IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

EFFECT OF Mechanical Traction for Lumbar Radicular Pain

Ankur kumar[1st], Dr. Uzma Khan[2nd], (prof) Dr. Jasmine Anandabai[3rd]

PG Student[1st] Assistant Professor[2nd] Dean and Professor[3rd]

Jyotirao Phule Subharti College of Physiotherapy

Faculty of Physiotherapy and Allied Health Sciences

Swami Vivekananda Subharti University, Meerut

Abstract

Objective

The aim of the study was to compare the effects of mechanical lumbar traction either in the supine or in the prone position with conventional physical therapy (PT) in patients with chronic low back pain and lumbosacral nerve root involvement in terms of disability, pain, and mobility.

Design

Participants (N = 125) were randomly assigned to receive 15 sessions of PT with additional mechanical lumbar traction either in the supine position (supine traction group) or in the prone position (prone traction group) or only PT without traction (PT only group). Patients were assessed at baseline and at the end of the PT sessions in terms of disability, pain, and mobility. Disability was assessed using the modified Oswesty Disability Index; pain was assessed using a visual analog scale, and lumbar mobility was assessed using the modified lumbar Schober test.

Results

One hundred eighteen patients completed the trial. All groups improved significantly in the Oswesty Disability Index, visual analog scale, and modified lumbar Schober test ($P < 0.05$). In the between-group analysis, improvements of Oswesty Disability Index and visual analog scale were found significantly better in the prone traction group compared with the PT only group (adjusted $P = 0.031$ and 0.006, respectively).

Keywords:

Low Back Pain; Mechanical Lumbar Traction; Physical Therapy; Prone; Supine; Radiculopathy

Conclusions

Addition of traction in the prone position to other modalities resulted in larger immediate improvements in terms of pain and disability, and the results suggest that when using traction, prone traction might be first choice. Further research is needed to confirm the benefits of lumbar traction in the prone position.

Low back pain (LBP) is one of the most common causes of disability among the general population. Approximately 50%–80% of adults are affected at some time during their lives.,Lumbar intervertebral disk disorders associated with nerve root irritation are one of the causes of LBP with the prevalence of 3%–10% among patients with LBP.4–6 Despite this relatively small percentage, patients with nerve root irritation may have increased severity of symptoms, higher risk of chronicity, and lower rates of recovery.

There are numerous treatment guidelines on LBP, yet no consensus about management has been achieved.Conventional treatment methods such as physical therapy (PT) are still preferred by most physicians for patients with LBP and nerve root involvement, although results of randomized controlled trials that assessed their efficacy are conflicting.

Mechanical lumbar traction, which is one of the previously mentioned modalities, has been used to treat spinal disorders and LBP for centuries, since Hippocrates (5^{th}–4^{th} century BC). Evidence-based guidelines and systematic reviews have generally not supported the use of traction for patients with LBP because of the lack of high-quality studies, heterogeneous patient samples, and lack of power. Despite the lack of evidence, traction is widely used, ranging from 41% to 76% of therapists, often in combination with other treatments without any clear consensus in terms of treatment parameters such as type, duration, frequency, force, or patient position. Although the supine position is generally preferred by therapists,the patient may also be positioned prone during traction treatment, To achieve the optimal beneficial effects of traction, patient comfort and muscle relaxation are considered essential. In a study by Weatherell,20 it was shown that sacrospinal muscles were relaxed in both supine and prone position during traction in normal subjects, and muscle activity was significantly less in the prone position compared with the supine position. Thus, it may be reasonable to think that lumbar traction performed in the prone position may even be more successful for patients with LBP. However, to the best of our knowledge, no studies have compared the effects of lumbar traction in these two different positions for patients with chronic LBP. In this study, it was aimed to investigate the effectiveness of PT including mechanical lumbar traction and to compare the efficacy of traction performed in either supine or prone positions for the treatment of chronic lumbar radicular pain.

METHODS

This study was an investigator-blinded randomized clinical trial with three active treatment arms that compared interventions for patients with chronic LBP who had signs or symptoms of lumbosacral nerve root irritation. The study protocol was approved by the medical ethics committee of Antalya Training and Research Hospital, Antalya, Turkey. Written informed consent was obtained from all participants before data collection, and the rights of the subjects were protected. This study conforms to all CONSORT guidelines and reports the required information.

