Influence of Spinal Traction in Treatment of Cervical Radiculopathy

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ABSTRACT

Background: *This study investigated the efficacy of the intermittent cervical traction versus the continuous cervical traction in treating C6-C7 radiculopathy patients.* ***Objectives:*** *to compare between the efficacy of intermittent cervical traction and continuous cervical traction on neck and arm pain severity, amplitude and latency of H-reflex of flexor carpiradialis muscle, and neck mobility in patients with C6 and C7 radiculopathy.* ***Subjects:*** *Thirty patients diagnosed as cervical spondylosis or cervical disc prolapse at the level of C5-C6 and C6-C7 or at the level of C6-C7 suffering from unilateral radiculopathy.* ***Methods:*** *Patients were distributed randomly into two equal groups. The intermittent traction group with a mean age 47.13±6.69 years, received infrared radiation followed by intermittent cervical traction. The continuous traction group with a mean age 46.40±6.01 years, received infrared radiation followed by continuous cervical traction. Patients were evaluated before and after treatment for neck pain severity, arm pain severity, amplitude and latency of flexor carpiradialis H-reflex, and neck mobility.* ***Results:*** *Both groups showed significant improvement in all the measured variables. However the significant decrease in neck pain severity and significant increase in frontal and transverse neck mobility are in favor of the intermittent traction.* ***Conclusion:*** *The intermittent and the continuous cervical traction had a significant effect on neck and arm pain reduction, a significant improvement in nerve function, and a significant increase in neck mobility. However, the intermittent traction was more effective than the continuous type.* **(Egypt J. Neurol. Psychiat. Neurosurg., 2009, 46(2): 455-461)**

Key words: cervical radiculopathy, intermittent traction, continuous traction, flexor carpiradialis, H-reflex.

INTRODUCTION

Cervical radiculopathy is a pathologic process, which has been defined as pain in the distribution of a specific cervical nerve root resulting from damage to either the dorsal or ventral nerve root or both. This lesion may affect sensory and/or motor fibers. Thus, patients may have radicular pain, parasthesia, or motor symptoms, such as muscle weakness in the dermatomal or myotomal distribution of an affected nerve root[1,2]. It is generally agreed that involvement of the C6 and C7 nerve roots secondary to lesion of the C5-6 and C6-7 motion segments are most common[3]. Cervical range of motion is often impaired and may result in functional limitation in patients with cervical radiculopathy[4].

The H-reflex offers a unique ability to show the proximal integrity of the peripheral nerves[5]. Christie et al.[6] showed that H-reflex can be easily evoked in the flexor carpiradialis (FCR), the latency and amplitude of these recordings are highly reliable and provide a tool for clinicians to assess the C7 level of the spinal cord and median nerve function.

Cervical traction is frequently used in patients with cervical radiculopathy[7]. However there are very few studies that compare between continuous and intermittent traction in treatment of cervical radiculopathy[8]. This gives the motive for conducting this study in order to compare between the efficacy of intermittent cervical traction and continuous cervical traction on neck and arm pain severity, amplitude and latency of H-reflex of flexor carpiradialis muscle, and neck mobility in patients with C6 and C7 radiculopathy.

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SUBJECTS AND METHODS

This study was conducted in the outpatient clinic of the Faculty of Physical Therapy, Cairo University and in the Clinical Neurophysiology Unit, Faculty of Medicine, Cairo University.

Thirty patients diagnosed as cervical spondylosis or cervical disc prolapse in the levels of C5-C6 and C6-C7 or in the level of C6-C7 only, participated in this study after they give their informed consent prior to their inclusion in the study. All cases had unilateral radicular symptoms for at least 6 months and up to 2 years. The patients were randomly distributed into two equal study groups. The first group was the intermittent traction group consisted of 15 patients (5 males and 10 females) with mean age of 47.13±6.69 years and mean duration of illness of 11.60±3.27 months; they received infrared radiation followed immediately by intermittent cervical traction. The second group was the continuous traction group consisted of 15 patients (7 males and 8 females) with mean age of 46.40±6.01 years and means duration of illness of 12.47±3.74 months and they received infrared radiation followed immediately by continuous cervical traction. There was no significant difference between groups before treatment for these demographic data.

Patients were assessed before and after the traction therapy as regarding:

i. Neck and arm pain severity

Assessment was done by using numerical pain rating scale (NPRS) by giving the patient a paper with a line of 10 cm.[7] this line is divided from 0 to 10 with 1 cm interval and explanation was made to patients to choose a point on that line that corresponds to pain severity.

ii. Neck range of motion

Assessment was done by using OB goniometer[9]. The instrument consists of a fluid filled rotatable container mounted on a plate. The container has a compass needle that measures movements in the horizontal plane, an inclination needle that measures movements in the frontal and sagittal planes.

iii. H-reflex of flexor Carpiradialis muscle.

