

MULTIDISCIPLINARY APPROACH OF CAUSAL IMBALANCES OCLUZAL-POSTURE REHABILITATION

Elena Costescu^{1#}, Gabriela Calin^{1#*}, Cozmin Mihai^{1#}, Norin Forna^{2,#}, Tudor Ciuhodaru^{1#}

1 “Apollonia” University of Iasi, Faculty of Dental Medicine, 11 Pacurari Str., 700511, Iasi, Romania;

2 “Grigore T. Popa” University of Medicine and Pharmacy Iasi, 16 Universitatii Str., 700115, Iasi, Romania.

*Corresponding author; m_gabriela2004@yahoo.com , norin.forna@gmail.com

THESE AUTHORS CONTRIBUTED EQUALLY TO THIS WORK

ABSTRACT

Aim of the study This report aimed to assess the nonpainfull and currative effect of the electropuncture technique complemented by massage and active proprioceptive postural kinetotherapy of causal occlusion-posture imbalances accompanied by acute or chronic pain. This research provide an insight into the report of evidence available for the analgesic, uses of TENS in pathologies of the stomatognathic apparatus that induce postural defects. Malocclusion correction correlated with postural rehabilitation with non-invasive and non-drug methods, without adverse effects, including electropuncture (TENS) applied in conjunction with proprioceptive kinetotherapy techniques, massage and psychotherapy is the path to the success of occlusion-postural rehabilitation with significant results both on painful suffering and on the correction of malocclusions and global postural imbalances. **Material and methods** The forty-for patients ranged in age from 20 to 50 years, came to the rehabilitation center accusing important pain and functional impotence at various levels: temporo-mandibular, occlusal, postural, sole etc. Patients received clinical consultation, occlusal, postural and plantar evaluation, occlusal, postural and plantar analysis with the posturograph device receiving diagnostics of malocclusion overlapped with postural imbalances like kyphosis, scoliosis, genu varum, genu valgum, flat foot or claw foot and even psychotherapy. Group P1 received only orthodontic dental treatment to correct the occlusion. Group P2 received in addition to orthodontic treatment to correct the occlusion the complete non-invasive postural rehabilitation treatment including transcutaneous electrical neurostimulation (TENS), massage, proprioceptive kinetoterapy and psychotherapy. **Results** La finalul tratamentului aplicat complet, holistic si tenace, am constat rezultate notabile relevate la Group P2 (who benefited from electroneurostimulation therapy and psychotherapy in addition to kinetotherapy and massage) fata de Group P1 (who only benefit from the stomatologically approach) prin atenuarea semnificativa si chiar eradicarea durerii resimtite la nivelul articulatiei temporo-mandibulare, a zonei cervicale, toracale si lombare, reducerea dezechilibrelor de curbura si posturale ale coloanei vertebrale, corectarea dezechilibrelor de arcurire la nivelul talpilor, dupa caz. In plus, we obtained physiological mobility angles of the temporomandibular joint, muscle relaxation on paravertebral and abdominal hypertonic areas, muscle toning on hypotonic areas, efficient, operational muscle strength, so that the muscles are able to support physiologically correct posture, physiological posture at the umeral, pelvis, knee level as well as plantar flatfoot rehabilitation, patients finally approaching a plantar arch at the limit of physiological values. **Conclusions** The multidisciplinary collaboration regarding both diagnosis and treatment has an effect and proves its effectiveness in the context of the existence of occlusal and global postural imbalances. The increased incidence and prevalence of global postural imbalances induced by daily static professional, family, recreational activities requires opting for holistic and multidisciplinary integrative treatments.

