creating tension in the neck and shoulder girdle.



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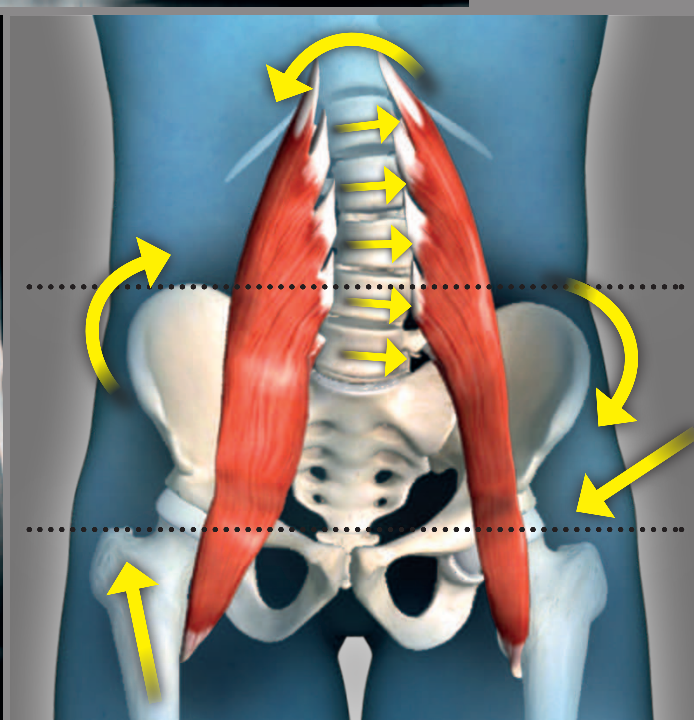
175-180 _
The patient suffered from severe pubalgia due to the significant contraction of both Psoas muscles caused by an occlusal disequilibrium. The right muscle appeared much more contracted than the left muscle. The objective intraoral examination showed teeth 26 and 27 in a crossbite and the loss of the lower first molars, with the consequent mesial inclination of the second molars.



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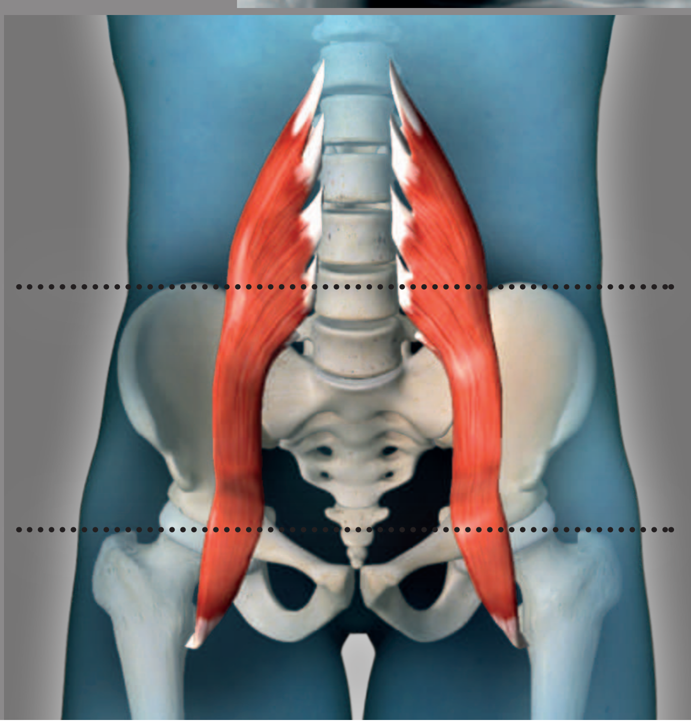
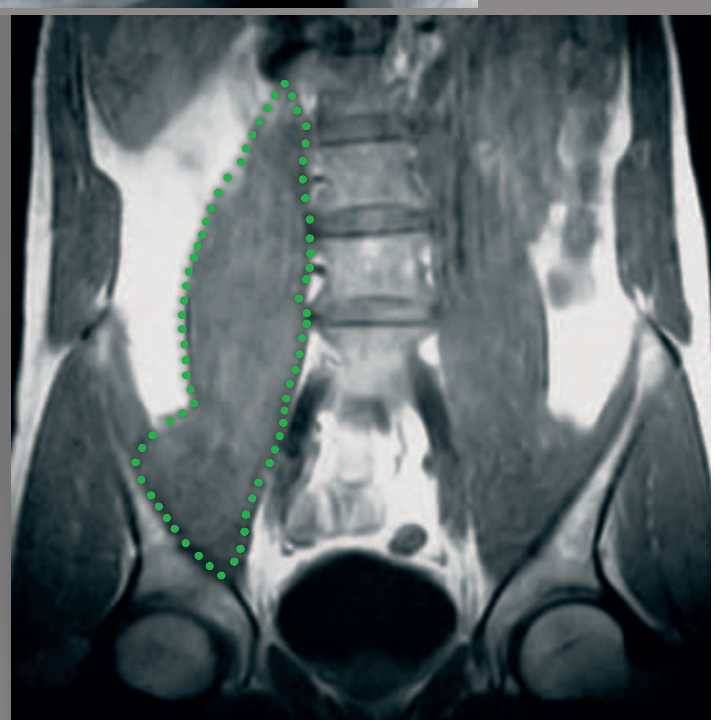
185 186

181-186 _
After rehabilitative therapy aimed at solving the occlusal problems and in particular, correcting the crossbite and uprighting teeth 37 and 47, the appearance of the lumbar spine and Psoas appears to be improved. The patient no longer suffers from pubalgia.





by the sensory motor system.
From this perspective, the muscular system condition reflects that of the sensory motor system, therefore, we should always consider a muscular problem from a functional point of view, taking into consideration the role the central nervous system plays in the genesis of the disease.
During the rehabilitation of a patient with **Postural Syndrome**, we should not expect a purely mechanical body balance change, but we must consider that the sensory motor system has adapted itself to work, often for years, in an abnormal situation. A physical therapist, for example, working on the muscle groups involved in the pathology FIGS. 187, 188, encounters resistance of the nervous system, which tends to restore the muscle tone to the condition used to working. Patience and time are necessary during the treatment of a patient with **Postural Syndrome**, since, after removing the causes (descending and ascending problems), the sensory motor system needs time to re-register and readapt to the new postural equilibrium.
When considering the functional approach and the sensory motor system, one of the greatest pioneers in this field was Vladimir Janda. His approach to the syndrome, which he characterized as "**chronic pain**", classified from a functional standpoint, muscles as tonic and phasic. For neurophysiological reasons, the former are prone to tension and shortening, the latter to inhibition and weakness. Although this classification is not rigid, a list of tonic and phasic muscles was drawn up TAB. 1.
Janda was been able to define two syndromes: **the Upper Crossed Syndrome** and **Lower Crossed Syndrome**, characterized for the crossing by definition of tonic or phasic muscles between two parts of the body. In the **Upper Crossed Syndrome** when the suboccipital muscles contract, the Superior Head of the Trapezius and Levator Scapulae, there is a corresponding contraction of the ipsilateral Pectoralis and Sternocleidomastoid; with an inhibition/weakness of Rhomboidei and the inferior head of the Trapezius, there is a corresponding weakness in the cervical flexors FIG. 189. With this pattern, the head is forced to move forward and tilt on same side, the shoulder must lean forward and, therefore, the shoulder blade is raised and detached from the rib cage, just like in the **Postural Syndrome** pattern previously explained.
These dynamics are necessary from a functional point of view. For the sensory motor system, the contraction of a certain muscle group necessarily generates an inhibition of the group that performs the opposite function. This happens because the system is designed to react not only from a purely mechanical, but also a neuromuscular point of view (the central nervous system is the control center of all bodily functions and reactions).
Similarly, in the **Lower Crossed Syndrome** the neuromuscular facilitation of the Thoracolumbar Extensors, Iliopsoas and Rectus Femoris muscle, corresponds to an inhibition of Abdominal and Gluteus Minimus, Medius and Maximus muscles FIG. 190.
To emphasize the functional concept, it is necessary to highlight that the division into Upper and Lower Syndrome proposed by Janda, has a purely educational significance, since a change in balance between head, neck and shoulder blades corresponds (and it must always correspond) to pelvis adaptation in order to keep our balance FIG. 191.
In Dentistry, the clinical significance of Janda's theory is very important for the purposes of complete occlusion-postural rehabilitation.
The patient with chronic occlusal imbalance, in fact, presents a situation of chronic neuromuscular postural adaptation with contracted and hyperactive muscles on one side, with corresponding weak and inhibited muscles both at the level of the scapular girdle

(on the side where the mandible is diverted), and in the lumbosacral region. The occlusal rehabilitation must, therefore, be supported by the postural rehabilitation performed by supporting colleagues of the dentist, such as the osteopath, the chiropractor and the physiotherapist. Often the role of these three figures is confused and not well identified. The osteopath and chiropractor treat the spine and joints reducing the torsions of the vertebrae to reorganize and rebalance the neurovascular system and promote the reprogramming of the neuromuscular system. The physiotherapist will improve the areas related to motor skills by working on the patient either directly or indirectly by prescribing home exercises.

Problems related to postural dysfunction

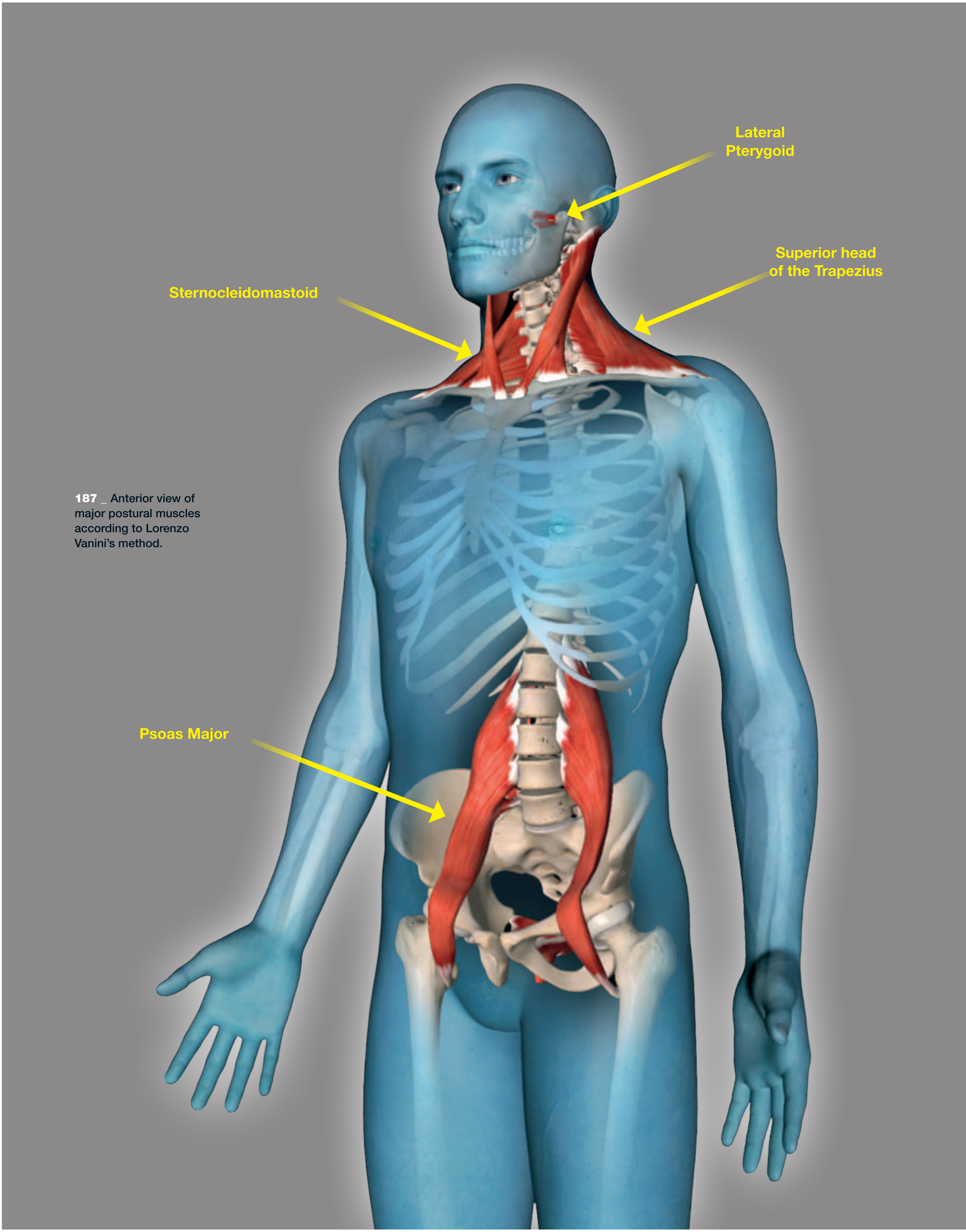
How many people suffer from postural problems? How many of them complain of continuous and repeated headaches, stiff neck, back pain and joint pain that cannot be explained and do not improve after careful analysis, pharmacological therapy and/or physiotherapy? They are everyone’s problems, however, that few really fully understand.

