



Effect of manipulative treatment in patients with mechanical neck pain: a systematic review

Jossandra Cássia de Maria Alves Teles^{1,3}, Daniel Nunes de Oliveira^{1,3}, Antônia Vitória Silva Mota^{1,3}, Patrícia Xavier Lima Gomes^{2,3}, Francisco Fleury Uchôa Santos-Júnior^{1,2,3}.

ABSTRACT

Introduction: The neck pain especially of mechanical origin (related to the joints of the spine) interfere in health and quality of life of individual widely affecting the population. **Objective:** Analyze through a systematic review the effectiveness of manipulation as a therapeutic tool in neck pain. **Method:** The search was performed using the following databases: *Scientific Electronic Library Online* (SCIELO), Virtual Health Library (BIREME), PubMed (MEDLINE) and Google Scholar with the descriptors “Cervical manipulation”, as well as associated with the word “joint”, in the last 14 years (2001 to 2015). The search resulted in 446 articles of which 49 were selected for reading the full text, but only 10 articles contemplated the methodological criteria. There were included studies that approach about the neck pain, using manipulation associated with physiotherapy techniques. Reviews, master and doctoral thesis and Completion of Course Work were excluded, as well as studies involving animals. **Results:** The articles included in this study were submitted to methodological quality analysis of the PEDro scale, in which all items have average higher than or equal to six. The sample size ranges from 6 to 96 subjects with age between 18 and 65 years old. Regarding the gender of patients the prevalence was 35.71% for males and 64.28% for females, being this one predominant in the studies included in the research. The majority of the evaluated articles proved to be favorable to cervical manipulation with improvement of pain in 48.9% of patients in primary care and about 75% decreased in 6 months, as well as improvement of functional limitation. **Conclusions:** The cervical manipulation proved to be an important and effective technique in the treatment of mechanical neck pain, because it can minimize the painful condition and restore range of motion.

Keywords: Spinal manipulation, Physiotherapy, Osteopathic Medicine.

INTRODUCTION

Neck pain is a musculoskeletal problem that compromises the health, the quality of life of individuals⁽¹⁾ and widely affects the population and can be acute or chronic. According to the World Health Organization (WHO), 50% of adults suffer from neck pain at some point in their lives.⁽²⁾ Among the most common conditions fit the whiplash injury, cervical muscle spasm, dysfunctions with impairment of the upper limbs and mechanical derangements.⁽³⁾

The origin of neck pain is multifactorial and may be related to repetitive movements, lack of breaks at work, static jobs keeping the head and/or arms in the same position for too long.⁽⁴⁻⁵⁾ Regarding the clinical features of the patients, they can report pain associated or not to a strength deficit in the flexor and extensor muscles of the cervical region,⁽⁶⁾ limited range of motion and increase in muscle fatigability.⁽⁷⁾ Neck pain can be related to sudden or abrupt movements, long stay in a forced position, stress or trauma, and can be defined as a pain on the back of the neck and upper shoulder blade or

upper dorsal, which is not accompanied by characteristic signs of the radiculopathy.^(8,9,10)

One of the neck pain treatment ways is through techniques related to physiotherapy, for example: in cases of mechanical neck pain, the Positional Release Therapy (PRT), which aims at the harmonization of the musculoskeletal system, approaching passively origin and muscle insertion with specific placement of body segments, with the finality of reduce the pain, normalize the myofascial tension, relax the periarticular tissues and improve the circulation.⁽¹¹⁾ Therefore, manipulation of the spine can be set as a manual application technique of a physical impulse performed in a short period of time, that is, high speed and low amplitude. These movements and applied forces are generated to cause vertebral displacement within physiological limits of movement modifying the local stress.⁽¹²⁾ The objective of the present study is to analyze the effectiveness of manipulation as a therapeutic tool in neck pain.

Corresponding author: Name: Francisco Fleury Uchoa Santos-Junior Telephone: +55 (85) 3201-2400 Address: Rua Av Aguanambi, N° 251, CEP 60055-400, Fatima, Fortaleza – Ceara E-mail: drfleuryjr@gmail.com

¹ Faculdade Maurício de Nassau (UNINASSAU), Fortaleza (CE), Brazil.

² Centro Universitário Estácio do Ceará (Estácio), Faculdade Maurício de Nassau, Fortaleza (CE), Brazil.

³ “Mouvement” research group, Fortaleza (CE), Brazil.