Key words: malocclusion, occlusion-posture, postural imbalance, correlation, rehabilitation, mutidisciplinary, electropuncture

INTRODUCTION

Worldwide, almost half (46.7%) of the population is affected by pain and imbalances of postural pathology. The analysis of human posture and its imbalances must take a

holistic approach to physiology and constitution, since second- and third-degree misalignments often lead to long-term postural disorders on multiple levels, and conversely, untreated postural disorders can

affect the closure of the teeth and make them Inoperable. Both variants can affect patients' quality of life and psychology. In the panorama of rehabilitation, stomatognathic rehabilitation seems to be of minor importance, but it often happens that in the case of cervical pain (neck), headache (headache) or dizziness, which do not find their solution by applying common rehabilitation techniques, multidisciplinary functional holistic approaches are needed, involving the study of the stomatognathic apparatus, dental occlusion and even psychological service. The specialized literature and the medical practice mention some correlations between the dysfunctions induced by the malocclusions of the stomatognathic apparatus on postural imbalances. They can be solved by the myofunctional rehabilitation and physiotherapy of the oral cavity but also of the entire body (Goat et al., 2000).

The stomatognathic system consists of a multitude of receptors and the proprioception of the entire area must be correlated with the proprioception of the general posture it influences. The stomatognathic system has no direct implication in the regulation of PTS (Postural Tonic System) but has the ability to destabilize it with its imbalances induced in chain by changes in the important characteristics of the dento-occlusal receptor, among which we list: bone conformation of the maxillary bone and mandible; the highest number of possible contacts, during swallowing, of the lower and upper teeth; language in balance at the center; symmetrical tension of masticatory muscles; correct breathing with the use of the airways, involving not only the mouth but all the upper airway (Eriksson et al., 2005).

The optimal condition of occlusion requires that the upper teeth are slightly external to the lower ones, that the incisors cover the antagonists of about one third and are not precontacted, also after the Angle (the occlusion key of the Angle) under normal

conditions the mesiovestibular cusps of the first upper molar must close in the vestibular soil of the first lower molar. It is a condition, this, as theoretical as it is, moreover, each individual has his own habitual occlusion (Pelosi et al., 2007).

A nonphysiological occlusion may be accompanied by a disharmony of skeletal and neuromuscular structures. These disharmonies can divide into skeletal and dental. Skeletal disharmonies refer to alterations in the closing ratio of teeth due to maxillary and/or mandibular bone growth defects; Dental ones refer to alterations in the mating ratio of teeth, caused by defects in tooth alignment and/or in the shape of arches. Electrical transcutan nerve stimulation (TENS) is a extra-pharmacological and non-invasive method used in the management of acute and chronic pain in a variety of conditions by medical and paramedical professionals. Through the option of sedation or stimulation polarity, electropuncture acts on the relaxation or stimulation of the muscles, thus offering the possibility to intervene on the cause.

MATERIAL AND METHODS

The forty-four patients ranged in age from 20 to 50 years, came to the rehabilitation center accusing important pain and functional impotence at various levels: temporo-mandibular, occlusal, postural, sole. Clinical consultation including occlusal evaluation, postural and plantar evaluation, postural and occlusal analysis with the help of the posturograph receiving diagnostics of malocclusion accompanied by postural imbalances of the torso like scoliosis, kyphosis, of the lower limbs like genu varum, genu valgum or even of the soles resulting flat foot or claw foot.

The inclusion criteria: patients diagnosed with class II or III malocclusion correlated with postural imbalances of the shoulders, torso, pelvis, legs and soles.

The exclusion criteria: patients with other dental diseases, without involving dental malocclusions, the absence of postural imbalances, patients who are disorientated in time and space or with chronic mental disorders.

All people gave their informed consent prior to their inclusion in the study and agreed for the study to be published. The study was approved by IRB no.9 of 15.11.2018.

This article describes a 10-month pilot study conducted at the Domenico Medical Center of Iasi, from March 1 to December 31, 2019. It involved 44 patients with diagnoses of malocclusion and global postural imbalances.

The 44 patients were divided into 2 groups, one having 21 patients (Group P1) and the second group having 23 patients (Group P2). Group P1 received orthodontic treatment to correct the occlusion, Group P2 received in addition to orthodontic treatment to correct the occlusion a treatment supplement of non-invasive postural rehabilitation including proprioceptive kinethotherapy, local, segmentar, zonal therapeutic massage, and the transcutaneous electrical neurostimulation (electropuncture) both on the orofacial, cervical and paravertebral level, at the trigger points at the the thoracic or sole level.

