The effect of thoracic spine mobilization and core stability exercise on chronic mechanical back pain patients

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Mechanical or nonspecific low back pain is the most commonly reported by the population. Stabilization exercise program has become the most popular treatment method in spinal rehabilitation since it has shown its effectiveness in some aspects related to pain and disability. The aim of this study was to investigate the effect of thoracic mobilization with movement and core stability exercise on pain and range of motion in patient with chronic mechanical low back pain. Comprised of thirty male and female patients diagnosed with chronic mechanical low back pain. Patients were randomly divided into two groups: (group A), thoracic mobilization with movement and core stability exercises and (group B), thoracic mobilization with movement. Patients were assessed two weeks prior and two weeks after treatment. The Pain Visual Analogue Scale (VAS) was used to measure the pain. The modified-modified Schober (MMS) method was adopted to measure the Lumbar flexion and extension range of motion. Results revealed significant decreases (p<0.05) in VAS, Trunk Extension, in the post treatment condition compared to the pretreatment one in both groups. However, there were evident increases (p<0.05) in trunk Flexion in the post treatment compared to the pre-treatment in both groups. It also indicated a substantial increase (p<0.05) in trunk Flexion in (group A) compared to (group B). The application of core stability exercises and thoracic spine mobilization were effective in reducing pain as well as improving lumbar flexion and extension in chronic mechanical back-pain patients.

Keywords: core stability exercises- thoracic spine mobilization- chronic mechanical back pain.

INTRODUCTION

Low back pain (LBP) is the fifth most common cause for physician visits. This condition affects nearly 60-80% of people throughout their lifetime (Balagué et al., 2012). Low back pain can best be described in terms of specific accompanying features. It is regarded as an acute condition, if it has duration of about one month or less. Chronic LBP is usually defined by symptoms that last two months or more. Both acute and chronic LBP can be further defined by the presence or absence of neurologic symptoms and signs. Non-specific or non-radicular LBP is not associated with neurologic symptoms or signs. In general, the pain is localized to the spine or Para spinal regions (or both) and does not radiate into the leg (Dagenais et al., 2010; Delitto et al., 2012 and Philadelphia, 2001). The symptoms of chronic mechanical low back pain (CMLBP) are usually worsened by activity and improved partially by
rest. Physical activity, particularly bending, extending, twisting and lifting, commonly aggravates the symptoms, whereas restriction of pain-producing activities results in improvement at least temporarily. Typical physical findings are nonspecific, including restricted range of motion of the spine, tight hamstring muscles, paravertebral muscle spasms, muscular trigger points, tenderness and aggravation of symptoms on flexion or extension and straight leg raising tests (Delitto et al., 2012). In the management of CMLBP due to benign disorders; it is important that an accurate diagnosis be made and appropriate therapy applied. CMLBP is only a description of a symptom complex. One of the most common causes of CMLBP is the frozen back syndrome. It may occur with or without surgery due to muscular contractures for immobilization of the injured lumbar spine to protect spinal cord and nerves, soft tissue structures, facet joints capsules and ligaments. (Sypert et al., 2003). Physiotherapy assessment aims to identify impairments that may have contributed to the onset of the pain, or increase the likelihood of developing persistent pain. These include: biological factors (e.g. weakness, stiffness), psychological factors (depression, fear of movement and catastrophisation) and social factors (work environment) (Hancock, 2014). Previous studies suggested that instability of the lumbar region was the main cause of MLBP. (Panjabi, 2003 and Jang et al., 2013). It emphasized on the significance of the application of the Active exercise and manipulation therapy to improve lumbar function and prevent recurrence (Johnson et al., 2007). Several studies focused on the frequent utilization of spine mobilization therapy to increase the spinal range of motion and reduce pain in patients with functional failure of the vertebral joints. Most of these studies suggested spine manipulation therapy as an appropriate treatment for patients with spinal pain. (Cleland et al., 2005).

The aim of this study was to investigate the effect of thoracic mobilization with movement and core stability exercise on pain and range of motion in patient with chronic mechanical low back pain.

MATERIALS AND METHODS

Subjects Characteristics and General Experimental Design

Design of the study:

Pre and post experimental design was used to investigate the effect of thoracic mobilization with movement versus thoracic mobilization with movement plus core stability exercise on pain and range of motion in patient with chronic MLBP.

