

# Neck pain: rehabilitation

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## DESCRIPTION OF THE EVIDENCE COLLECTION

### METHOD

We started the preparation of this directive with the capacitation of the authors by means of the methodology employed by the *Oxford Centre for Evidence Based Medicine*, for the preparation of clinical directives by the Directives Program of the Brazilian Medical Association (Associação Médica Brasileira - AMB). Next, we had five directive preparation meetings with the AMB Program's coordinators. Articles from the MEDLINE (PubMed) databases, the Cochrane Database of Systematic Reviews, by means of the Health Virtual Library, with no time limitation. The search strategy adopted was based on (P.I.C.O.) structured questions (from the initials "Patient"; "Intervention"; "Control" and "Outcome". The resulting search syntax for non-specific neck pain was:

**Question 1:** neck pain AND (analgesics OR paracetamol OR acetaminophen OR dipyrrone OR non narcotics OR analgesics OR opioid);

**Question 2:** neck pain AND (muscle relaxants OR ciclobenzaprine OR carisoprodol);

**Question 3:** neck pain AND (non-steroidal anti-inflammatory agents);

**Question 4:** neck pain AND (physical modalities OR hyperthermia induced OR diathermy OR ultrasonic therapy OR electric stimulation OR ultrasound OR transcutaneous electric nerve stimulation OR TENS);

**Question 5:** neck pain AND (exercise therapy OR physical activity);

**Question 6:** (neck pain OR myofascial pain syndromes) AND (massage OR manual therapy);

**Question 7:** (neck pain OR myofascial pain syndromes) AND (posture OR ergonomic OR ergometry);

**Question 8:** neck pain AND (sleep OR posture);

**Question 9:** (neck pain OR myofascial neck pain) AND (acupuncture therapy OR trigger points);

**Question 10:** neck pain AND education;

**Question 11:** neck pain AND (psychology OR interdisciplinary communication OR interprofessional relations OR cognitive behaviour therapy OR work style intervention);

**Question 12:** neck pain AND (mechanical OR manipulation);

**Question 13:** neck pain AND (nerve blocks OR local anesthetics);

**Question 14:** (neck pain OR myofascial pain syndrome) AND botulinum Toxin;

On all searches, we used *Field: All Fields, Limits: no age limits*, with metodological filter for study types: *narrow*. In this manner, we found 1495 articles. Next, based on the abstracts, we selected the ninety-one papers related to neck pain and its treatment. We classified the scientific evidence strength of these studies according to the *Oxford Centre for Evidence Based Medicine* guidelines. The randomized and controlled clinical essays were submitted to critical evaluation according to the Jadad scale, 1996. Finally, we selected the forty-seven references which, due to greater scientific evidence strength, consistence, and clinical relevance, gave support to the recommendations of this directive.

### LEVEL OF RECOMMENDATION AND EVIDENCE:

**A:** Strong consistency experimental or observational studies.

**B:** Fair consistency experimental or observational studies.

**C:** Case reports (uncontrolled studies).

**D:** Opinion lacking critical evaluation, based on consensus, physiological studies or animal models.

### OBJECTIVES:

Offering information about the rehabilitation of chronic non-specific neck pain.

## INTRODUCTION

Neck pain is a common pain cause in the general population with prevalence of 10% to 15%, affecting around 60% to 70% of adult individuals at some point in their lives.<sup>1</sup> Yearly incidence in adults is 14.6%, where women have higher probability than men of developing cervical pain and suffering from persistent cervical problems.<sup>2</sup> The use of personal computers and work overload are associated with the increase in cervical symptoms.<sup>3</sup> In the United States of America, around 92.2 million people use personal computers, and among them, around 63.9 million use it at work.<sup>4</sup> Neck pain can cause disability and high cost to the health care system, however, little is known about natural history and its evolution. In addition to pain, there may be complaints of limitation in amplitude of movements of the joints and localized rigidity, initiated or worsened by brusque cervical movements or sustained postures of the cervical segment.

Differently from chronic non-specific lower back pain, there are few controlled randomized studies yet that substantiate the use of several therapeutic modalities employed in the control of chronic non-specific neck pain. We excluded specific causes such as radiculopathy, cervicogenic headache, whiplash syndrome, tumors or metastases, fractures, ankylosing spondylitis, rheumatoid arthritis, surgeries, acute and subacute neck pain, myelopathy, spasticity, dystonia, infections, and headache.

#### 1. WHAT IS THE EFFECTIVENESS OF REGULAR ANALGESICS IN THE TREATMENT OF CHRONIC NON-SPECIFIC NECK PAIN?

The use of paracetamol with a 4 g dose, equivalent to the drug's maximum dose every twenty-four hours, daily, orally, maximum of nine consecutive weeks<sup>5</sup> (B) (n = 43, with three dropouts) does not improve symptoms, only two out of forty, and only 5% presented complete alleviation of pain.

#### RECOMMENDATION

There is no evidence to support the use of regular analgesic in the treatment of chronic non-specific neck pain<sup>5</sup> (B).

#### 2. WHAT IS THE EFFECTIVENESS OF MUSCLE RELAXANTS IN THE TREATMENT OF CHRONIC NON-SPECIFIC NECK PAIN?

The use of 10mg daily, orally administered cyclobenzaprine, during thirty days, alleviates the pain in patients with neck pain due to myofascial pain syndrome of the upper trapezius muscle ( $4.6 \pm 2.5$ ,  $3.1 \pm 1.8$ ; difference  $-1.2 \pm 0.9$ ,  $p < 0.0001$ )<sup>6</sup> (B). Adverse effects were observed in 75% of the patients, fifteen out of twenty patients, such as: xerostomy and sleepiness. In these cases, the dosage was reduced to 5mg daily after fifteen days of use<sup>6</sup> (B).

