Journal for Re Attach Therapy and Developmental Diversities
eISSN: 2589-7799
2023; 6(8s): 740 - 746

Effectiveness of Shock Wave Therapy Versus Intermittent Mechanical Traction On Mechanical Low Back Pain and Disabilities

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Abstract:

Background: Mechanical low back pain is serious physical and social health problem.
Purpose: To examine impact of shock wave therapy versus intermittent mechanical traction on mechanical LBP, and disabilities.
Subjects: 60 mechanical LBP male studied cases years old 20-35 years were assigned randomly into 3 groups, Picked up from Sohag university orthopedic hospital outpatient clinic.
Methods: (Study Group) A: 20 studied cases underwent shock wave therapy plus conventional physical therapy. (Study Group) B: twenty studied cases underwent intermittent mechanical traction plus conventional physical therapy. (Control Group) C: 20 patients underwent conventional physical therapy alone. Three sessions were applied weekly for four weeks. Pain was quantified using McGill Pain Questionnaire, Roland Morris Disability Questionnaire was used for measuring disability, and the ROM was evaluated by (BROM) device before as well as after treatment.
Results: Groups (A, B & C) found a reduction in pain & disability & rise in their in flexion and extension ROM after end of 4 weeks of program. Mean values of pain scale after therapy were 15.3, 9.47, and 23.07 in groups A, B, & C. mean values of Disability scale after therapy were 8.44, 4.87, 11.8in groups A, B & C. mean values of ROM of flexion were 25.53, 29.06, & 23.9 in groups A, B & C. mean values of ROM of extension were 11.73, 15.53 & 9.85 in groups A, B & C. studied cases who received intermittent mechanical traction & conventional physical therapy (group B), found reduction in pain & disability & improvement in ROM of flexion & extension value ($P<0.001$) after therapy program.
Conclusion: Shock wave therapy and intermittent mechanical traction, as well as conventional physical treatment, can be beneficial in studied cases with mechanical LBP.

Keywords: Shock wave therapy – intermittent mechanical traction - mechanical low back pain.

Introduction

Low back pain is a significant cause of disability-adjusted life years among various age groups globally, with an anticipated global mean incidence rate of 11.9 percent. It is among the top 10 reasons for this measure of impairment. While it is generally acknowledged that the majority of new causes of low back pain tend to resolve within the first two months, it is important to note that this is not always what happens. In some of the cases studied, surgery is the best option, while in others, non-invasive treatments and pain management are effective. However, many cases do not improve, and research shows that a significant number of people whose acute pain improves eventually experience a return within a year. The examined population presents with a unique mix of challenges, including chronic pain, impairment, as well as poor quality of life [1].

CLBP is the leading cause of movement restrictions, long-term disabilities, & decreased quality of life. NSLBP is characterized as a condition of discomfort in the lower back region that cannot be determined to a specific and well-established cause" [2]. Symptoms may be caused by variety of structures in back, such as joints, discs, & connective tissues [3].

There are several treatment options including non-invasive techniques for therapy of anon-specific low back pain massage, electrical agents, ultrasound, and exercises[4]. Extracorporeal shock wave therapy (ESWT) has been recognized as one of the influential techniques for several musculoskeletal problems, including low back pain, tendinitis, plantar fasciitis, as well as chronic pelvic pain. [5].

ESWT is a therapeutic approach used to enhance revascularization process and reactivate the process of curation of bonded tissues, including tendons and bones, by applying shock waves on the external lesions of the body so that pain can be alleviated and function improved [6]. ESWT may be used via proper motor stimulation of the muscles & tendons that modulate pain in addition to muscle strength development. Nowadays, ESWT is given for musculoskeletal system ailments, nonetheless chronic low-back pain has been rarely investigated[7].

