

Intermittent traction therapy in the treatment of chronic low back pain

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ABSTRACT

Aim To investigate the effect of intermittent traction therapy (ITT) on pain in patients with chronic low back pain (CLBP).

Methods A total of 81 patients with CLBP were included: experimental group received ITT (n=40) and control group received conservative physical treatment (n=41) 10 times for two weeks. A visual analogue scale (VAS) was used for measuring low back pain.

Results In the experimental group, 26 (out of 40; 65.0%) patients were females, in the control group 20 (out of 41; 48.8%) were females ($p=0.141$). In a within-group comparison, median of VAS value was significantly decreased in both groups after ITT. A comparison of pre-intervention and post-intervention VAS value showed no statistically significant difference. Females from the experimental group had a significantly greater decrease of VAS compared with females from the control group. Patients in the ITT group with L5/S1 level of hernia had lower estimated marginal mean of VAS scale compared to the control group, as well the patients with left side of leg pain.

Conclusion: Intermittent traction therapy is an effective treatment for pain reduction in patients with chronic low back pain.

Key words: physical therapy, traction, visual analogue scale

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INTRODUCTION

Low back pain (LBP) is a health disorder of high epidemiological, medical and economical importance. LBP is defined as pain, muscle tension and stiffness (1). Low back is the location where the highest incidence of musculoskeletal pain is observed (2). Approximately 80% of individuals experienced LBP during a part of their active lives (3). In most cases, patients' back pain is relieved within two weeks, but 20% of patients suffer from continuous pain that does not respond to therapy, which is known as chronic low back pain (CLBP). Global CLBP incidence is 9442.5 per 100,000 (9%) of population (4).

CLBP is a common, long-lasting and disabling condition with high costs for a society (5). Direct healthcare costs are usually connected with searches for pain treatment. Indirect or societal costs are usually secondary consequences of CLBP that include morbidity or disability (6,7). Although direct healthcare costs such as medical specialist care and hospital costs are high, indirect costs are the highest cost factor for CLBP (6).

The location of pain helps differ chronic discogenic low back pain (CDP) in clinical practice from other CLBP patients, which is more axial and pain is severe (8). There is evidence that CDP more often starts at a younger age than other types of chronic pain (9).

Traction is one of the physical therapy modalities used in the treatment of lumbar disc hernia (LDH), which can also be combined with other modalities (10). Lumbar traction is one of the oldest treatment modalities for LBP (10). Traction in physiatry practice is used on the neck and back spine, and it can ensure to achieve separation of the joint surfaces, decreased disc protrusion, elongation in the soft tissues, relaxation in muscles, and mobilization in the joints (11).

As a result of separation of the joint surfaces, the compression in the surrounding tissues can be removed. Investigating magnetic resonance images of lumbar spine before and after 30 min of horizontal traction of 42% body weight in participants without any LBP history, Chow et al. showed that horizontal traction was effective treatment that increased the disc height of lower lumbar levels, particularly in the posterior regions of the discs (12). Positive outcomes that can be achieved with ITT include improvement in the

bone structure and relaxation, that also helps to relieve pain due to spinal dysfunction (13).

Some systematic reviews have shown that lumbar traction has little or no value on clinical outcome of pain intensity and it does not appear to lead to quicker return to work among people with LBP with or without sciatica (14,15). These conclusions show a position of lumbar traction in the current clinical practice (16).

Mechanical traction in combination with extension exercises was investigated by Fritz et al. and the results showed significant improvement compared to extension exercises alone for patients with acute LBP (17). Researches Prasad et al. compared inversion traction in combination with physical therapy and physical therapy alone in patients who were waiting for surgery of disc herniation, and found that combined therapy in 77% of patients helped to avoid surgery, while 22% of patients that had only physical therapy avoided surgery (18).

Scientists also noticed that efficacy of lumbar traction therapy and physical therapy in patients with LBP has been questioned (13). The CLBP has not been investigated precisely in Bosnia and Herzegovina.

The aim of this study was to investigate the effect of intermittent traction therapy (ITT) on pain in patients with CLBP and to investigate time and traction power parameters on CLBP.