The electromyography unit (Nihon Kohden) four mini, Japan, was used to record the H-reflex amplitude and latency.

Disc-silver chloride electrodes with conducting gel were positioned on the flexor carpiradialis muscle where the active electrode was positioned on the motor point and the reference electrode about 2cm distally from the active. A surface hand-held bipolar stimulation electrode was applied to the medial surface of the lower third of the arm above the median nerve proximal to the cubital fossa[10,11].

Treatment procedures were carried out 3 times/week every other day for a total of 12 sessions in the form of:

a. Infrared therapy

Infrared radiation was applied on the back of the neck and the shoulder girdle of the affected side at a perpendicular distance which ranged from 50-75cm. depending on patient's tolerance for 15 min.[7,12] This was followed immediately by the traction therapy.

b. Traction therapy

Intermittent traction: the patient lying supine on the traction table, with his head on a hard pillow, which was adjusted to keep the neck flexed at 25°. The traction unit was adjusted to 12 kg loading force for 30 seconds and unloading traction force of 4.5 kg for 15 seconds, the total traction time was 20 minutes. Then the head halter was fitted under the patient occipit and chin and was adjusted to be fitted with the traction probe, then the safety button probe was given to the patient and was instructed to press it if any discomfort would be felt[7].

Continuous traction: The same protocol except that the traction force was adjusted to 12 kg for 20 minutes continuously[7].

The statistical data of the patients were expressed as arithmetic mean± the standard deviation. The paired t- test was used for data analysis within the same group and unpaired t-test were used for comparison between groups.

RESULTS

As regarding neck and arm pain severity:

Within the intermittent traction group a significant decrease in neck pain severity was found between pre and post treatment values with (t=12.25, P=0.0001), and a significant decrease in arm pain severity with (t=14.67, P= 0.0001).Within the continuous traction group, a significant decrease in neck pain severity was found between pre and post treatment values with (t=10.51, P=0.0001) and a significant decrease in arm pain severity with (t=12.08, P= 0.0001).

Comparing groups**:** Neck pain severity, significant difference was found in favor of the intermittent traction group with (t=2.12, P=0.0 4).

Arm pain severity, non significant difference was found with (t=1.02, P=0.32).This finding is shown in figure (1).

H-reflex amplitude:

Within the intermittent traction group, a significant increase in the amplitude of H-reflex was found between the pretreatment mean of 0.19±0.12 mv. And the post treatment mean of 0.59±0.22 mv, with (t=8.39, P= 0.0001) and a significant increase in the amplitude of H-reflex was found between the pretreatment mean of 0.14±0.09 mv. And the post-treatment mean of 0.44±0.22 mv. With (t=5.78, P= 0.0001) within the continuous traction group.

Comparing groups a non significant difference was found, with (t=1.37, P=0.18).

H-reflex latency:

Within the intermittent traction group, a significant decrease in the latency of H-reflex was found between the pretreatment mean of 15.58±3.15 msec. and the post treatment mean of 11.34±2.51 msec. with (t=5.19, P= 0.0001) and a significant decrease in the latency of H-reflex was found between the pretreatment mean of 14.37±2.25 msec. and the post treatment mean of 11.28±1.62 msec. with (t=4.54, P= 0.0001) within the continuous traction group.

Comparing groups a non significant difference was found with (t=1.08, P=0.29) as shown in figure (2).

Neck mobility:

Within the intermittent traction group a significant increase in the neck sagittal mobility between pretreatment and post treatment values with (t=8.45, P= 0.0001), a significant increase in the neck frontal mobility with (t=10.10, P= 0.0001), and a significant increase in neck transverse mobility with (t=6.38, P= 0.0001).

Within the continuous traction group a significant increase in the neck sagittal mobility between pretreatment and post treatment values with (t=6.53, P= 0.0001), a significant increase in the neck frontal mobility with (t=6.24, P= 0.0001), and a significant increase in the neck transverse mobility with (t=8.79, P= 0.0001).

Comparing groups a significant difference was found between groups in favor of the intermittent traction as regarding frontal and transverse neck mobility, with no significant difference as regarding the sagittal neck mobility with(t=2.24,P=0.03), (t=2.57,P=0.02) and (t=1.71,P=0.10) respectively. These findings are shown in figure (3).