Diazepam in 5 mg daily dosage, orally administered, provides alleviation of the affective ( $3.0 \pm 0.8$  to  $2.2 \pm 1.0$ ;  $p < 0.01$ ) and sensitive ( $1.9 \pm 0.7$  to  $1.6 \pm 0.7$ ;  $p < 0.05$ ) components of pain, two hours after administration, whereas the same dosage of placebo provides alleviation solely of the affective component ( $2.7 \pm 1.0$  to  $2.2 \pm 1.3$ ;  $p < 0.05$ ), but not of the sensitive component of the pain ( $1.9 \pm 0.8$  to  $1.7 \pm 1.0$ ;  $p > 0.05$ )<sup>7</sup> (B).

#### RECOMMENDATION

The use of 10 mg daily, orally administered cyclobenzaprine, during thirty days in patients with chronic non-specific neck pain due to myofascial pain syndrome of the upper trapezius muscle is recommended. In cases of adverse effects, the dosage should be reduced to 5 mg. There is no evidence to support the use of diazepam in the treatment of chronic non-specific neck pain<sup>6,7</sup> (B).

#### 3. WHAT IS THE EFFECTIVENESS OF ANTI-INFLAMMATORY DRUGS IN THE TREATMENT OF CHRONIC NON-SPECIFIC NECK PAIN?

The use of celecoxib in daily single dose of 200 mg to 400 mg, maximum of nine consecutive weeks<sup>5</sup> (B) does not improve the symptoms, only 5% of the patients presented complete alleviation of pain. Adverse effects were observed in seven patients corresponding to 6.1%, such as: indigestion, abdominal pain, and skin rash. Eleven patients, 26%, changed treatments due to lack of therapeutic results<sup>5</sup> (B).

#### RECOMMENDATION

There is no evidence to support the use of anti-inflammatory drugs for the treatment of chronic non-specific neck pain<sup>5</sup> (B).

#### 4. IS THE USE OF PHYSICAL MEANS INDICATED FOR THE TREATMENT OF CHRONIC NON-SPECIFIC NECK PAIN?

The association of infrared surface thermotherapy in the neck region during twenty minutes, followed by transcutaneous electrical nerve stimulation, with electrodes over the acupuncture points Ex 21, LI 11, and GB21 during thirty minutes, twice a week for six weeks, ( $4.7 \pm 1.8$ , with  $0.6 \pm 2.4$  improvement,  $p = 0.027$ ) is not superior neither to the combined use of infrared with supervised exercises, nor to the isolated use of infrared ( $p = 0.119$ ). The exercises had total duration of thirty-five minutes and consisted of the activation of the deep cervical muscles followed by fifteen repetitions of isometric contraction of cervical extension and flexion and muscle strengthening with progressive and variable resistance according to the patient's tolerance<sup>8</sup> (B).

Ultrasound with a 0.8 cm<sup>2</sup> area head, with a 3 W/cm<sup>2</sup> dosage, 100 Hz frequency, 2:8 pulse, applied in circular movements over maximum of five painful spots or myofascial triggers in the cervical and shoulder region, for no longer than fifteen minutes, followed by transverse friction massage of these spots and myofascial release for ten minutes, twice a week, over six weeks, associated with six types of home exercises for cervical and shoulder stretching and strengthening reduces pain, analgesics consumption and the number of trigger points, however, it is not superior to placebo<sup>9</sup> (B).

Likewise, ultrasound with a 1.5 W/cm<sup>2</sup> dosage over the myofascial trigger points of the upper trapezius muscle, during six minutes, in a total of ten sessions, followed by cervical stretching exercises, is superior to the cervical stretching exercises program by itself in the reduction of pain intensity, increase in the pressure tolerance threshold, and increase in cervical amplitude of movement (visual analog pain scale pre-treatment and three months after treatment:  $7.24 \pm 1.62$  to  $3.08 \pm 2.42$ ;  $p < 0.001$ ). The results obtained were similar to Lidocaine 1% injections in the trigger points of the upper trapezius muscle followed by cervical stretching exercises (visual analog pain scale pre-treatment and three months after treatment:  $7.16 \pm 1.66$  to  $3.19 \pm 2.51$ ;  $p < 0.001$ )<sup>10</sup> (B).

Similar effect was observed with the use of ultrasound in continuous mode, with intensity ranging from 0.5-2.0 W/cm<sup>2</sup>, according to the patient's maximum tolerance, during three to four seconds, three times<sup>11</sup> (B).

The association of manual traction, massage, thermotherapy and interferential current with active muscle strengthening and joint amplitude of movement exercises, including postural, functional, stretching, and relaxation exercises during thirty minutes, twice a week and in six consecutive weeks, performed by therapists not specialized in manual therapy, presents similar results to the general clinical orientations<sup>12</sup> (B).

The improvement rate regarding pain alleviation was 50.8% in patients submitted to exercises in relation to 35.9% in the general clinical orientations group, and there was no statistical difference between those interventions<sup>12</sup> (B).

No decrease is noted in the number of absence from work in patients who received therapy with physical exercises compared to general clinical orientations (ARR 0.025, CI<sub>95%</sub> from -0.212 to 0.162; with NNT 40,6 to infinity). Compared to manual therapy, active physical exercises are, statistically, inferior and there is lower absenteeism rate in 15.8% among patients submitted to manual therapy (ARR 0.158; CI<sub>95%</sub> -0.009 to 0.325, with NNT = 6 (3 to infinity))<sup>12</sup> (B).

#### RECOMMENDATION

There is no difference among the following therapeutic modalities: manual traction, massage, thermotherapy, and interferential

current with active exercises, therefore, there are no evidences to support the use of these modalities in the treatment of chronic neck pain<sup>8-12</sup> **(B)**.

##### 5. WHAT IS THE BENEFIT OF PHYSICAL ACTIVITY IN THE REDUCTION OF PAIN AND DISABILITY IN CHRONIC NECK PAIN?

###### SENSORY PERCEPTION EXERCISES AND CONVENTIONAL PHYSICAL THERAPY

Sensory perception exercises are intended to sensing how the body works. To do so, they use movement sequences from the simplest to the most complex and with greater amplitude, aiming to reduce effort in the joints to attain movement<sup>13</sup> **(B)**.