Each person has some individual capacity or adaptation threshold, influenced by many internal and external factors, for example, visual, otovestibular, proprioceptive (articular-muscular-tendon-ligament-fascia), exteroceptive (skin) and endoceptive (visceral system) information that is translated, modulated and integrated by reflexes into the central nervous system. Only when the individual adaptation threshold is exceeded do symptoms appear. The good clinician must be capable of recognizing the signs, before they manifest into symptoms!

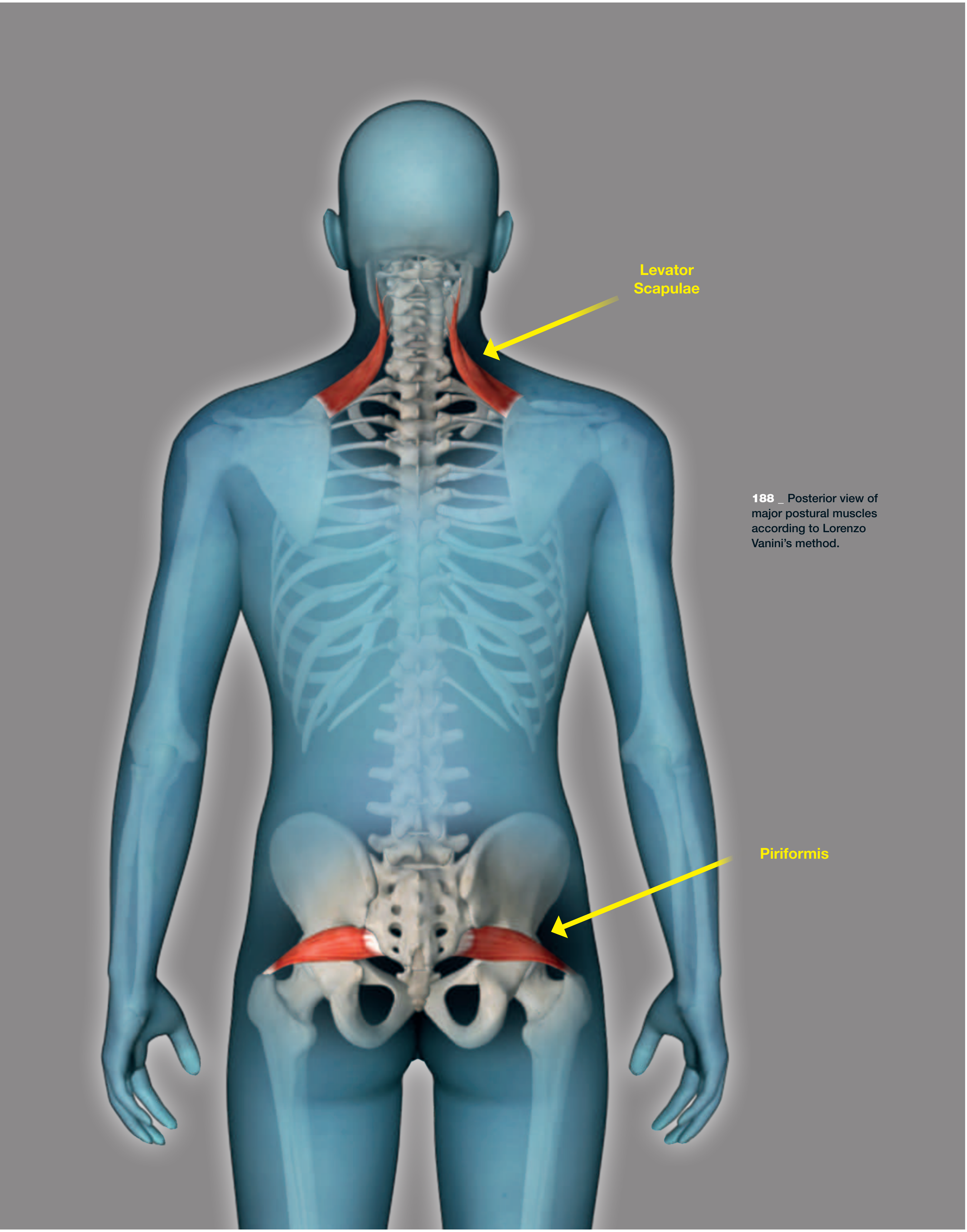
The **Postural Syndrome** is characterized by signs and symptoms that can affect various anatomical areas and present

TONIC MUSCLES	PHASIC MUSCLES
Inclined towards tension and shortening	**Inclined towards inhibition and weakness**
Upper head of the Trapezius	Deep neck flexors
Levator Scapulae	Rhomboids
Sternocleidomastoids	Rectus Abdominis
Pectoralis Major	Hip extensors
Thoracolumbar extensors	Gluteus Medius, Minimus and Maximus
Iliopsoas	Anterior Tibialis
Flexors of the hip	
Piriformis	
Tensors of the fascia lata	
Rectus Femoris	
Gastrocnemius	
Soleus	
Posterior Tibialis	

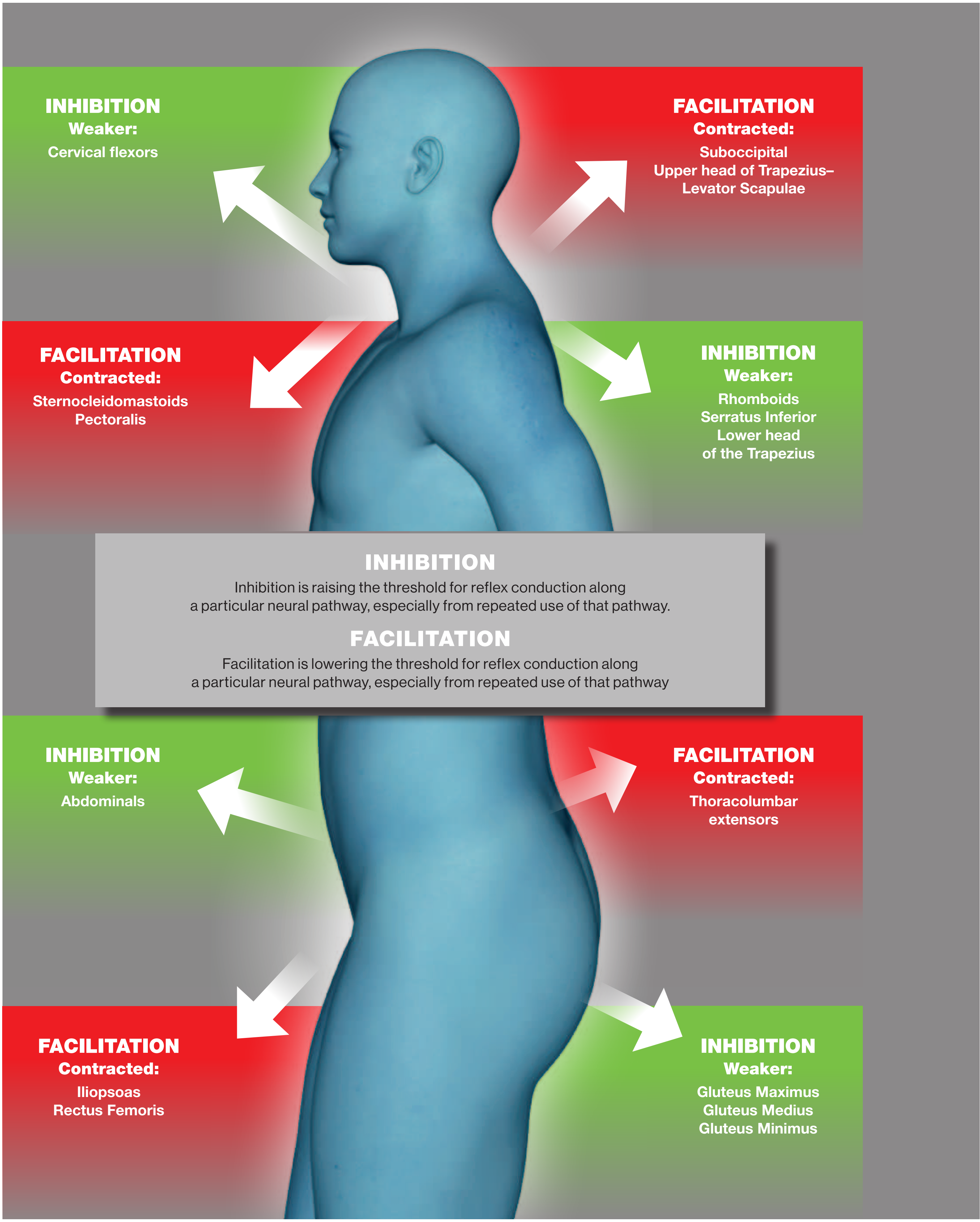
Table 1
Tonic muscles and phasic muscles according to V. Janda.

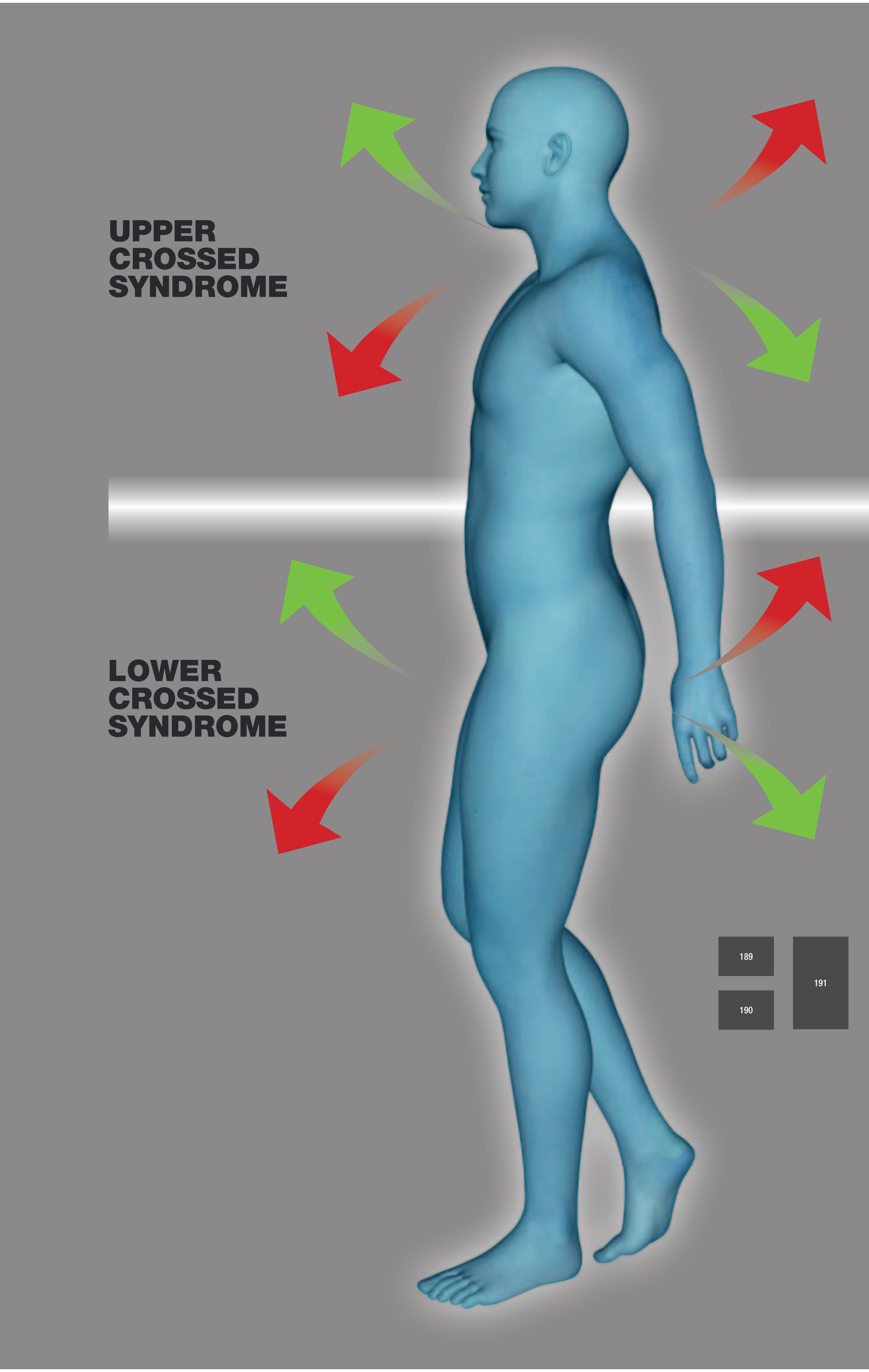


187 _ Anterior view of major postural muscles according to Lorenzo Vanini's method.