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METHOD

Eligibility Criteria

The study included articles that approached manipulation of the cervical spine with the use of high speed and low amplitude techniques related to range of motion disorders. In this study were excluded clinical trials that did not report diseases involving cervical joint, the ones that had absence of clinical trials randomized without amounts of group of participants, as well as reviews, master and doctoral thesis, completion of course work and studies involving animals.

Search strategy and selection of the study

The search was performed using the following electronic databases in the last 14 years (2001 to 2015): *Scientific Electronic Library Online* (SCIELO), *Virtual Health Library* (BIREME), *PubMed* (MEDLINE) and *Google Scholar*. The researches were

realized between March and May 2015 and comprehend the following descriptors: “Cervical manipulation” isolated or associated with the word joint. The articles were reprocessed in English and Portuguese.

Data extraction

Initially in Figure 1, by placing the descriptors in the databases were found 446 articles, in which: *Scientific Electronic Library Online* (SCIELO) with n=274; *PubMed* (MEDLINE) with n=21; *LILACS* with n=19; *Virtual Health Library* (BIREME) with n=26; *Google Scholar* with n=106. Shortly after a thorough reading of the abstracts of the studies, 436 were excluded because they did not include the established methodological criteria. In total were read 10 papers in full. The overall quality of the articles was analyzed according to the evaluation items of the *Physiotherapy Evidence Database-PEDro* scale.

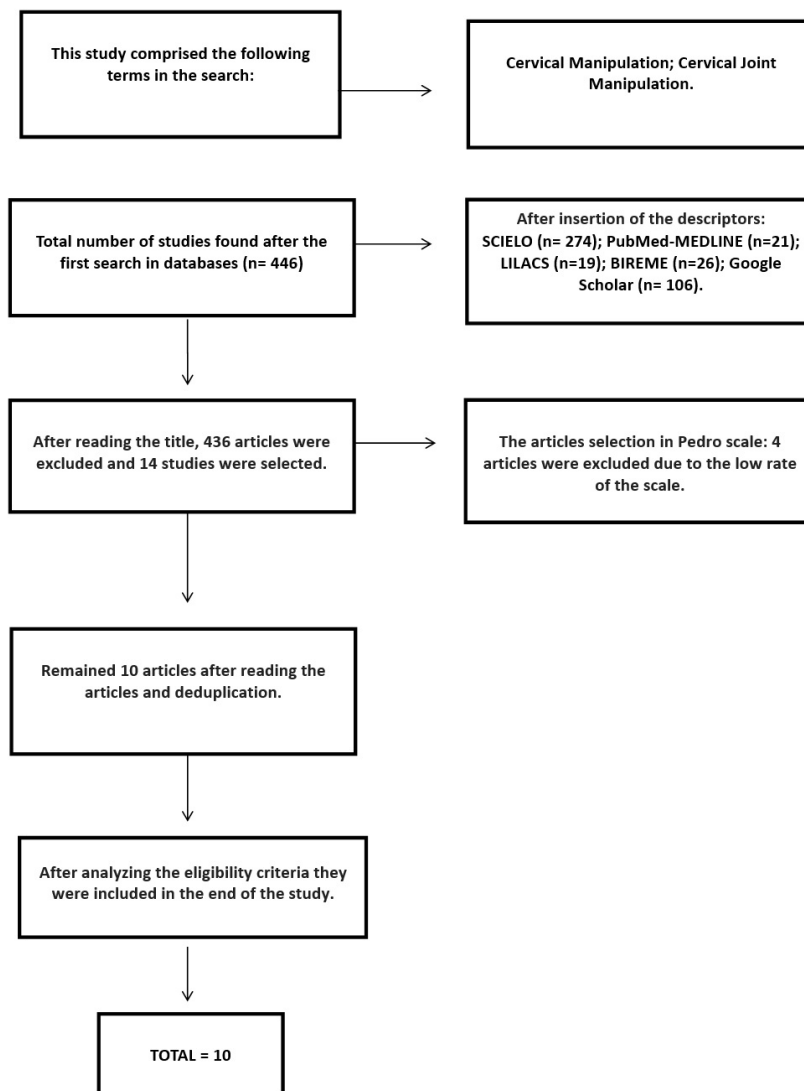


Figure 1. Flowchart of the studies included in the research.



This scale has 11 items for assessment of PEDro table and for better classification of articles was applied specific result, according to the table criteria. Each satisfied item (except the first) contributes one point to the total score of the scale. The final score is obtained by the sum of all positive responses, and those that have average equal or higher than five on the scale were considered of high methodological quality.

