LOCOMOTOR APPARATUS IN EXERCISE AND SPORTS

ASSESSMENT OF HANDGRIP STRENGTH AFTER NEURAL MOBILIZATION

ORIGINAL ARTICLE

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ABSTRACT

Introduction: Neural mobilization is a technique that seeks the restoration of motion and elasticity of the nervous system; however, there are few studies evaluating its effectiveness on clinical variables. Objective: To assess handgrip strength among individuals undergoing intervention with neural mobilization. Methodology: a crossover study in which 20 subjects were sampled, mean age 19.5 ± 0.92 years, divided in two groups (G1 and G2) that received each week a single intervention session so that G1 received neural mobilization and G2 was submitted to conventional stretching exercises for the supraspinal in the first week. The opposite happened on the second week, in which G1 was submitted to conventional stretching exercises for the supraspinal and G2 received neural mobilization. Stretching for the supraspinal served only as placebo and did not impose tension to the nerves under study. The neural mobilization was applied in the radial, median and ulnar nerves. The hand grip strength was assessed using a grip dynamometer at various times: before and immediately after, 20 minutes and one hour after each intervention. Results: no significant results were found for the neural mobilization or the stretch. Conclusion: Neural mobilization was not effective to produce increase in handgrip strength in healthy subjects.

Keywords: exercise therapy, hand strength, muscle strength dynamometer.

INTRODUCTION

Men's hand has multiple functions due to its high complexity. As a sensory organ, it is an extension of the brain in providing information about the environment. It also plays an important role as an organ of the locomotor system, since it greatly influences on men's social efficiency. Thus, it can perform intricate distinctions about the external scenario, since it combines strength and skill. The movements performed by the hand, such as grip and manipulation of objects, are essential to the daily life and some tasks require maintenance of handgrip strength for a long period of time, causing a series of diseases[1].

The mobilization of the nervous system has been used for restoration of movement and elasticity of this system, promoting return to normal functions. The technique takes as starting point of compromising of the nervous system mechanics involving movement, elasticity, axoplasmatic transport and flow, may result in other dysfunctions of the nervous system or in structures which receive its enervation[2].

The reestablishment of suitable biomechanics, through movement and/or tension, allows recovery of distensibility and normal function of the nervous system, as well as of the compromised structures[2]. Neural mobilization is a specific technique, to approach neurogenic diseases and, after its application, decrease of pain intensity and improvement of related symptoms are observed[3,4].

According to Shacklock et al.[5], the nervous structures can be activated, more easily, with the application of a mechanical force. The authors also stress the importance of integrating factors such as physiology with neural emphasis, the sensitivity of the neural tissue and the effects of the slides in the structures adjacent to the nervous system, stating that the neurodynamic tests distinguish the normal and abnormal nervous system through its mechanosensitivity.

During mobilization of the nervous system the approach should be efficient and with specific progressions. The treatment can be based on emphasis on the diagnosis and systematic progressions categories. The neural mobilization techniques include repetitive movements of the segments, which reproduce the symptoms and produce a combination of distal movements for more proximal segments[6].

Valid and reliable assessment of handgrip strength is used for comparison of effectiveness of many procedures, definition of treatment measures and evaluation of patient's functionality[7]. The instrument used to assess handgrip is the dynamometer, which measures the handgrip strength the individual is able to perform. Besides verifying the hand and upper limb strength, the handgrip strength can be used as an indicator of a general strength status, being used hence in physical fitness tests. It also provides an index of functional integrity of the upper extremity[8].

Some studies demonstrate that the handgrip is directly proportional to age until 32 years, and that from that time on, it becomes inversionally proportional. It was also verified that male individuals present higher handgrip strength when compared with female ones[7-9]. Moreover, it was observed that warm-up activities before the test result in increase of handgrip strength[7].

Due to the little information about the theme, the literature lacks results concerning the application of the neural mobilization, in muscular strength. Thus, the aim of the present study was to assess handgrip strength in healthy individuals submitted to neural mobilization intervention.

MATERIAL AND METHODS

Study characterization

The study was an analytical, interventional, clinical assay, quantitative, double-blind crossed and with samples by convenience. The intervention was performed in the Laboratory of Study of Injuries and Physiotherapeutic Resources of the State University of Western Paraná (Unioeste), Cascavel campus.

Sample

20 female volunteers, aged between 19.5 ± 0.92 years participated in the study. The individuals signed the Free and Clarified Consent Form, and the Project was previously approved by the Ethics in Research with Humans Committee of the Western University, under law number 198/2010-CEP.

The inclusion criteria were healthy individuals, with no skin alterations or wounds, tactile alterations, acute or chronic pain, neuropathies or any kind of hypersensitivity. Exclusion criteria were: one absence during the intervention period or report of having had any other treatment which could interfere in the results.