188 _ Posterior view of major postural muscles according to Lorenzo Vanini's method.


INHIBITION
Weaker:
Cervical flexors
FACILITATION
Contracted:
Suboccipital
Upper head of Trapezius–
Levator Scapulae
FACILITATION
Contracted:
Sternocleidomastoids
Pectoralis
INHIBITION
Weaker:
Rhomboids
Serratus Inferior
Lower head
of the Trapezius
INHIBITION
Inhibition is raising the threshold for reflex conduction along
a particular neural pathway, especially from repeated use of that pathway.
FACILITATION
Facilitation is lowering the threshold for reflex conduction along
a particular neural pathway, especially from repeated use of that pathway
INHIBITION
Weaker:
Abdominals
FACILITATION
Contracted:
Thoracolumbar
extensors
FACILITATION
Contracted:
Iliopsoas
Rectus Femoris
INHIBITION
Weaker:
Gluteus Maximus
Gluteus Medius
Gluteus Minimus

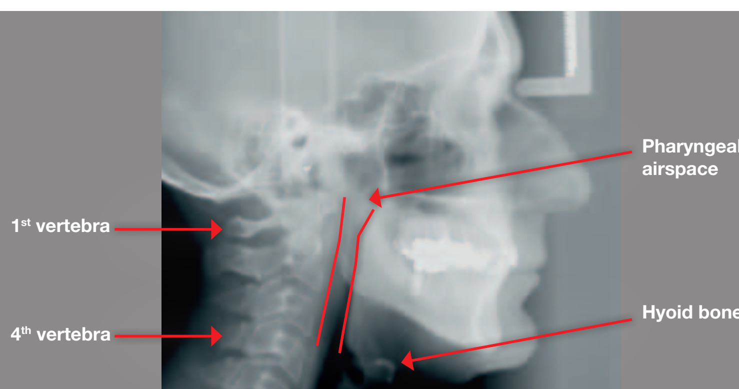


189 _ *Upper Crossed Syndrome.*

190 _ *Lower Crossed Syndrome.*

191 _ *Upper Crossed Syndrome* and *Lower Crossed Syndrome* can never be separated, because a modification of the balance in one region will always cause a change in the other as well.

descending pathogenesis factors (from the head to the rest of the body) or **ascending** (from the body to the head). The **Postural Syndrome** is characterized by musculoskeletal pain initially located in the cervical spine, but then spreading to other areas down to the lower back.
For example, the reduction of the suboccipital space, caused by an excessive contraction of the neck muscles is at the root of many headaches. When the upper part of the Trapezius muscle is overly contracted, it causes an excessive stimulation of the Greater Occipital nerve that crosses it (Simmons et al. 1998).
Pain in the head and neck, pain in the area innervated by the trigeminal nerve and impaired speech and swallowing are often associated with dislocation of the first cervical vertebrae (Munthos et al. 2005, Catanzariti et al. 2005, Stack & Sims 2009, Sims et al. 2012). C2 and C3 vertebrae dislocation can cause hoarseness and the feeling of having a lump in the throat. These conditions can be caused by a contracture of the Levator Scapulae muscle, which originates from the transverse processes of vertebrae C1 to C4 and from the Omohyoid muscle, which originates from the upper edge of the shoulder blade and inserts on the hyoid bone, thus affecting functions in the oropharyngeal area.
Problems during sleep, such as sleep apnea or snoring, frequently depend on reduced posterior air space, caused by a malposition of the hyoid bone and the vertebrae making up the cervical spine.
The hyoid bone is of particular importance in the Postural Syndrome. It is the only bone in the human body that is not hinged to any other, and its position is kept in balance only by the Suprahyoid and Subhyoid muscle tone. These muscles contribute to important functions such as chewing, mandibular movement, swallowing and phonation. The muscular system tied to the hyoid bone seems to also play an important role in adjusting the posture between both sides of the body. The connections between hyoid bone and mandible, neck, shoulder, collarbone, sternum and thyroid generate a considerable transmission of information from neuromuscular spindles.
Since our central nervous system is receiving complete information on the hyoid bone position at all times, any



192 _ The hyoid bone and the oral pharyngeal space are highlighted. The cervical vertebrae have a lordotic curve in the first part of the spinal column.

193 _ Patient with physiological cervical lordosis. The hyoid bone is located between the third and fourth cervical vertebra.

194 _ Patient with reduction of cervical lordotic curvature. The hyoid bone is in a forward and upwards position.

change in one or more of these areas generates repercussions to the hyoid, which are also detected on a central level (Whalter 1996).
For example, a jaw deflected to the right with a frontal inclination, on the ipsilateral side of the skull, generates a lateral displacement of the hyoid bone with possible repercussions on all the functions it plays and its attached muscles.
An interesting analysis on the lateral side can also be performed when observing the lateral cephalometric radiograph.
In patients with Postural Syndrome, we can observe a reduction of the posterior air space, changes in their cervical lordotic curve and the hyoid bone position FIGS. 192, 193.
The lordotic curve may look reduced, sometimes even reversed. Typically, in these cases, the hyoid bone moves forward and upwards FIGS. 194-196. In other cases, the curve looks hyperlordotic with head and neck hyperextension FIGS. 197, 198. The hyoid bone, in general, moves back and down, but rises when the head is straightened FIGS. 199-246, TABB 2-5. These conditions are also associated with the presence of flat or hollow feet (Stefanelli 2003).

The posterior dislocation of the TMJ condyle in the glenoid fossa creates a compression and, consequently, generates an excessive stimulation of retrodiscal tissue, which is full of vessels and nerves, especially of the auricular-temporal nerve fibers. This condition can lead to static and dynamic equilibrium problems (Stack & Sims 2009), and tinnitus.
Studies show that patients with temporomandibular disorders may, more frequently than others, be suffering from problems such as tinnitus and vertigo (Lee et al. 2015). These symptoms, however, disappear when injecting anesthetic in some postural muscles such as, for example, the Lateral Pterygoid muscle (Björne 2007).
The presence of ear disorders, such as tinnitus, have an approximate three times higher frequency in patients who also have temporomandibular disorders (Lee et al. 2015). In addition, patients suffering from tinnitus suffer from myofascial and TMJ pain (Bernhardt et al. 2004).
It appears, therefore, critical to treat temporomandibular disorders in patients with tinnitus (Vielsmeier et al. 2011).

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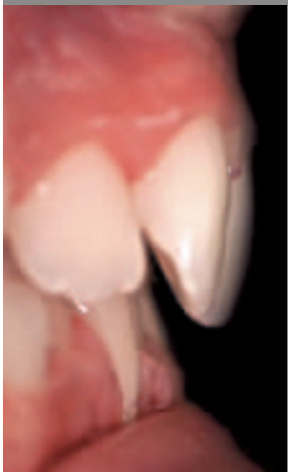
195 _ Patient with reversed cervical lordotic curvature. Note the forward and upward position of the hyoid bone.

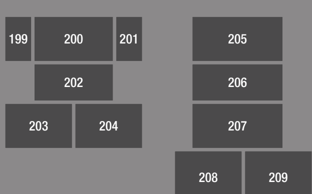
196 _ The patient shows an important reversed cervical lordotic curvature.

197 _ Patient with cervical hyperlordosis. The hyoid bone tends to move backwards and downwards. Note a reduction in the posterior air space.

198 _ Patient with cervical hyperlordosis. The hyoid bone has moved backwards. Note the reduction in the posterior air space.



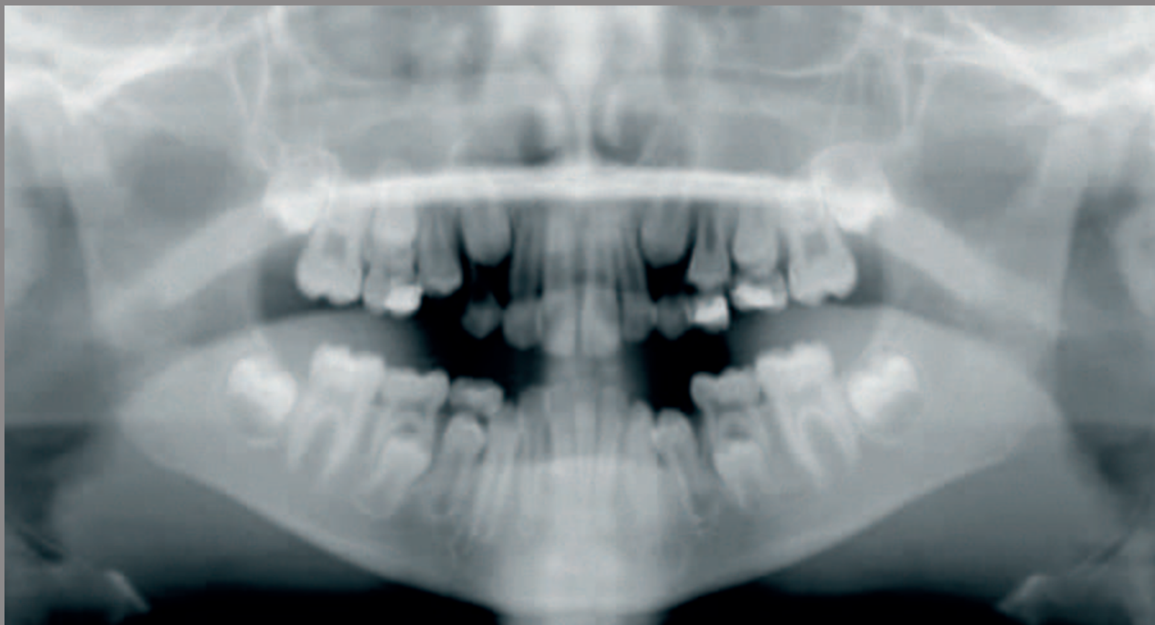


199-204 _ 9.5-year-old female patient, who had a skeletal Class II malocclusion, with a 6 mm overbite and a 5 mm overjet, Class II molar relationship on the right and a Class I molar relationship on the left; the arches showed an excess dental-maxillary disharmony, with consequent overcrowding. Please note the gingival recession on tooth 41.

205 _ The treatment plan called for the use of only one preformed elastodontic device to wear 2 hours a day performing active exercises and continuous passive nocturnal use. Once the molar relationship was corrected, the device was worn only during the night to stabilize the result and guide the remaining adult teeth into place.

206-209 _ After 24 months of elastodontic treatment, a correct transverse upper jaw dimension has been restored. The physiological gingival level on tooth 41 was almost completely recovered. Please note a slight deviation of the midline (that was corrected during maintenance post-treatment).



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210, 211 _ The examination of the cephalometric radiograph shows an important cervical hyperlordosis with hyperextension of the head on the neck. The hyoid bone is positioned downwards and backwards. This position of the head in the sagittal plane also forces an incorrect positioning in the Frankfurt plane to perform the teleradiography, because the patient is not able to maintain a correct head posture.

212 _ Note the reduction of joint spaces between C2, C3 and C4.

