

POSTURE OPTIMIZATION – IS IT THE KEY TO MYOFASCIAL NECK PAIN RELIEF?

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ABSTRACT

Introduction. In recent years, the incidence of chronic cervical pain, as the result of degenerative processes, increased among younger people. Studies show a close relationship between cervical pain and sedentarism, as well as occupational risk factors. Throughout life, intervertebral discs are prone to a physiological wear-out process; in the degenerative discopathy, the wear is accelerated, even when it comes to young people, due to the increasingly frequent postural alterations.

Objectives. To demonstrate a direct link between the postural system receptors disruption and the degenerative disc pathology, as well as the importance of postural rehabilitation strategies and specific manual therapy in the clinical-functional and therapeutic approach of degenerative cervical discopathies with a painful component.

Methods. 174 patients divided into two groups undergone specific assessment tests. The study group followed a *personalized therapeutic program* (manual therapy, postural re-education), while the control group benefited exclusively from the *standard therapeutic program*, according to the medical prescription.

Results. The data confirm the increased incidence of cervical algic syndromes of myofascial origin among the young population and its close relationship to

RÉSUMÉ

L'optimisation de la posture – est-elle la clé pour le soulagement de la douleur myofasciale cervicale?

Introduction. Les dernières années, l'incidence de la douleur cervicale chronique comme résultat des processus dégénératifs a augmenté parmi les plus jeunes. Les études montrent une relation étroite entre la douleur cervicale et le sédentarisme, aussi bien que les facteurs de risque professionnel. Tout au long de la vie, les disques intervertébraux sont enclins à un processus d'usure physiologique ; dans la discopathie dégénérative, l'usure est accélérée, même lorsqu'il s'agit de jeunes, en raison des alternances posturales de plus en plus fréquentes.

Objectifs. Démontrer un lien direct entre la perturbation des récepteurs du système postural et la pathologie dégénérative des disques, aussi bien que l'importance des stratégies de réadaptation posturale et la thérapie manuelle spécifique dans l'approche clinique-fonctionnelle et thérapeutique des discopathies cervicales dégénératives avec un composant douloureux.

Méthodes. 174 patients répartis en deux groupes ont subi des tests d'évaluation spécifiques. Le groupe d'étude a suivi un programme thérapeutique personnalisé (la thérapie manuelle, la rééducation posturale)

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postural syndromes and CCM biomechanical changes identified in the patients included in the study. This study also highlights the importance of a multidisciplinary approach of the patient with myofascial cervical pain.

Conclusions. A significant and long lasting improvement in postural balance results in an obvious improvement in cervical algic syndromes and in slowing the evolution of the cervical disc degeneration process.

Keywords: crano-cervical-mandibular complex, postural deficiency syndrome, myofascial neck pain, sedentarism, manual therapy.

Abbreviations. CCM – crano-cervical-mandibular; PDS – postural deficiency syndrome; MNP – myofascial neck pain; G1 – group 1 (study group); G2 – group 2 (control group)

INTRODUCTION

In recent years, the incidence of degenerative musculoskeletal pathology has increased^{1,2}, especially among the younger population³, among the often cited factors being sedentarism, postural alterations⁴ and the repetition of incorrect gestures during the activities of daily living⁵.

This study attempts to demonstrate the existence of a direct link between the postural system receptors disruption and the degenerative disc pathology⁶, as well as the importance of postural rehabilitation strategies and specific manual therapy in the clinical-functional and therapeutic approach of degenerative cervical discopathies with algic component, using functional tests to detect the primary causes that led to postural alterations^{7,8}.

Standard physiotherapeutic approach, combined with anti-inflammatory medication, generally has an immediate local effect, but this does not persist over time and the rhythmicity of long-term application is limited. As an alternative, we suggest individualized programs based on postural re-education⁹ and manual therapy, which can be applied without long-term restrictions and provide long-term continuity and benefits.

In addition, consideration should be given to the possibility of an etiology away from the painful

tandis que le groupe de contrôle a bénéficié exclusivement du programme thérapeutique standard, selon la prescription médicale.

Résultats. Les données confirment l'incidence accrue des syndromes algiques cervicaux d'origine myofasciale parmi la jeune population et sa relation étroite avec les syndromes posturaux et les changements biomécaniques CCM identifiés chez les patients inclus à l'étude. Cette étude met aussi en évidence l'importance d'une approche pluridisciplinaire du patient présentant des douleurs cervicales myofasciales.