Procedures

The participants were randomly divided in two groups of 10 individuals each. The first group (G1) received intervention through neural mobilization and the second (G2) of conventional stretching, during the first week. On the second week G1 received conventional stretching while G2 received the neural mobilization protocol. Protocols with neural mobilization of the median, ulnar and radial nerve and conventional stretching which did not produce strain of the nerves under study were performed.

Assessment of handgrip strength

Assessment of handgrip strength was performed with an analog handgrip dynamometer, brand name North Coast®, which verifies the strength in pounds per square centimeter (l/cm^2), with scale of $0.5l/cm^2$. The procedure was conducted before and immediately after the neural and stretching maneuvers, 20 minutes and one hour after them.

The maneuver used to measure strength with the dynamometer was in accordance with the guidelines by the American Society of Hand Therapists, which recommends the subject is seated with shoulder adducted and neutrally rounded, elbow flexed at 90º, forearm at neutral position and wrist between 0º and 30º of extension and 0º to 15º of ulnar swerve[8].

Neural mobilization

Neural mobilization was performed from the position at which the volunteer did not feel discomfort, established during one test. At the end of the predicted amplitude, slow and consecutive oscillation of the involved extremity was performed for one minute[3], with the individual being given three minutes of rest in only one session. The order of the segments positioning until the test amplitude was reached was strictly followed as postulated for each nerve and is described below.

The volunteer was positioned in dorsal decubitus, with depression of scapular waist, elbow extension, wrist, fingers and thumb, shoulder external abduction and rotation for mobilization of the median nerve. Regarding the radial nerve, initial position of the median nerve with shoulder medial rotation, wrist flexion, ulnar swerve and thumb flexion was used. Finally, for the ulnar nerve, the volunteer was positioned at dorsal decubitus, with lateral rotation and glenohumeral abduction, extended wrist and pronated forearm. The elbow was completely flexed and shoulder depression was performed by the examiner. The head of the volunteer was at inclination to the opposite side during all types of mobilization[2].

Conventional stretching

The conventional stretching group in the present study, acted as placebo and stretching of the supraspinal through horizontal adduction of upper limb was performed, keeping shoulders aligned and pressing them down for 30 seconds and resting for 30 seconds, alternating until completing the set total time of three minutes. During the stretching head was at neutral position without any kind of lateral inclination or rotation.

Statistical analysis

The data were evaluated concerning their normality by the Kolmogorov-Smirnov test. Since distribution was normal, ANOVA test with repeated measures and Tukey post-test for assessment of the different intragroup moments and the paired Student's t test for the intergroup assessment were used, since the individuals who composed the groups were the same. The significance level accepted was of 5%.

RESULTS

The comparison for G1 in the beginning of the first week with the beginning of the second week, as well as for G2, did not present significant differences ($p = 0.1212$ and $p = 0.8411$, respectively), indicating there were no differences between basal values, between the two weeks; that is to say, there was no combined effect of the treatment.

Comparing the different moments of evaluation, both for neural mobilization (figure 1) and stretching (figure 2), there were no significant differences ($p > 0.05$).

The results of the two interventions, neural mobilization and stretching were compared with each other in the distinct periods, being also evidenced that there were not significant differences either ($p > 0.05$).

DISCUSSION

The nervous system is able to adapt to mechanical loads, but if the adaptive mechanisms fail, the nervous system will become vulnerable to many affections, altering hence the neurodynamics[10]. When there is injury in the nervous system, consequent mechanical deformation of the nervous fibers and local ischemia take place, with decrease of the axoplasmatic flow and consequent alteration of the nervous function[11]. Thus, muscular strength depends on the integrity of the central and peripheral nervous system[12].

According to Butler[11], neural mobilization may be used for signs and symptoms originated from biomechanical compromi-

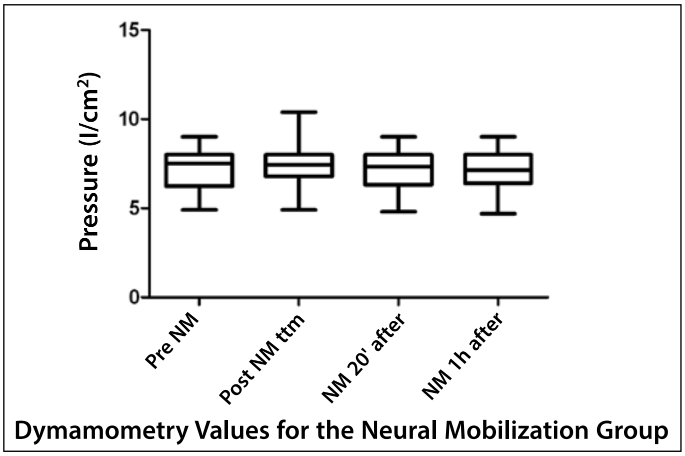

Figure 1. Chart representative of the values obtained in the handgrip dynamometry in l/cm2, in the different moments of evaluation (previous– preNM; immediately after – post-NM ttm; 20 minutes – NM 20' after; and one hour after mobilization – NM 1h after), for the neural mobilization group.