The sensory perception exercises performed in fifty-minute weekly sessions over sixteen weeks, being four of these, individual sessions and the other twelve, group sessions, in combination with similar exercises at home do not show significant improvement in neck pain when compared to physical therapy exercises for neck postural correction, strengthening, coordination, resistance, and flexibility when performed under supervision for fifty minutes, twice a week, for sixteen weeks. Comparing patients that perform the sensory perception technique with those that do not have any intervention, it is observed that those who performed the sensory perception exercises had a significant reduction in neck and shoulder pain complaint, in the first evaluations and later within one to two years for neck pain (averages and standard deviations, respectively:  $0.45 \pm 1.32$  vs.  $-0.35 \pm 1.07$ ;  $p = 0.034$ ); neck and shoulder combined (averages and standard deviations, respectively:  $0.80 \pm 1.82$  vs.  $-0.09 \pm 1.44$ ;  $p = 0.083$ ); confirming that there is a difference between not doing anything and practicing sensory perception exercises (ARR = 0.346;  $CI_{95\%}$ : 0.065 to 0.627; NNH = 3  $CI_{95\%}$ : 2 to 15)<sup>13</sup> **(B)**.

###### RECOMMENDATION

Sensory perception exercises are not recommended for the improvement of neck pain, since those do not show superiority compared to conventional physical therapy with neck postural correction, strengthening, coordination, resistance, and flexibility<sup>13</sup> **(B)**.

###### STRENGTHENING EXERCISES, PHYSICAL THERAPY AND MANIPULATION

Comparing patients that perform training program for neck strengthening with warm-up, stretching and isometric strengthening of the flexors (one series with twelve repetitions), extensors, and inclination muscles of the neck (three series with twelve repetitions), both with rest and stretching of the same muscles, in addition to exercises with weights for the shoulder region and strengthening and stretching exercises, in approximately one hour long sessions, with a group of patients that are submitted to the conventional physical therapy practices with application of heated pads for twenty minutes, continuous ultrasound (3 W/cm<sup>2</sup> for five minutes), massage, manual traction of the neck and proprioceptive exercises during forty-five minutes, and also with a third group of patients that receive manipulation techniques with manual traction of the cervical spine and massage in the muscles and pain key-points during forty-five minutes, all of the three programs performed in two sessions a week during six weeks, it was demonstrated that all patients were benefited with improvement in pain scores (medians and  $CI_{90\%}$  pre and post-treatment, respectively, for strengthening training: 12, 10-15 and 6, 3-9; for physical therapy: 12, 10-15; 6, 3-8; and for Manipulation: 13, 10-15; 6, 4-7;  $p < 0.05$  for all cases) and neck disability (medians and  $CI_{90\%}$  pre and post-treatment, respectively, for Group

I: 8, 7-10; 5, 4-7; Group II: 9, 8-11; 4, 3-6; Group III: 8, 7-10; 4, 4-5;  $p < 0.05$  for all cases) after the treatments. However, none of the techniques showed superiority over the others<sup>14</sup> **(A)**.

There was a decrease in the number of patients who took analgesics. Apparently, the patients submitted to the massage program were the ones that most stopped using these drugs, fourteen out of thirty-three patients, however this number is not, statistically, significant when compared to the Physical Therapy program, in which eight out of thirty-five patients stopped taking them (0.054  $CI_{95\%}$ : -0.155 to 0.263; NNH = 19; 4 to infinity), or even when compared to the strengthening training program, four out of thirty-four participants stopped taking analgesics by the end of the treatment (ARR = 0.048,  $CI_{95\%}$ : -0.116 to 0.262; NNH = 21,  $CI_{95\%}$ : 4 to infinity)<sup>14</sup> **(A)**.

Another relevant information found is that the improvement in cervical pain score was maintained for up to twelve months after the participants performed the programs (medians and  $CI_{90\%}$  pre-treatment and after twelve months, respectively for Strengthening program: 12, 10-15 and 6, 4-9; Physical therapy: 12, 10-15; 8, 6-11; and Manipulation: 13, 10-15; 6.6-8;  $p < 0.05$  for all cases). The same effect can also be observed in the neck disability measurements (medians and  $CI_{90\%}$  pre-treatment and after twelve months, respectively for Strengthening program: 8, 7-10; 5, 4-7; Physical Therapy: 9, 8-11; 6, 4-7; and Manipulation: 8, 7-10; 5, 3-6;  $p < 0.05$  for all cases)<sup>14</sup> **(A)**.

It is also noted that there is no difference in the seeking for health care services to treat neck pain among the participants who performed these three programs (Strengthening vs. Physical therapy: ARR = 0.065,  $CI_{95\%}$ : -0.142 to 0.272; NNH = 15,  $CI_{95\%}$ : 2 to infinity; Massage vs. Strengthening: ARR = 0.039,  $CI_{95\%}$ : -0.183 to 0.261; NNT = 26 - 5 to infinity; Physical Therapy vs. Manipulation: 0.104  $CI_{95\%}$ : 0.109 to 0.317; NNH = 10; -9 to infinity)<sup>14</sup> **(A)**.

Even if strengthening trainings and manipulation have comparable results when performed isolatedly<sup>14</sup> **(A)**, the combined use shows superiority compared to the exclusive use of manipulation<sup>15</sup> **(A)**.

A neck and upper trunk strengthening program with eleven one-hour sessions being forty-five minutes for arm flexions, shoulder exercises with 1 to 4.5 kg barbells (two sessions of fifteen to thirty repetitions) and exercises and neck lifting in the supine position with a pulley system attached to the head with weights ranging from 0.5 to 4.5 kg, when combined with the cervical and thoracic manipulation program for fifteen minutes with quick movements, of little amplitude and short levers, in addition to light massages over soft tissue demonstrated better results with greater increase in strength (averages and  $CI_{95\%}$ : 8.3 e 6.3-10.2; 2.4 and 0.5-4.3;  $p < 0.05$ ), resistance (averages and  $CI_{95\%}$ : 284.6 and 185.4-387.7; 145.6 and 50.5-240.6;  $p < 0.05$ ) and amplitude of movement of the neck (averages and  $CI_{95\%}$ : 8.3 and 5.4-11.2; 1.6 and 1.2-4.4;  $p < 0.05$ ) than when submitted to the practice of cervical manipulation isolatedly<sup>15</sup> **(A)**. In this case the occurrence of adverse effects did not differ between those that perform manipulation techniques combined with strengthening training or isolatedly ( $\chi^2 = 1.44$ ;  $p < 0.49$ ), being the increase in headaches and neck pain the most common manifestations in the patients who received those interventions (ARR = 0.031,  $CI_{95\%}$ : -0.077 to 0.039; NNH = 32,  $CI_{95\%}$ : 7 to infinity)<sup>15</sup> **(A)**. This would demonstrate that the combination of programs does not cause overload and is safe, because other events such as radicular or thoracic pain are self-limited and do not cause permanent damages.