Subjects

Patients were recruited between December 2022 to March 2023 from two outpatient PT and rehabilitation clinics in meerut(optimus). The main inclusion criteria were the following:

Age of 18–65 yrs, men and women

Chronic LBP with accompanying radiculopathy of L4-L5, L5-S1, or L4-S1 for more than 3 mos.

Radiculopathy or nerve root compression sings were identified by the presence of LBP with pain and/or numbness radiating below the knee with at least one of the following and correlated with a lumbar magnetic resonance imaging.

A. sensory loss or presence of paresthesia in any of the L4-S1 dermatomes,

b. diminished patella or Achilles reflex,

c. muscle strength deficit in any of the L4-S1 myotomes.

Moderate symptom severity (pain threshold of 4/10 visual analog scale [VAS])

Able to attend PT for 15 sessions (5 times a week for 3 wks)

Willingness to adhere to any one of the randomly chosen treatment programs.

Subjects were excluded based on any of the following:

Red flags: LBP due to neoplastic, inflammatory or infectious causes, indication of urgent surgery (cauda equina syndrome or progressive motor deficit),

Previous history of spinal surgery,

Current pregnancy or early postpartum period (6 mos),

Co-existing medical conditions (severe central or foraminal spinal stenosis with narrowing of the normal canal cross-sectional area by more than two-thirds,24 osteoporosis, gross structural abnormalities such as spondylolisthesis or scoliosis, ankylosing spondylitis, spinal fracture, spinal tumor).

Outcome Measures

Demographic characteristics, including age, sex, working status, and duration of symptoms were obtained. Each participant underwent a detailed physical examination including reflex, strength, and sensory testing of the lower limbs. Strength was evaluated through manual muscle testing and graded in accordance with the Medical Research Council guidelines.

Outcome measures were collected at the baseline evaluation and repeated at the end of the PT sessions by a researcher who was blind to the group allocation.

The primary outcome measure was the Oswestry Disability Index (ODI), which was used to determine disability due to LBP.Oswestry Disability Index is a disease-specific self-administered questionnaire that quantifies the effects of LBP on daily activities. It has the following 10 dimensions: pain intensity, personal care, lifting, walking, sitting, standing, sleeping, sex life (if applicable), social life, and travelling. Each dimension has six levels with a score of 0 allocated to the least disabled level and a score of 5 allocated to the most disabled level. The subscales together add up to a total maximum score of 50. The score is then doubled and interpreted as a percentage of the patient-perceived disability, that is, the higher the score, the greater the disability.

Secondary outcome measures were pain and lumbar flexion range of motion. Pain was evaluated using a VAS (VAS: 0 mm, no pain; 100 mm, severe pain).28 Lumbar flexion range of motion was determined using a modified lumbar Schober test (mLST), which has shown to be a valid and reliable method.30 The participants were asked to stand in a neutral erect position without shoes and with their feet spaced hip-width apart; 5 cm below and 10 cm above of the lumbosacral junction (15-cm distance in total) was marked. The participant then bent forward maximally without bending the knees, and the distance between the marks was measured, the increase being a measure of anterior flexion.

A PT program that consisted of ultrasound, superficial heating with hot packs, and transcutaneous electrical nerve stimulation was scheduled for all patients, five times a week, 15 sessions in total. All patients were asked to perform home exercises that consisted of isometric and isotonic strengthening exercises for the paraspinal and abdominal muscles as well as stretching exercises for the back extensors, hamstrings, and calf muscles. The exercises were demonstrated by a physiotherapist on the first session, and then, the patients were given written instructions. Other co-interventions were not allowed during the treatment period.