During the stomatologically evaluation, the presence of carious lesions is highlighted, practicing specific treatment, but also occlusal defects type II and III. Also, during the specific dental treatment, most of the patients introduced in the study experimenting the production of cracks and pain localized to the temporomandibular joint (TMJ). Postural imbalances of the spine, functional deficiencies of the temporomandibular joint when mobilizing or statically but also of the neck and torso. Limitations of head and torso rotation movements and limiting deficiencies in

patients' communication with the environment and even with medical staff were also observed.

After applying the dental individually treatment and correcting the occlusion, the patients underwent posture rehabilitation treatment, following punctually, in stages and simultaneously each of the deficiencies found during the postural evaluation performed with the posturograph provided by the center. Postural evaluation was performed both clinically (lead wire, goniometer, flexible meter, etc.) and evaluation at a posturograph equipped with podoscope.

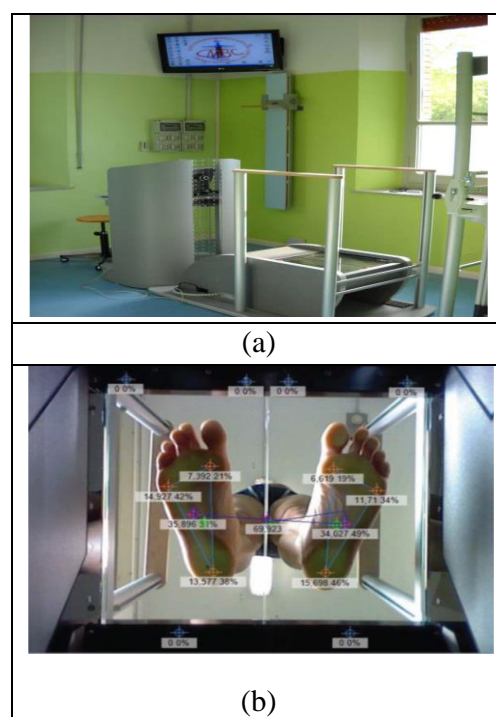


Figure 1. (a) Posturographer 01599-Podata, Chinesport S.P.A. Italy, 2010, (b) Podoscopy

The postural evaluation revealed pain manifestation, imbalances of alignment of the cephalic extremity, non-physiologically curvatures at cervical, thoracic and lumbar level, postural imbalances at the level of bilateral symmetry of the shoulders and pelvic assembly, but also at the level of the coxal joints, knees, ankles and soles. With

the entry into recovery treatment, a hypotonic, hypotrophic, hypokinetic, poorly represented muscle mass with marked tonicity deficiency could be observed and found in all patients included in the study, both those in P1 and P2 groups, local muscle contractures being also present in areas affected by imbalances: cervical, thoracic, lumbar, lower limbs, foot, as appropriate.

At the same time, facial and manducatory muscles (masseter, temporal, medial pteroidian, lateral pteroidian) registered tonicity imbalances, most likely induced by deficient, unbalanced occlusion. P2 group of patients were referred to a psychology office, where they received appropriate psychological counselling on anxiety, self-perception and the patient's relationship with people in immediate interaction. It turned out that patients were partially aware of posture and interaction deficiencies but failed to act functionally on them, experiencing a negative opinion of lack of self-confidence.

P1 group received the dental evaluation and adequate occlusal treatment while P2 groups received both occlusal dental treatment and physiotherapy treatment consisting of non-invasive reeducation methods: segmental and zonal relaxation massage, trigger point pressure and electropuncture, respiratory kinetotherapy with respiratory reeducation, active kinetotherapy specific to increasing muscle tone and strength, active kinetotherapy to reeducate coordination, postural control and balance, specific techniques for reeducation of sensitivity and postural proprioception.