Assessment procedure:

The Pain Visual Analogue Scale (VAS) was used to assess the pain intensity. The modified modified Schober (MMS) method was adopted to measure the lumbar flexion and extension range of motion. The assessment was done just before the treatment and after two weeks from receiving it.

Treatment procedure:

Patients were randomly divided into two groups: (group A) thoracic mobilization with movement and core stability exercises and (group B) thoracic mobilization with movement.

Patients:

Thirty male and female patients were diagnosed as chronic mechanical low back pain, aged 20-50 years. The chronicity of the disease ranged from (3-12) months. Signs and symptoms of pain and limitation of range of motion that were interpreted as referred from the lumbar spine. All subjects who participated in this study were to read, sign and date an informed consent form required by ethical committee of faculty of physical therapy, Cairo University. Patients were randomly divided into two groups: (group A) thoracic mobilization with movement and core stability exercises and (group B) thoracic mobilization with movement. Subjects were asked to pick an index card out of box to determine their group, (30 cards and 15 per group). They were randomly selected from the out patient clinic of Beni-Suef University Hospital (Egypt) where physical therapy treatment took place. Patients were excluded from the study if they had one of the following: disco genic patients with or without radiculopathy, underlying disease such as malignancy, viscergenic causes of back pain, infection or systemic disease of musculoskeletal system, sensory disturbance, evidence of previous vertebral fractures or major spinal structural abnormality, spondylolisthesis or spinal stenosis, neuromuscular diseases like multiple sclerosis and history of previous back surgery. The assessment procedure included the following, height and weight; scale for measuring the height and the weight of the subject to calculate the Body Mass Index (BMI) as shown in Table (1), pain were measured by Visual Analogue Scale (VAS) consists of a horizontal line of 10 cm long, with...
anchors at either ends. The first anchor represents no pain while the last anchor represents pain as bad as it could possibly be (Tashjian et al., 2009). The patient was asked to place a mark through the line at the point that best describes how much pain was experienced. The measurement was taken as the distance from the zero ends to the mark made by the patient. Lumbar flexion and extension range of motion were measured according to the modified-modified Schober (MMS) method. The MMS test has shown to produce reliable measurements of spinal flexion and extension in patients with LBP, with less time to obtain the measurement (McKenzie and Taylor, 1997). To measure lumbar ROM, the investigator stood behind the standing patient to identify the two posterior superior iliac spines with his thumbs and connected them with a line on the skin, the middle of this line is the first mark then, the second mark was marked by measuring 15 cm above the first mark, The investigator instructed the patient to bend backward in extension or bend forward in flexion as he can within limits of pain.

**Statistical Analysis:**

ANOVA was used to compare the tested variables of interest at different tested groups and training periods.

**RESULTS**

The study involved thirty patients, their age ranged from 20-50 years. The subjects were divided into two equal groups: (group A) thoracic mobilization with movement plus core stability exercises (10 females and 5 males), (group B) thoracic mobilization with movement only (13 females & 2 males). Statistical analysis using mixed design MANOVA analyzed thirty patients assigned into two equal groups. It revealed that there was significant effect within subject (F = 61.345, p = 0.000). There was no significant effect between subject (F = 2.266, p = 0.073) and treatment time (F= 2.012, p = 0.105). Tables (1 and 2) provide descriptive statistic and multiple pairwise comparison tests (Post hoc tests) for the VAS, trunk flexion, trunk extension, respectively as shown in Table (2). In the same context, the multiple pairwise comparison tests revealed that there were significant decreases (p < 0.05) in VAS, trunk extension, in the post treatment condition compared with the pretreatment one in both groups. However, there were evident increases (p<0.05) in trunk flexion in the post treatment compared to the pretreatment in both groups. Between subject effects multiple pairwise comparisons revealed that there was significant increase (p< 0.05) in trunk flexion in group A compared with group B.