Supine Traction Group

Patients in this group received mechanical lumbar traction using a standard motorized traction therapy system in the supine position in addition to standard PT. Patients were laid on a split table in the Fowler position (the patient was supine with hips and knees at 90-degree flexion, and legs were supported by a stool with adjustable height) during traction .14 The lower thoracic cage and lower pelvis were stabilized using canvas straps. Intermittent traction was applied (30-sec hold, 10-sec rest) for 15 mins (13 mins at the aimed intensity, 1-min acceleration phase, 1-min deceleration phase).11,21 Traction was started with 25% of the patients' body weight and increased until the patient indicated that the tolerance for pulling was reached, with a maximum of 50% of the total body

Prone Traction Group

Patients in this group received mechanical lumbar traction in the prone position in addition to standard PT The other traction parameters in terms of mode, force, duration, or frequency were the same as the supine

RESULTS

thirty-seven patients were assessed for eligibility, and 12 entered the trial from December 2023 to March 2023 . Seven (5.6%) (three from the supine group, two from the prone group, and two from the PT only group) of the 125 patients dropped out during the treatment period. The reasons for dropout are provided in Figure 3. In total, 118 patients completed the study; 72 (61%) of them were women. The mean (SD) age was 44.01 (9.64) yrs and mean (SD) symptom duration was 16.37 (19.28) mos. Further demographic and clinical features of the patients are presented in Tables 1 and 2. There were no statistically significant differences between the groups regarding age, sex, body mass index, symptom duration, symptomatic side, working status, or effected root (Table 1). Outcome measures of the study (ODI, VAS, and mLST) were similar between groups at baseline ($P > 0.05$ for all variables) (Table 2). Physical examination in terms of reflex and strength of the lower limbs and sensations of L4-L5-S1 dermatomes were also well balanced between all groups ($P > 0.05$)

In the within-group analysis, there were significant improvements for all outcome measures at the end of 15 sessions compared with the preintervention values in all groups ($P < 0.05$) (Table 3). The between-group analysis revealed that the mean change in ODI, VAS, and mLST were higher in the prone traction group than in the other groups (Table 4). However, only the differences of mean change in ODI and VAS were statistically significant ($P = 0.022$ and 0.008, respectively). Post-hoc tests were performed for further analysis. In pairwise comparisons using the Bonferroni-Dunn test, the mean changes in ODI and VAS of the prone traction group were found statistically higher than the PT only group (adjusted $P = 0.031$ and 0.006, respectively). The mean (SD) change in ODI scores was similar between the supine and prone traction groups (17.12 [17.76] and 17.82 [14.65], respectively, adjusted $P = 0.687$). There was a slight nonsignificant difference in favor of the prone traction group compared with the supine traction group in terms of mean (SD) change in VAS scores (4.30 [2.49] and 3.65 [2.16], respectively, adjusted $P = 0.486$). Although results of the supine traction group were better than the PT only group, the differences were not statistically significant (mean [SD] change in ODI scores were 17.12 [17.76] for the supine traction group and 8.55 [16.31] for the PT only group, adjusted $P = 0.091$, and the mean change in VAS scores were 3.65 [2.16] for the supine traction group and 0.52 [2.70] for the PT only group, adjusted $P = 0.268$) (Table 4). Rates of successful outcome based on 50% improvement on ODI scores were 53.8% (12/39) in supine traction group, 74.4% (29/39) in prone traction group, and 40.0% (16/40) in PT only group. Percentage of responders were higher in the prone traction group when compared with the PT only group (odds ratio = 4.35, 95% confidence interval = 1.67–11.32, $P = 0.008$).

DISCUSSION

The results of this study showed that PT had positive effects on disability, pain, and mobility for patients with chronic LBP, and the addition of mechanical lumbar traction in the prone position to PT further increased this efficacy. Although there are conflicting reports, exercises and several combinations of PT modalities including superficial and deep heat with analgesic currents have been commonly used to decrease or relieve pain and to improve functional status. In accordance with previous reports, the PT in this study was composed of transcutaneous electrical nerve stimulation for pain relief, hot packs for superficial heating, and ultrasound for heating deep tissues and home exercises that consisted of stretching and strengthening exercises, and these modalities were found to be effective in diminishing pain and disability and in improving mobility.

The exact mechanism through which traction might be effective is unclear. It has been suggested that spinal elongation inhibits nociceptive impulses by decreasing lordosis and increasing intervertebral space, improves mobility, decreases mechanical stress, reduces muscle spasm or spinal nerve root compression, and releases adhesions around the zygoapophysial joint and the annulus fibrosus. In addition, in studies by Chung et al. and Öztürk et al. reduction of the herniated disc volume by lumbar traction has been shown. Conversely, there are several authors such as Beurskens et al. and Borman et al.who have found that traction was ineffective in treatment of nonspecific LBP and systematic reviews have generally not supported the use of traction for patients with LBP.