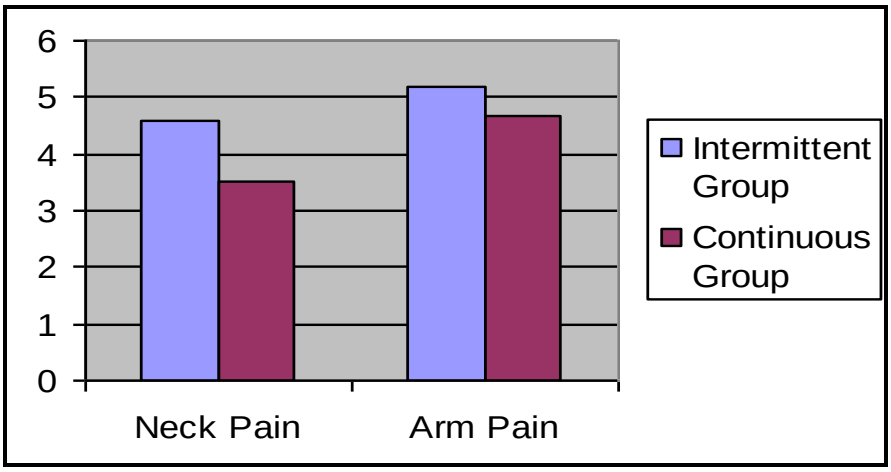

Fig. (1): Post treatment effect on neck and arm pain severity.

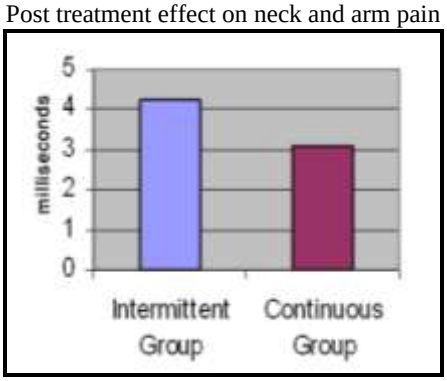

Fig. (2): Post treatment difference of the H-reflex latency.

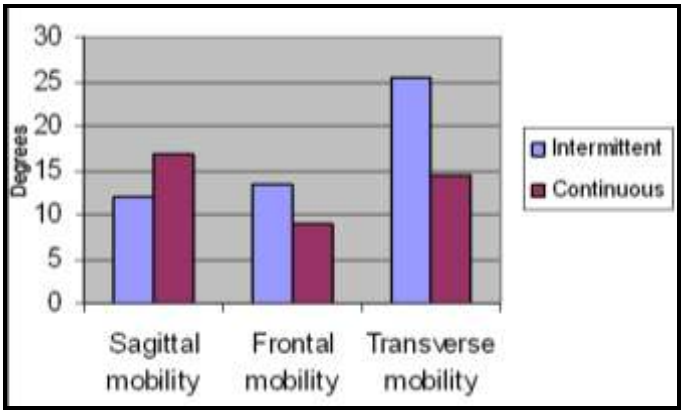

Fig. (3): Comparison between groups as regarding neck mobility

DISCUSSION

In our current study there was a significant decrease in neck and arm pain severity within the intermittent and the continuous traction groups. These findings are consistent with those reported by Voltonen et al.[13], who concluded that traction relieves muscle spasm and significantly decreases electrical activity in the muscles producing relaxation, which leads to systematic relief of pain. Krause et al.[14] found that traction has been shown to separate the vertebrae, stretch the cervical joint capsules, stretch neck muscles, and open the foramina. The herniated portion is retracted presumably from a combination of negative pressure and pushing effect of the posterior longitudinal ligament. Vertebral separation could provide relief from radicular symptoms by removing direct pressure or contact forces from sensitized neural tissues[14]. On the contrary to our results, Schwerz et al.[15] mentioned that cervical traction may result in a distraction force that overwhelms vessel wall compliance, leading to failure and dissection. Tristle[16] also reported that there is a protective spasm in neck musculature during pull phase of cervical traction resulting in more pain. However, some investigators[17,18,19] attributed this failure of traction in relieving neck pain to poor muscle relaxation as a preparation for stretching and they proved that application of hot pack under the neck for muscle relaxation before traction application provides best effects. The results of the present study also revealed that there was a significant difference between both groups concerning neck pain in favor of the intermittent traction. The success of the intermittent traction in reducing neck pain as compared to continuous traction was explained by Constantoyannis et al.[20] as they reported that intermittent traction helps to relieve the inflammatory reaction of nerve roots by improving the circulation to the tissues and reducing swelling of the tissues, gentle alteration of stretching and relaxation of the spasm of neck muscles and soft tissue structures prevents the formation of adhesions of the dural sleeve. Lee et al.[17] and Nanno[19] concluded that the cervical intermittent traction is effective in relieving pain, decreasing the myoelectric signals and improving blood flow in the affected muscles.