Conclusions. Une amélioration significative et durable de l'équilibre postural entraîne une amélioration évidente des syndromes algiques cervicaux et un ralentissement de l'évolution du processus de dégénérescence discale cervicale.

Mots-clés: complexe crano-cervical-mandibulaire, syndrome de déficience posturale, douleur myofasciale du cou, sédentarisme, thérapie manuelle.

Abbréviations: CCM – crano-cervical-mandibulaire; PDS – syndrome de déficience posturale; MNP – douleur myofasciale du cou; G1 – groupe 1 (groupe d'étude); G2 – groupe 2 (groupe de contrôle).

segment¹⁰ and the local treatment should be completed with causal programs such as foot, vestibular or visual system¹¹ rehabilitation and/or orthodontic treatment. The correct treatment of any illness has to start from the primary cause that triggered the problem and not from the algic syndrome, which occurs later and which is often far away from the origin of the problem. This study is based on this principle and the results have demonstrated the efficacy of this approach.

It has long been considered that chronic cervical pain is the result of degenerative processes commonly encountered in elderly people, but then how is the increasing incidence among younger population explained?

Anatomically and neurophysiologically, in addition to the axial support function of the skull, cervical spine plays an important role in the provision of proprioceptive impulses from the mechanoreceptors, having various connections to the vestibular, stomatognathic and visual systems, continuously modulated by the central nervous system. The proprioceptive function of the cervical spine is ensured by deep intervertebral muscles¹²⁻¹⁴.

The cervical region is the area of the human body with the highest predisposition to pain¹⁵. Two-thirds of the world's population suffers from cervical pain, with the estimated 15% experiencing

cervical pain at some point in life for more than 3 months. The incidence increases with age, reaching the peak in the range 50-59 years; women have a double predisposition to cervical pain compared to men¹⁶. In about 10% of those suffering from cervical pain, this suffering will become chronic¹⁷.

Invalidity associated with chronic pain is becoming more common in modern society¹⁸. Chronic cervical pain is responsible for a high degree of morbidity, with an important negative impact on occupational activities and quality of life^{19,21}.

Over time, many studies²² have shown that several structures of the cervical spine (muscles, tendons, ligaments, joint capsules, intervertebral discs, plateau and vertebral body), with the exception of the nucleus pulposus of the intervertebral disc and the yellow ligament (Ligamentum flavum), have rich innervation with demyelinated C-type nerve fibers, so all these can be origins of pain.

Most authors claim that cervical pain is a multifactorial clinical manifestation. In most cases, risk factors are directly related to the type of work performed, but there are also situations where cervical pain is related to contexts other than professional ones.

We encounter physical (some sports, professional activities, sedentarism), psychosocial (stress) and individual (constitutional type, postural profile, gestures, habits, certain medical conditions) risk factors.

Studies have shown that there is a close relationship between cervical pain and the length of time a person maintains a sedentary position, having the backbone in flexion and rotation²³. The same studies have noted a correlation between chronic cervical pain and occupational risk factors: flexion of the cervical spine, prolonged vicious position of the arms, flexion and rotation of the torso, head and upper limb vibrations. Throughout life, intervertebral discs are prone to a physiological wear-out process; degenerative discopathy is a pathological phenomenon where wear is accelerated, even when it comes to young people, due to the increasingly frequent postural alterations²⁴.

We define posture as the ability of the body systems to adapt efficiently and consistently to all the influences of the environment in which they live, the most important being gravity and friction. Postural control allows optimization of movement, minimizing energy consumption and being possible due to a complex system comprising²⁵: exteroceptors (cutaneous, visual, auditory), proprioceptors (cutaneous, articular, muscular, providing the necessary information for maintaining balance, orthostatism and changes of positioning), superior nerve centers (role in integrating, elaborating, responding and controlling the received information) and effector

organs, which translate in their response the information developed by the higher centers, correct any changes, guaranteeing an ideal balance.

The alterations of the receptors cause erroneous transmission of data to the central nervous system, the consequences being the overuse of the joints and the neuromuscular levers, forced to additional activities in order to restore the balance of the body.

THE OBJECTIVE OF OUR STUDY was to demonstrate that improving the postural balance leads to a significant improvement of the cervical algic syndromes as well as the slowing of the evolution of the cervical disc degeneration process.