There is, however, controversy regarding the use, since studies demonstrate that programs for the strengthening of neck and shoulder muscle groups with the use of exercises with barbells, from 1 kg

to 3 kg, followed by stretching or even relaxation exercises programs using several techniques with the purpose of promoting only the use of the muscles needed for daily tasks and the relaxation of the other muscles, being both programs with three thirty-minute sessions a week during twelve weeks, presented similar results as when no specific intervention was performed. Although there is mild improvement in the amplitude of cervical rotation and in the lateral flexion, both exercise programs did not improve neck pain in a significant manner (average pain scale  $2.9 \pm 2.6$  for strengthening program,  $2.9 \pm 2.4$  for relaxation and  $2.7 \pm 2.5$  for control) and, after twelve months from completion of the trainings, the averages of absences from work and the absenteeism rates were similar between those that performed the strengthening trainings and those that had no intervention at all ("strengthening" vs. control, ARR = 0.006, CI<sub>95%</sub>: -0.080 to 0.092; NNH = 167, CI<sub>95%</sub>: -12 to infinity)<sup>16</sup> (A).

#### RECOMMENDATION

A training program for the strengthening of the cervical region is recommended in sessions of approximately one hour, with stretching followed by isometric strengthening of the flexors (one series with twelve repetitions), extensors, and inclination muscles of the neck (three series with twelve repetitions), both with rest, in addition to exercises with weights: shoulders with 1 to 4.5 kg barbells (two sessions of fifteen to thirty repetitions) and neck lifting in the supine position 5 kg with pulley system attached to the head with weights ranging from 0.5 to 4.5 kg (two sessions of fifteen to thirty repetitions)<sup>14-16</sup> (A).

#### STRENGTHENING AND RESISTANCE EXERCISES

Patients with chronic and non-specific neck pain who during ten weeks perform three supervised sessions a week of cervical muscles strengthening programs (exercises performed in devices that provide resistance in the concentric phase of the movement, with four exercises for neck and shoulder, in three series of ten to twelve repetitions, with progressive increment of the load) as well as muscular resistance training (exercises in devices such as "arm cycle", during two minutes, alternating with three minutes of exercises for the shoulders with elastic, with thirty contractions) show improvement in neck pain (averages and standard deviations pre and post-training, respectively:  $72 \pm 15$ ;  $58 \pm 12$ ,  $p < 0.05$ ;  $70 \pm 17$ ,  $58 \pm 19$ ,  $p < 0.05$ )<sup>17,18</sup> (B).

In this study, results indicate that the improvement in pain is greater in the resistance group ( $p = 0.004$ ; ARR 0.309, CI<sub>95%</sub>: 0.123 to 0.495; NNT: 4, CI<sub>95%</sub>: 2 to 8). On evaluations performed three years after trainings the scores for "worse pain" are lower than the initial ones (averages and standard deviations pre and post-trainings, respectively:  $74 \pm 16$ ,  $61 \pm 27$ ,  $p = 0.02$ ;  $70 \pm 17$ ,  $58 \pm 27$ ,  $p = 0.092$ ;  $77 \pm 13$ ,  $57 \pm 28$ )<sup>17,18</sup> (B).

Another study indicates that similar exercise programs with training regimens of muscle strengthening with five forty-five minute sessions a week during twelve months (seated training of the flexor muscles of the neck with elastics in a session of fifteen repetitions for each direction: forward, backward, right and left) or resistance training (exercises in the supine position for the flexor muscles of the neck against gravity resistance being those exercises repeated for three series of twenty repetitions), with both programs followed by dynamic exercises with barbells for the upper limbs after the specific neck training, demonstrate there is significant reduction in pain (medians and Q<sub>25-75%</sub> of the groups after twelve months of

training, respectively: -40, from -48 to -32; -22, from -42 to -28; -16, and Q<sub>25%-75%</sub> = -22 to -9) and in the disability in the cervical region compared to patients who do not perform any training (medians and Q<sub>25-75%</sub> of the groups after twelve months of training, respectively: -23, CI<sub>95%</sub>: -27 to -20; -22, CI<sub>95%</sub>: -26 to -19; -12, CI<sub>95%</sub>: -15 to -8). In this case, the muscle strengthening program had better results regarding muscular strength gain and, although not significant, the complete alleviation of pain was attained by 73% of participants in the strength training and by 59% in the resistance training (ARR = 0.147, CI<sub>95%</sub>: -0.022 to 0.316; NNT = 7; CI<sub>95%</sub>: 3 to infinity)<sup>19</sup> (A).

#### RECOMMENDATION

Cervical muscles strengthening exercises are recommended (exercises performed in devices that provide resistance in the concentric phase of movement, with four exercises for the neck and shoulder, in three series of ten to twelve repetitions, with progressive increment of load) as well as muscular resistance training (exercises on devices such as "arm cycle", during two minutes alternating with three minutes of shoulder exercises with elastic, with thirty contractions), three times a week, during ten weeks, for improvement in neck pain<sup>19</sup> (A).

#### SUPERVISED AND HOME EXERCISES

Programs of home environment exercises, as long as there is previous orientation, distribution of explanatory booklets with the exercise program and at least two supervised instructive classes, bring similar results to the practices performed entirely in therapeutic environment and supervised by physical therapist (two forty-five minute sessions a week over twelve weeks, comprising of upper limb, shoulders and neck warm-up, cervicothoracic stabilization to restore cervical resistance and coordination, relaxation training to reduce tension in the unnecessary muscles, behavioral support to reduce anxiety and fear of pain, eye-fixation exercises to prevent dizziness and balance board training to improve postural control), being both programs effective in the reduction of intensity of cervical pain compared to those that only receive oral and written orientation about exercises, but with no initial classes under professional supervision (EVA averages after three months of training, respectively: 23, 22, 39;  $p = 0.018$ )<sup>20</sup> (A).