PATIENTS AND METHODS

Patients and study design

A clinical prospective study included 81 patients with CLBP admitted to the Clinic for Physical Medicine and Rehabilitation, Clinical Centre of the University of Sarajevo, during the period between September 2019 and March 2020. All patients gave and signed their consent to be included in this investigation. Inclusion criteria were the patients with CLBP associated with lumbar disc herniation (LDH) for more than three months, without lumbar spinal injection or lumbar surgery history, and without previous physical therapy and rehabilitation session during the past six months. Exclusion criteria were: cognitive dysfunction, neurological deficits, extruded and/or sequestered LDH, spinal fusion, pregnancy, malignancy, spinal compression fracture, spondylolisthesis, aortic aneurysms, severe

re peripheral neuropathy, vertebral infection, rheumatic diseases, and moderate to severe depression.

Methods

Patients were divided in two groups: experimental group who received ITT (n=40) and control group who received conservative physical treatment (n=41).

In the experimental group, thermotherapy (Solux, bulb for optimal daylight illumination) was applied five minutes before traction therapy and after ITT each patient rested for 15 minutes in a supine position. In the control group, isometric exercises and electrotherapy were administered. Both groups received therapy 10 times for two weeks.

The visual analogue scale (VAS) was used to measure participants' back pain at start and after therapy. A 10 cm Visual Analog Scale (VAS) was used to evaluate the pain severity (19). The patients were asked to mark the score corresponding to their pain level on the pain scale, which was between 0=no pain and 10=most severe pain before and after therapy.

The patients' body weights were taken with a weighing scale before the treatment. Traction was applied to the patient lying on the table in the supine position. A chest strap was fitted over the lower ribs, and a waist strap on anterior iliac crests. A stool was placed below the patient's legs in such a way that the hip and knees flexed to 90 degrees to reduce the patient's lumbar lordosis. Traction power on the BTL-16 Plus traction device (Madrid, Spain) started at the initial level of 15 kg and increased gradually at a certain rate of 30% of body weights. The ratio between hold time and rest time was set at 2:1.

Statistical analysis

Data are presented as mean±standard deviation or median with interquartile range (IQR, 25th to 75th percentiles) dependent on normality of variables distribution. The Kolmogorov–Smirnov test with a Lilliefors significance level was used for testing normality of distribution. In the case of categorical variables, absolute numbers and percentages were reported. ANCOVA was used to determine the effect of a difference in the treatment on post-intervention of VAS after controlling for pre-intervention VAS value of pain that was measured. p<0.05 was considered as significant. VAS scale was presented in MS Excel.

RESULTS

In the experimental group, 26 (out of 40; 65.0%) were females, in the control group 20 (out of 41; 48.8%) were females (p=0.141).

There was no statistically significant difference in the mean of age between the ITT and control group, 51.9±13.2 and 50.0±10.5 years, respectively (p=0.099) (Table 1.).

The most common hernia was at L5/S1 (Table 1, 2).

In a within-group comparison, median of VAS value was significantly decreased in the both groups (p<0.001) (Table 1)

The direction of hernia that was the most effective in both of groups was protrusion, in 78 (97.5%) patients. (Table 1).

After adjustment for pre-intervention VAS value, there was no statistically significant difference in post-intervention VAS value between the two treatments, $F(2, 78) = 2.893$ (p=0.093; partial $\eta^2 = 0.036$) (Table 1).

Table 1. Demographic and clinical characteristics of patients

Variable	No (%) of patients in the group	
	ITT (n=40)	Control (n=41)
Males/females	14/26	21/20
Age (years)		
Males	52.0 (IQR=45.0 to 63.0)	48.0 (IQR=40.0 to 58.0)
Females	51.5 (IQR=39.8 to 64.3)	51.5 (IQR=43.5 to 56.0)
Level of hernia		
L1/L2	1 (2.1)	0 (0.0)
L2/L3	2 (4.2)	4 (8.2)
L3/L4	6 (12.8)	4 (8.2)
L4/L5	17 (36.2)	23 (46.9)
L5/S1	21 (44.7)	18 (36.7)
Multiple levels of hernia		
1	30 (75.0)	34 (82.9)
2	9 (22.5)	7 (17.1)
3	1 (2.5)	0 (0.0)
Type of hernia		
Protrusion	39 (97.5)	39 (95.1)
Prolapse	1 (2.5)	0 (0.0)
Extrusion	0 (0.0)	2 (4.9)
Direction of hernia (N)		
Central/Other	6/34	18/23
The side of leg pain		
Right	9 (22.5)	12 (29.3)
Left	15 (37.5)	8 (19.5)
Both	16 (40.0)	21 (51.2)

ITT, intermittent traction therapy;

Post-intervention VAS values in females were statistically significantly lower in the ITT group vs the control group: mean difference of -1.229 (95% CI -2.026 to -0.431) mmol/L (p=0.003) $F(1, 43) = 9.660$ (p=0.003; partial $\eta^2 = 0.183$) (Table 1).