MATERIAL AND METHODS

The study was conducted in 2010-2015 at Pelican Hospital in Oradea (Romania), in the Department of Physical Therapy and Rehabilitation, in collaboration with the Orthodontic Center of Cluj (Romania), as part of the research work that underpins the elaboration of the doctoral thesis of the first author.

A number of 174 patients were enrolled, 102 women and 72 men, aged between 16 and 65 years.

There were two inclusion criteria: age between 16 and 65 years; the presence of postural deficiency syndrome (PDS) and a degenerative cervical disc damage.

Exclusion criteria: neurodegenerative and neuropsychiatric pathologies; the presence of a neoplastic pathology; cervical dissection of traumatic cause; a hereditary PDS (malformations).

All subjects were assessed clinically, biologically, imagistically and biomechanically.

The clinical evaluation consisted of anamnesis, objective examination by regions and an interdisciplinary assessment (ophthalmology, dental medicine - orthodontics, physical medicine and rehabilitation, neurology, neurosurgery, E.N.T., orthopedics-traumatology, internal medicine and psychology).

The imaging evaluation was performed by cervical column radiographs and nuclear magnetic resonance.

The biomechanical evaluation included specific tests: the assessment of the cranial-cervical-mandibular (CCM) complex (Rocabado), postural receptors (Romberg, Fukuda, De Cyon, near point of convergence test), clinical cervical spine tests, the gait evaluation, the posturographic examination, computerized static and dynamic baropodometry and computerized stabilometry.

The subjects were divided into two batches:

Group 1 (study group, G1): 93 patients who followed (upon agreement from the attending physician)

a *personalized therapeutic program* comprising, as appropriate, elements of: manual therapy applied to the cranial-cervical-mandibular complex (Palmerini), scapular belts (Kaltenborn), pelvis and foot; postural re-education (Souchart); respiratory re-education; correction of ocular convergence disorders; vestibular and proprioceptive rehabilitation; orthodontic treatments; feet orthosis; therapeutic exercises to improve lumbopelvic control (Sahrmann); psychotherapy.

Group 2 (control group, G2): 81 patients, who benefited exclusively from the *standard therapeutic program* performed in various physiotherapy and rehabilitation services, according to the medical prescription.

The subjects' belonging to any of the two groups was established solely on the basis of each patient's agreement on a specific therapeutic plan (either classic or experimental), after presenting the two possibilities.

Several sources of cervical pain, named after the dominant component (myofascial, osteoarticular and neurological) have been identified following initial evaluations. This study will discuss strictly the cervical pain of myofascial origin.

Statistical analysis was done using EPIINFO, version 6.0, a program of the Center for Disease Control and Prevention in Atlanta, adapted to the medical statistics, as well as SPSS processing. Parameter averages, frequency ranges, standard deviations, statistical significance tests (t and χ^2) were calculated.

RESULTS AND DISCUSSIONS

Women were predominant in both groups (60.22% in G1 and 56.79% in G2), the women/men ratio being 1.5:1 vs 1.3:1 (no significant differences in gender distribution, $p = 0.489$). The mean age was 37.5 years (G1) and 38.91 years (G2).

85 patients in G1 (91.40%) and 67 patients in G2 (82.72%) reported cervical pain, 2-5 times a week, for an average of 3 years. The prevalence of cervical pain is significantly higher in patients in G1 compared to G2 ($p = 0.022$).

In G1, the prevalence of cervical pain was almost equal between women and men (91.07% vs 91.89%) ($p = 0.764$), while the prevalence of cervical pain in G2 was significantly higher in women (95.65% vs 65.71%) ($p < 0.001$).

Most patients in both groups had a pain score of 2 to 7 points (89.41% and 77.61%, respectively). Scores over 7 points were recorded in 10.59% of G1 patients and 22.39% of patients in G2 ($p = 0.005$). The intensity of pain is perceived as higher in males than in women, both in G1 and G2, with scores above 7, being significantly higher in males than in

females (20.59% vs 3.92%, $p < 0.001$ and 30.43% vs 18.18% respectively, $p = 0.008$). Thus, there are significant differences between the study and the control group, both in females and in males ($p < 0.001$, respectively $p = 0.032$).

In both groups, the prevalence of cervical pain with predominantly myofascial component (75.29% vs 76,125) prevailed in both women (74.51% vs 72.73%) and in males (76.47% vs 82.61 %).

Myofascial neck pain (MNP) was found in patients aged under 45 years in both groups (76.32% vs 68.63%) and the osteoarticular neck pain in patients over 45 years of age (80.95% vs 56.25%). The same applies to both women and men.