LBP is a major health issue worldwide & significant reason for medical costs, absenteeism & disabilities. Traction, in which a force is applied to separate two bones that are otherwise close together in order to enlarge the size of their joint, is a treatment option for LBP that has been used for centuries. Numerous traction kinds are utilized, usually combined with concomitant treatments [8].

Several possibilities have explained the potential therapeutic advantage of lumbar traction for CLBP. Traction with or without neurological participation is indicated for LBP. Diagnostic radiography may be needed to exclude illness conditions such as severe osteoporosis before providing CLBP traction therapy or if there are any indications or symptoms of neurological impairment[9]. The existing medical hypothesis is that traction only mechanically affects the spinal column to increase disc spaces and the intervertebral foramen to relieve pathology and disc herniation of lumbosacral neural compression. Traction can also be utilized to reduce hypertonia of the segmental muscle[10].

Methods:

Patients: 60 male patients, aged 20 to 35 years old, suffering from mechanical LBP, The signs and symptoms must last more than 3 months without any intervention physical therapy. The patients just treated with pharmaceutical treatment were chosen from orthopedic hospital at Sohag University. For nineteen mm SD & significance of twenty mm, minimum of 20 studied cases would be essential for each group with ninety-five percent power. Research happened between April & August 2021.

Therapy sessions 3 times week for 4 weeks. The exclusion criteria encompassed a number of criteria, including the absence of acute and subacute mechanical low back pain, the absence of rheumatoid arthritis or any diseases affecting the spine, no history of lumbar vertebrae surgery or cancer, non-smoking subjeects, and the absence of any chronic heart conditions among all subjects. Research received approval from Ethics Committee of Faculty of Physical Therapy, Cairo University with NO: P.T.REC/0112/003361, & received approval from clinical trial registration with NCT05088031.

1-Assessment methods:

- **Pain assessment:** The McGill Pain Questionnaire is valid to evaluate quality as well as severity of pain. Questionnaire consisted of four subscales examining sensory, affective & miscellaneous aspects of pain. Scale contains 78 pain descriptor items, which varied from zero (no pain) to seventy eight (severe pain) [11].
- **LBP dysfunction assessment:** Roland Morris Disability Questionnaire is accurate measurement for LBP dysfunction. The scale includes 24 items. Questionnaire was counted by adding up number of 'yes', which varied from no disability (0) to severe disabilities (24)[12].
- **Back ROM (flexion and extension) assessment:** Back Range (BROM) tool is reliable, objective method for measuring LBR at all levels irrespective thoracic or hip movement.It is a modified protractor goniometer in all three l evels to quantify lumbar spinal movement.[13]The BROM was used to measure spinal flexion. The patient was erect about shoulder-width apart with his feet.
- The anatomical landmarks for measurements were palpated at spinous procedures of T12 & S1 vertebrae.
- - Palpate and mark S1 and T12. Mark on bare skin.

- The examiner placed BROM on spinal procedure S1 & requested studied case to connect straps over lower abdominal area. The examiner then confirmed if inclinometer was fixed on reference & positioned it on right side of volunteer with a view of right side of body.
- Examiner carried out reading
- Patient was then asked to bend the trunk, slide their hands along legs & hang their arms at finish of movement. Again, examiner read BROM angle and called on studied case to return to original position. Same methods for the extension have been repeated.

2-Treatment methods:
Groups were compared in single-center, prospective, randomized, double-blind, as well as controlled clinical trial. Randomization blocks were organized & planned by person blinded to research.
Studied cases were selected haphazardly into three groups, each with the same number of patients: All patients were allowed to leave the research. After a complete description of the trial, all participants gave their consent forms. Studied cases in study group (A) were given shock wave therapy along with conventional physical therapy. Studied cases in study group (B) were given intermittent mechanical traction treatment along with conventional physical therapy. control group (C) were given stretching exercises, which were performed in three sessions per week for a duration of four weeks. Each stretching exercise consisted of a 30-second period of retaining the stretch, followed by a 30-second period of relaxation. This sequence was repeated three times throughout each session. One set of strengthening exercises comprised 10 repetitions with a duration of five seconds for each hold.