Following are described the aspects analyzed by PEDro table as criteria to be followed to evaluate the studies.

1. The eligibility criteria were specified.
2. The subjects were randomly allocated to groups (a crossover study, the subjects were placed randomly into groups according to the treatment received).
3. The allocation of subjects was secret.
4. Initially, the groups were similar in regard to most important prognostic indicators.
5. All subjects participated in the study blindly.
6. The therapy was administered blindly by all therapists.
7. All assessors who measured at least one key outcome did it blindly.
8. Measurements of at least one key outcome were obtained in more than 85% of the subjects initially distributed between the groups.
9. All subjects who presented measurements of results received the treatment or control condition as allocated, or when this was not the case,

the analysis was made for at least one of the key outcome by "intent treatment". 10. The results of statistical comparisons intergroup were described for at least one key outcome. 11. The study presents both precision measures as variability measures for at least one key outcome.

RESULTS

The table 1 presents the main data as author and year, objective of the study, intervention, results and outcome. The sample size ranges from 6 to 96 subjects with age between 18 and 65 years old. Regarding the gender of patients the prevalence was 35.71% for males and 64.28% for females, being this one predominant in the studies included in the research.

In Table 2 contains information about methodological quality using the PEDro scale, which can be evidenced that all the items included in this study underwent this legitimacy, and according to the classification all of them had average higher or equal to six, in which 33.3% of these score six, 41.62% score seven and 24.97% score eight. Therefore, all items had a good methodological quality.

Table 1. Main characteristics of the studies as author and year of the article, objectives, intervention, results and outcome.

Author/year	Objective	Intervention	Results	Outcome
Kamonekiet al 2012 [13]	Determine the immediate influence of high-velocity low-amplitude technique (HVLA) applied to the upper cervical spine in active mouth opening.	High-velocity low-amplitude technique (HVLA).	In intragroup analysis: there were no significant differences from the control group. In experimental group: amplitude of mouth opening was significantly higher post-intervention when compared to pre-intervention time.	This study showed that HVLA applied in the upper cervical region promoted immediate improvement in mouth opening, because the range was greater after performing the technique in the experimental group compared to the control group.
Barbosa et al 2012 [14]	Check the effectiveness of spinal manipulation by full-scanning technique in the correction of head protrusion and the relief of neck pain and headaches, as well as the electrical activity of the upper trapezius muscle before and after the protocol.	Full-scanning technique	Pain analysis: the ten patients who completed treatment achieved significant results in pain analysis in the studied groups, with a group with very significant results. The biophotogrammetry analysis has indicated significant differences in the groups.	The results suggest that the full-scanning technique was relevant to pain reduction between the initial and final moments as well as for angular reduction occurred in biophotogrammetry data, with consequent improvement of cervical and head positioning of the studied volunteers.
Stelleet al 2013 [15]	Check if the osteopathic manipulation through the rhythmic articular technique generates increase of cervical rotation amplitude measured by fleximetry.	Osteopathic manipulation with the cervical rhythmic articular technique.	There was a significant increase of range of motion in all cases.	There was a significant increase of range of motion in all cases. The OM-CRAT (Osteopathic Manipulation with Cervical Rhythmic Articular Technique), proved to be effective in cervical rotation amplitude gain and may serve as a treatment for diseases that are related to vertebral hypomotility, as neck pain and cervical osteoarthritis.



Table 1. Continued...