There was no significant difference in VAS value for hernia L1 to L4, and hernia L4/L5. (Table 2).

Table 2. Adjusted and unadjusted intervention mean and variability for post-intervention visual analogue scale (VAS) value with pre-intervention VAS value as a covariate by level of hernia

Level of hernia	Group (No of patients)	VAS intervention mean (standard error)		P
L1 to L4	ITT (9)	2.56 (0.44)	2.97 (0.49)	0.119
	Control (8)	4.63 (0.51)	4.17 (0.52)	
L4/L5	ITT (17)	2.7 (0.32)	3.06 (0.37)	0.721
	Control (21)	3.52 (0.34)	3.24 (0.34)	
L5/S1	ITT (14)	2.36 (0.30)	2.69 (0.29)	0.048
	Control (12)	4.01 (0.32)	3.61 (0.32)	

M, mean, SE, standard error; ITT, intermittent traction therapy;

Patients in the ITT group with L5/S1 level of hernia had lower estimated marginal means of VAS scale compared to the control group (p=0.048). Patients in the ITT group with left side of leg pain had lower estimated marginal means of VAS scale compared to the control group (p=0.038) (Table 3). Pain in leg was most often on the left side and showed the highest decrease of VAS value after ITT (Table 3).

Table 3. Adjusted and unadjusted intervention mean and variability for post-intervention visual analogue scale (VAS) values with pre-intervention VAS values as a covariate by side of leg pain

Side of leg pain	Group (No of patients)	Mean (standard error)		P
		Unadjusted	Adjusted	
Right	ITT (9)	1.67 (0.53)	2.45 (0.56)	0.627
	Control (12)	3.42 (0.44)	2.83 (0.48)	
Left	ITT (15)	2.47 (0.30)	2.79 (0.32)	0.038
	Control (8)	4.63 (0.40)	4.01 (0.44)	
Both	ITT (16)	3.12 (0.35)	3.42 (0.39)	0.682
	Control (21)	3.86 (0.30)	3.63 (0.34)	

Females in the intermittent traction therapy (ITT) group had significantly greater decrease of VAS values compared to the control group (p=0.003) (Figure 1).

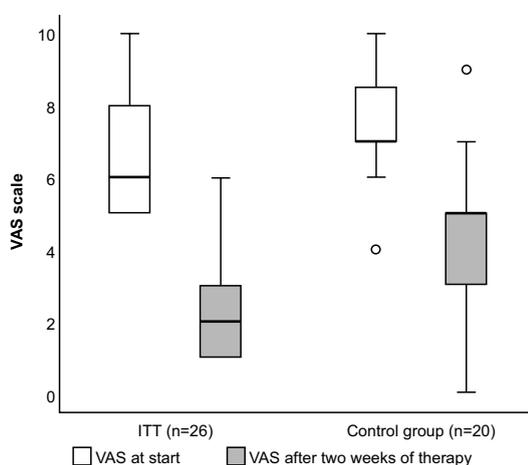


Figure 1. Visual Analogue Scale (VAS) values at start and after two weeks of therapy in females with intermittent traction therapy (ITT) and controls

Patients in the ITT group with L5/S1 level of hernia had lower estimated marginal means of VAS scale compared to the control group (p=0.048). (Figure 2).