The results of the current study were consistent with studies that stated that traction may be beneficial for the subgroup of patients with LBP who are characterized by the presence of radicular signs and symptoms of nerve root compression. If the subjects of a trial are of a heterogeneous nature, patients who are unlikely to respond to traction may also be included, which dilutes the effects of the intervention.In the present study, only a subgroup of patients with chronic LBP who had radicular signs or symptoms were recruited to obtain a homogenous study population, which may account for the level of treatment success.

The supine position is traditionally preferred during lumbar traction14,18; nonetheless, traction can also be effectively applied in the prone position. Patient comfort and muscle relaxation during traction are considered essential to achieve the optimal effects of the intervention.Cyriax postulated that lumber muscle relaxation was necessary to allow vertebral separation, which causes relief of "pinched" spinal nerves and reduction of protrusion. It has been shown in an electromyographic study that sacropinal muscles are electrically silent, thus relaxed, during lumbar traction in the supine position.37 Subsequently, Weatherell20 compared the electromyographic activity in sacropinal musculature during lumbar traction in healthy subjects in two different positions: supine and prone. In that study, optimal muscle

relaxation occurred earlier in the prone position compared with the supine position, and the decrease in the muscle activity was significant only in the prone position. According to Weatherell,20 relatively low-level muscle activation during traction in the prone position may allow greater intervertebral separation and therefore prone may be the position of choice. Consistent with this author's argument, in the current study, better results regarding pain and disability were achieved through traction in the prone position.

There are several important limitations of this study. Main limitation is that no follow-up was performed at a later point than at end of treatment. Thus, the results of this study are limited only to the short term, and further trials with longer follow-up periods are needed to confirm these results. The patients were not blinded, and this was an important limitation of the study. The first and second groups received traction in either the supine or prone position, whereas the patients in the third group received PT only without traction. Therefore, the placebo effect of traction in the supine and prone traction groups might have interfered with the results. Blinding of the patients might be achieved by using sham or low-weight traction as the placebo treatment. However, the mechanism by which traction effects the lumbar spine is not totally clear. Therefore, it cannot be assumed that using sham traction with low weights will not have any effect. It could be argued that sham traction is not a real placebo. All the patients received the same set of exercises, they were not patient-specific, which was another limitation of our study. Furthermore, the inadequacy of the existing scales in the initial evaluation of radiculopathy and the absence of an objective evaluation method such as electromyography are all considered as limitations of the study.

CONCLUSIONS

The results of the current study showed that addition of traction in prone position to other PT modalities resulted in larger immediate improvements in terms of pain and disability in patients with chronic lumbar radicular pain. Application of traction in the prone position may be the position of choice in this subgroup of patients with LBP. Further research with biomechanical analysis and with longer-term follow-up is needed to confirm the benefits of lumbar traction in the prone position.

REFERENCES

1. Cai C, Pua YH, Lim KC: A clinical prediction rule for classifying patients with low back pain who demonstrate short-term improvement with mechanical lumbar traction. Eur Spine J 2009;18:554–61

Cited Here

2. Koldas Dogan S, Sonel Tur B, Kurtais Y, et al.: Comparison of three different approaches in the treatment of chronic low back pain. Clin Rheumatol 2008;27:873–81

Cited Here

3. Park WM, Kim K, Kim YH: Biomechanical analysis of two-step traction therapy in the lumbar spine. Man
4. Fritz JM, Thackeray A, Childs JD, et al.: A randomized clinical trial of the effectiveness of mechanical traction for sub-groups of patients with low back pain: study methods and rationale. BMC Musculoskelet Disord 2010;11:81

Cited Here

5. Harte AA, Baxter GD, Gracey JH: The effectiveness of motorised lumbar traction in the management of LBP with lumbo sacral nerve root involvement: a feasibility study. BMC Musculoskelet Disord 2007;8:118

Cited Here

6. Konstantinou K, Dunn KM: Sciatica: review of epidemiological studies and prevalence estimates. Spine 2008;33:2464–72