Author/year	Objective	Intervention	Results	Outcome
Stelleet al 2014 [16]	Check if osteopathic manipulation with cervical rhythmic articular technique generates abnormal oscillations of the blood flow velocity or risks to the circulation of the internal, vertebral, basilar and carotid arteries.	Cervical rhythmic articular technique.	It is possible to say that OM-CRAT in sliding and in rotation generated no risk to the movement of the arteries, osteopathic manipulative treatment or vertebral manipulation did not cause injury or undue stress on the vertebral and carotid arteries. There was only a discrete increase of the flow velocity in the intracranial arteries after OM-CRAT.	There is no significant oscillation in flow velocity in the vertebral arteries (intracranial and extracranial - bilateral), internal carotid and basilar (bilateral) with OM-TARC, which allows to provide security in the cervical manipulative treatment without the risk of vascular complications.
Camargo et al 2012 [17]	Determine the immediate effects of C5/C6 (<i>Ashmore</i>) manipulation technique on the bilateral EMG activity of the middle deltoid muscle during resting and contractions.	<i>Ashmore</i> technique	Cervical manipulation to C5/C6 level with rotation to the left in the sitting position was able to change the behavior of muscle activity during contractions of 30" in patients with neck pain. These changes were of a reduced size effect and was lacking uniformity with regard to the periods of beginning and end of the contraction.	The <i>Ashmore</i> C5-C6 technique reduced significantly the bilateral EMG activity of middle deltoids for 30" of isometric contraction, increasing muscle recruitment and fatigue resistance compared with the electrical activity in the control group subjects.
Leaveret al 2010 [18]	Determining whether neck manipulation or mobilization is most effective for pain.	Technique of high speed manual therapy, low-amplitude impulse techniques. Technique of low-speed manual therapy, passive oscillating movement.	There were no statistically significant differences between groups of manipulation and mobilization in the secondary outcomes of pain, disability, function, global perceived effect or health-related quality of life at any point of time.	Nearly half of the participants of the study did not fully recovered from the episode of neck pain, however there has been rapid and significant improvement in pain scores in both groups.
Vargas et al 2014 [19]	Investigate the real-time feedback effect on the performance of CSM (cervical spine manipulation).	<i>Cervical spine Manipulation Technique (CSMT)</i> .	There were significant differences in angular velocity of rotation. The results also showed no significant difference in pre-manipulator position, impulse displacement or lateral flexion of angular velocity.	Suggest that the feeding in real-time <i>feedback</i> derived from an inertia sensor can be used for key-variable amounts associated with the important CSM and can assist in the development of impulse speed.
Gong 2013 [20]	Identify the effects of cervical joint manipulation at the joint position sense (JPS) of normal adults.	Cervical joint manipulation at the joint position sense (JPS).	Test group results revealed statistically significant differences in flexion and extension, but the control group showed no significant differences in any of the variables.	Combined of massage and cervical joint manipulation is more effective in increasing the range of motion.
Hernandez et al 2012 [21]	Examine the effects of Kinesio taping against cervical spine manipulation in pain neck intensity, disability and cervical range of motion in patients with mechanical neck pain.	Manipulative technique of high-speed and low-amplitude. <i>Kinesio Taping</i> .	Patients who received impulse manipulation experienced a greater increase in the cervical motion rotation range than those who received the application kinesio tape.	Patients with mechanical neck pain receiving a cervical impulse manipulation or a <i>KinesioTaping</i> application showed reduction in neck pain and disability and changes in cervical range of motion over a period of 7 days.



Table 1. Continued...

Author/year	Objective	Intervention	Results	Outcome
Puentedura et al 2011 [22]	The differences in the result of cervical thrust manipulation compared to chest thrust manipulation to treat patients with cervical pain showed that the treatment of the thoracic spine demonstrated benefits and involves less risk.	Thrust manipulation	The study shows that patients with mechanical neck pain in the cervical group compared with the thoracic group showed significant and greater improvement in all outcome measures.	It was found that patients who were treated with a combination of cervical spine manipulation and exercises showed significantly greater improvement in pain and disability compared to those treated with thoracic spine manipulation and exercises.
Kolberg et al 2015 [23]	The aim of this study was to investigate the parameters of oxidative stress in patients with chronic neck pain or back pain after 5 weeks of treatment with high-speed and low-amplitude manipulation (HVLA) of the spine.	High-velocity low-amplitude manipulation (HVLA).	The study showed treatment by spine manipulation twice a week for 5 weeks. In subjects with unspecific chronic neck pain increased SOD and GPx activities, without significant changes. And metabolites activity in systemic blood were almost unchanged after 6 sessions of HVLA manipulation in men with neck pain.	This study showed that SOD and GPx activity in patients with nonspecific cervical chronic pain or back pain increased after 10 sessions of HVLA manipulation of the spine. This study supported the hypothesis that the effects of HVLA manipulation of the spine on the oxidative stress depend on the time and the frequency of treatment.
Hurwitz et al 2002 [24]	To evaluate the relative efficacy of approaches of treating pain in the neck approaches commonly used by chiropractors.	High-Velocity Low-Amplitude manipulation. Stretching, flexibility or strengthening exercises and advice on ergonomics and modifications in the workplace.	Manipulation and mobilization with or without heat, with or without electrical muscle stimulation produced similar improvements in the intensity of pain and disability after 6 months.	The results suggest that cervical mobilization of the spine is as effective as manipulation in reducing neck pain and disability among patients of chiropractic. Furthermore, was showed that no heat or electrical muscle stimulation, alone or in combination with manipulation or mobilization, significantly improves the clinical results, although heat may provide short-term benefits for some patients.

