Effectiveness of Kinesio Taping versus Cervical Traction on Mechanical Neck Dysfunction

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ABSTRACT
Objective: To investigate the effect of kinesio taping versus cervical traction posture pump on mechanical neck dysfunction.

Design: A randomized controlled trial.

Setting: Physical therapy outpatient clinic.

Subjects: Fifty four patients with mechanical neck dysfunction participated in this study.

Interventions: Participants were assigned randomly into three groups; group (A) received Kinesio taping every 4 days for 8 sessions with exercises program, group (B) received cervical traction posture pump with exercises program 3 days/week for 12 sessions, and control group (C) received exercises program only inform of stretching, postural and isometric exercises for neck and shoulder joint 3 days/week for 12 sessions.

Main measures: Absolute rotatory angle, pain intensity and neck function disability were measured pre and post treatment by digital radiography, visual analogue scale and neck disability index, respectively.

Results: There was a significant increase in absolute rotatory angle, significant decrease in visual analogue scale and neck disability index for experimental groups (A) and (B). The control group (C) had a significant decrease in visual analogue scale and neck disability index with least effect, but with no effect on Absolute rotatory angle.

Conclusion: The combined therapy of kinesio taping or cervical traction posture pump with exercise program are effective in improving the absolute rotatory angle, pain intensity and function neck disability in mechanical neck dysfunction more than exercise alone.

Key Words: Kinesio taping, cervical traction posture pump, mechanical neck dysfunction.

INTRODUCTION

Mechanical neck dysfunction (MND) can result from poor or faulty posture, overuse injuries or trauma. Neck pain affects about two thirds of people in middle age. Neck posture can be affected by sedentary lifestyles such as prolonged sitting in front of computer, watching television, electronic games and office work [1]. However, in most patients neck pain is not due to a serious disease, but rather to postural or mechanical factors. It is then commonly referred to as simple or non-specific neck pain [2].
Conventional treatment of mechanical non-specific neck pain includes patient education and physical exercises [3], primarily as preventive methods. In more acute or severe cases, spinal manipulation, physical therapy, or medicinal or injection therapies may be applied [4]. However, additional treatment options are needed, especially for patients with more severe pain or with low expectations of conventional treatment alone [5].

Kinesio taping is a new therapeutic modality that corrects and treats many musculoskeletal disorders which is based on natural healing process. Kenzo Kase, the creator of Kinesio tape, proposed the following mechanisms for the effects of Kinesio Tape: altered muscle function by the tapes effects on weakened muscles, improved circulation of blood and lymph by eliminating tissue fluid or bleeding beneath the skin, decreased pain through neurological suppression, repositioning of subluxed joints by relieving abnormal muscle tension, and helping to affect the function of fascia and muscle [6].

Cervical traction has been applied widely in restoring the cervical lordosis and to relieve neck pain due to muscle spasm, nerve compression and general soft tissues stiffness. Several mechanisms with focus on axial traction have been proposed for the possible therapeutic effects of traction [7, 8]. Shealy (2008) concluded that unlike axial linear traction, Expanding Ellipsoidal Decompression (EED) via posture pump successfully decompresses joints and enhances or restores the lordotic curve [9].

Among literature, there is lack of experimental clinical trials which explore the therapeutic effects of Kinesio taping and/or posture pump in patients with mechanical non-specific neck pain. Hence, the purpose of the current study was to compare the effects of kinesio taping and cervical traction posture pump on MND.

MATERIAL AND METHODS

This study was commissioned and approved by the ethics committee of Physical Therapy College, Cairo University. Participation was voluntary and participants provided written consent to be involved in the study.

Subjects

Fifty four patients of both sexes (39 male and 15 female) participated in the current study with age range from 22-36 years [10]. Their average weight was 73.94 ± 10.91 kg, and their average height was 172.42 ± 6.60 cm. Participants were referred from orthopedic consultants of Saudi German hospital (SGH) in Jeddah with the diagnosis of mechanical non-specific neck pain for at least three months. Other inclusion criteria include cervical lordotic curve less than 34° [11] and score above 5 in neck disability index (NDI) [12]. The exclusion criteria were; cervical disc problems or cervical spondylosis, history of previous neck trauma or head injuries, ankylosing spondylitis, osteoporosis, cervical rib, post-surgical neck conditions.