Cephalometric values at the beginning of treatment

ANB	ANB	5.91
Position of the maxilla	SNA	82.46
Position of the mandible	SNB	76.54
Articular angle	SArGo	137.88
Gonial angle	ArGoMe	128.81
Lower incisor angle mandibular body	liMand	90.12
Upper incisor angle anterior cranial base	IsCran	93.15
Interincisal corner	II	142.26

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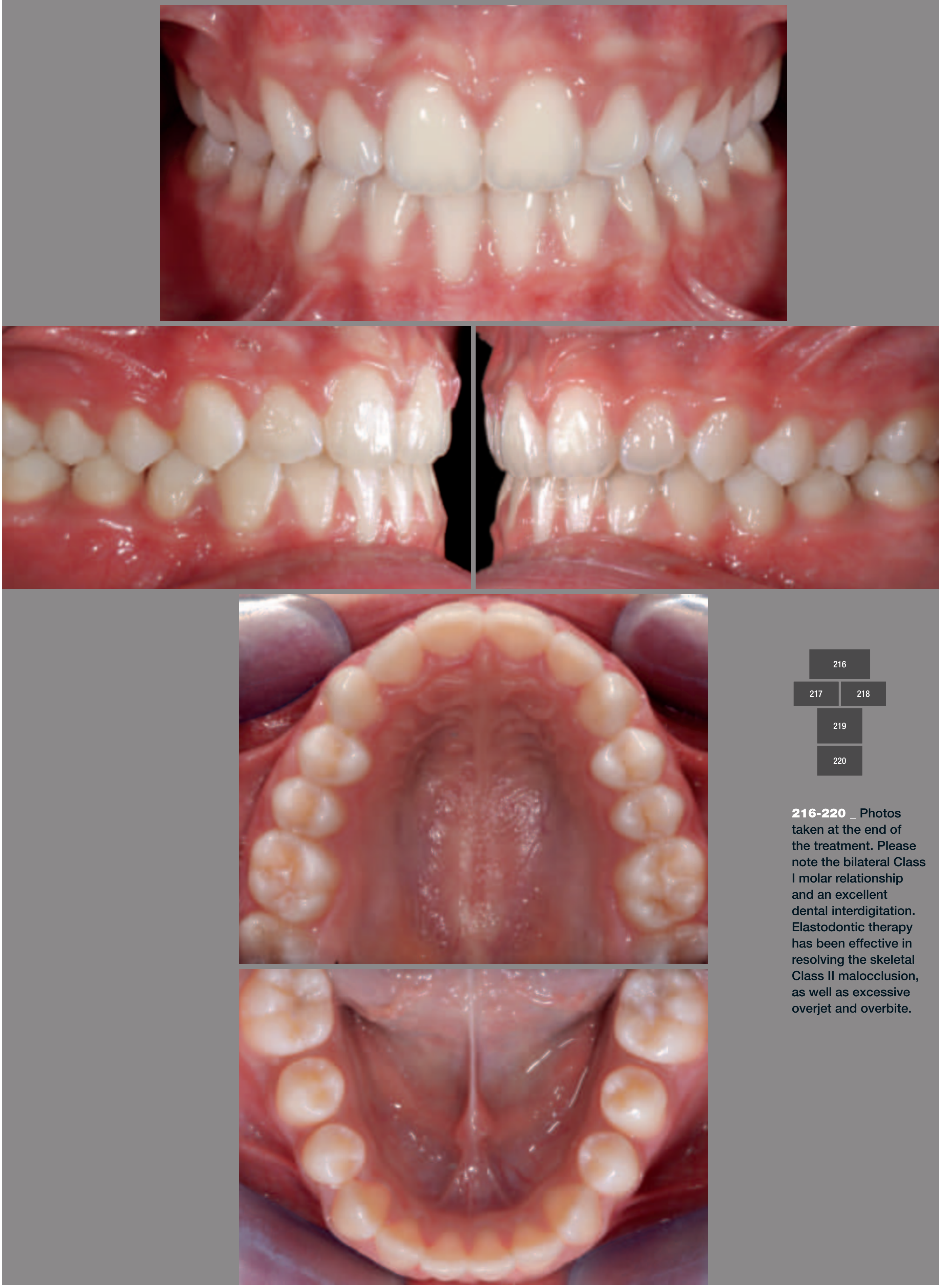
213, 214 _ Lateral cephalometric radiograph performed at the end of treatment shows a normal cervical lordosis and a hyoid bone correctly positioned. Postural correction was achieved with elastodontic treatment alone, without the aid of physiotherapy.

215 _ Note the normalization of joint spaces between C2, C3 and C4.

Cephalometric values at the end of the treatment

ANB	ANB	2.26
Position of the maxilla	SNA	78.72
Position of the mandible	SNB	76.46
Articular angle	SArGo	142.76
Gonial angle	ArGoMe	127.73
Lower incisor angle mandibular body	IiMand	94.00
Upper incisor angle anterior cranial base	IsCran	96.36
Interincisal corner	II	131.55



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216-220 _ Photos taken at the end of the treatment. Please note the bilateral Class I molar relationship and an excellent dental interdigitation. Elastodontic therapy has been effective in resolving the skeletal Class II malocclusion, as well as excessive overjet and overbite.

221
222 223
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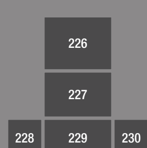
221-225 _ Photos taken 4 years post-treatment. The patient wore the same elastodontic device as a nocturnal orthodontic retainer. Note the improvement in the intercuspidation of the lateral sectors and a perfect centering of the median line and the frenula. The occlusal photos highlight the closure of the spaces present in the posterior sectors of the inferior arch; the result was obtained by wearing the elastodontic device on alternate nights.



226-230 _ 11-year-old male patient, who had a severe skeletal Class II malocclusion, 5 mm overbite with a 7 mm overjet, mild Class II molar relationship on the right and on the left, Class II canine relationship on the right and on the left, protrusion of the upper arch, and retracted chin.

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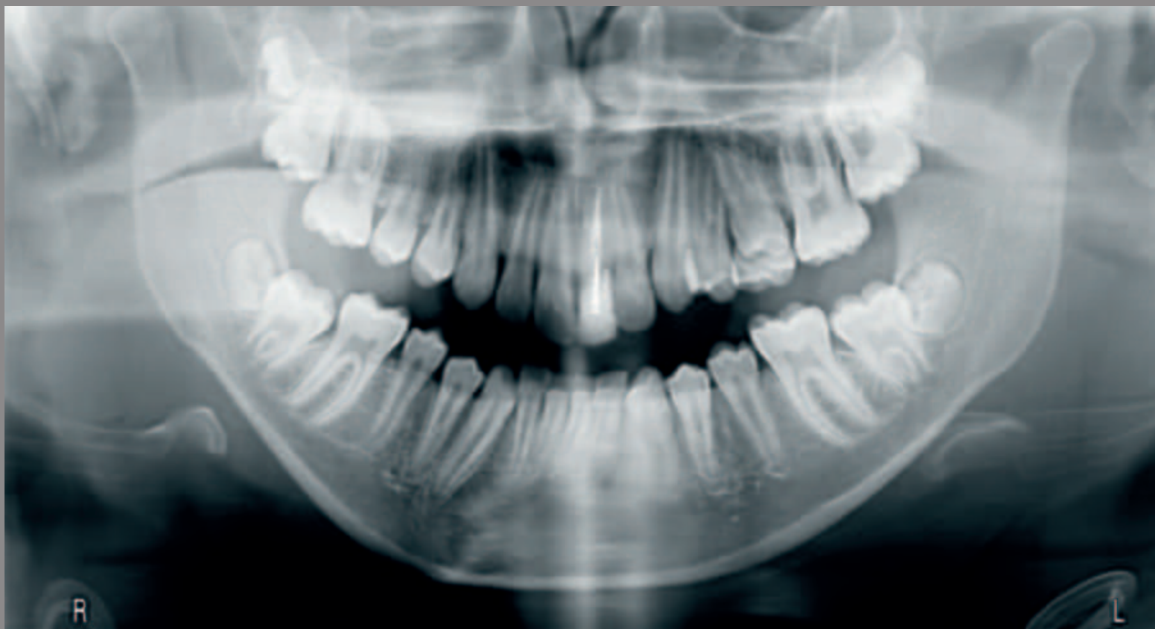
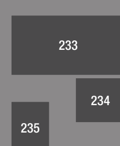
231 _ The treatment plan involved the use of a preformed elastodontic device to be worn 2 hours a day doing active exercises and passively during the night.
Once the correction of the molar relationship was obtained, the patient wore the device only during the night to stabilize the results obtained, and to restore the balance between the muscles of the lips and the tongue in an optimal manner.

232 _ After 12 months of elastodontic treatment, a correct occlusal relationship and adequate mandibular posture were restored. Furthermore, a correct upper transverse dimension was achieved, and consequently, a functionally valid mandibular position.

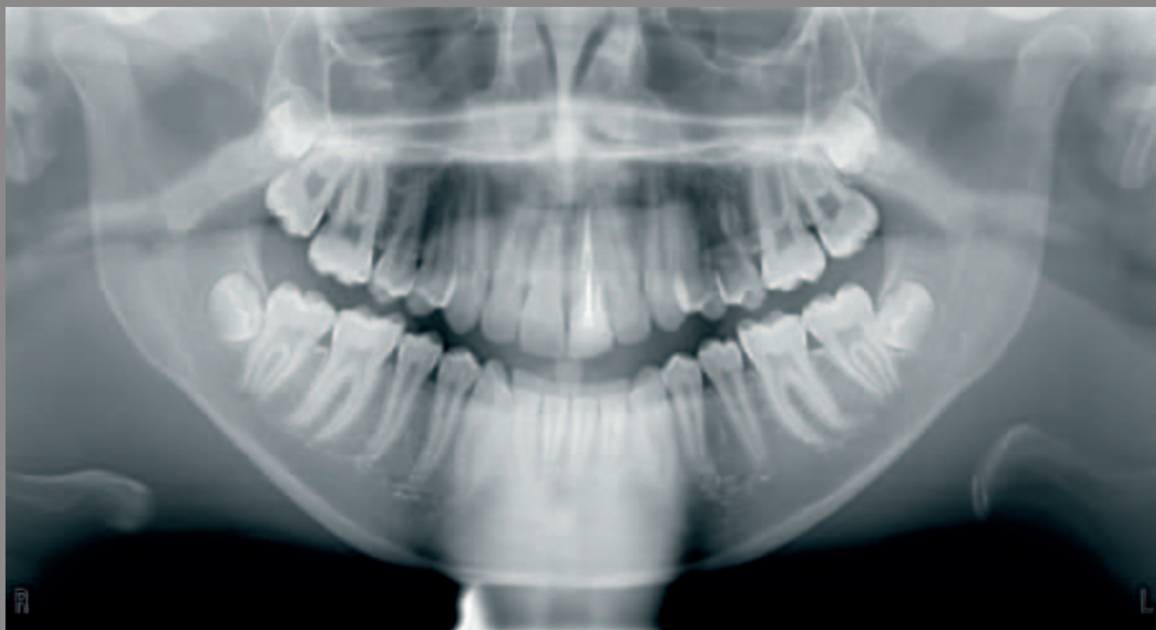




233-235 _ Lateral cephalometric radiograph showing cervical hyperlordosis. It is possible to note a reduction of the joint spaces between the C2, C3, C4 and C5 vertebrae.

Cephalometric values at the beginning of treatment

ANB	ANB	6.00
Position of the maxilla	SNA	84.00
Position of the mandible	SNB	78.00
Articular angle	SArGo	145.00
Gonial angle	ArGoMe	142.00
Lower incisor angle mandibular body	IiMand	86.00
Upper incisor angle anterior cranial base	IsCran	110.00
Interincisal corner	II	121.26



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236-238 _ Laterolateral teleradiography, performed at the end of the treatment, reveals a normal cervical lordotic curve and a normalization of the articular spaces between the C2, C3, C4 and C5 vertebrae. Postural correction was obtained with elastodontic treatment alone, without the aid of physiotherapy, demonstrating that the simple orthodontic treatment performed according to minimally invasive criteria, respecting the postural system, leads to an improvement in the postural alignment of the head and cervical vertebrae.

Cephalometric values at the end of the treatment

ANB	ANB	3.80
Position of the maxilla	SNA	80.00
Position of the mandible	SNB	76.20
Articular angle	SArGo	147.00
Gonial angle	ArGoMe	137.00
Lower incisor angle mandibular body	IiMand	83.00
Upper incisor angle anterior cranial base	IsCran	105.00
Interincisal corner	II	128.00

239, 240 _ Preliminary lateral photos.

241, 242 _ Lateral photos at the end of treatment. The elastodontic therapy has resolved the skeletal Class II malocclusion and the excessive overjet and overbite.

243 _ Front image at the end of the elastodontic treatment.