-The following were the therapy programmes:
1- Study group of twenty studied cases would receive shock waves in addition to conventional physical therapy. A total of 12 sessions were conducted, wherein 1000 shock waves were administered at a frequency of seven times per second, with a frequency of 2.5 Hz. The shock waves were applied at low energy flux densities ranging from 0.01 to 0.16 mJ/mm2. A seventeen mm head was utilized for a duration of fifteen minutes each day, for a period of four weeks. [14]. Treatment is administered to affected area overlying low back muscle. The point of interest is located 1.5 cm laterally from the posterior midline, specifically on the lower border of the spinous process of the second lumbar vertebra [15].
2- Group B: twenty studied cases would receive intermittent mechanical traction along with conventional physical therapy. Mechanical traction would last thirty minutes for each studied case (with ten-second pull & five-second rest) the intervention was administered three times per week consistently over a period of four weeks, resulting in an overall of twelve sessions. Patients lied in the supine posture on the traction table. After the movable table was unlocked, the linen bracing was mounted around the iliac crest and the lower chest region. The therapist has raised traction to 50% of the body weight[16].
3-Control group (C): Twenty studied cases would go through conventional physical therapy programmes. The treatment regimen consisted of the application of hot packs for a duration of twenty minutes, followed by a five-minute session of ultrasound therapy along with a fifteen-minute session of electrotherapy using TENS. Additionally, stretching exercises targeting the back, hamstring muscles, as well as abdominal muscles were performed for a total of thirty minutes. The stretching exercises were conducted in three weekly sessions over a period of four weeks, with each stretch being held for thirty seconds followed by a thirty-second relaxation period, repeated three times. One set of strengthening exercises comprised 10 repetitions with a five-second duration of each repetition.[17.]

Statistical Analysis

SPSS for Windows, version sixteen was used for statistical analysis (SPSS, Inc.). Two independent variables were used in this experiment. The first variable was a three-level between-subjects factor called (tested group). The second variable was the (measurement periods), which had 2 levels among subject components. Furthermore, 4 dependent factors were investigated in this study (pain Questionnaire, disability Questionnaire and flexion, and extension ROM assessment). A mixed design using a 3x2 factorial arrangement. MANOVA was conducted to compare the variables of interest across different groups as well measuring time . Given an alpha level of 0.05

Results

Table 1. Descriptive data & 1 Way Analysis of Variant for 3 tested groups' mean years old, weight, height, & BMI values.

	Group A	Group B	Group C	F-value	P-value	Level of significant
Age(years)	26.34 ± 3.22	27.8±4.56	26.3±4.31	0.656	0.374	N.S
Weight(kg)	67.74±7.91	70±8.51	70.5±9.01	0.446	0.482	N.S
Height (cm)	161.5±7.15	163.6±9.42	165.74± 7.98	1.328	0.173	N.S
BMI (kg/m^2)	25.28±2.45	25.15±1.73	24.66±2.13	0.359	0.534	N.S

A-Pain scale

Table 2. Descriptive statistics & three×two mixed design MANOVA regarding pain at variant measuring times between diverse groups.

Pain scale	**Group A ($\overline{X}$ ±SD)**	**Group B ($\overline{X}$ ±SD)**	**Group C ($\overline{X}$ ±SD)**
Before treatment	62.14 ± 3.98	62.4 ±3.39	63.24±3.08
After treatment	15.3 ± 2.27	9.47±1.84	23.07±1.32
% improvement	75.37%	84.82%	63.51%
Comparing among before & after-treatment values at different groups			
Before Vs. after	**Group A**	**Group B**	**Group C**
p-value	0.0001*	0.0001*	0.0001*
Comparing between before and after treatment (post hoc exams) between different groups at different measuring times			
	Group A Vs. group B	**Group A Vs. group C**	**Group B Vs. group C**
Before	0.242	0.261	0.152
After	0.0001*	0.0001*	0.0001*

***Significant at alpha level <0.05**

B-Disability scale:

Table 3. Descriptive statistics & three×two mixed design MANOVA for disability at variant measuring times between variant groups.