Therapists

Two physical therapists working in the physical therapy clinic of the local hospital participated in this research. A 2-h pre-study briefing regarding study measures, introduction, intervention and ethics issues was given to the therapists.

Outcome Measures

1. **Cervical Curve Lordosis (Absolute Rotatory Angle):** Absolute Rotatory Angle (ARA) of cervical curvature was measured using Digital radiography (Axiom Artis). A tangent was drawn at the posterior body margins of C2 and C7; the intersection of the two tangents form the ARA (Figure 1). Normal angle ranges between 34° to 42 ° [13-14].

2. **Pain Intensity:** Pain intensity was measured by Visual Analogue Scale (VAS; 0–10, 0 indicates no pain, 10 indicates maximum pain). All participants completed the VAS by indicating the average pain level experienced during the past 2 week before intervention [15].

3. **Functional Neck Disability:** Disability related to neck pain was measured by the Neck Disability Index (NDI). NDI have been shown to be reliable and valid [16].

All measures were evaluated by an assessor blinded to group allocation before intervention and reassessed in the same manner after 4-week intervention had been completed.

Interventions

All patients were informed about the aim and the procedure of the study and they were asked to sign a consent form. Participants were randomly assigned into three groups, crossover between groups was not allowed to avoid the order and carry over effects between treatments:

**Group A:** Nineteen subjects were assigned to this group and treated using kinesiotaping with exercise program. Before applying the tape, the treated area was cleaned and shaved. Skin sensitivity was tested...
by applying a small piece of tape for 24 hours prior to intervention [17]. One patient showed signs of skin sensitivity and was shifted to the control group. Subjects were taped for a lateral ankle sprain in accordance to Kenzo Kase’s Kinesio™ taping manual. Two strips (I and Y) of the tape were used; Y strip started from thoracic vertebrae 3-5 to the occiput of the skull, and I strip was put at middle of the neck horizontally (Figure 2).

The patient was asked to move his neck in flexion. Then the base of Y strip was applied over the spinous process of T3-5 and with no tension the tails of Y strip were applied paraspinal over the hair line. With the same position of the patient, the middle paper packing of I strip was torn and applied with tension on the middle of the neck horizontally then the tension was released at the ends. The total period of application was four weeks; however the tape was replaced every 4 days [18].

**Group B:** Nineteen subjects were assigned to this group and treated using cervical traction via posture pump 1000 Device with exercise program. Posture pump is a manual and, inflatable device with no cables, springs or levers and it is simply restraint. The amount of inflation of the air cell determines the degree of traction. The patient was placed in a supine position and the cervical traction device was applied on a comfortable and firm surface. The neck was centered on neck cradle then the head restraint was applied (Figure 3). The traction unit was slowly pumped manually the maximum. The treatment duration was 15 minutes in the first three sessions which progressed into 20 min until the end of the treatment course. The cervical traction posture pump was applied 3 days/week for four weeks [19-20]. However one patient from this group did not complete the study and was not included in calculations.

**Group C:** Sixteen subjects were assigned to this group and treated using with exercise program only and considered as the control group. The exercises program was composed of 3 components; neck stretching exercises [21-22], postural correction exercises [23-24], and isometric exercises [25]. Patients were instructed to perform exercise twice a day (10 times each). This exercise program was reviewed with the assigned individuals 3/week for 4 weeks to ensure protocol compliance. In addition, patients were instructed to put a rolled towel under his neck at least twice a day for 10 minutes to maintain the cervical curve [26].

### Statistical analysis

Data was analyzed using the Statistical Package for Social Sciences (SPSS version 16). Data was subjected to normality test. Nonparametric data analysis was used to compare between pre and post values of three groups by using Wilcoxon signed ranks test, and Kruskal-wallis test to compare between the pre and post values of three groups. The level of significant was set at 0.05 for all statistical tests.

### RESULTS

The pre and post mean values of ARA, VAS and NDI within groups are shown in table (1).

1. **Absolute rotatory angle results**

   Kruskal-wallis test proved that there was no significant difference between pre values of the three groups for ARA (p =0.701) and chi-square value = 0.712. However, there was significant difference between post values of the three groups (p =0.004) and chi-square value = 11.047. Mann-whitney test proved that no significant difference between post values of group A and group B (p = 0.884). However, post values of group A and B were significantly higher than post of group C (p = 0.002 and 0.007) respectively.