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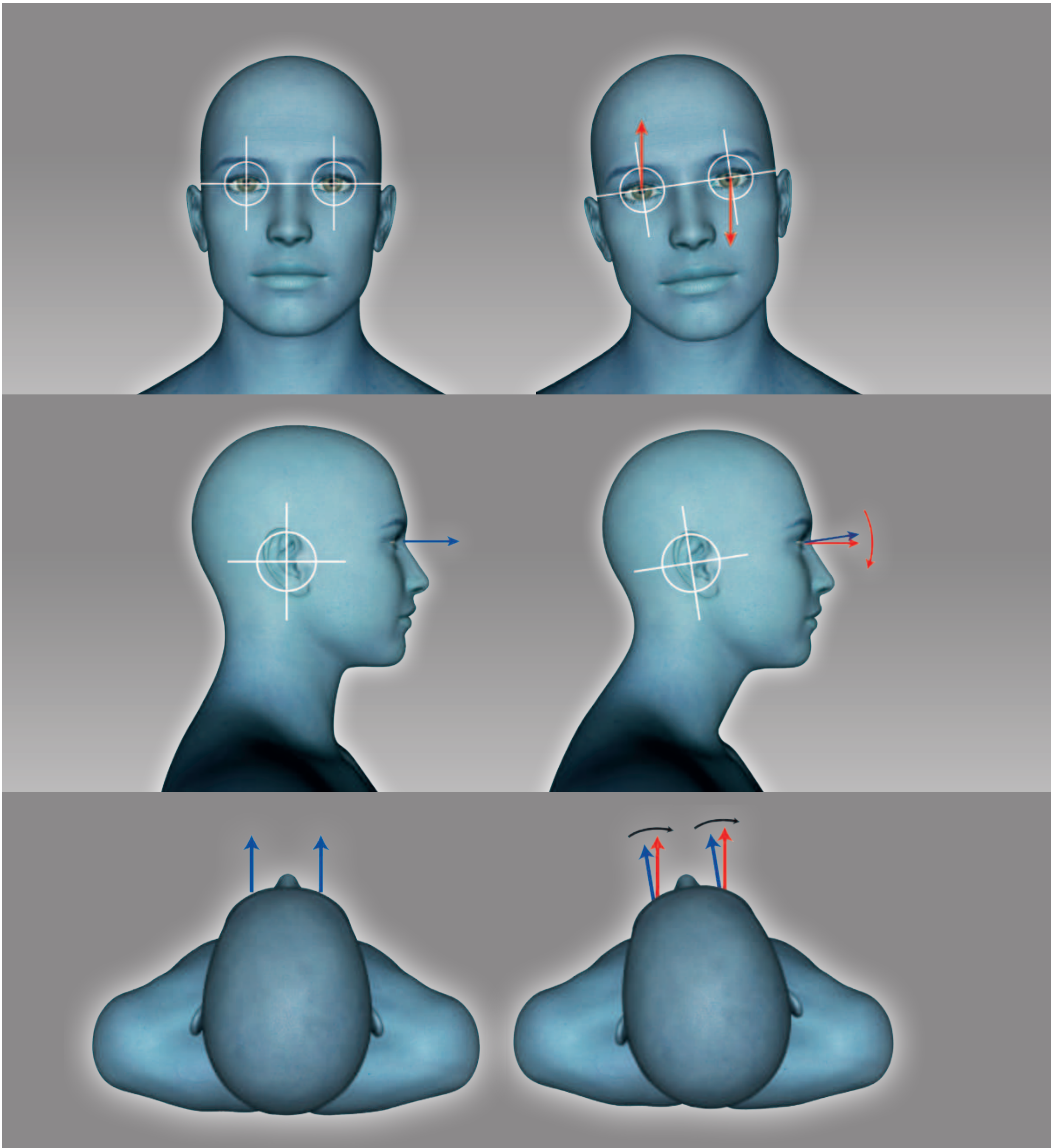
244-246 _ Photos taken 1 year after the end of the treatment. The patient wore the same elastodontic device used during therapy every night, as a retainer for the results achieved.



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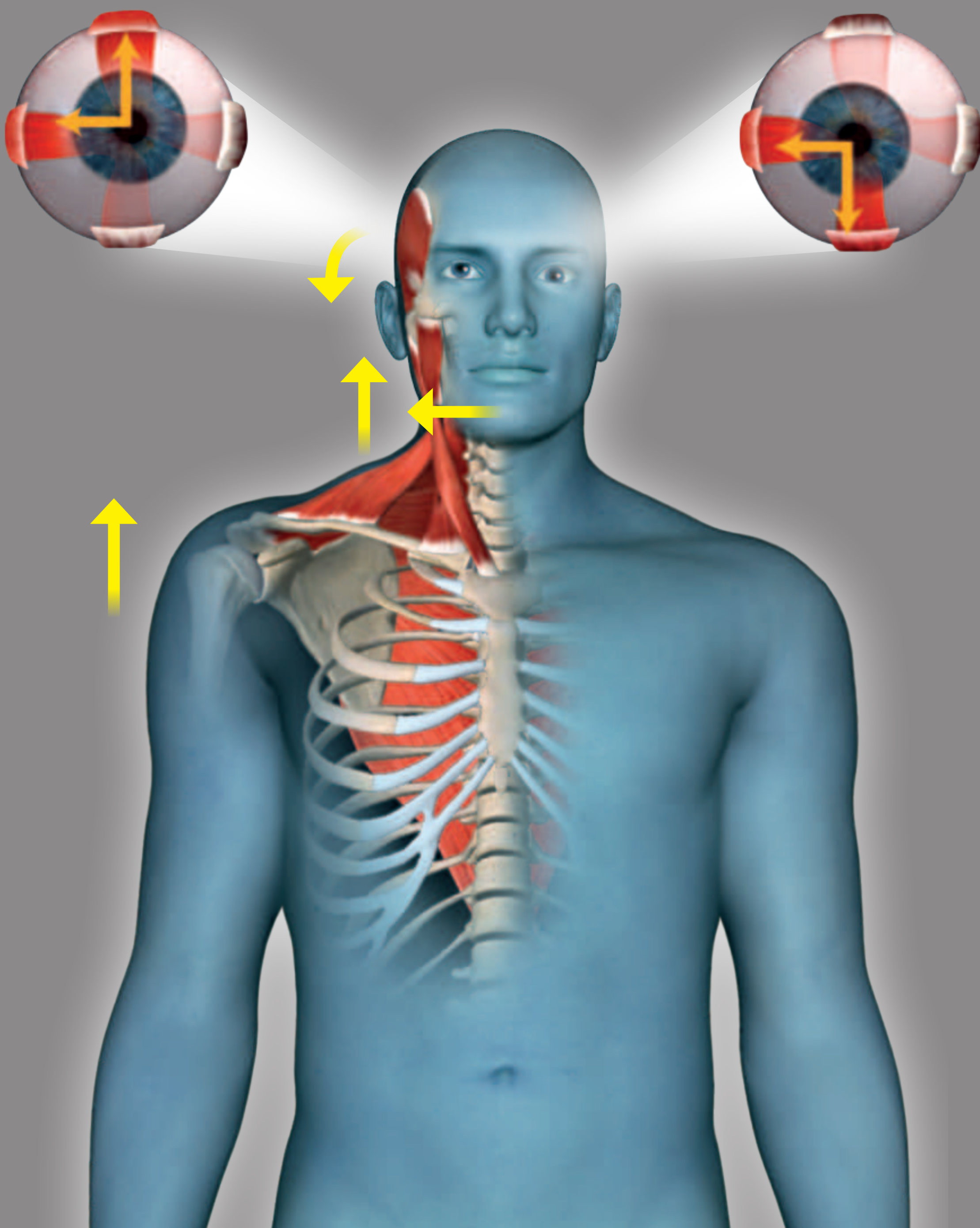
247, 248 _ When the head is tilted to the side, the eyes have to asymmetrically compensate to correct the change in the horizontal vision.

249, 250 _ The contraction of the posterior muscles of the neck causes a forward and extended positioning of the head. The downward shift in the horizontal vision with regard to the position of the head causes the eyes to compensate.

251, 252 _ The rotation of the head causes a contralateral shift in the horizontal vision, forcing the eyes to compensate.

Trigeminal nerve projections were found at the level of the encephalic trunk (brainstem) and in the cervical spine, in addition to common origins of the chewing muscles and the Tensor Tympani muscle (this anatomical structure of the middle ear belongs to our body posture control system). Hence, there is possibly a very close link between occlusion, the Temporomandibular Joint, posture, the ear and between all their related disorders (Eckerdal 1991).
Our eyesight is greatly influenced by the position of our head (Casini et al. 2010) and therefore, our posture. On the front plane, an asymmetrical contraction of the Upper Trapezius muscle with an inclination to one side of the head, causes a misalignment of the visual field. Our eyes, whose purpose is to precisely keep our sight in primary convergence, must compensate for this tilt. If, for example, our head is tilted to the right, the Superior Rectus muscle of the right eye and the Inferior Rectus muscle of the left eye will be hyperfunctioning, i.e., contracted. As a result, the respective Superior and Inferior Rectus muscles of our right and left eyes will be forced to reduce their muscle tone FIGS. 247, 248.
On the lateral plane, Trapezius muscle tension, that causes a reduction of the suboccipital space, brings the head forward and forces it to extend. The visual field is lowered and, therefore, the Inferior Rectus muscles of both eyes are forced to contract in order to compensate. The Superior Rectus muscles look stretched FIGS. 249, 250.
On an axial plane, for instance, the contraction of the right Sternocleidomastoid muscle causes a counter-rotation of the head; the Lateral Rectus muscles of the right eye and the Medial Rectus muscles of the left eye will be contracted, while the opposing muscles will forced to reduce their muscle tone FIGS. 251, 252.

The asymmetric tone in the extrinsic muscles of each eye determines a postural imbalance of the neck muscles, causing a deforming strain on the eyeball. The persistence of such imbalances can, therefore, lead to visual disturbances with important symptomatology FIGS. 253-255.
It is also interesting to note that the Trapezius and the Sternocleidomastoid muscles are innervated, for their motor component, by the Accessory Nerve (XI pair of cranial nerves). In its course, the nerve, after leaving the jugular foramen, passes in front of the anterior surface of the transverse process of the first cervical vertebra (C1).
If the jaw is dislocated posteriorly and, therefore C1 is also in torsion or twisted, the compressive tensions of the hard and soft tissues on the nerve, due to the reduction of the homolateral lateral-cervical space, can facilitate to generate excitatory signals that cause further contraction of these contributing muscles, together with, the inclination and counter-rotation of the head and the elevation of the shoulder FIG. 256.
Our eye muscles are also closely linked to our neck muscles: every time we move our eyeballs, our muscle spindle receptors are stimulated. These receptors activate the neck muscles so they can move our head to focus on a moving object. As a consequence to postural change, the articular receptors in the neck send information to the vestibular system that, in turn, activates the vestibular nuclei of the spinal bulb. Such nuclei, manage the position of the head in space.
Excessive tension of the neck muscles can create swelling and compression of the brachial plexus FIG. 257.
In particular, the contracted Scalene muscles hold the first rib raised towards the collarbone, squeezing the vessels and nerves of the brachial plexus.



253 _ The asymmetric contracture of the muscle chains in the cervical-facial area causes an alteration of the position of the head in space, with consequences also on the visual functions. In particular, the primary position of convergence will be compromised, and the eyes will have to compensate for this alteration. The eyes appear to be misaligned, thus contributing to the asymmetry of the face.

In this example, the contraction of the cervical-facial chain on the right side causes hyperextension and counter-rotation of the head on the neck.

254 _ The right eye reacts by contracting the right Upper and Lateral Rectus muscles to compensate for the right tilt and the left rotation of the head.

255 _ The left eye reacts by contracting the Inferior Rectus and Medial Rectus muscles to compensate for the right tilt and the left rotation of the head.

This impedes blood and lymph flow, and nervous transmission causing pain to radiate to the arm, chest, or hand, causing swelling of the hand for lymphatic stasis, soreness, itching, burning and trembling. These symptoms are often confused with carpal tunnel syndrome (Davies & Davies 2014).

Muscle imbalance at the shoulder girdle level does not allow the shoulder joint to work properly and, over time, one may experience pain and motion limitation. For example, a shoulder pathologically raised by contracted muscles, will undergo an acromion-clavicular conflict, where the humeral head compresses the Acromion Supraspinatus muscle tendon, generating motion limitation and pain when raising the arm **FIGS. 258, 259**.

A particularly delicate articulation like a shoulder joint, that cannot work properly due to neck and shoulder muscle tone imbalance, generates problems in the muscles that help hold the humerus in place in the glenoid cavity and to the scapula. Patients with Postural Syndrome often suffer problems and pain at the long head of the biceps tendon and in the interscapular area. A particularly contracted lateral head of the Triceps, for example, compresses the radial nerve, causing numbness in the thumb, arm and hand.