Disability scale	**Group A ($\overline{X}$ ±SD)**	**Group B ($\overline{X}$ ±SD)**	**Group C ($\overline{X}$ ±SD)**
Before treatment	14.27 ± 1.38	15.1±2.16	15.76±1.82
After treatment	8.44 ± 1.3	4.87±1.52	11.8±2.02
% improvement	40.85%	67.74%	25.12%
Comparing among before & after-treatment values at different groups			
Before Vs. after	**Group A**	**Group B**	**Group C**
p-value	0.0001*	0.0001*	0.0001*
Comparing tests between different groups at different measuring times			
	Group A Vs. group B	**Group A Vs. group C**	**Group B Vs. group C**
Before treatment	0.162	2.00	0.131
After treatment	0.0001*	0.0001*	0.0001*

C-ROM of back flexion:

Table 4. Descriptive data & three×two mixed design MANOVA for ROM of back flexion at variant measuring times between variant groups.

ROM of flexion (degrees)	**Group A ($\overline{X}$ ±SD)**	**Group B ($\overline{X}$ ±SD)**	**Group C ($\overline{X}$ ±SD)**
Before treatment	20.13± 2.09	21.4± 2.54	20.85± 2.41
After treatment	25.53± 2.46	29.06 ± 2.71	23.9 ± 2.65
% improvement	26.82%	35.79%	14.62%
Comparing among before & after-treatment values for ROM of flexion at different groups			
Before Vs. after	Group A	Group B	Group C
p-value	0.0001*	0.0001*	0.0001*
Comparing tests for ROM of flexion between different groups at different measuring times			
	Group A Vs. group B	**Group A Vs. group C**	**Group B Vs. group C**
Before-treatment	0,176	0,132	0,181
After -treatment	0.0001*	0.0001*	0.0001*

***Significant at alpha level <0.05**

D-ROM of back extension:

Table 5. Descriptive data & three×two mixed design MANOVA for ROM of back extension at variant measuring times between variant groups.

ROM of extension (degrees)	Group A ($\overline{X}$ ±SD)	Group B ($\overline{X}$ ±SD)	Group C ($\overline{X}$ ±SD)
Before treatment	7.06±1.65	8.26±1.85	7.26±1.84
After treatment	11.73±1.97	15.53±1.05	9.85±1.73
% improvement	66.14%	88.01%	35.67%
Comparing among before & after-treatment values for ROM of extension at different groups			
Before Vs. after	Group A	Group B	Group C
p-value	0.0001*	0.0001*	0.0001*
Comparing tests for ROM of extension between different groups at different measuring times			
	Group A Vs. group B	**Group A Vs. group C**	**Group B Vs. group C**
Before treatment	0,382	0,474	0,563
After treatment	0.0001*	0.0001*	0.0001*

***Significant at alpha level <0.05.**

Discussion

The purpose of this study was to compare the effectiveness of shock wave therapy vs mechanical traction for treating mechanical low back pain. current investigation was conducted on 60 patients ranging from 20-35 years old with lower back mechanical pain, separated into three equal-quantity groups. Roland Morris Disability Questionnaire examined all patients to evaluate LBP functional disability and BROM for assessment of the ROM as well as McGill Pain Questionnaire prior to and following a four-week trial period.

Results of this study agreed with Schneider. 2018 showed that combining of shock wave plus manual therapy targeting spinal muscles activate points as well as region of quadratus lumborum muscle permits for greatest therapeutic efficacy in LBP. 28 patients who were suffered from LBP were recruited by Lee et al., 2014, those patients were categorized in two groups. The study group included 13 pateint were rescived ESWT, and control group included 15 patients were received ultrasound therapy, & transcutaneous electrical nerve stimulation. Ultimately, the findings demonstrated a decrease in pain levels in both groups; however, the reduction was notably more pronounced in the group subjected to shock wave treatment.