For self-knowledge and postural self-perception the mirror was used in the application of all applied techniques and methods. Simultaneously At the same time treatments involving massage, active proprioception kinetotherapy which has the role of stimulating one's own perception of the spatial position of the cephalic extremity,

body and limbs, respiratory kinesiotherapy and electropuncture.

The transcutaneous electrical neurostimulation method was applied in 20 session for 40 days. The electrical transcutaneous neurostimulation method is a noninvasive and extra-medicated alternative. On the stomatognathic apparatus, TENS applications have indications in the pain therapy, in hyperactivity of the muscle (which coats the masticatory muscles - 3rd branch of the trigeminal nerve) and coordinates its activity. Transcutaneous electric nerve stimulation can prompt or inhibit the pastime of nociceptive neurons withinside the significant fearful system, relying on their polarity. Pain is relieved via way of means of growing the amplitude of the TENS pulse to generate a painless paresthesia beneathneath the electrodes. (Wang et al., 2019). Neuromuscular electrostimulation produces the stimulation of muscle contractions, bringing the muscles to the state of physiological functioning. Similarly, the sedation function (polarity change) induces relaxation in the contracted muscles. These two effects, acting synergistically, balance imbalances in muscle tone.

In this study Pointoselect Digital DT device (Figure 2) was used.



Figure 2. Pointoselect Digital DT device, Pierenkemper GmbH, Germany, 2014

The device allows a usage of the probe to accurately detect a stimulation point automatically. After the exact location of the stimulation point, the same probe is used to

release the electrical current, with a range of feasible options available: Bahr or Nogier frequencies, or even other frequencies. The technical operating specifications are: frequency range: 2 – 128 Hz, impulse duration: 60 – 120 μ s, intensity: 28 mA, power supply: 9 V.

In additional P2 group received 12 sessions of psychotherapy approaching specific topics, techniques and methods from the perspective of individual self-knowledge and self-perception but also from the perspective of the environment.

The cephalic extremity and mandibular posture is able to interfere with cervical paravertebral muscle activity through facial, muscular and nerve connections. Both the mandible and tongue are integrated into the anterior muscle tissues through the supra- and subhyoid muscles, while the upper jaw, through the skull, is intergrewed into the posterior chains through the trapezius and sternocleidomastoidian muscle and the hyoid bone, which is inside this system, joins the mandible with the posterior part of the skull, with the sternum and with the scapula (Pelosi et al., 2007). It is needed that the muscular interest respects the stability and mobility wishes of the cephalic extremity, that's ensured with the aid of using the functioning in worldwide stability of the prevertebral muscle tissues, the elevator muscle tissues of the mandible, the lingual and sublingual muscle tissues inserted at the hyoid respecting the triple antagonism defined with the aid of using the Brodie-Akerman-Lejoyeux scheme, as we see in the Figure 4 (Alizadeh et al., 2024).

The mandibular-hyoid-lingual stability - posture may be acquired via a relative passivity of the muscle tissues concerned with an superior vertical adjustment, the condyles being targeted withinside the glenoid cavity. We can outline the posture courting with the aid of using the sum of the mandibular-

cranial ratios while the mandible is in a postural function with recognize to the cranium below the impact of the tonic antigravity stability of the masticatory muscle tissues (Clauzade et al., 2006).

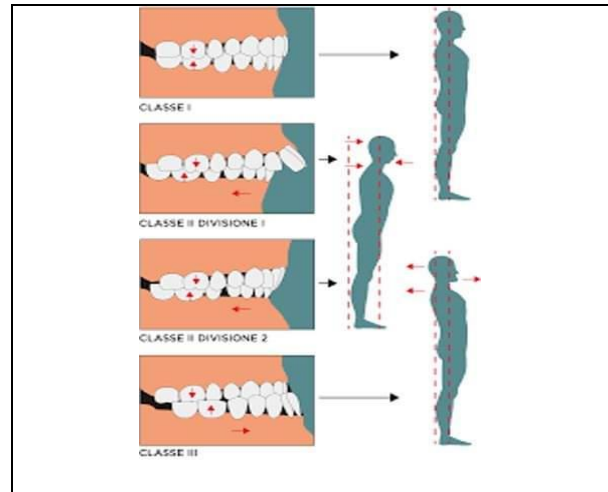


Figure 3. The correlation between dental occlusion & body posture. Occlusal classes (Colloca et al., 2017)