#### RECOMMENDATION

A program of home exercises supervised by physical therapist is recommended: two forty-five-minute sessions a week, during twelve weeks, comprising of upper limb, shoulders and neck warm-up, cervicothoracic stabilization to restore cervical resistance and coordination, relaxation training to reduce tension in the unnecessary muscles, behavioral support to reduce anxiety and fear of pain, eye-fixation exercises to prevent dizziness, and balance board training to improve postural control. These exercises can be beneficial in the reduction of cervical pain even when performed at home<sup>20</sup> (A).

#### 6. WHAT IS THE BENEFIT OF MASSAGE IN THE REDUCTION OF CHRONIC NON-SPECIFIC NECK PAIN?

The ischemic compression of painful myofascial points with a plastic instrument in the shape of a cane, aiming the application of continuous and sustained pressure in the pain areas, followed by sustained muscular stretching during thirty to sixty seconds, at least twice a day, during five days at home (pain reduction -12.5 (20.7)) is superior to stretching isolatedly (pain reduction -1.9 (16.4),  $p = 0.043$ )<sup>21</sup> (B).

Digital compression with the thumb, in the cervical spine region during one minute, applied two consecutive times, reduces cervical pain in 36% of cases<sup>22</sup> (B). There is no difference in the place of application of compression ( $p = 0.98$ )<sup>22</sup> (B).

Manual therapy with muscular and articular passive movements combined to coordination and stabilization techniques to reestablish cervical spine physiology by experienced manual therapists, during forty-five minutes, once a week, during six weeks is superior to seeing a general practitioner who provides orientations regarding prognosis, psychosocial matters, self-care, ergonomics, pillow height, and posture at work, in addition to prescribing analgesic drugs with paracetamol and non-steroidal anti-inflammatories and, even, additional medical consultations lasting ten minutes, every two weeks with a six-week follow-up, if needed<sup>12</sup> (B). The improvement rate regarding alleviation of pain is 68.3% compared to 35.9% in the general clinic orientations group (difference 32.4  $CI_{95\%}$  15.8-49.0). Manual therapy reduces the risk of absence from work in 13.3% (ARR 0.133  $CI_{95\%}$  -0.026-0.292, with NNT = 8 (3 to infinity))<sup>16</sup> (B).

#### RECOMMENDATION

The association of ischemic compression to the myofascial painful points increases the effectiveness of cervical stretching exercises in the reduction of pain, favouring the return to work in patients with chronic non-specific neck pain<sup>21</sup> (B).

#### 7. WHAT IS THE INTERFERENCE OF ERGONOMY IN THE ACTIVITIES OF PATIENTS WITH CHRONIC NON-SPECIFIC NECK PAIN?

Ergonomic reorientation with the use of forearm supports during work in front of the computer among call center operators, has shown to be beneficial with decrease in neck complaints that happened to 49% of the employees and that, after twelve weeks using the device, were present in only 18% of them ( $\chi^2 = 5.05$ ;  $p = 0.008$ ). Even though it is not statistically significant, the decrease in the proportion of operators with neck complaints can already be noted after six weeks<sup>23</sup> (B).

Ergonomic orientation in the work environment, either combined or not to orientation regarding physical activities, by means of monthly interactive lecture programs for six months, can improve body posture and the adaptation of the workstation and number of pauses during work compared to workers who do not receive this intervention. It is believed that these factors may reduce the incidence of neck and upper limb symptoms, however, this factor was not studied in this research<sup>24</sup> (A).

An intensive ergonomics program, individualized and performed in the workplace with the visit of a specialist physical therapist, shows to be effective in the reduction of neck and upper limb complaints in office workers when compared to coworkers that receive only a one-page leaflet about ergonomics at work after two months from the intervention. Also, those workers who receive one-hour lectures in small groups and detailed ergonomics information booklets also present benefits in the reduction of pain in the cervical region compared to the reference group. Workers who receive the intensive ergonomic program present reduction of symptoms in other regions of the body<sup>25</sup> (B).

Finally, we can see that the application of an electronic questionnaire with questions about risk factors for neck, shoulder, and arms symptoms in office workers who use computers, who after evaluation could provide a devolutive with ergonomics orientations, e.g., position for seating, small interruptions, workload and stress

management, to be applied in the workplace both individual and collectively, and when necessary, request referral to a medical appointment for ergonomic evaluation and orientations, did not show to be a good ergonomic practice, since similar groups of workers who answered the questionnaire, but did not receive orientations, presented the same rate of reduction of 9% in the prevalence of neck, shoulder, and arm symptoms found in the group that was oriented<sup>26</sup> (B).

#### RECOMMENDATION

The use of ergonomic measures can be indicated for workers who use computers during work, such as the use of forearm support, for the improvement of neck pains, and correct positioning of monitors and keyboards<sup>23</sup> (B). Apparently, the best results regarding neck pain and discomfort are attained by cooperative and individualized programs, in which both workers and ergonomics professionals are actively involved<sup>24-26</sup> (B).

#### 8. WHAT IS THE INTERFERENCE OF THE SLEEP POSTURE OF PATIENTS WITH CHRONIC NON-SPECIFIC NECK PAIN?

The night use of 10.2 cm high polyester-fiber pillows, with 3.8 cm base of water and filled with 2360 ml of water during two weeks (VAS alleviation of  $3.87 \pm 0.41$ ) is superior to the 17.8 cm high cylindrical polyester pillow (VAS alleviation of  $2.42 \pm 0.42$ ) in the alleviation of morning pain in men and women with chronic neck pain ( $p < 0.005$ ). There is no difference in night pain with both types of pillows (VAS alleviation of  $2.76 \pm 0.44$  - cylindrical  $p < 0.5$ ;  $3.86 \pm 0.42$   $p < 0.1$ ) compared to the usual ( $p > 0.1$ )<sup>27</sup> (B).