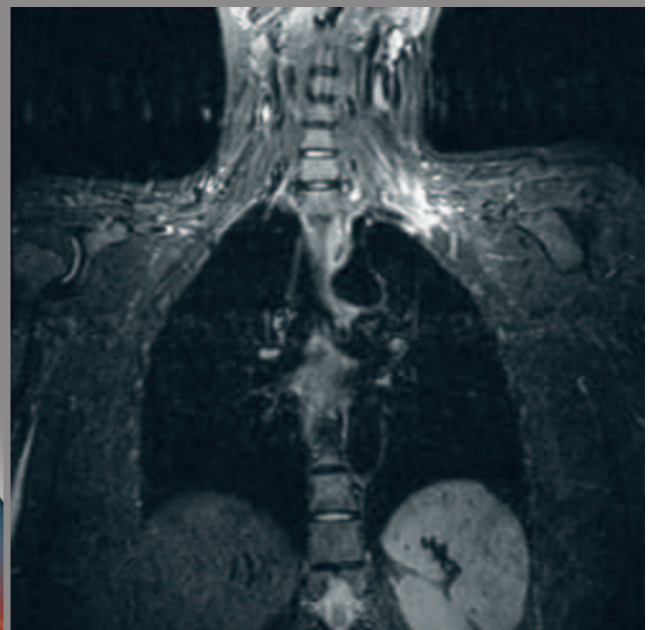
The Psoas Major muscle originates on the transverse processes and intervertebral discs from the T12 to L5 vertebrae and inserts on the lesser trochanter. An imbalance between Psoas muscles alters the position of the pelvis and, consequently, of the lumbar vertebrae creating over time low back pain problems (Sahar et al. 2007) and protruding hernias. A contracted Psoas Major can also rotate the leg to the outside, as well as the Piriformis muscle, which is particularly active in this function. A contracted Piriformis muscle, with its then increased diameter, may cause a compression of the Sciatic Nerve that passes between the Piriformis and the other hip rotators. This can cause sciatica, which is felt on the back of the thigh, the calf, and the sole of the foot **FIG. 260**.

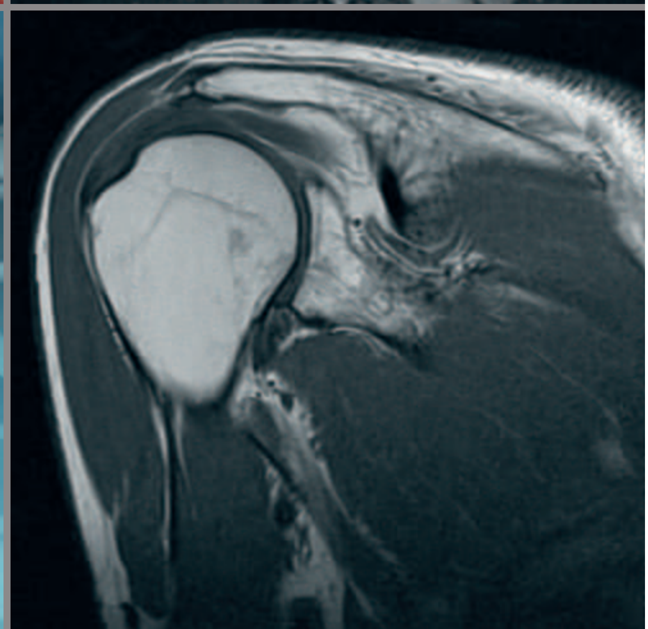
A contracted Piriformis also solicits the Pudendal Nerve causing pain to the groin, the genitals, and the rectal area (pubalgia) (Davies & Davies 2014).

A tilted pelvis creates asymmetry in the lower limbs (one leg apparently shorter than the other one): this results in a change in the distribution of the body weight at foot level (Yoshino et al. 2003). In addition, it generates an excessive load on the coxofemoral (hip) joint and knee joint on the opposite side of the Psoas contracture **FIG. 261** with consequent problems in these joints.

As said, the occurrence or not of the various problems depends on the individual personal tolerance/adaptation threshold. In this light, women are more affected by postural problems, because their muscular system is usually less developed than that of men. In women, the constant tension in muscle groups frequently becomes chronic over time, thus generating a disease that is defined as fibromyalgia. According to epidemiological studies, about 90% of people with fibromyalgia are women (White et al. 1999). Fibromyalgia is often seen in patients with postural disorders and could be interpreted as a consequence and a complication of the syndrome, due to the continuation of the static muscle tension that causes anatomical and physiological changes in muscle fibers (Álvarez et al. 2002, Grünheid et al. 2009).

Fibromyalgia is a pathology characterized by widespread musculoskeletal pain, initially located in the cervical and lumbar areas, but then spreads to create a constant tension in the entire musculature. Muscular tension is reflected in the tendons that increase sensitivity to pressure at their insertion points (tender points) with a lowering of the pain threshold FIG. 262, 263.
The origins of fibromyalgia is to be found in a number of factors. Many studies carried out on the pathology have reported numerous alterations of the neurotransmitters at the central nervous system level.
The nervous system is the physiological element that triggers musculoskeletal activity: a pulse coming from the central nervous system produces depolarization and a discharge of the action potentials of the motor neurons with a release of acetylcholine, which causes an increase in the ionic permeability of the sarcoplasmic membrane at the motor plate level, initiating a depolarization that triggers the discharge of the action potential. Acetylcholine binding to the Na^+ channels causes their opening, resulting in depolarization of the plasma membrane of the fiber. This depolarization (defined resting potential - with a value of 70 mV), causes the opening of ion channels for voltage-dependent Na^+, thus triggering the potential for action. In this sense, fibromyalgia can be considered essentially a disease of intercellular communication.
The two main features of fibromyalgia are hyperalgia and allodynia. Hyperalgia refers to a very intense perception of pain in response to mild painful stimuli; whereas allodynia means the perception of pain in response to painless stimuli. In patients with fibromyalgia, both hyperalgesia and allodynia are two clinical conditions that manifest themselves in a persistent and widespread manner. In the fibromyalgia syndrome, the onset of pain is due to a lack of blood circulation in the muscles. This deficit derives from a dysfunction of the neurotransmitters and, in particular, serotonin and noradrenaline. A characteristic of fibromyalgia, as well as other neurodegenerative disorders, is that the course of symptoms varies depending on external factors that can cause worsening: hormonal factors (during the menstrual period there is a worsening and even in case of thyroid dysfunction), climatic factors (pains are exacerbated in the intermediate seasons) and stress (tensions at work, quarrels, discussions) (Àlvarez et al., 2002). In addition to pain, there are almost always other symptoms present such as sleep disorders, migraine, pain in the maxilla and mandible, carpal tunnel syndrome, tinnitus, dizziness, vomiting, feeling of fullness, heartburn, impaired vision and hearing, osteitis pubis (groin pain), pain in the spine and limbs, and moodiness.
The diagnosis of fibromyalgia is based on the presence of widespread pain combined with the presence of tender points elicited with acupressure. Neither common laboratory tests nor diagnostic imaging give any result that can explain so many different symptoms. Such a situation discourages the patient, who is often described by many physicians as “simply neurotic or depressed”.
In conclusion, a Postural Syndrome that is not treated generates, over time, a series of problems in various parts of the body, even anatomically distant from the source of the problem, and often disabling.





256	257
258	259

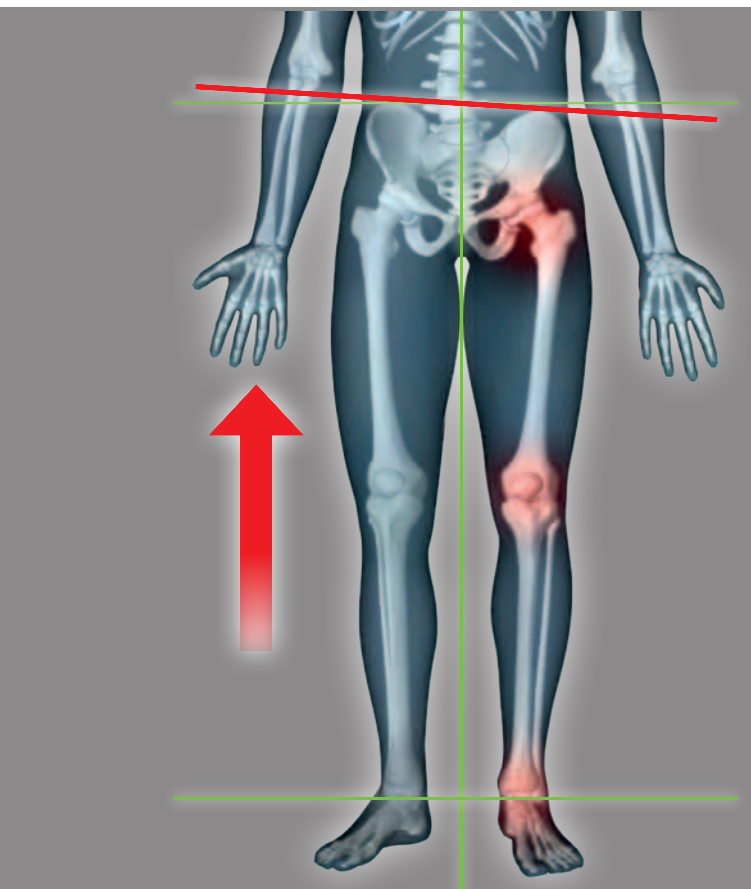
256 _ As the Accessory Nerve transits before the first cervical vertebra, a subluxation of C1, due to an alteration of the mandibular position, can cause nerve facilitation, which will then send excitatory signals to the fibers of the Sternocleidomastoid and Trapezius muscles, causing their contraction.

257 _ The MRI shows the brachial plexuses: on the left there is a high intensity signal which is to be clinically interpreted as a state of edema in the area of this plexus.

258, 259 _ Scapulohumeral (shoulder) joint: note the Supraspinatus muscle and the subacromial bursa in the passage between the acromion and the humeral head.

The occurrence of these problems depends on the threshold of adaptation and tolerance of the individual and how long the pathological stimulus has been able to act on the subject. The dentist who is able to successfully treat Postural Syndrome, frequently observes patients who not only report an improvement in TMJ symptoms or headaches, but also of back pain or other problems described previously FIG. 264.
Unlike physiological occlusion, which usually involves radiological exams and joint relationships in the norm, in the absence of specific pathologies, pathological occlusion causes an imbalance in muscle tone and can be complicated by the degenerating structures of the TMJs, with muscular imbalances of the descending chains and of all the lower areas. To make a correct diagnosis and plan a targeted and effective treatment of Postural Syndrome, you must know the complexity of its composition.
During the diagnosis and therapy phases, the dentist plays a key role: he or she often is the treatment director, who directs the activity of the other specialists involved, from the radiologist to the orthopedist, the chiropractor, the osteopath, the physiotherapist, the acupuncturist, all necessary specialists to treat the postural pathology as a whole.
The road to the knowledge and understanding of Postural Syndrome is long and demanding, made of passionate and sincerely interested study, as well as clinical observation and multidisciplinary scientific skills. A fundamental support in this endeavor is a profound knowledge of anatomy that the clinician has available to understand the interrelated connections between the various anatomical structures. As will be explained later, the academic study of anatomy must necessarily be integrated in the functional analysis, as one accordingly considers the dynamics of actions and reactions occurring in the human body during its operation.