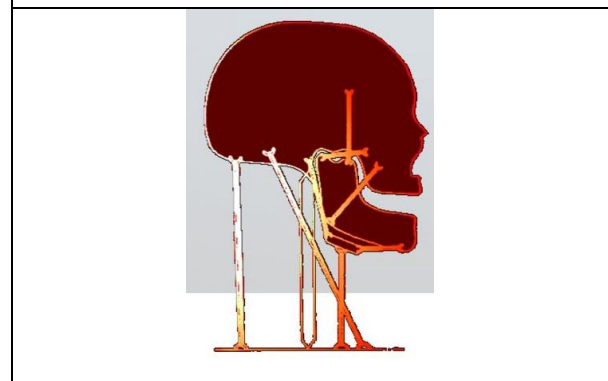


Figure 4. Brodie-Ackerman-Lejoyeux Scheme - the triple antagonism (Alizadeh et al., 2024)

These muscle connections should not make us think of pure mechanical adjustments, but of integrated neuromuscular adjustments, being obvious that the dialogue between muscles for postural regulation does not happen directly in one muscle structure or another, but is transmitted through nerves, with proprioceptive involvements.

Consequently, the spatial position of the mandible actively participates in the stabilization of the skull on the spine, dental occlusion and, further, in the mandibular neuromuscular balance, being an integral part of the craniomandibulo-cervical system (Burlui et al., 2012).

This is a scientific rehabilitation pilot take a look at, constituting itself to be a initial check aiming to evaluate the feasibility thereof and to pick out any capacity troubles and factors earlier than carrying out a much wider take a look at at the physiotherapeutic noninvasive remedy used withinside the postural-ocluzal rehabilitation. For this research, the statistic analysis was carried out by using Origin Lab 2019 version.

A search of the PubMed/Medline electronic database was performed for dates up to May 2024. The search terms used included "occlusion-posture causal relation", "diagnosis" or "non-surgical management" or "conservative management" or "drug treatment" or "behavioral therapy" or "physical therapy". Further research had been selected on the idea of guide searches of reference lists and evaluate papers and from conferences of the National Institutes of Health (NIH), University of Pisa or Royal Australian College of General Practitioners (RACGP). Some guiding principle agencies had been additionally looked for current exercise recommendations and systematic critiques on analysis and non-surgical control of occlusion-posture causal relation.

RESULTS AND DISCUSSIONS

2.1. Characteristics of the patients (age, gender, environment)

Au fost luati in studiu 44 pacienti dintre care 31 femei reprezentand 70% din total si 13 barbati reprezentand 30% din totalul pacientilor inclusi in studiu. Din total pacienti inclusi in studiu, 33 pacienti provin din

mediul urban reprezentand 75% din total, restul de 11 pacienti reprezentand 25% din total provenind din mediul rural. Au fost inclusi in studiu indivizi cu varsta cuprinsa intre 20 si 50 ani, varsta medie inregistrata fiind 33.29 ani, abaterea standard fata de varsta medie fiind de 8.11. Majoritatea pacientilor din grupul de studiu se afla in intervalul de varsta 25-41 ani.

Table 1. Characteristics of the patients (age, gender, environment)

	No.	%	Min/Max age (years)	MD±DS
Gender (Female/ Male)	31 F 13 M	70% 30%		
Age range (years)			20 - 50	33,29± 8,11
Environment (Urban/ Rural)	33 U 11 R	75% 25%		

2.2. Results obtained after using the treatment

At the end of the non-invasive treatment applied holistically for nine months, in compliance with the physiotherapist's indications, Group P2 patients (who benefited from electroneurostimulation therapy and psychotherapy in addition to kinetotherapy and massage) acquired mainly compared to Group P1 (to which physiotherapy and psychotherapy were not applied) significant attenuation and even eradication of pain at temporo-mandibular level both during mastication, of other daily activities and even independently of them, we obtained physiological mobility angles of the temporomandibular joint, muscle relaxation on paravertebral and

abdominal hypertonic areas, muscle toning on hypotonic areas, efficient, operational muscle strength, so that the muscles are able to support physiologically correct posture, physiological posture at the humeral, pelvis, knee level as well as plantar flatfoot rehabilitation, patients finally approaching a plantar arch at the limit of physiological values.