### Table (1): Demographic characteristics of both groups

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
<th>Comparison</th>
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<tbody>
<tr>
<td></td>
<td>Mean±SD</td>
<td>Mean±SD</td>
<td>t-value</td>
</tr>
<tr>
<td>Age (years)</td>
<td>31.66±7.65</td>
<td>33.13±10.11</td>
<td>-0.448</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>25.14±4.31</td>
<td>26.65±5.60</td>
<td>-0.825</td>
</tr>
</tbody>
</table>

### Table (2): Descriptive statistics for all dependent variables at both groups at different measuring periods

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group A</th>
<th>Group B</th>
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<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td>VAS</td>
<td>6.87±0.73</td>
<td>4.06±0.88</td>
</tr>
<tr>
<td>Trunk Flexion</td>
<td>18.13±0.81</td>
<td>19.7±0.45</td>
</tr>
<tr>
<td>Trunk Extension</td>
<td>13.23±0.65</td>
<td>11.96±0.69</td>
</tr>
</tbody>
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DISCUSSION

The aim of this study was to investigate the effect of thoracic mobilization with movement versus thoracic mobilization with movement plus core stability exercise on pain and range of motion in patient with chronic MLBP. The study revealed that there were significant decreases \((p<0.05)\) in VAS, trunk extension, in the post treatment condition compared to the pre-treatment one in both groups. However, there were substantial increases \((p<0.05)\) in trunk flexion in the post treatment compared to the pretreatment in both groups. Between subject effects multiple pairwise comparisons, revealed that there was significant increase \((p<0.05)\) in trunk flexion in (group A) compared with (group B). In the presence of LBP, the function of the stabilizing muscles is impaired (Hodges, 1999 and Urquhart et al., 2005). This impairment can be related to alterations in timing or a decreased cross-sectional area (Comerford and Mottram, 2001 and Jansen et al., 2010) which can occur due to reflex inhibition caused by pain (Dickx et al., 2010). Results obtained in this study were similar to those found by Muhammad et al., (2017) in his study to evaluate the efficacy of core stabilization exercise and routine physical therapy exercise in low back pain patients. Age range for participant was 20-60 years, for both male and female. Results of this study showed that both exercise proved to be effective in the management of low back pain statistically but clinically there was greater pain reduction in core stabilization exercise group in comparison with routine physical therapy exercise group. Another pilot randomized controlled trail conducted by Areeudomwong et al., (2012) measured the effect of 10 weeks core stabilization program on pain presentation pattern, disability and activation of trunk muscles in subjects with clinical instability of the lumbar spine. The subjects in the control group were treated with stretching of the trunk muscles and hydro collar therapy. Results of their study indicated decreases in pain and disability in both treatment groups similar to the findings of this study. However, the improvement in the activation ratio of transversus abdominus and internal oblique relative to rectus abdominus muscle were found in the subjects that were treated with core stabilization exercise. It has been hypothesized that core stabilization exercise enhance the ability of the segmental muscles that result in improving function and decreasing pain in subject with chronic nonspecific low back pain (Koumantakis et al., 2005). Subjects allocated to core stabilization group demonstrated a decrease in pain. These findings were also reported in similar studies by Koumantakis et al., (2005) of chronic low back pain. According to the gate theory for the control of pain, passive spinal mobilization activates mechanoreceptors of vertebral joints, the stimulus of which is transported by fast myelinated fibers to the posterior horns of the spinal cord, causing blockage to stimuli coming from the nociceptors of the same area. Furthermore, spinal mobilization involves contact with the skin that can potentially influence the nociceptor activity. Thus, if the pain is of particular origin, it is possible that the increased volume of nerve impulses from the skin can result in pain reduction (Dworkin et al., 2008). In the present study, stabilization exercises with thoracic spine mobilization were performed within a 2 weeks period, resulting in significant increases in the ROM. This result is in agreement with previous studies. For example, Kaltenborn (1989) reported that the therapeutic method of controlling abnormal movements through relative adjustment of excessively restricted or large segmental movements could affect lumbar stability. Besides, lumbar stabilization could be improved by thoracic mobilization and thoracic manipulation for the improvement of thoracic mobility (Sung et al., 2014).

CONCLUSION

The application of core stability exercises and thoracic spine mobilization were effective in reducing pain as well as improving lumber flexion and extension in chronic mechanical back -pain patients.

CONFLICT OF INTEREST

The present study was performed in absence of any conflict of interest.

ACKNOWLEDGEMENT

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AUTHOR CONTRIBUTIONS

All authors contributed equally in all parts of this study.

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Application of core stability exercises and thoracic spine mobilization in reducing pain

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