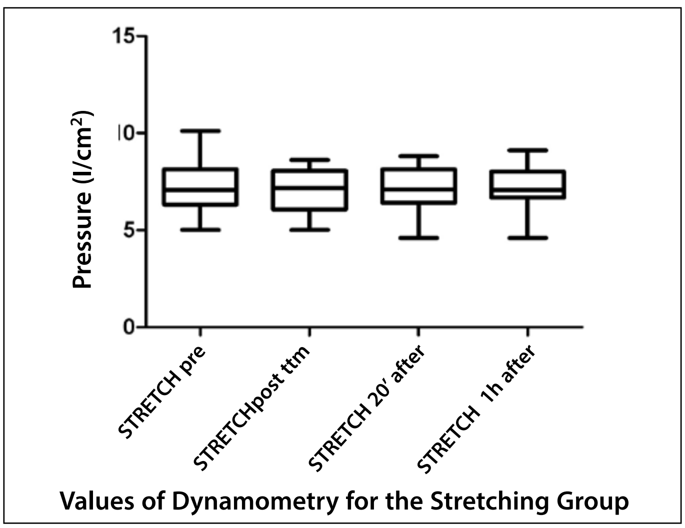

Figure 2. Chart representative of the values obtained in the handgrip dynamometry in l/cm2, in the different moments of evaluation (previous– STRETCHpre; immediately after – STRETCH post ttm; 20 minutes – STRETCH 20' after; and one hour after mobilization – STRETCH 1h after), for the placebo group, which performed muscular stretching.

sing or inflammatory reactions which lead to alterations in the neurodynamics. Thus, mobilization has the purpose to reestablish the dynamics balance between movement of the neural tissues and its interfaces, reducing intrinsic pressure of the neural tissue and consequently, promoting optimum physiological function[10], which according to Butler[11], occurs via improvement in the axoplasmatic flow.

However, for structures which are not altered in the neurodynamics, the literature does not make it clear if the neural mobilization could act optimizing its function, despite the use in the clinical practice, with prevention and improvement in physical performance goals due to possible improvement in the axoplasmatic flow. Thus, in the present study neural mobilization was used in healthy young adults without apparent compromising of the neurodynamics, with the aim to verify the effects of the neural mobilization on the handgrip strength and it was not verified that this function was simply kept. In other words, the hypothesis that neural mobilization of the median, radial and ulnar nerves, direct or indirectly responsible for the handgrip strength, could improve the axoplasmatic flow and hence produce better recruiting of the motor units and consequent increase in the muscular handgrip strength was not observed. It is believed that the crossed study outlining had not interfered in the results, since the groups did not significantly alter their basal values from one week to another.

In a review by Ramos et al.[12], which verified the influence of the muscular stretching on muscular strength, it was verified that, despite the controversies, the majority of the studies indicates that stretching reduces muscular strength due to factors as: alterations in the viscoelastic properties of the muscle and musculotendinous, alterations in the length/tension of the muscular fiber and also due to neurological factors. Thus, in the present study, stretching of muscles directly responsible for gripping was not performed, with the purpose to avoid contamination of the results; even if in the previous week the individual had performed neural mobilization (with consequent stretching of the musculature responsible for gripping), it is highlighted again that there was no significant difference between the weeks, in the comparison within the group.

Neural mobilization may cause stretching of the musculature involved in the handgrip strength test, which could help so that there was not increase in the handgrip strength after the technique performance, with even its possible reduction. However, since this strength decrease was not observed, it is believed that the procedure did not cause the alterations reported by Ramos et al.[12], due to the cyclic movements and the lack of static maintenance of the wrist and hand position at the end of the range of motion, or by the restricted time in which the technique was used (only one minute for each nerve).

It is crucial that physiotherapists perform effective treatments based on scientific evidence. Despite good results of the use of neural mobilization in the clinical practice, there are still few studies which approach the effects of the use of the technique. There is evidence that the neural mobilization can contribute to the gain of range of motion (ROM)[13], maintenance of elasticity and nervous extensibility[2,6,10] and also influenced on the intensity of nociception[3,4,6,10,14]. However, rare studies present the effects of the neural mobilization in healthy individuals, such as in the one by Parreira et al.[15], where the authors observed that the radial nerve mobilization produced gain in range of motion, in the tests of straight leg and slump, that is, in lower limbs. Due to this low number of investigations, there was a limitation to compare the found results; that is, the absence of effects, with other studies. Therefore, it is suggested that further investigations on the topic should be carried out, including with non-crossed studies, to guide the activity of physiotherapists who use this technique, not only as cure but also prevention and performance improvement.

CONCLUSION

It was concluded in this study through the methodology used that neural mobilization was not efficient in producing increase in handgrip strength in healthy individuals

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