MNP disappeared starting with the 2-week assessment in both groups: 2 patients in G1 (3.12%) and 10 patients in G2 (19.61%). The absence of MNP had an ascending trend up to 18 months in the study group, reaching 93.75%. In the control group, the absence of MNP had an upward trend up to 3 months (52.94%), the pain re-occurring after 6 months in 6 patients (11.76%) and 18 months in 23 patients (45.10%).

At the final assessment (18 months), MNP was absent in 60 patients in G1 (93.75%) and in 16 patients in G2 (31.37%) ($p < 0.001$).

In women, MNP disappeared from the 2-week assessment in the study group and 6 weeks in the control group: in one G1 patient (2.63%) and one G2 patient (3.12%) respectively. The absence of MNP had an upward trend of up to 18 months in G1, reaching 92.11%. In G2, the absence of cervical-myofascial pain had an ascending trend up to 3 months (40.62%), with pain recurring in 6 months in 8 patients (25.00%) and 12 months in 24 patients (75.00%). At the final assessment (18 months), MNP was absent in 35 patients in the study group (92.11%) and one in the control group (3.12%) ($p < 0.001$).

In men, the MNP disappeared starting with the 2-week assessment in both groups: one patient in the study group (3.85%) and 10 patients in the control group (52.63%) respectively. The absence of MNP had an ascending trend up to 18 months in the G1, reaching 96.15%. In G2, the absence of MNP had an ascending trend up to 6 months (84.21%), the pain recurring in 12 months in 2 patients (10.53%). At the final assessment (18 months), MNP was absent in 25 patients in the study group (96.15%) and 15 in the control group (78.95%) ($p < 0.001$).

In patients with cervical pain, we considered the pain intensity improved when the pain score dropped and worsened if the pain score increased.

In G1, MNP patients experienced 2 cases of worsening (increase in score) at 3 months and 6 months, most of them experiencing pain intensity

drop. In G2, MNP worsening occurred at 6 weeks (3 cases, 8.33%), 3 months (8 cases, 33.33%), 6 months (one case, 3.33%) and 18 months (18 cases, 51.43%).

In G1, the pain score decreased steadily over the seven assessments, with a significant decrease at 6 weeks. In G2, the pain score decreased steadily over the first 3 months, with a significant decrease at 6 weeks.

MNP is closely related to CCM biomechanical changes; their prevalence was 46.24% (G1) and 55.56% (G2) ($p = 0.061$). In women, it is significantly higher than in males in G1 (55.36% vs 32.43%, $p < 0.001$) and significantly lower in G2 (50.00% vs 62.86%, $p = 0.008$).

The patients in the study group were treated with C0-C1-C2 specific manual therapy techniques (C2 manual derotation, C1 derotation with sub-occipital neuro-muscular stabilization, myofascial stretching), postural re-education, ergonomic measures and specific active exercises recommended at home.

Subjects in the control group followed a standard therapeutic program, based mainly on local applications (antalgic electrotherapy, topical anti-inflammatory drugs, relaxing massage), active vertebral mobilization exercises, ergonomic measures.

The results obtained demonstrated the effectiveness of this specific manual therapy concept; thus, in the case of patients in the study group, algic syndrome progressively decreased from one session to another, with slight recurrence (at the 4th and 7th session) in women and a reduced number of patients, where the psychogenic component was more strongly represented, this group being ranked higher in the subjective description of the algic syndrome.

Starting from the algic syndrome (we strictly refer to the myofascial component), statistical studies have demonstrated that this clinical manifestation is strongly associated with the CCM biomechanical syndromes, translated into abnormal head positions, which in turn are expressions of global postural disorders of different etiology. The data presented above demonstrate that a significant and long lasting improvement in postural balance results in an obvious improvement in cervical algic syndromes, as well as in slowing the evolution of the cervical disc degeneration process.

In patients who experienced improvements in postural alignment in the sagittal plane (postural syndromes were approached in all planes, but the sagittal plane was the one to be followed) no worsening of disc degeneration was observed, no worsening from the stages of protrusion to disc herniation or from the early stages of hernia to advanced stages, but, on the contrary, the phenomena of regeneration and reduction of the degree of protrusion have been

observed, which confirms that improving the posture and maintaining a balance between the body segments (by defeating sedentarism and with the use of specific postural exercises and manual therapy where needed) is an important measure in preventing degenerative pathologies of the cervical spine, but also a curative measure for many types of musculoskeletal syndromes, which are often seen as pain.