The comparison of six different types of soft low pillows, during three weeks, favoured sleep in thirty-six out of fifty-five patients corresponding to 65% and alleviated pain in twenty-seven out of forty-two, or 64% of patients. The meaning of these results is that there is improvement in chronic neck pain in those patients with chronic neck pain<sup>28</sup> (C).

#### RECOMMENDATION

There is no evidence to defend the use of pillows to improve posture during sleep and reduce non-specific neck pain<sup>27,28</sup> (B,C).

#### 9. WHAT IS THE EFFECTIVENESS OF ACUPUNCTURE IN THE TREATMENT OF CHRONIC NON-SPECIFIC NECK PAIN?

Classical acupuncture, performed by experienced physician, in the SI3, UB10, UB20, LV3, GB20, GB34, TE5, GB20, and SI14 points combined with auricular acupuncture points, during thirty minutes, in five sessions over the period of three weeks, reduces the pain related to cervical movement up to one week after finishing the applications (ARR = 0.223,  $CI_{95\%}$  0.049 to 0.397, with NNT = 4,  $CI_{95\%}$  3-10)<sup>31</sup> (A). The adverse effects observed are mild and include mild pain, neurovegetative reactions (sweating, lowered blood pressure), and can be found in similar manner both in patients who receive acupuncture, and in those who do not receive it (ARR = 0.10,  $CI_{95\%}$  -0.053 to 0.261, with NNH = 10,  $CI_{95\%}$  19 to infinity)<sup>31</sup> (A), occurring in 8.9% of the cases ( $n = 1.005$  patients). However, adverse effects happen, with lesser frequency, in the group that receives massage (ARR = 0.237,  $CI_{95\%}$  0.101 to 0.373, with NNH = 4,  $CI_{95\%}$  3-10)<sup>31</sup> (A). During the acupuncture treatment period, 70.5% of the patients does not use any rescue analgesic drugs, compared to 17.7% in the control group (RR = 4.0;  $CI_{95\%}$  2.3-7.0)<sup>29</sup> (A).

It is also observed the reduction of 12% ( $CI$  3 to 21%) in intensity of pain, corresponding to 6.3mm ( $CI_{95\%}$  1.4 - 11.3 mm) in the visu-

al analog scale compared to the control group, statistical difference ( $p = 0.01$ ), however, not clinically significant<sup>30</sup> (A) and obtained by means of eight classical acupuncture sessions, over four weeks in the GB20, GB21, GV 14, LI4, SI3, GB34, and TE5 points, combined to the local points SI12, SI13 ou SI14, BL9, BL10, ST11, SI15, and BL11<sup>30</sup> (A). The main adverse effects observed are the increase in symptoms, headache, dizziness, hematoma in the needle insertion point<sup>30</sup> (A).

The association of fifteen sessions of acupuncture, during three months, with the usual treatment<sup>32</sup> (A) is superior to the usual treatment by itself ( $p < 0.001$ ) and the effect lasts for three months<sup>32</sup> (A). There is improvement both in pain and in cervical disability. It is also observed that the acupuncture is a cost strategy and effective in the treatment of chronic neck pain, with additional gain of QALy of  $0.024 \pm 0.004$  compared to the usual treatment by itself<sup>34</sup> (A). The average of treatments is  $10.3 \pm 2.6$ <sup>34</sup> (A).

In the course of three years, there is reduction in chronic neck pain by the combination of classical acupuncture, electroacupuncture, and auricular acupressure, applied for forty-five minutes, three times a week, ten sessions during three to four weeks<sup>33</sup> (A). Electroacupuncture parameters are: 100  $\mu$ s wave, 170-200 v amplitude, and 5 Hz frequency<sup>33</sup> (A). It is observed a greater reduction in the intensity of pain (70% and 29%) compared to the intensity of pain by the end of treatment ( $p = 0.001$ ) and three years after ( $p < 0.04$ )<sup>33</sup> (A).

#### RECOMMENDATION

Classical acupuncture, applied by itself or combined with electroacupuncture and auricular acupressure, reduces the intensity of pain and improves pain related to cervical movement, in sessions two to three times a week, during three to four weeks<sup>29-31</sup> or up to three months<sup>32-33</sup> (A).

#### 10. WHAT IS THE ROLE OF PATIENT EDUCATION REGARDING PAIN IN THE TREATMENT OF CHRONIC NON-SPECIFIC NECK PAIN?

An educational program of postural orientation performed with eight to ten repetitions followed by muscle relaxation exercises during ten to fifteen minutes, intended to reduce hyperactivity and contraction maintained in the muscles of the neck and shoulder region, every two or three hours, in group and individually, reduces pain in a significant manner compared to the group that does not receive the educational program (OR 0.69,  $CI_{95\%}$  0.56-0.85). After six months, the group with no treatment started the same exercise educational program and presented the same improvement as the group with exercises (OR 0.80,  $CI_{95\%}$  0.64-1.00)<sup>35</sup> (B).

Educational brochures with the orientation for the practice of exercises are less effective than the orientation supervised by physical therapists in the quality of the exercises performed, muscle state and alleviation of pain ( $p < 0.01$ ). Only 50% of the patients oriented by brochures perform the exercises correctly<sup>36</sup> (B). The alleviation of pain correlates to the adequate performance of the exercises<sup>36</sup> (B).

An educational program for the performance of muscular relaxation exercises and of postural exercises with visual feedback reduces pain in 62.3% ( $CI_{95\%}$  50.9 to 73.85%), seven to eight months after instruction and in 60.9% ( $CI_{95\%}$  49.4 to 72.4%) within thirteen to fourteen months after instruction<sup>37</sup> (B). The average number of days of neck pain during one month is 6.79 before treatment and 3.88 within seven to eight months after the educational program and 3.88 within thirteen to fourteen months after instruction<sup>37</sup> (B).

#### RECOMMENDATION

Supervised educational orientation is recommended regarding posture and exercises to be performed at home taking into consideration patient adherence. The performance of exercises based in educational brochures, with no previous orientation, does not show satisfactory results<sup>36</sup> (B).