Table 2. Analysis of the articles according to the Physiotherapy Evidence Database – PEDro table scores.

Study Criteria	1 2 3 4 5 6 7 8 9 10 11	Total quality	Methodological quality
Kamonseki et al 2012 [13]	+++++--	6/11	High
Barbosa et al 2012 [14]	+++--++	7/11	High
Stelleet et al 2013 [15]	+---++-++	7/11	High
Stelleet al 2014 [16]	+--++-++	6/11	High
Camargo et al, 2012 [17]	+++--++-+	8/11	High
Leaver et al, 2010 [18]	+++--++-+	8/11	High
Vargas; Williams. 2014 [19]	+--++-++	6/11	High
Wontae Gong, 2013 [20]	+--++-++	7/11	High
Hernández et al 2013 [21]	-++-++-+	6/11	High
Kolberg et al 2015 [22]	+++--++	7/11	High

Of the articles analyzed 85% were observed performing a type of manipulation and/or cervical technique, showing positive results such as decrease of pain and proper posture at the time of intervention to the end of the study. In 40% of

subjects analyzed were seen that cervical joint manipulation in a single session revealed significant positive differences in flexion and extension. In 48.9% of the participants in the studies showed pain reduction in primary care and about



75% had reductions in 6 months. It was seen in the studies that 85.71% had the presence of high intensity pain at the initial moment of the research, taking into consideration the improvement in pain during the sessions.

Of the observed articles, various manipulations were performed such as: Positional Release Therapy (PRT), Osteopathic Manipulation (OM), osteopathic manipulation with cervical rhythmic articulatory technique, low-amplitude impulse techniques applied to the cervical spine, these manipulations and techniques have significant results for decrease in pain, resulting in the improvement of the posture, cervical and head positioning of the evaluated.

It was observed that 92.8% of subjects treated with cervical manipulation along with another technique presented with considerable satisfaction, i.e., the combination of manipulation of the cervical spine and exercises techniques resulted in significant improvement in the pain and disability compared with those treated only with manipulation or a type of technique.

DISCUSSION

In this systematic review, it was found that the joint manipulation promotes positive results such as reducing pain, range of motion and quality of life in patients with mechanical cervicalgia. ⁽²³⁾ The method of study of the manipulation has provided more detailed critically on this techniques, setting it to one of the best indications of treatment for mechanical neck pain. ⁽²⁴⁾

It may be emphasized that all articles included in this study were considered of good methodological quality according to the PEDro scale thus underlining the importance of the quality of clinical studies used to perform this review. Lacerda et al (2011), highlighted the importance of this quality in evidence-based medicine because it contributes to search for more judicious practices, by meeting, recognition and critical analysis of the knowledge produced. ⁽²⁵⁾

The manipulation of the cervical after 4 to 6 treatment sessions, being highlighted the Gonstead techniques, high-speed low-amplitude (HVLA) and full-scanning promoted pain relief in patients with mechanical neck pain. Haavik et al (2012), demonstrated that manipulation may help treat pain through a mechanism which can contribute to changes that alter cortical plasticity influenced in motor control. ⁽²⁶⁾

In the study of Bronfort et al (2001), was showed that the manipulation technique associated with stretching and isometric strengthening obtained better result than utilized only the manipulation, during this study was observed that there was an improvement in disability and an increase in neck range of motion, showing that such combination therapy has more effective and lasting results leading to an improved quality of life. ⁽²⁷⁾

Cervical manipulation, besides relieving the pain, makes the patient return to daily activities, improving functional

ability. The use of cervical manipulation for the treatment of mechanical neck pain, disability and increased range of motion, promotes positive results reducing the pain symptoms and increasing the amplitude neck movement. ⁽²⁸⁻²⁹⁾

CONCLUSION

The joint manipulation proved a significant tool for the treatment of mechanical neck pain, minimizing pain symptoms and reestablishing the range of motion. However, further studies should be encouraged in order to improve the treatment of mechanical neck pain, because of the diversity of manipulative techniques.

AUTHOR'S CONTRIBUTION

JCMAT: Article writing; DNO and AVSM: Search strategy and analysis of articles; PXLG and FFUSJ: Experimental design, article writing.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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