Concerning the amplitude and latency of FCR H-reflex, there was a significant increase in the amplitude of FCR H-reflex and a significant reduction in the latency of FCR H-reflex within both the intermittent and the continuous traction groups. There was a non significant difference between both groups. The above mentioned findings are most likely due to the decompression of the compromised spinal root or dorsal root ganglia[21-24]. The previously reported widening of disc space during traction may decrease pressure and stretch the anterior and posterior longitudinal ligaments[14]. This may result in negative pressure within the disc space that, in effect, sucks back the herniated nuclear substance and helps to push the herniation back into place by stretching the posterior longitudinal ligament[25,14,26]. This may explain the nerve root decompression effect of traction and the recovery of the compromised H-reflex in this study. Abdulwahab[27] concluded that the traction could decompress the blocked and irritated small axons resulting in H-reflex amplitude recovery and that reduction in the radicular symptoms after traction could support the possibility of decompression of the compromised nerve root. On the contrary, this finding of the present study disagree with the findings of Bradnam et al.[28], who found the excitability of the flexor carpiradialis motor neuron pool was reduced following manual cervical traction in normal subjects. They reported that traction induced mechanical strain of the ligament-muscular system of the spine which evokes reflex activation of the paraspinal muscles, and this may depress the Ia motor neuron synapse. Gregory et al.[29] attributed this inhibition of motor neuron to the influence of after-effects.

Regarding neck mobility, the results of our study revealed that there was a significant increase in all neck motion within the intermittent and the continuous traction groups. These results are supported by the work of Browder et al.[30] and Piva et al.[31]. Browder et al.[30] found that using intermittent cervical traction combined with spinal manipulation often improves cervical active range of motion and decreases symptoms provocation with cervical movements. Piva et al.[31] in their study to determine

the appropriate treatment for a patient with cervical radiculopathy using a decision-making algorithm. They concluded that intermittent traction and spinal manipulation could be the appropriated approach to treat those patients. Our findings are also supported to some extent by the work of Olah et al.[32], who reported that underwater traction therapy effectively mitigates pain, enhances range of motion, and improves the quality of life of patients with cervical and lumbar disc and these benefits persisted after 3 months of follow up.

The results of present study showed that there was a significant difference between groups concerning neck frontal and transverse mobility in favor of the intermittent traction. The superiority of the intermittent traction in increasing the neck frontal and transverse mobility may be attributed to the effectiveness of this type of traction in reducing neck pain significantly more than the continuous traction. There was no significant difference between groups in increasing neck sagittal mobility. The cervical flexion range of motion is the most characteristic limited range in patients with cervical radiculopathy[33] and complete pain-free range of motion may need longer time to recover.

Conclusion:

Both of the intermittent and the continuous cervical traction had a significant effect on neck and arm pain reduction, a significant improvement in nerve function, and a significant increase in neck mobility. However, the intermittent traction was more effective than the continuous type.

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الملخص العربى

يهدف هذا البحث إلى مقارنة فاعلية الشد المستمر مقابل الشد المتقطع فى علاج اعتلال الجذور العنقية السادسة والسابعة وقد أجريت هذه الدراسة على عينة مكونة من ثلاثين مريضا تم تقسيمهم عشوائيا إلى مجموعتين متساويتين.

مجموعة الشد المستمر تكونت من 15 مريض متوسط أعمارهم 46.40±6.01 سنة تم علاجهم بالأشعة تحت الحمراء يليها الشد المستمر ومجموعة الشد المتقطع تكونت من 15 مريض متوسط أعمارهم 47.13±6.69 سنة تم علاجهم بالأشعة تحت الحمراء يليها الشد المتقطع للفقرات العنقية. تم علاج كل مريض لمدة 12 جلسة خلال أربعة أسابيع وتم قياس شدة آلام

الرقبة والذراع وسعة رد الفعل وزمن توصيل الانعكاس لهوفمان في العضلة الكعبرية القابضة للرسغ. كما تم قياس الحركات العنقية السهمية والأمامية والعرضية قبل وبعد البرنامج العلاجى.

أثبتت النتائج تحسنا ملحوظا فى كلتا المجموعتين مع وجود فروق إحصائية بالنسبة لشدة ألام الرقبة والحركة العنقية الأمامية والعرضية فى صالح الشد المتقطع. كما أثبتت أيضا عدم وجود فروق إحصائية بالنسبة إلى شدة آلام الذراع وسعة رد الفعل وزمن توصيل الانعكاس لهوفمان في العضلة الكعبرية القابضة للرسغ الكعبرية القابضة للرسغ والحركة العنقية السهمية.

ومما سبق يتضح أن كلا من الشد المستمر والمتقطع طرق فعالة فى علاج اعتلال جذور الأعصاب العنقية مع أفضلية ملحوظة للشد المتقطع.