#### 11. WHAT IS THE ROLE OF COGNITIVE-BEHAVIORAL THERAPY IN THE TREATMENT OF CHRONIC NON-SPECIFIC NECK PAIN?

One study indicates that Cognitive-Behavioral Therapy (CBT) does not show better indices of return to studies measured up to eighteen months after interventions in workers with lumbar and cervical pain, subacute or chronic, of up to fifty-nine years who had been absent from work for two to twenty-four months, than among those absent by conventional treatments with doctor appointments, physical therapy and occupational therapy<sup>38</sup> (B). The exception is the measure of chance of reduction in the absenteeism rates in which workers submitted to CBT present better results, however, only in subacute patients (HR = 3.5;  $CI_{95\%}$ : 1.001-12.2).

Another study demonstrated that the use of some CBT techniques intended to encourage self-control and return to normal activities in a brief intervention program for neck pain, proposing from one to three sessions with physical therapists who received one-day training regarding CBT principles, with no time pattern for therapy completion, is not superior to the practice of conventional physical therapy composed of electrotherapy, manipulation, and counseling according to the patients demands in five weekly sessions in the reduction of neck pain. The pain level was assessed by the measure of the Northwick Park questionnaire regarding treatment of subacute and chronic neck pain three months after treatment (average change in score on brief CBT and control, respectively: -1.481 and -2.101; average difference among groups in the change in score of 0.620;  $CI_{95\%}$ : -0.444 to 1.684;  $p = 0.2518$ )<sup>39</sup> (B).

One study showed that in patients with chronic neck pain, five weeks of multimodal CBT during internment is not superior to other more traditional primary care techniques, such as physical therapy and rest among others in the reduction of the pain measured by the Visual Analog Scale - VAS (averages of the CBT intervention and control groups before and after six months of treatment: 52.2 and 51.6; 45 and 42.4; 45.2 and 48.5) and, also, the the application of cognitive-behavioral therapy raises treatment costs (cost per patient in intervention and control, respectively: US\$ 30,422.00 and US\$ 902.00)<sup>40</sup> (B). However, this study's results must be carefully analyzed, since the study had low methodological quality in key requisites such as randomization, blinding, group characteristics and co-interventions.

In an effectiveness study of cognitive-behavioral therapy for the treatment of insomnia in patients with chronic lumbar and cervical pain, it was demonstrated that the patients submitted to eight forty-five to ninety-minute weekly sessions administered by a CBT-trained nurse, present improvements in the score of pain interference in daily and labour activities and in social functioning. This evolution was measured with the use of Multidimensional Pain Inventory (MPI - 0 to 6 scale) compared to patients who only have appointments with nursing professionals for orientations and explanations about sleep and pains and that face sessions with the same frequency and duration (average score in pain interference  $\pm$  deviations in CBT and control groups after interventions, respectively:  $2.7 \pm 1.5$ ;  $3.7 \pm 1.5$ ;  $p = 0.0318$ ). However, the comparison between

patients does not show differences in the aspects of average daily pain, intensity of pain and pain disability index<sup>41</sup> (B).

It must be highlighted that in the cognitive-behavioral therapy the procedure executor may influence the patients' functional recovery results by 0.8% to 8%. Different treatment modalities are also susceptible to this influence, but the highest values are observed in psychosocial interventions<sup>42</sup> (B).

The meta-analysis regarding physical conditioning techniques in workers with neck pain indicates that the conditioning programs with intense training which include CBT components intending to divert the attention from the pain and disability and focus in function recovery reduce, in average, in forty-five days ( $CI_{95\%}$ : 3 - 88) the absence from work due to medical leave during one year. This suggests a beneficial role of CBT when compared to programs that do not include these therapeutic resources. However, it should be pointed out, this is an indirect conclusion, taken from the comparison between studies which were not designed to evaluate CBT effectiveness<sup>43</sup> (A).

In the preventative area, the use of CBT in six two-hour weekly group sessions in cervical and lumbar pain recurrence prevention in people with history of spinal pain shows that the people submitted to these programs present 5% chance of going on medical leave for over fourteen days than those who use conventional primary attention techniques (physician appointments, exercise recommendations and referrals, physical therapist, or other health care professional appointments) against a 15% chance for other people who do not have prevention, i.e., this group has three times more chances of going on medical leave for over fourteen days (OR: 3.3;  $CI_{90\%}$  = 1.19 -10.2)<sup>44</sup> (B). When compared to those who receive only written orientations regarding how to deal with and recover from pain, people who receive CBT present nine times less chances of going on medical leave for over thirty days (OR 9.3;  $CI_{95\%}$ : 1.2 -70.8)<sup>45</sup> (B).

#### RECOMMENDATION

There are not enough scientific evidences to support the use of cognitive-behavioral therapy for chronic neck pain, either in the treatment or in the prevention of its recurrence, since the studies show little expressive and controverted results (B).

#### 12. WHAT IS THE BENEFIT OF SPINAL MANIPULATION IN CHRONIC NON-SPECIFIC NECK PAIN?

Comparative study between the use of medication, acupuncture and spinal manipulation in twenty-minute weekly sessions for up to nine weeks for the treatment of neck pain showed that the manipulation techniques produce better results than the other techniques over the patients' spinal complaints, with the exception of neck pain<sup>5</sup> (B).

Similarly, the comparison of patients who receive a program of techniques that combine manipulation with manual traction of the spine and massage during forty-five minutes, with cervical strengthening exercises preceded by warm-up, stretching and isometric strengthening of the flexors (one series with twelve repetitions), extensors, and inclination muscles of the neck (three series with twelve repetitions), exercises with weights for the shoulder region and exercises during one hour, and, also, with a third group of patients submitted to conventional physical therapy techniques with the application of heated pads for twenty minutes, continuous ultrasound (3 W/cm<sup>2</sup> for five minutes), massage, neck manual traction, and proprioceptive exercises during forty-five minutes, being all three programs performed in two sessions a week over six weeks,

it was demonstrated that all patients were benefitted with the improvement in pain score (medians and  $CI_{90\%}$  pre and post-treatment, respectively, for Manipulation: 13, 10-15; 6, 4-7; strengthening training: 12, 10-15 and 6, 3-9; and physical therapy: 12, 10-15; 6, 3-8;  $p < 0.05$  for all cases) and neck disability (medians and  $CI_{90\%}$  pre and post-treatment, respectively, for; Manipulation: 8, 7-10; 4, 4-5; Strengthening: 8, 7-10; 5, 4-7; and Physical Therapy: 9, 8-11; 4, 3-6;  $p < 0.05$  for all cases) after the treatments. However, none of the techniques showed superiority over the others<sup>14</sup> (A).