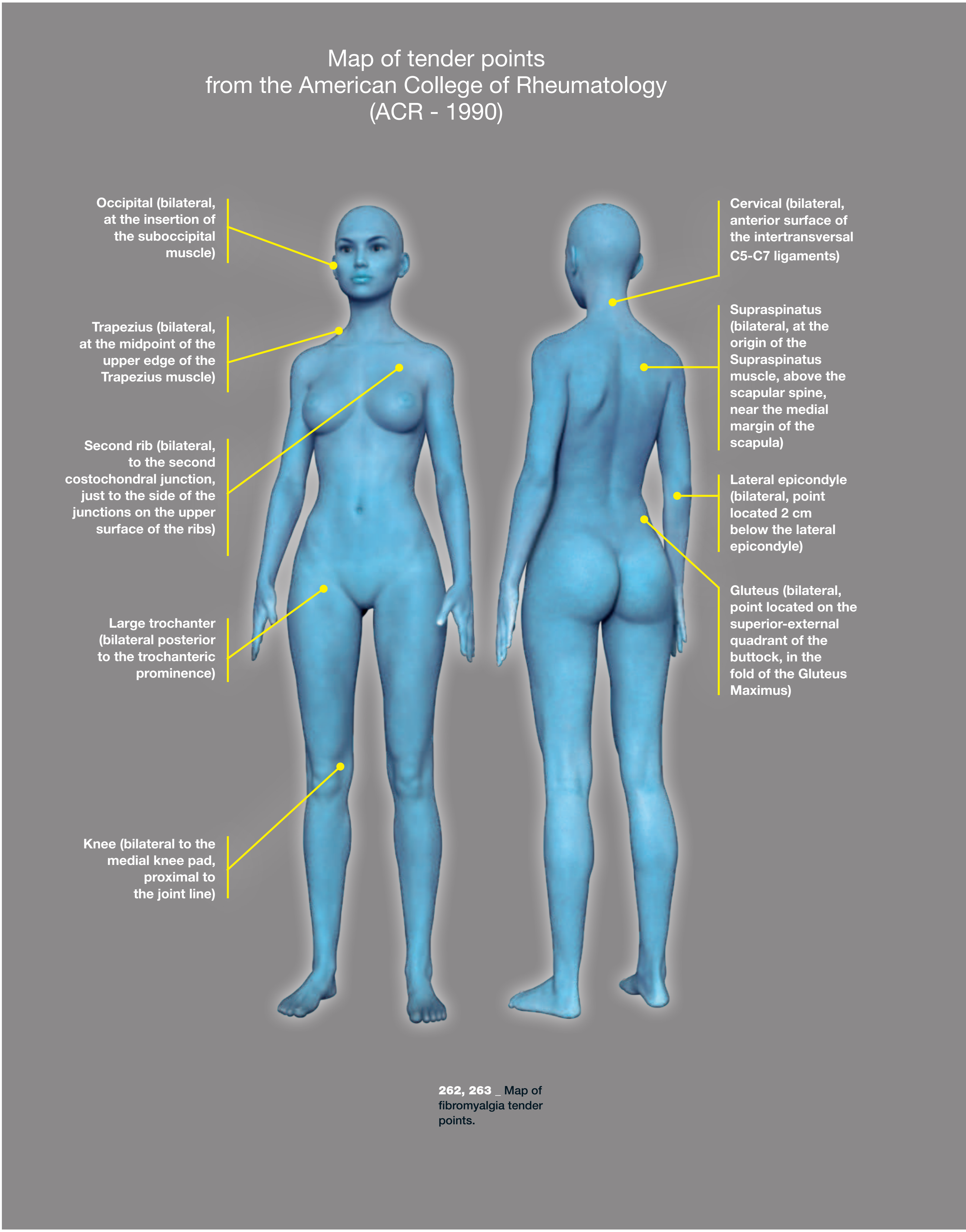
It is also important that the clinician correctly knows how to interpret the diagnostic tests at his/her disposal, knowing how to observe the results, but above all, being aware of the information that can be deduced from them. Correctly assessing the condition of a patient and knowing which of the components that are contributing in determining Postural Syndrome and the most relevant in generating disequilibrium, is one of the most important and complex aspects for the clinician. For this purpose, applied kinesiology can provide a highly effective complementary diagnostic approach to "dialogue" with the patient's body. Compared to other methods, applied kinesiology also requires time and study for its understanding, but above all, practice. In this way, through a complete cognitive approach to the patient, it is possible to gain an overall general view of the problem, so that it can be correctly interpreted and, for this purpose, it is important that the dentist rediscovers the value of being able to draw on the skills that derive from all the different branches of dentistry. Among the most fascinating aspects in dealing with patients suffering from Postural Syndrome is the certain opportunity to deepen and understand the knowledge of the human as a whole, in a holistic way. Through this approach, all notions related to the different techniques or the characteristics of the various materials necessary for rehabilitation only represent a means to achieve the final therapeutic goal: the general equilibrium of the patient FIGS. 265-301.



260 261

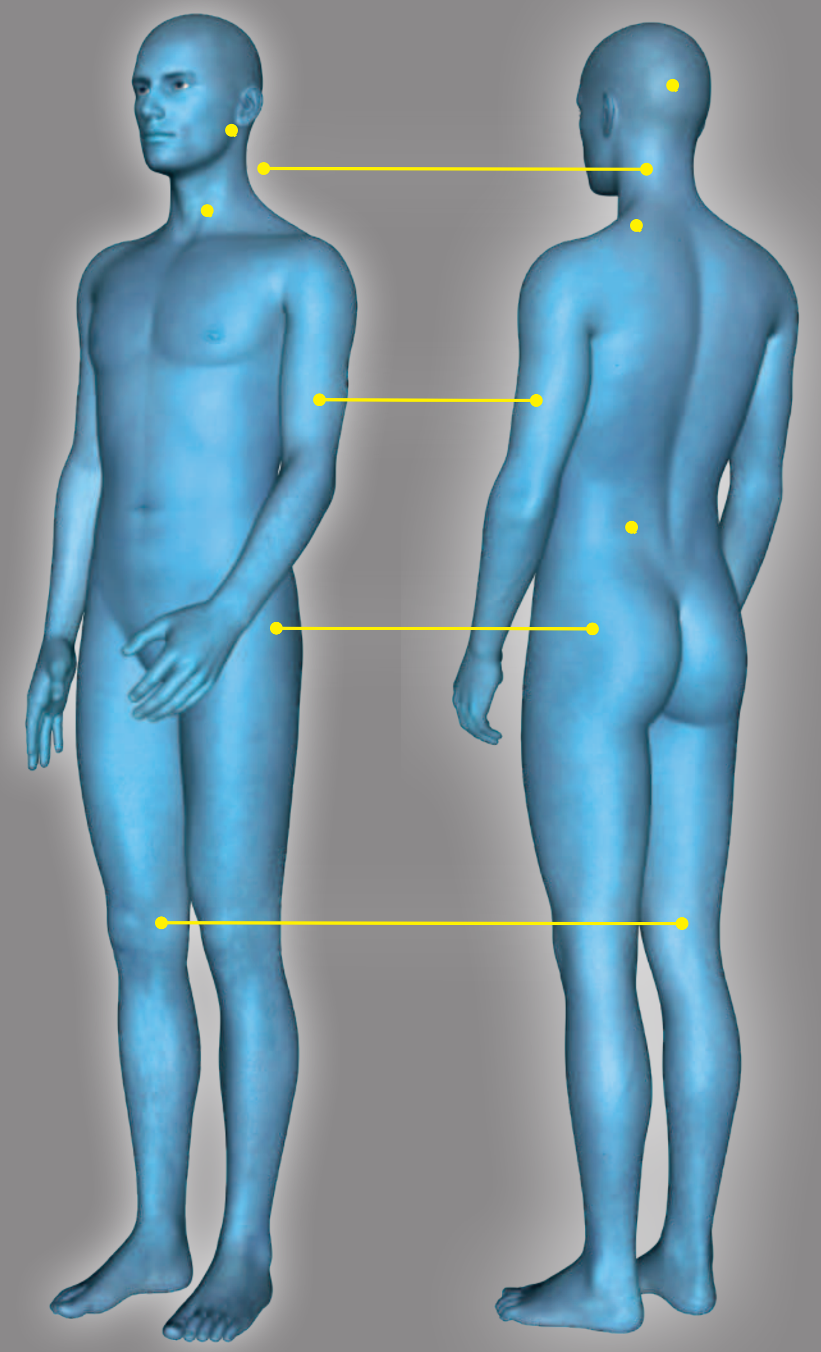
260 _ The Piriformis muscle and other external rotator muscles of the hip (from the top: Gemellus Superior, Obturator Internus, Quadratus Femoris) and the Sciatic Nerve. Note the Sciatic Nerve runs between the Piriformis and the Obturator Internus muscles. Since the Psoas muscle contributes to hip external rotation when it is contracted, the Piriformis and the other external rotators will also be. A contracted Piriformis also has an increased diameter, therefore it can compress the sciatic nerve, creating intense pain perceptible at the back of the thigh, the calf and the sole of the foot.

261 _ An imbalance at the pelvis level (red line) causes an apparent asymmetry of the lower limbs (in this case, the right leg appears shorter); in this condition, the left leg is subjected to an excessive workload resulting in pain in the joints (pink zones).



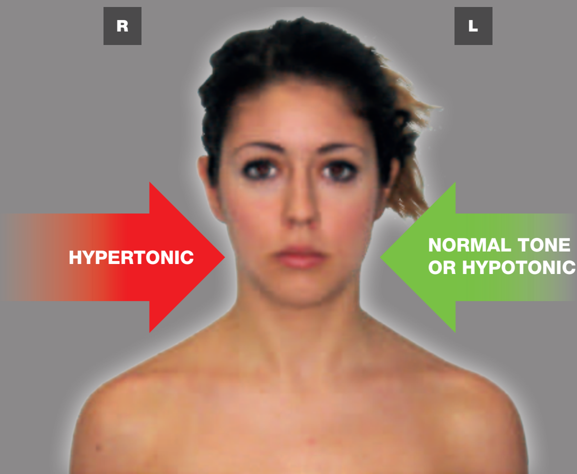
262, 263 _ Map of fibromyalgia tender points.

Forward of the Lateral Sagittal Plane

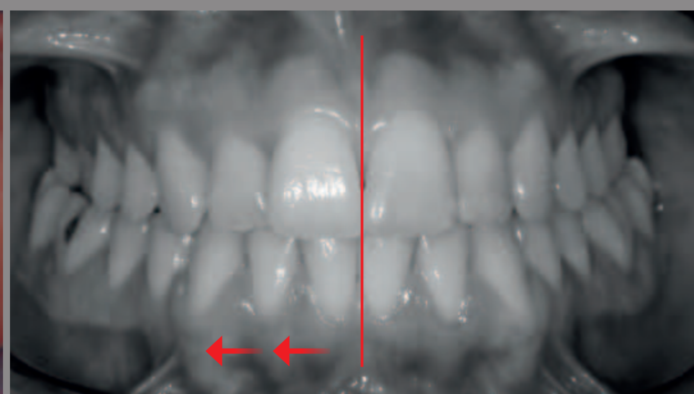


- Widespread muscle tensions
- Headaches
- Spinal pain
- Joint pain
- Pubalgia
- Tingling of the fingers and the hand
- Dizziness
- Disturbances of hearing and sight
- Digestive disturbances
- Depression
- Insomnia

264 _ Postural Syndrome is characterized by signs and symptoms that can affect different areas with ascending and descending pathogenetic components.



265-271 _ Young patient presenting a right-sided deviation of the jaw, caused by a single-sided crossbite on the right. A clinical facial, intraoral and occlusal examination was performed: the patient shows muscle tone asymmetry between the right and left sides of the face and evident malocclusion with crossbite. The mandible shows a midline deviation to the right.