Physiological extensibility of nerves to ensure a physiologically normal posture, non-stop postural control during daily activities to ensure balanced posture of the body, thus reducing unnecessary or unbalanced muscle labor, daily physical activities or extra usual activities (work, walking, jogging etc.), wearing comfortable shoes with a heel of maximum 3 cm.

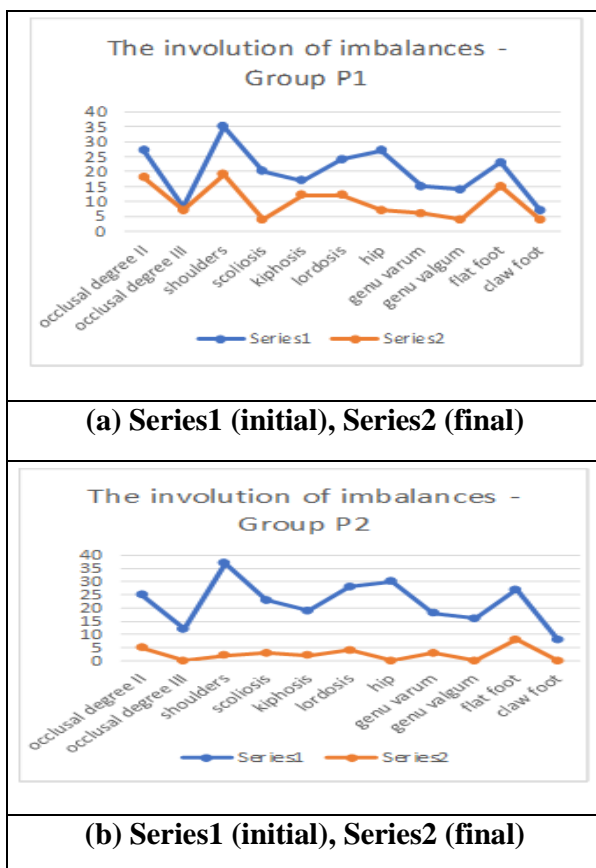


Figure 5. The involution of imbalances: (a) Group P1; (b) Group P2

Figure 5 shows the drastic decrease in occlusal and postural imbalances in Group

P2 compared to Group P1 following the application of complete and complex treatment that includes both physical therapy and massage (which were also applied to Group P1 patients) as well as transcutaneous electroneurostimulation (TENS) and integrative psychotherapy.

Patients received indications for long-term physiological postural approaches, on proprioception and posture control, on daily use of stubs and plantar supporters, on rapid presentation to the doctor as soon as any painful manifestations occur both at oromasticatory level, as well as at the postural level or any other potential dysfunction he finds.

We see a significant increase in the number of Group P2 patients experiencing significant pain reduction at all levels (oral, global) falling within the pain threshold of 2-4 or even 0-2. After application of the treatment, the majority of patients in Group P2 experienced a significant reduction in pain levels compared to Group P1, as evidenced by an increase in functionality, general well-being and self-confidence, resulting in a significant improvement in the quality of treatment improve, astfel cum reiese din Figure 6. Reintegration of these patients' lives into family and social occupations.

