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Immediate Effects of Side Lying Manual Lumbar Traction in Patients with Painful Active Lumbar Motion

The purpose of this study was to determine if a gentle form of manual lumbar traction could reduce painful lumbar motions associated with lumbar disc degeneration (LDD). This clinical trial incorporated 134 participants with painful active lumbar motion. Participants were randomly assigned to an experimental treatment or sham group. 67 participants received sidelying manual lumbar traction while the other 67 participants received a sham treatment. Pre and post treatment NPRS values for the painful active lumbar motion were recorded for each group. There was a statistically significant improvement (P=0.00) for decreased pain intensity during active lumbar motion in the experimental group as compared to the sham treatment group. The average percent decrease in numeric pain rating scale (NPRS) values was 52.1% for the experimental treatment group and 8.1% for the sham group. The results of the study suggest that side-lying manual lumbar traction can improve painful lumbar motion in patients with LDD.

Key words: *Low back pain; Lumbar disc degeneration; Lumbar manual traction*

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INTRODUCTION

Low back pain (LBP) is the most common musculoskeletal complaint of the adult population [1]. The prevalence of back pain and the number of patients seeking care in the US has increased over the last two decades [1]. It is estimated that 60% to 80% of people will have it during their lifetime and 2-5% will have it at any given time [2, 3]. Lumbar traction, lumbar mobilization, and lumbar manipulation are common forms of conservative care intervention for LBP [4]. All three of these interventions have all demonstrated positive immediate effects for lumbar pain and motion impairments [4]. Lumbar traction involves the application of a low-velocity passive motion to distract or separate the lumbar segments in a straight sagittal plane [4]. Spinal mobilization involves the use of a low-velocity passive motion applied either directly to a portion of the vertebrae or more generally the pelvis or lower extremity (LE) [5]. Spinal mobilization is typically applied in a graded or oscillatory fashion [5-7]. Spinal manipulation involves the application a high-velocity (HV) passive motion [8]. This passive movement is typically applied to the lumbar segments in an indirect fashion using the patient's pelvis, trunk, or shoulder region as a lever to deliver what is typically a rotatory motion into the lumbar segments [9]. Spinal manipulation, when applied in this fashion, is controversial if not potentially dangerous if applied to patients with LDD and associated segmental instability [10].

In a comprehensive review of the literature published in 1996, Stevinson identified 295 cases of complications following HV spinal manipulation. Sixty-one of these cases noted disk herniation, worsening of radicular symptoms, or development of cauda equina syndrome. Fifty-six reports of other types of complications, including dislocations and fractures that were often accompanied by spinal cord compression [11]. In a case study by Morandi, neurological symptoms including worsened

low back pain, paresthesia in bilateral lower extremities, loss of sensation, urinary incontinence, and absence of deep tendon reflexes in both lower extremities followed a spinal manipulation in a patient with low back pain. These findings were strongly associated with HV manipulation of the lumbar spine [12].

The use of HV spinal manipulation in cases of symptomatic LDD may be further called into question when one considers the association between intervertebral disc (IVD) degeneration and spinal instability. Miyazaki has shown that an increase in lumbar segmental translation accompanies grade II (mild) disc degeneration and grade III (moderate) disc degeneration [13]. Lumbar segmental stiffness, a principal indication for lumbar mobilization and HV lumbar manipulation, did not until a grade V level of disc degeneration was reached [13]. Miyazaki concluded, similar to Kirkaldy-Willis that the changes in segmental motion occur with disc degeneration and progress from a normal state to an unstable phase with greater mobility and subsequently to an ankylosed stage [13, 14]. Tanaka also demonstrated that the kinematic properties of the lumbar spine are related to disc degeneration. Greater lumbar segmental motion was generally found with disc degeneration, particularly in grades III and IV. Disc space collapse and osteophyte formation is associated with grade V IVD degeneration and this resulted in stabilization of the motion segments [15]. Finally, Murata et al completed a study in 1993 that demonstrated similar segmental motion findings in relation to the five grades of disc degeneration [16].

In a study of adults of ages 50-59 years old, fifty-three percent of patients with confirmed lumbar IVD degeneration demonstrated symptoms of low back pain. Degeneration of the lumbar IVD has the potential to be a source of low back pain due to excessive mechanical deformation of damaged or sensitized disc tissue [17]. In a study by Schepper, the presence of disc space narrowing at the grade I and II levels were strongly associated with low back pain [18]. Luoma found that the prevalence of sciatic pain increased with increasing numbers of degenerated lumbar discs [19]. The literature demonstrates an association between lumbar disc degeneration, lumbar pain, and the development of lumbar instability. Given this, and the potential association between HV rotatory lumbar manipulation and injury to the lumbar IVD, we hypothesize that a more gentle and translatory form of manual intervention should be applied to patients demonstrating disc degeneration with painful lumbar motion.