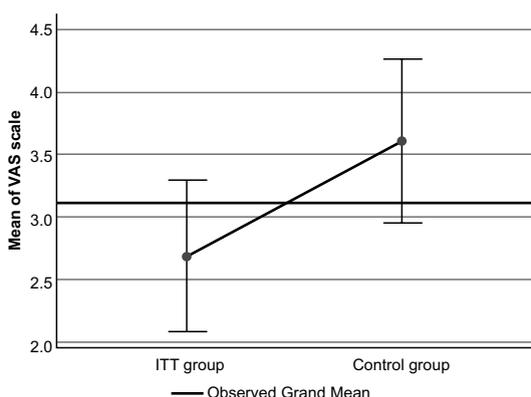


Figure 2. Mean of Visual Analogue Scale (VAS) with 95% confidence interval in patients with L5/S1 level of hernia with intermittent traction therapy (ITT) and controls

*Covariates appearing in the model are evaluated at the VAS at start = 6.77

DISCUSSION

In our study, post-intervention VAS values in females were statistically significantly lower in the ITT group vs. the control group. In the ITT group, patients with L5/S1 level of hernia and patients with left side of leg pain had lower estimated marginal means of VAS scale compared to the control group.

Chronic LBP is a complex disorder that must be managed with a multidisciplinary approach including physical and socioeconomic aspects of the illness (14). The leading causes of work absence, unproductivity and disability before the age of 45 are LBP and sciatica in many countries. Therefore, we did not include patients over the age of 65 in the study, which is similar to the results from other studies (20).

Traction is a technique used to stretch soft tissues and separate joint surfaces or bone fragments by the use of a pulling force (21). Many physicians recommended the technique of traction for conditions such as protruded intervertebral discs, spinal muscle spasm, and general pain and stiffness (19).

Recent research and systematic reviews indicated small samples of respondents and a general lack of high-quality studies. Traction for patients with sciatica cannot be judged effective at present either, due to inconsistent results and methodological problems in most studies (20).

In a randomized-controlled study experimental group received ITT, exercises and ice packs, while the control group received only exercises and ice packs, the authors concluded that intermittent traction had a big impact on pain reduction, although this effect was not statistically significant (22).

The results of retrospective study conducted by Macario et al. included 94 patients with chronic discogenic LBP and measured verbal numerical pain intensity rating (NRS) by the scale using ITT and decompression (all patients received physical therapy that included hot pack application before the treatment and ice application and stretching exercises after the treatment) showed that VAS scores were reduced from 6.1 ± 2.3 to 0.9 ± 1.2 , and the amount of analgesics was also decreased, while every day activities were improved (23).

Medication and physical therapy methods including traction have proven to be useful in pain relief. They also have a large impact on every day activities that include exercises and education that promotes functional restoration (14,23).

Lumbar traction has been used previously for spinal disorders. Its mechanism of action is based on relieving pain with separating the vertebrae. It removes pressure or contact forces from injured tissue, while it increases peripheral circulation by a massage effect, and reduces muscle spasm (24,25).

The treatment for patients with low back pain is not a static process, but rather a fluid one that changes together with a clinical status of the patients. This approach with traction therapy is supported with clinical experience and indirect evidence (26).

In our study, patients with LBP reported feeling better as a result of both therapy programs, conservative physical therapy and ITT, but they still experienced recurrence of pain at follow-up. Other factors such as psycho-social or environmental are not included in this study, although they may have an effect on perceiving chronic pain (27).

International studies have estimated that back pain affects 65% to 80% of the population during their life at least once. Costs of LBP are among the greatest total costs of a health care system. The

expenses are even greater if LBP is a chronic problem (28, 29). Different physical therapy programs are often included in patients with chronic LBP and they require great different implementation costs. The key role in therapy of chronic LBP is that it must be treated optimally in order to reduce this high financial and human cost (30).

Research conducted at several orthopaedic clinics showed that lumbar traction as a therapy for patients with chronic LBP enables an immediate positive response after traction (31). In other studies, also conducted on several orthopaedic clinics, various traction delivery modes/parameters in combination with multiple interventions showed best results (32).

Professional characteristics that include education level and clinical specialist credentialing have an important role in traction usage (32).

Patients are important as well because the key role in education and home-based exercise depends on them. This is one of the most cost effective approaches that was considered (33).

In conclusion, our results provide evidence for additional effects of traction compared with traditional physical therapy in patients with persistent, nonspecific LBP. We suggest additional different focus on back education and exercise therapy in the management of patients suffering from persistent LBP. These methods are effective and they include less burden on the health care system. All patients should have instructions about correct posture principles in their daily activities along with descriptions of recommended therapeutic exercises.

Further evidence of the effects of traction of different modes, magnitudes and duration is required for a proper control of traction applied to different disc levels.

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TRANSPARENCY DECLARATION

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