Patients in the control group experienced a stagnation in posture improvement. As mentioned above, those who have experienced minimal improvements have followed various rehabilitation programs, some have chosen to make more movement. Overall, no improvement in posture has been observed in these patients since they have not done anything specific in this respect, and cervical pain is directly related to CCM syndromes (as revealed from the data presented above), syndromes that are the consequences of postural disorders and their early chronicization.

Regarding the origin (dominance) of the cervical pain, our study demonstrated an increased incidence of the myofascial component, which is almost the same in all ages, which explains the direct involvement of postural syndromes in the altering of pre- and paravertebral cranial-cervical and cervical-spinal paravertebral tissues.

In patients with cervical pain of myofascial origin, the main factors responsible for the aggravation of symptoms and recurrence (reactivation) were sedentarism and lumbopelvic instability caused by the prolonged standing position.

Chronic cervical pain is a consequence of important biomechanical destabilizations that can be compensated for a certain period during lifetime in which pain is absent or minimal in intensity. But when compensation mechanisms can no longer ensure that false equilibrium, the symptomatology is installed.

In the treatment of chronic cervical disease, patients in the control group received medication (anti-inflammatories, analgesics), repeated on an average of four times throughout the study, while the patients in the study group were not prescribed analgesic and anti-inflammatory drug therapy.

We chose the short and long term monitoring of body segment changes in the sagittal plane in patients in both groups. This choice is based on the following reasoning: most patients who present changes in the frontal and transverse planes are already at the age at which postural changes of the developmental stages (such as scoliosis, craniofacial alterations, inferior limb inequalities) are already structured (hard, or even impossible to be influenced by postural exercises or manual therapy). Instead, in the sagittal plane, in most cases, a certain „elasticity“ is maintained

even in adults (not the young ones), the segments of the body moving in this plane in larger angles than the gravitational line.

At the same time, we consider that the assessment of the postural alignment, the position of the body segments and the gestures in this plane are important for the study of the pathology approached in the present study, namely the degenerative cervical discopathy, because most of the biomechanical alterations that caused the establishment of the chronic cervical symptomatology in the patients under study, but also the early degeneration of cervical intervertebral discs seem to occur within the head protrusion attitude.

Our study confirms the effectiveness of these methods, the results being similar to other studies structured on the global approach of patients with musculoskeletal pain^{26,27}.

THE LIMITS OF THE STUDY

The main limitation of the study is the low number of subjects, which does not reduce its scientific value, but may draw criticism on its statistical value. We are already working on overcoming this limitation, continuing the same methodology, with the inclusion of new subjects for a broader and more statistically significant study.

Another limit has been identified in the relatively small number of patients who undergone psychological assessment (here we have faced the reluctance of some of them), which we consider extremely important for a better understanding of the subjective component (the pain assessment).

CONCLUSIONS

1. The initial asymptomatic and progressive adaptation of body segments to pathological changes of the postural and stomatognathic system receptors will result in severe changes of the CCM complex and then of the entire postural system, with significant negative consequences on the intervertebral disc metabolism.

2. Most often, the compensatory levers of the postural disorders converge into the CCM system. It adapts over time, initially suffering asymptomatic changes, then, depending on the type of tissue altered by overloading, compression or excessive stretching (inter apophyseal joints, deep or superficial muscles, ligaments, vessels, roots or nerve plexuses), it develops a specific symptomatology.

3. Before the onset of the painful symptom, patients with chronic cervical pain have significant changes in the CCM complex, induced either by

myofascial or axial alterations in the cranio-mandibular area, postural syndromes or postural disorders with ascending influence.

4. Depending on the dominant component, manual therapy and postural reeducation programs have been effective, an important role in improving the functions of the CCM complex and implicitly in the improvement and even the disappearance of cervical pain in the short and long term.

5. In view of the severe psychosocial impact, the overall manual and postural therapeutic approach of patients with cervical and chronic headache is particularly important, both in terms of the effectiveness and the small number of necessary therapeutic sessions, and from the point of view of the costs of treatments, which are minimized by the active involvement of the patient.

Compliance with Ethics Requirements:

„The authors declare no conflict of interest regarding this article“

„The authors declare that all the procedures and experiments of this study respect the ethical standards in the Helsinki Declaration of 1975, as revised in 2008(5), as well as the national law. Informed consent was obtained from all the patients included in the study“

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