Radial Shock Wave Therapy (RSWT) represents a very successful way of treating lower back pain conservatively. RSWT reduced CLPB in combination with the exercise regimen[20]. Han et al., 2015 contained thirty studied cases (nine males & twenty one females) in their research on quadrilateral lumbar region. Studied cases were separated into two groups. 1st group of fifteen studied cases received regular physical therapy, which included therapeutic heat (20 minutes) (20 minutes), ultrasound therapy (5 minutes), and electrotherapy (fifteen minutes). 2nd group of fifteen studied cases received shock wave processes. Therapies were given two times week for 1.5 months. All of participants were measured by VAS for pain & Oswestry Disability Index for disability. At end of research, second group were received shock wave therapy showed that significant reduction in pain from 7.0 to 3.6 and in disability from 30.1 to 17.5. This outcome was better than in control group

Randomized clinical trial included thirty studied cases with LBP was performed by Notarnicola et al., 2018 those patients are divided in two groups. The study group was received radial shock wave; the control group was received kinesio therapy. Both groups were measured at one and three month after the end of the therapy. The researchers observed that the study group had a more pronounced effect compared to the control group. Specifically, the VAS scores were significantly different between the two groups, with a p-value of 0.02 at 1 month and a p-value of 0.002 at 3 months. Similarly, the ODI scores also showed significant differences, with a p-value of 0.002 at 1 month and a p-value of 0.002 at 3 months.

The findings of this study align with the results reported by Zimmermann et al., 2009, which demonstrated the statistically significant reduction in pain following the implementation of a low-energy ESWT [23]. Hammer DS et al., 2000 revealed that, when used for lesions, ESWTG cures inflammatory tendons and ligaments. ESWT works by breaking calcification and gallstones, increasing circulation, revascularization, and stimulating and reactivates the tendon and bone cure processes.

Chronic LBP is a complicated condition to be addressed with a comprehensive approach to the physical and socio-economic elements of the disease. Medications and physical therapy modalities, including traction, proved effective for an active exercise and training program that supports functional rehabilitation for spinal problems[25]. Lumbar traction was

utilized to reduce the pain that appears to separate vertebrae from harmed tissues, eliminate pressure or contact forces, promote peripheral circulation through massage and lessen muscle spasm. [26].

Assessed the effects of stretch plus infrared and lumbar extension traction concerning stretch and infrared only in 80 studied cases with persistent low-back pain (CMLBP) on lumbar curve, discomfort, and intervertebral motions[27]. They noted that the lumbar extension tractions and infrared were significantly better than stretching training and infrared alone in enhancing the sagittal lumbar curve, discomfort, or intervertebral motions of, found that prone traction was related with improving pain severity and ODI when compared results of prone & supine lumbar traction in studied cases with chronic low back pain[28].

Intended to research impact of lumbar traction in subjects with L5-S1 disc herniation with unilaterally lumbosacral radiculopathy. The hypo-lordotic lumbar spine (<39°) is likewise used for all patients. Frist group undergoes heated packs and interferential therapy (IF). The second group undergoes lumbar extension traction in addition to heated packing, and IF. They found that the traction group is much better than the first group in pain, function status, H-reflexes, and intervertebral segmental mobility.

The limitation of the study was short term of treatment and a single central source for patients.

Conclusion

Treating mechanical low back pain with mechanical traction showed better results than shock wave therapy in decreasing pain intensity, increasing range of motion of back (flexion & extension) & improve the functional status of the back.

These findings are short-term, after treatment. Furthermore, we do not know whether the greater improvement in the shock wave therapy and mechanical traction groups may be due to a greater number of techniques used and/or longer treatment time compared to the control group.

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