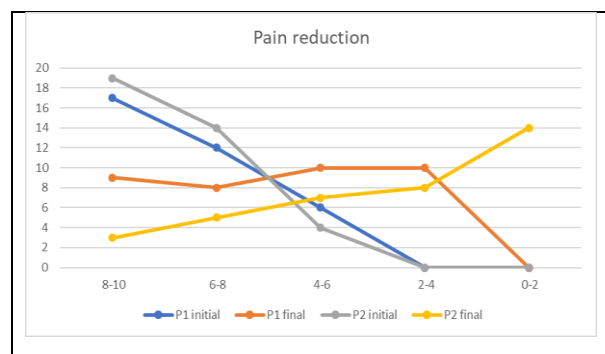


Figure 6. Pain reduction: P1 group no. of patients intial/final; P2 group initial/final

In the dental clinic, patients were diagnosed, besides gingival retraction /

periodontitis, carious processes and with class II and III malocclusion associated with temporo-mandibular syndrome, meniscus displacements at the level of the temporomandibular joint, jaw compression, myofascial pain syndrome.

The dysfunctions found produced oversensitization of the temporomandibular joint, oro-facial pain, functional jaw impotence. Within the global niche of postural rehabilitation methods, the literature on the correlates of occlusal posture is weak and incomplete. The professional literature views the topic separately from the perspectives of diagnosis, symptoms, manifestations or occlusion treatment and postural rehabilitation, whereas combined treatment is not relevant. However, segmented treatment approaches (which we usually find in professional literature) document immediate or short-term effects and results, but in the long term, systemic postural disorder will persist or even worsen and become chronic, which is more difficult to resolve. and treatment, thereby reducing the actual chance of overall postural recovery.

Rehabilitation treatment eliminates the cause of the disease by treating the cause, and also effectively intervenes in the after-effects to avoid recurrence. Pain and dysfunctions, individuals experiencing postural-occlusal imbalances, particularly young and active individuals, can benefit greatly from a conservative, long-term maintenance treatment approach. This approach involves implementing permanent postural control, engaging in maintenance gymnastics, and regularly addressing any new occlusal imbalances that may arise. By doing so, these individuals can alleviate physical and mental strain caused by functional limitations and discomfort.

Psychiatric approach. Patients with chronic back pain are affected both

mentally and somatically. A mental pain can accentuate the dorsalgia and vice versa, a dorsalgia can cause an influenced mental state. For this reason, dorsalgia in patients with mental disorders, especially depression, is indicated to be treated in a very short time so as not to decompensate the already precarious mental state of these patients. Depressed patients need daily mobilization and are dependent on postural health. Social isolation and the inability to mobilize physically aggravate their psychoemotional state (Bope, 2003). Some psychiatric medications like Gabapentin and Duloxetine impact and resolve chronic pain. This medication is often used in patients with corneal osteomuscular disease (Colloca et al., 2017). The mechanism of action of gabapentin is due to its effect on calcium channels located in the peripheral nervous system and central nervous system. They alter the release of neurotransmitters and thereby reduce the excitability of nerve cells. This mode of action of gabapentin has antiepileptic, analgesic, sedative and mood stabilizing effects (Colloca et al., 2017). A significant number of patients with neuropathic pain are disabled with moderate or severe pain for many years. Conditions caused by chronic pain fell into five of the 11 conditions that define years lived with disability and a decline in quality of life (Wiffen et al., 2017). In addition, this leads them to the inability to perform their professional activity well, in some cases even with the loss of jobs and with a major impact on medical insurance that suffers from chronic treatments, repeated hospitalizations and sick days. Duloxetine also has an analgesic effect, particularly at a dose of 60 mg/day in patients with chronic pain, and is well tolerated by patients (Vos et al., 2010). These treatments have psychiatric, neurological and other specialties depending on the psychic and

somatic profile of each patient. Chronic postural pain (dorsalgia) must be treated multidisciplinary, so pain relief will occur faster and other medical conditions such as psychiatric or neurological conditions can be detected early.

CONCLUSIONS

Due to the ultra-demanding environment and daily activities, occlusal-postural imbalances have become increasingly common in medical practice.

The early presentation of the patient in the medical service as well as the approach to the rehabilitation of the patient from both perspectives - dental, occlusal but also multilevel postural guarantees the success of his global rehabilitation.

Incorrect posture will generate in time discomfort both physically and mentally, will considerably diminish the quality of life, being the source of the development of other future pathologies.