Madson and Hollman demonstrated that the use of manual lumbar traction has been shown to significantly reduce pain in patients with LBP. This study sampled 4000 Orthopedic Section members of the American Physical Therapy Association and determined that 76.6% (767) of respondents reported using some form of traction, with manual traction being the most common form of delivery (68.3%) [20]. In a study by Scand et al, forty-nine patients with LBP, sciatica, and prolapsed lumbar intervertebral discs were randomized and given auto-traction and manual traction with strict bed rest for one week. The two traction treatments were found equally effective and about one fourth of patients avoided surgical intervention. After two years, there was no recurrence of symptoms [21]. Presently, there is still a lack of high quality studies on manual traction. Many studies are underpowered, and in most studies, traction is often supplied in combination with other treatment modalities making the true effect of this intervention difficult to determine [22]. Given this, we believe an additional study which examines the effect of manual traction in isolation of other interventions is warranted. Therefore, the purpose of this study is to evaluate the immediate effects of lumbar manual traction in patients with painful active lumbar motion in isolation of other treatment modalities.

METHODS

Participants

Following approval from the Institutional Review Boards at Oakland University and Team Rehab Incorporated, participants with radiographically or clinically confirmed cases (Physical Therapist diagnosis) of one or more degenerated lumbar discs, were at 18 years of age, and who were referred to Team Rehab, in Farmington Hills, Michigan were recruited into this study if they reported provocation of low back pain at an intensity of two or greater on the numeric pain rating scale (NPRS) during the performance of active lumbar movement in the standing position. Participants were excluded if they had any contraindications to lumbar traction. Contraindications for spinal traction include disease processes and other conditions

for which movement is contraindicated [23]. A total of 67 participants, 25 male and 42 female, with a mean age of 51.6 years received side lying lumbar manual traction (experimental treatment technique), and 67 subjects, 29 males and 38 females, with a mean age of 49.7 years received a sham manual intervention.

Table 1. Mean of patient demographics

	Manual Traction Group	Sham Group
Age (years)	51.6	49.7
Body Weight (lb)	177.7	176.7
Gender	25 male, 42 female	29 males, 38 females

Outcomes

Pain intensity data was collected by having the participants perform active lumbar flexion, extension, side bending, or rotation of his/her lumbar spine to a point where pain was perceived. The participants maintained that position and reported his/her low back pain intensity using the 11-point NPRS scale (0=no pain, 10=worst possible pain). This painful point in the range of lumbar movement was marked with a black marking pen using the participant's finger tips touching his/her lower extremity. The NPRS scale has been found to have high test-retest reliability and high construct validity compared to the visual analog scale [24]. The NPRS is shown to have a standard error of measurement of a 1.02 when used to assess low back pain [24]. The standard error of measurement estimates how repeated measures of a person on the same instrument tend to be distributed around his or her "true" score. The minimal detectable change for low back pain is 2 points based on a 95% confidence interval [(24)]. The self-report of low back pain intensity using the NPRS was recorded a second time immediately after provision of either the manual traction intervention or the sham intervention by having the participant perform the same active lumbar motion to the point previously marked on his/her lower extremity. This ended the participant's involvement in the study.

Interventions

The manual traction technique was applied in the side lying position on a standard traction table. Lumbar traction was achieved by positioning the lateral aspect of the participant's pelvis on the moveable section of the traction table, releasing the lock on the table, pulling the entire pelvis in a caudal direction through a manual contact on the participant's sacrum. (Figure 1) Treatment dosage was three sessions of manual traction, holding each session for 10 seconds. A 10 second pause was given in between each session. The same procedure was followed for the sham group with regards to testing active lumbar motion and recording NPRS values for a painful lumbar movement both immediately before and after the sham treatment. The sham treatment consisted of having the participant lie on the same traction table and in the same side lying position as the

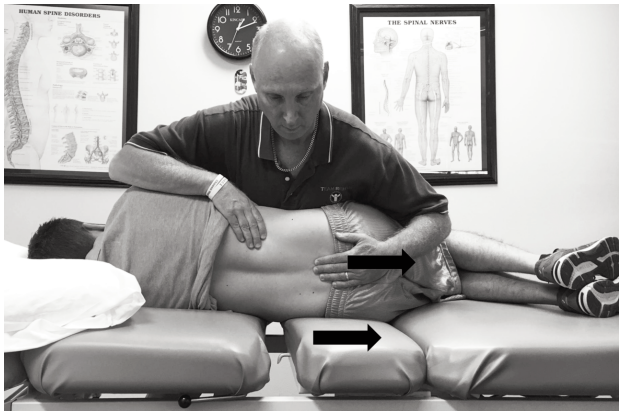

Fig. 1. Manual lumbar traction treatment technique delivered to a patient in the side lying position. The clinician stabilizes the rib cage and pulls the pelvis in a caudal direction while the traction table separates and facilitates the traction procedure.

Fig. 2. The Sham technique delivered to a patient. The patient's rib cage is manually stabilized while an anteriorly directed pressure is applied to the posterior surface of the sacrum.

experimental treatment group. For 30 seconds, the participant received an anteriorly directed pressure onto his/her sacrum through contact with the clinician's hand (Figure 2). The sham group participants received what was described to them as a deep pressure manual therapy technique. No caudally directed manual traction was performed during the sham technique.