   Wilcoxon signed ranks test of pre and post values of ARA of groups A and B proved that there was significant increase in ARA after treatment (Z = 3.415; p= 0.001 and Z = 3.427; p= 0.001) respectively. However, there was no significant increase in ARA of group C after treatment (Z = 1.890; p= 0.059)
2. Visual analogue scale results

Kruskal-wallis test proved that there was no significant difference between pre values of the three groups for neck disability (p = 0.918) and chi-square value = 0.170. However, there was significant difference between post values of the three groups (p = 0.000) and chi-square value = 16.301. Mann-whitney test proved that no significant difference between post values of group A and group B (p = 0.673). However, post values of group A and B were significantly lower than post of group C (p = 0.000 and 0.002) respectively.

Wilcoxon signed ranks test of pre and post values of neck disability of groups A, B and C proved that there was significant decrease in neck disability after treatment (Z = 3.416; p = 0.001, Z = 3.297; p = 0.001 and Z = 2.932; p = 0.003) respectively.

Table 1. The pre and post mean values of ARA, VAS and NDI within groups.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group (A) Mean ± SD</th>
<th>Group (B) Mean ± SD</th>
<th>Group (C) Mean ± SD</th>
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</thead>
<tbody>
<tr>
<td>ARA</td>
<td></td>
<td></td>
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<tr>
<td>Pre</td>
<td>14.26 ±5.90</td>
<td>15.42 ±7.54</td>
<td>14.43 ±6.33</td>
</tr>
<tr>
<td>Post</td>
<td>22.16 ±5.7</td>
<td>22.25 ±6.65</td>
<td>15.05 ±4.11</td>
</tr>
<tr>
<td>VAS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>7.34 ±0.86</td>
<td>7.16 ±1.20</td>
<td>6.98 ±0.86</td>
</tr>
<tr>
<td>Post</td>
<td>2.56 ±0.75</td>
<td>2.86 ±0.84</td>
<td>4.5 ±1.17</td>
</tr>
<tr>
<td>NDI</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Pre</td>
<td>23.87 ±9.62</td>
<td>22.6 ±11.03</td>
<td>23.32 ±7.57</td>
</tr>
<tr>
<td>Post</td>
<td>9.53 ±3.17</td>
<td>10.56 ±4.5</td>
<td>18.60 ±7.59</td>
</tr>
</tbody>
</table>
3. Neck disability index results

Kruskal-wallis test proved that there was no significant difference between pre values of the three groups for VAS (p = 0.659) and chi-square value = 0.833. However, there was significant difference between post values of the three groups (p = 0.001) and chi-square value = 13.880. Mann-whitney test proved that no significant difference between post values of group A and group B (p = 0.466). However, post values of group A and B were significantly lower than post of group C (p = 0.000).

Wilcoxon signed ranks test of pre and post values of VAS of groups A, B and C proved that there was significant decrease in VAS after treatment (Z = 3.461; p= 0.001, Z = 3.426; p= 0.001 and Z = 3.475; p= 0.001) respectively.

**DISCUSSION**

This study was conducted to examine the effect of kinesiotaping and cervical traction posture pump on selected mechanical and functional parameters in mechanical neck dysfunction. The results indicated that both kinesiotaping and postural pump cervical traction are effective increasing the absolute rotatory angle, decreasing the values of visual analogue scale and neck disability index. However, no statistical differences were calculated between both groups. Home exercise program solely found less effective than kinesiotaping and cervical pump in reducing neck pain and disability with no effect on absolute rotatory angle.

It has been hypothesized that kinesiotaping may exerts its effects through increasing local circulation, reducing local edema, facilitating the targeted muscles, providing a positional stimulus to the skin, muscle, or fascial structures providing proper afferent input to the central nervous system [27].

The results of the present study are in coincidence with the findings of González-Iglesias et al [28]. They showed a significant improvement of neck pain and cervical range of motion following short term application of the kinesiotaping; on acute whiplash disorders in comparison to sham tape. Similarly, Kaya et al. (2010) compared the effects of kinesiotaping against traditional physical therapy modalities in patients with shoulder impingement syndrome for two weeks. They found significant decrease in pain intensity and disability scores of arm, shoulder and hand scale in the kinesiotaping group in comparison with the other group [29].