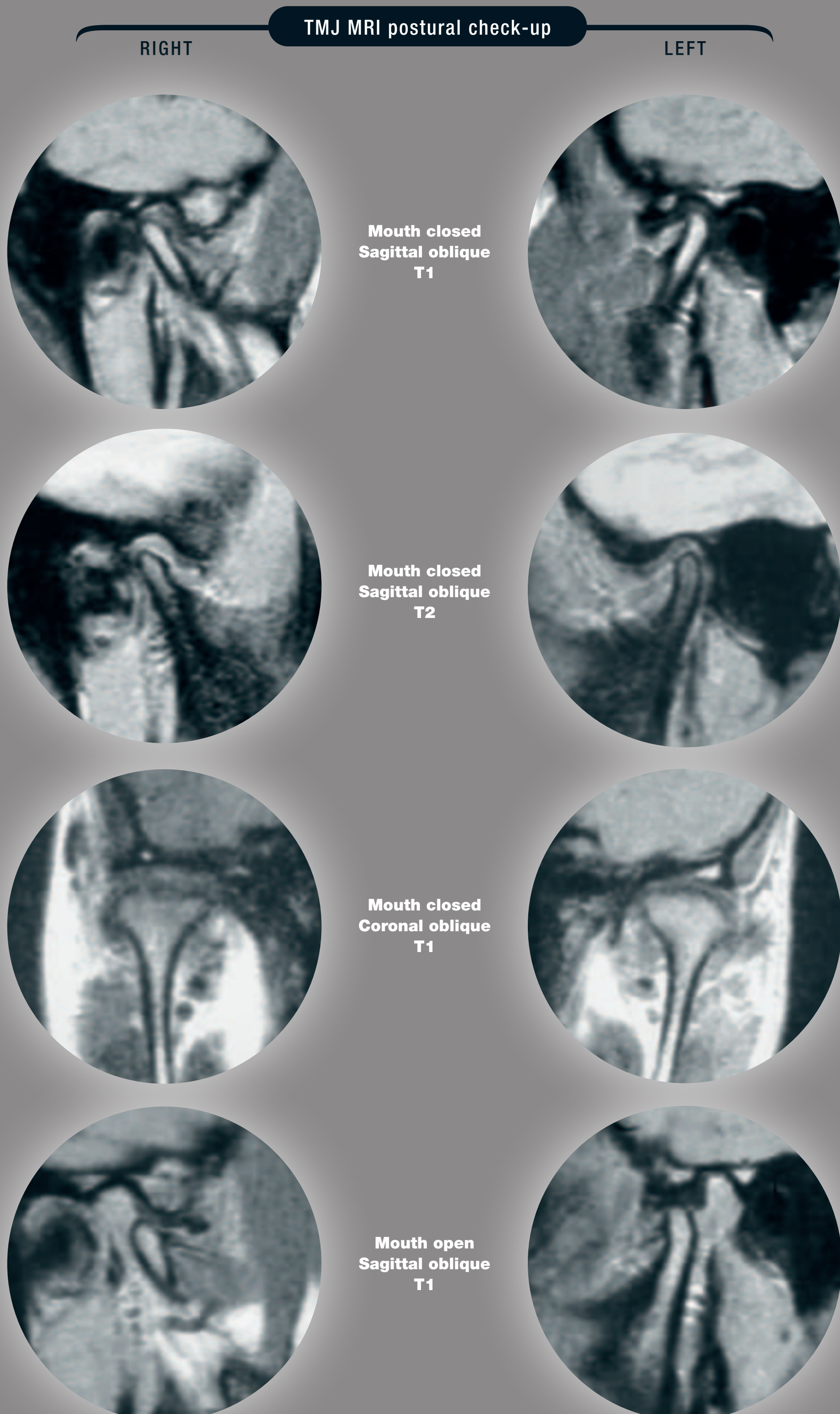
272	273
274	275

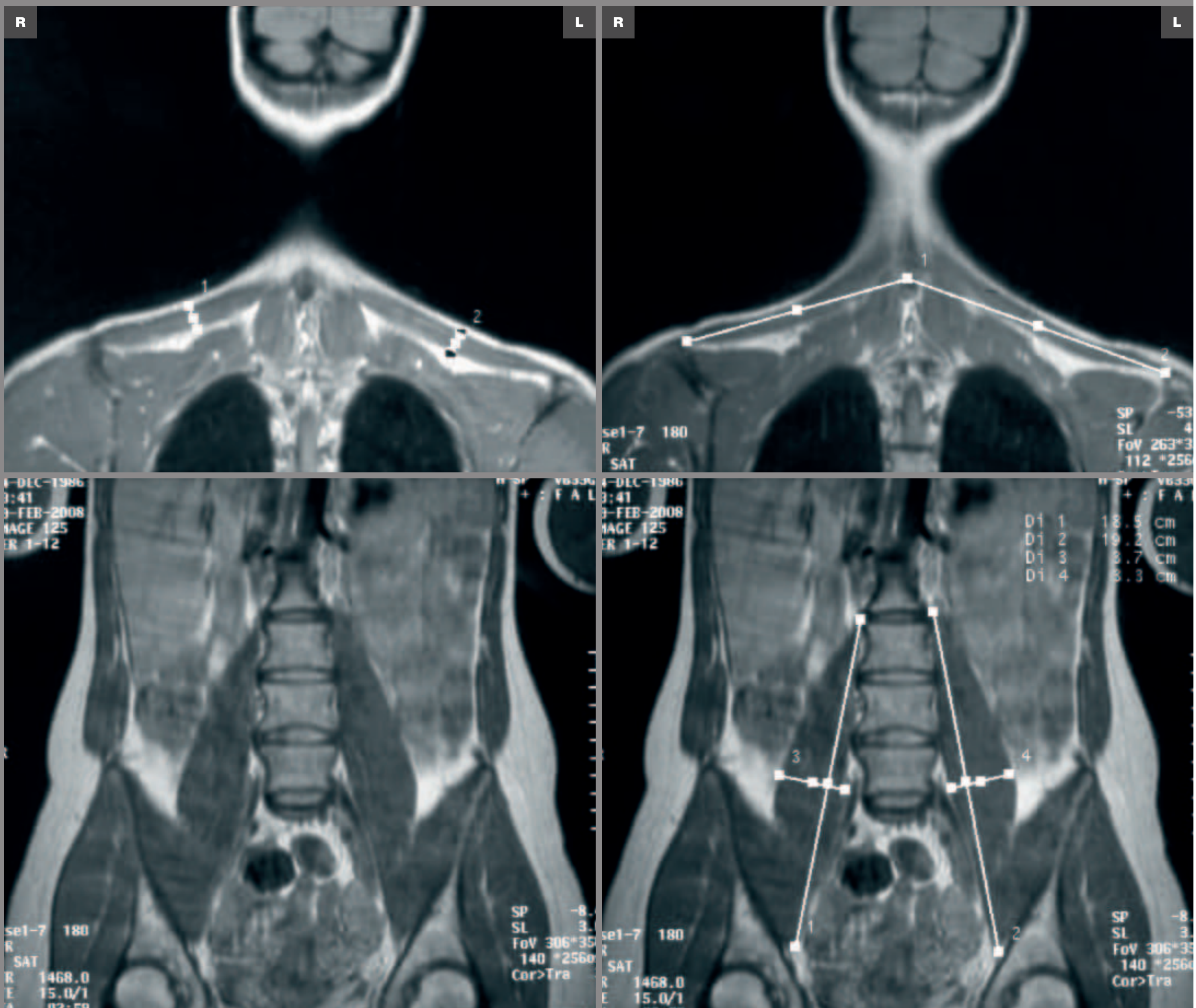
272 _ Side view of the front teeth.

273 _ Limitation and pain in maximum mouth opening. An opening of less than 4.5 cm is an index of joint disease.

274 _ Palpation of the right TMJ causes spontaneous pain, provoked by slight pressure on the front wall of the external acoustic meatus.

275 _ An acoustic exam of TMJ on the right side demonstrates crackling upon opening and closing, while on the left side a click upon opening and closing can be heard.


TMJ MRI postural check-up
RIGHT
LEFT
Mouth closed
Sagittal oblique
T1
Mouth closed
Sagittal oblique
T2
Mouth closed
Coronal oblique
T1
Mouth open
Sagittal oblique
T1



276 277
278 279
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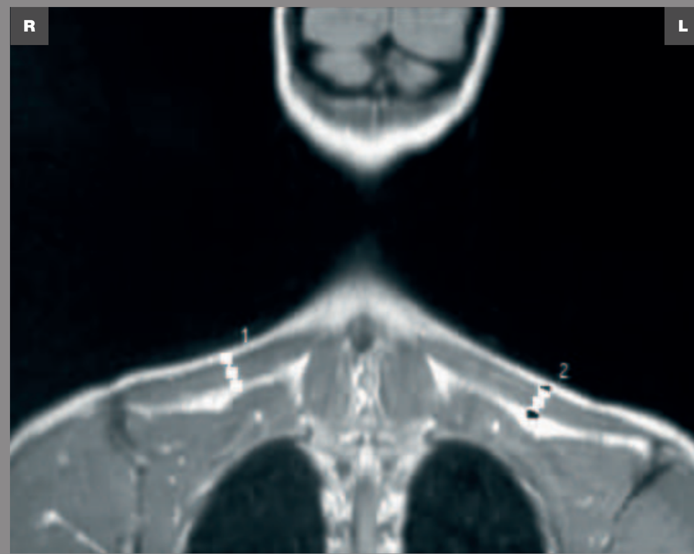
284 285
286 287

276-283 _ MRI of the TMJ showing a dysmorphic condyle on the right, affected by an arthropathic process with erosion and an anterior osteophyte (boney projections that grow along the joint margins) and a crumpled disc dislocated forward with the mouth closed and not recaptured with the mouth open. There are microeffusions in the upper and lower compartments. On the left, there is a purely dislocated, rotated disc with regular recapture when opening and the absence of effusions and muscle edema.

284, 285 _ MRI at, at the level of the most significant postural muscles, showing a right Upper Trapezius more contracted than the contralateral muscle. This condition causes tension at the shoulder girdle and the suboccipital region with an altered position of the head. In the images, the right Upper Trapezius appears shortened (12.7 cm) compared to the contralateral muscle (15.4 cm).

286, 287 _ Even the Psoas Major presents differences in length: the right is shorter than the left (18.5 cm right, 19.2 cm left). Note how the right, now shortened due to contracture, shows an increase of the belly size (3.7 cm) compared to the contralateral (3.3 cm).



288	289
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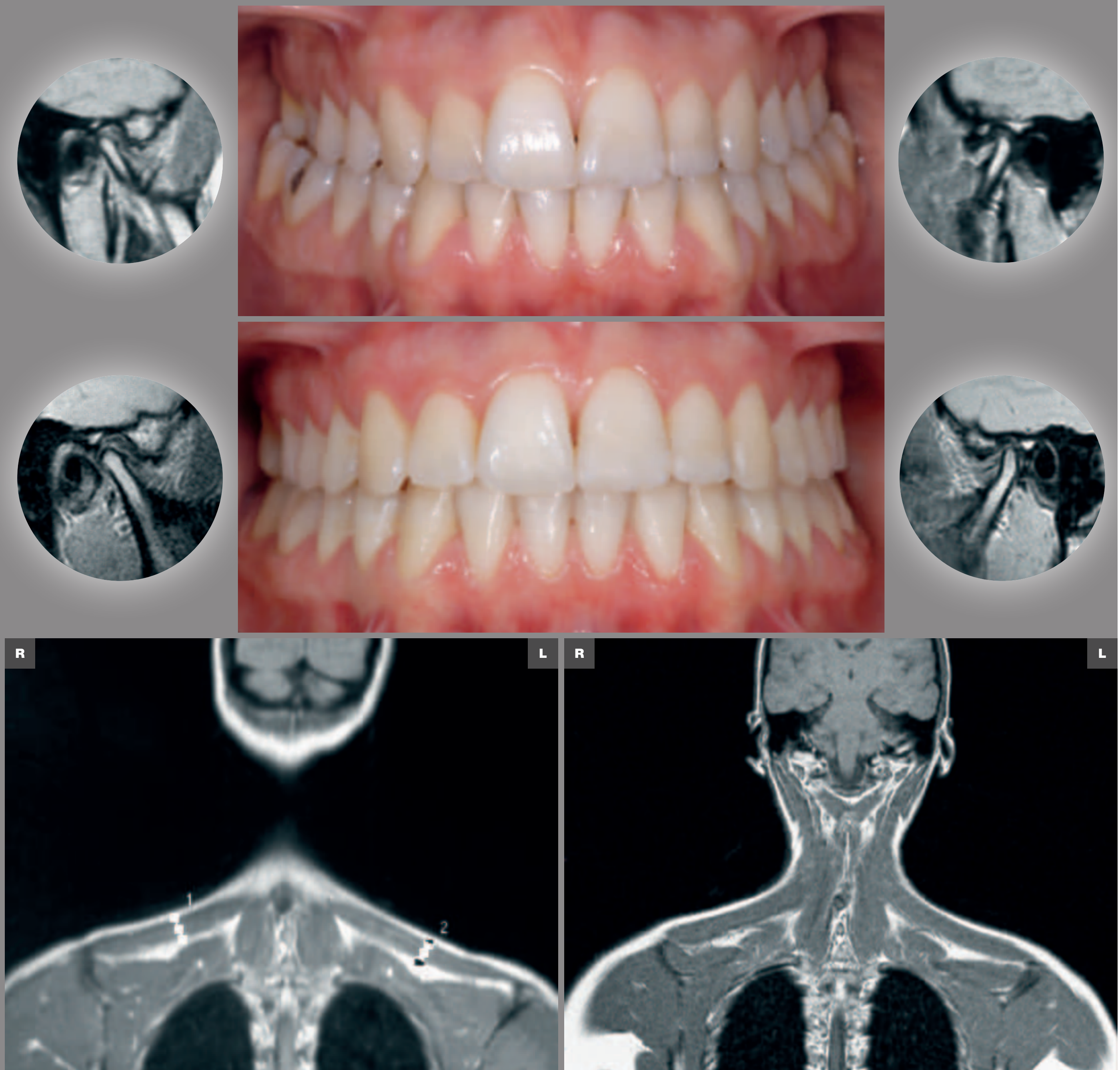
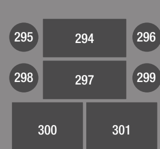
292	293

288, 289 _ The instrumental examination is a verification of the clinical examination. From the MRI it is clear that the upper head of the Trapezius muscle and the right Sternocleidomastoid are more contracted than the contralateral ones, confirming the findings of the clinical examination.

290, 291 _ The diagnosis is followed by the treatment that begins with the use of an EFP2 advancement type splint, modified to recapture the articular disc distracting and advancing the condyle, decontracting, deconditioning and balancing the muscles thanks to the work of the physiotherapist, who in this stage must interact with the dentist in order to rebalance the shoulder blades and pelvis.

292, 293 _ Orthodontic stabilization phase to correct the crossbite and improve contacts between the arches.





294-301 _ The case before and after the treatment: the clinical aspect shows a better relationship between the arches with a complete crossbite correction on the right (Figs. 294, 297). MRI of the TMJs, performed at the beginning and at the end of treatment, showing a clear regeneration of the morphology of the right condyle (Figs. 295, 296, 298, 299) and, in both joints, there is good repositioning of the menisci, thanks to the excellent regenerative capacity of retrodiscal tissue. In addition, the images of the shoulder girdle show well balanced and toned Upper Trapezius muscles at the end of the treatment (Figs. 300, 301).