Data Analysis

The effect of the side lying manual traction technique of pain level was analyzed using inferential statistics. The P-value was set at P=0.05. Data analysis was performed using a statistician, not involved with data collection.

RESULTS

Group assignment in the traction group or the sham group was initially determined by a coin toss and altered thereafter. There were 67 participants in each group. All of the 134 participants completed the study, and no participants reported any discomfort from either the manual traction intervention or the sham intervention. Table 1 describes the demographics for the participants in both groups. Table 2 describes the average percent improvement in NPRS after the provision of the experimental treatment or sham intervention.

A Wilcoxon signed-rank test was used to analyze within group and age range comparisons for changes in participants NPRS before and after treatment. Based on the analysis, the p-value exceeded 0.005 which indicates there was a statistically significant improvement (decreased pain intensity) with active lumbar motion. In the sham group, the p-value was 0.25 indicating an insignificant value.

The authors note that participants receiving the sham intervention did demonstrate a small percent improvement (reduced lumbar pain during active motion), but these NPRS values fell below the minimal detectable difference of less than two points. A total of 21 participants in the sham group had a change of less than two points in their post sham intervention NPRS score, compared to only five in the treatment group. Additionally, there were only two participants in the manual traction group that had no change in their pain intensity value post intervention, as compared to 35 in the sham group.

DISCUSSION

The purposes of this study were to determine if there was immediate post- intervention effect on painful active lumbar motion after the application of manual lumbar traction performed in the side-lying position, compare this to a sham intervention, to document the effect of side lying manual lumbar traction on participants both genders and different age groups (Table 2). The participants treated in this trial were representative of patients commonly referred to outpatient physical therapy practices. The percent decrease in pain intensity level for the entire manual traction group was 52.1% after side lying manual traction was provided.

Both genders receiving manual traction showed

Table 2. Average improvement in NPRS scores following treatment or sham

	Number of Participants in Experimental Treatment Group	Percent Improvement in Experimental Treatment Group	Number of Participants in Sham Treatment Group	Percent Improvement in Sham Group
18-29:	6	65.5%	17	3.9%
30-39:	13	47.6%	4	3%
40-49:	10	59.6%	11	6.8%
50-59:	17	47.1%	11	6.2%
50-69:	10	53.6%	8	16.7%
70-79:	6	41.9%	10	5.76%
80-94:	5	64%	6	3.1%
P value		P=0.005		P=0.25

percent improvement in NPRS values with an average decrease in NPRS for males at 57.3% and females at 49.4%. When broken down into age categories, two groups showed the greatest decrease in pain, 80–92 year old group demonstrated a 64% in NPRS and 18–29 year old group demonstrated a 62.5% decrease. The sham treatment group demonstrated an 8.1% decrease in active lumbar motion pain. This may have occurred due to the manual contact on the participant's sacrum, or perhaps due to lying on his/her side in a comfortable position the treatment table for just over 30 seconds.

The side–lying position is unique to this study and is beneficial for many reasons. The position is easy for the participants to transition into and out of and manual contact on portion of the patient's pelvis easily facilitates the delivery of manual traction to the lumbar segments [25]. The side–lying position eliminates the uncomfortable pressure in the abdominal region and passive pelvis positioning (tilting) can be performed to find the participant's most comfortable sagittal plane position for his/her lumbar segments. The side lying position also allows the clinician easily deliver manual traction while maintaining safe body mechanics.

Clinical Implications

Early grade lumbar disc degeneration is associated with pain and segmental instability [13–16, 26] High–velocity rotatory lumbar manipulations has potentially been associated with the possibility of injuring the lumbar IVD [10–11]. This manual traction intervention likely provides a gentle, safe, and effective treatment option of patient's with painful movement impairments secondary to lumbar disc degeneration. Currently there is minimal research on the effects of manual lumbar traction as a potential conservative care intervention option for patients with LBP. This study provided evidence for the immediate effects of manual traction when provided as a sole treatment.

Limitations and Suggestions for Future Research

There were several limitations to this study. Despite random allocation to group assignment, the same clinician performed both the manual traction and placebo treatment to all participants and was not blinded to group assignment. Secondly, the participants who received either the traction treatment or the sham treatment are potentially at risk for the placebo effect as both groups thought they were receiving treatment. So, there may have a psychological implication on their symptoms, resulting in the improvement in the NPRS value, regardless of the treatment received. Finally, since the pre– and post– NPRS values were self–reported, the participants could have response bias, and exaggerated the effects of treatment. Further research still needs to be conducted regarding the potential long term benefits of manual lumbar traction on low back pain, and painful active lumbar movement.

CONCLUSIONS

This study assists in demonstrating that a gentle form of translatory passive motion (manual traction) was effective in reducing lumbar pain experienced during active motion in patient with LDD. No participants reported any increase in pain during active lumbar motion after the technique. The manual treatment technique used in this study offers clinicians a safe way to treat patients who present with LBP.

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