Incorrect posture will lead to imbalances of the skeletal system on multiple levels, will hinder the respiratory process, will diminish the exercise of cardio-vascular functions, will induce digestive discomfort,

increases the pressure exerted on the spine thus hastening its degeneration, induces neck, shoulder and back pain, reduces flexibility and damages joints, affects body balance increasing the risk of injury, increases stress and fatigue levels.

All of these, each or together, leading to anxiety or even depression and social exclusion. Postural analysis involves static and dynamic analysis, the two being intertwined. The defining structure of a balanced functional posture is given by the spine with its three physiological curvatures: cervical, thoracic, lumbar.

Proper posture keeps these curves in the neutral position, without interfering with physiologically functional angles. The multidisciplinary collaboration regarding both diagnosis and treatment has an effect and proves its effectiveness in the context of the existence of occlusal and global postural imbalances.

The increased incidence and prevalence of global postural imbalances induced by daily static professional, family, recreational activities requires opting for holistic and multidisciplinary integrative treatments.

REFERENCES

1. Goat N.F.; Ro J.Y.; Experimental muscle pain produces central modulation of proprioceptive signals arising from jaw muscle spindles. *Pain*. 2000. 86:151-162.
2. Eriksson P.O.; Zafar H.; Musculoskeletal disorders in the jaw-face and neck. In: Conn's current therapy. *Rakel RE*. 2005.
3. Bope E, editors. Philadelphia; WB Saunders, 2003, chapter 247.
4. Colloca L.; Ludman T.; Bouhassira D.; Baron R.; Dickenson A.H.; Yarnitsky D.; Freeman R.; Truini A.; Attal N.; Finnerup N.B.; Eccleston C.; Kalso E.; Bennet D.L.; Dworkin R.H. and Raja S.N.; Neuropathic pain, *Nature Reviews Disease Primers* 3. 2017. Art.no: 17002, doi: 10.1038/nrdp.2017.2.
5. Wiffen P.J.; Derry S.; Bell R.F.; Rice A.S.; Tolle T.R.; Philips T.; Moore R.A.; Gabapentin for chronic neuropathic pain in adults. 2017 Jun. *Cochrane Database Syst Rev*. 2017 Jun; 2017(6): CD007938, doi: 10.1002/14651858.CD007938.pub4
6. Vos T.; Flaxman A.D.; Naghavi M.; Lozano R.; Michaud C.; Ezzati M. et al.; Years lived with disability (YLDs) for 1160 sequelae of 289 diseases and injuries 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*. 2012;380(9859):2163-96. [DOI: 10.1016/S0140-6736(12)61729-2]

7. Wang G.; Bi L.; Li X.; Li Z.; Zhao D.; Chen J.; He D.; Wang C.N.; Wu T.; Duenas H.; Skljarevski V.; Yue L.; Maintenance of effect of duloxetine in Chinese patients with pain due to osteoarthritis: 13-week open-label extension data, *BMC Musculoskeletal Disorders*. 2019. Article number 174 (2019) doi: 10.1186/s12891-019-2527-y
8. Pelosi A.; *Interferenze orali nelle sindromes cranio-mandibulo-cervicali e posturali*, Castello Editore, Milan, 2007
9. Alizadeh A.; Karagah A.; Tabrizi R.; Shadman L.; Arjmand A.; Tofangchiha M.; Patini R.; Effect of transcutaneous electrical nerve stimulation on pain, edema, and trismus after surgical removal of impacted third molars: a split-mouth randomized clinical trial, *Med Oral Patol Oral Cir Bucal*. 2024 Mar 1; 29(2):e211-e218. doi: 10.4317/medoral.26193.
10. Clauzade M.; Marty J.P.; *Orthoposturodentie. vol.I*. Editeur Espace Mediterranee, 2006
11. Burlui V.; Morarasu C.; Stroici C.; Hasna T.E.; Chirap I.; Munteanu B.S.; *Gnatologie*, Ed. Apollonia, Iasi, 2012