The findings of this study may be attributed to the effect of kinesiotaping on proprioception as kinesiotaping has an effect on cutaneous mechanoreceptors through stretching skin. This sense of stretching is thought to elaborate signal information for joint movement or joint position [30]. Riemann and Lephart confirmed the role of cutaneous mechanoreceptors in detecting joint movement and position resulting from skin stretching at extremes of motion, much like joint mechanoreceptors [31].

In contrast to the results of the current study, Thelen et al. (2002) found no improvement in shoulder pain and disability index after six days application of kinesiotaping as compared to sham tape in patients diagnosed with rotator cuff tendinitis/impingement [32]. This can be attributed to two factors. First, the nature of underline pathology in experimental group; rotator cuff tendinitis can be categorized under overuse injuries which is primarily treated by biomechanical correction, modification of daily living activities and avoidance of bad habits. Second, length of treatment program which was short in comparison to the present study.

Cervical traction posture pump is a unique device which provides ellipsoidal decompression and expansion of the cervical vertebrae and simultaneously aligns them in curved or lordotic configuration [9]. In consistence with this study, Shealy (2009) concluded that unlike axial linear traction, cervical traction posture pump successfully enhances or restores the cervical lordotic curve [33]. In the previous study, Magnetic resonance image (MRI) showed that after axial linear traction the cervical lordotic curve was flattened or even buckled posterior into kyphosis in 83% (30 of 36) of subjects, while when posture pump was applied the lordotic curve was enhanced or restored in 72% (26 of 36) of subjects.

Shealy also supported the use of cervical traction posture pump as an inflatable device to decompress cervical vertebrae and relieve cervical pain. He applied the posture pump on cervicogenic pain for 20 minutes 3 days/week for four weeks. MRI was used for evaluation, he concluded that the posture pump separates the joints at the anterior and posterior aspect of vertebral bodies, discs in a ratio coinciding with their natural wedged spacing and the cervical spine was molded into curved or lordotic configuration [19]. In addition, Marovino stated that posture pump could be considered as a novel approach to the treatment of neck pain and postural dysfunction over the conventional traction therapy [34].
However, the effect of extension cervical traction was clarified by Harrison et al. [14] who explained that traction in extension reduced the magnitude of mechanical stress and strain in the nervous system. Alice et al. [35] evaluated the cervical intervertebral separation under different traction angles (30° flexion, 15° extension and neutral) in supine position. The results revealed that posterior intervertebral separation was significantly increased in 30° flexion but significantly decreased in extension traction, these findings are opposite to the results of the current study.

Exercises therapy aimed to improve the performance of the cervical muscles are effective for the alleviation of pain and improvement of disability and function associated with MND [36] in addition to increase cervical ROM and head excursion [37]. In agreement with the results of the present study, Ylinen et al. (2007) evaluated the effect of isometric exercises on chronic neck pain women. The exercises were applied for 6 weeks 3 sessions/week. They found that there was a significant difference in muscle strength and neck pain before and after treatment [38].

In contrast to the result of the present study, Morningstar (2003) evaluated postural correction program on forward head posture. After 6 weeks with 3 sessions/week x-rays were used to evaluate ARA. It was found that there was a reduction of forward head posture and restoration of lordotic curve [39]. This could be attributed to the different lengths in application of the exercises program. The short term of postural exercises in the current study could reflect on soft tissue dysfunction only, while longer period might be required to achieve similar change on the osseous components which lead to restoration of the normal cervical curve. This hypothesis could be supported by Harrison et al. [40] which achieved improvement in cervical curvature after 12 weeks of application of postural correction exercises program.

Limitation of the study: the small sample size per each group makes the validation study essential, before the results of this study could be applied to clinical practice.

Conclusion

Based on the results of this study, it was observed that kinesiotaping and cervical traction posture pump are equally effective in improving cervical curvature, pain intensity and function neck disability in patients with mechanical neck disorders compared to exercises program alone which was the least effective. Being easy, safe with low coast, make Kinesiotaping and cervical traction posture pump more recommended than other physical therapy modalities for MND.

Anyway due to the study’s limitation, future validation study is necessary before the results can be implemented on broad-scale clinical practice.

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Conflict of Interest

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