Even though the strengthening trainings and manipulation produce isolatedly comparable results<sup>14</sup>, a cervical and upper trunk strengthening program, with eleven one-hour sessions, being forty-five minutes for arm flexions, shoulder exercises with 1 to 4.5 kg barbells (two sessions of fifteen to thirty repetitions) and neck lifting exercises in supine position with pulley system attached to the head with weights ranging from 0.5 to 4.5 kg, when combined with cervical and thoracic manipulation program for fifteen minutes with quick movements, of small amplitude and short levers, in addition to massage, showed better results with greater increase in strength (averages and  $CI_{95\%}$ : 8.3 and 6.3-10.2; 2.4 and 0.5-4.3;  $p < 0.05$ ), resistance (averages and  $CI_{95\%}$ : 284.6 and 185.4-387.7; 145.6 and 50.5-240.6;  $p < 0.05$ ) and amplitude of movement of the neck (averages and  $CI_{95\%}$ : 8.3 and 5.4-11.2; 1.6 and 1.2-4.4;  $p < 0.05$ ) than when there is the isolated practice of cervical manipulation<sup>15</sup> (A).

In this case, the occurrence of adverse events did not differ between those who receive manipulation techniques combined with strengthening training or isolatedly ( $\chi^2 = 1.44$ ;  $p < 0.49$ ), being the increase in headache and neck pain the most common manifestations among patients who received these interventions (ARR = 0.031,  $CI_{95\%}$  -0.077 to 0.039; NNH = 32,  $CI_{95\%}$  7 to infinity)<sup>15</sup> (A).

#### RECOMMENDATION

The use of spinal manipulation techniques can be recommended, because it provides benefits to patients, with reduction of pain and neck disability, and gain in resistance and amplitude of movement of the neck. Whenever possible, the manipulation techniques can be indicated, in combination with cervical strengthening trainings, since in literature, this combination can potentialize the therapeutic benefits of spinal manipulation<sup>14</sup> (A). However, one must consider the referral of patients to qualified and trained in the performance of spinal manipulation procedures services and therapists, given the great variety of professionals that work in this field and the inherent risks of manipulation techniques.

#### 13. IS BLOCK ANESTHESIA USEFUL IN CHRONIC NON-SPECIFIC NECK PAIN?

The infiltration of 1% lidocaine without vessel constrictor in up to six painful myofascial points, in single dose, alleviates the pain in patients with neck pain due to myofascial pain syndrome of the upper trapezius muscle ( $4.8 \pm 2.1$ ;  $2.5 \pm 1.8$ ; difference  $-1.8 \pm 0.8$ ,  $p < 0.0001$ ). However, these effects are similar to those obtained with the use of 10 mg cyclobenzaprine in daily single dose. Adverse effects to the block were observed in 66% of patients - twelve out of a total of eighteen patients: pain and edema in the injection site<sup>6</sup> (B).

The single dose of 1ml Lidocaine 0.5% intramuscular injection in each cervical and scapular muscles myofascial trigger-point improves the pain, four weeks after the application<sup>46</sup> (B). This effect is superior to dry needling (SMD -1.27  $CI_{95\%}$  -2.25 a -0.29) and similar to botulinum toxin (SMD -0.49  $CI_{95\%}$  -1.41 to 0.42)<sup>46</sup> (B).

The injection of trigger-points in the upper trapezius muscle with 1% Lidocaine followed by cervical stretching exercises is superior to the isolated treatment with cervical stretchings (SMD -1.36  $CI_{95\%}$  -1.93 to -0.80; NNT = 3)<sup>10</sup> (B). There is a 45% benefit with improvement in the visual analog scale of 40 mm, three months after application<sup>10</sup> (B).

#### RECOMMENDATION

There is evidence that the infiltration of 1% lidocaine without vessel constrictor in the myofascial painful points is beneficial in the treatment of chronic non-specific neck pain<sup>10</sup> (B).

#### 14. WHAT ARE THE RESULTS OF USING BOTULINUM TOXIN IN THE TREATMENT OF CHRONIC NON-SPECIFIC NECK PAIN?

100 U type A botulinum toxin was studied as an instrument for improvement of pain in the treatment of chronic neck pain of myofascial origin and showed improvement in pain and quality of life if used in 2 to 34 U dosage in patients aged between twenty-one and seventy years, applied, directly, on the trapezius muscles, in the low cervical region, high cervical or thoracic regions, however with no statistical difference compared to the placebo<sup>47</sup> (B).

There is 4.3 ± 2.4, 3.3 ± 2.0 reduction in neck pain after injections of saline and 4.1 ± 2.1, 3.3 ± 2.2 after injections of type A botulinum toxin. The pain threshold value increased from 5.2 ± 1.6 to 5.9 ± 1.5 and from 5.7 ± 1.6 to 5.9 ± 1.6 after injections with saline and Type A botulinum toxin, respectively. No statistically significant changes to neck pain and pain threshold values occurred between Type A botulinum toxin and saline. After the initial applications, the treatment result was significant ( $p = 0.008$ ) regarding type A botulinum toxin, and after the second application the result was better for saline solution, but the difference was not statistically significant ( $p = 0.098$ ). Also, there was no significant difference in the prevalence of side effects between saline and Type A botulinum toxin<sup>48</sup> (A).

#### RECOMMENDATION

We do not recommend the use of botulinum toxin, because there is no benefit proven by literature yet<sup>47,48</sup> (A).

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