Egyptian Journal of Occupational Medicine, 2014; 38 (2) : 125-139

EFFECT OF THERAPEUTIC EXERCISES WITH OR WITHOUT POSITIONAL RELEASE TECHNIQUE IN TREATMENT OF CHRONIC MECHANICAL LOW BACK PAIN PATIENTS: A RANDOMIZED CONTROLLED TRIAL

By

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Abstract

Introduction: Chronic Mechanical Low Back Dysfunction (CMLBD) is the most common problem of the working-age population in modern industrial society; it causes a substantial economic burden due to the wide use of medical services and absence from work. **Aim of work:** To investigate the effect of positional release technique on patients with chronic mechanical low back pain. **Materials and Methods:** Thirty two patients from both sexes were diagnosed with CMLBP, aged 20 to 45 years and were divided randomly into two equal groups; sixteen patients each; group A (control group) received therapeutic exercises that include (Stretch and Strength exercises for back and abdominal muscles). Group B (experimental group) received therapeutic exercises with positional release technique; treatment was applied 3 days/week for 4 weeks. Pain was measured by Visual Analogue Scale, Lumbar range of motion was measured by Inclinometer and Functional disability was measured by Oswestry disability scale. Measurements were taken at two intervals pre-treatment and post-treatment. **Results:** Data obtained was analyzed via paired and unpaired t-Test. There were statistical differences between the 2 groups, where the experimental group showed greater improvement than control group. **Conclusion:** Positional release technique

is considered as an effective treatment for reducing pain, functional disability and increasing lumbar range of motion in individuals with chronic mechanical low back pain.

Keywords: Chronic Mechanical Low back Pain, Traditional physical therapy program, Positional release technique, Functional disability.

Introduction

Chronic mechanical low back dysfunction (CMLBD) is a major cause of illness and disability, especially in people of working age, and in most cases there is no clearly demonstrable underlying pathology(Endean et al., 2011)

It is a common problem which affects the majority of the population. The lifetime prevalence of LBP varies from 60 to 90 percent with an annual incidence of 5% (Aroma and Koskinen, 2000).

In Egypt, gradually shifting from agriculture to an industrial era, low back pain is one of the leading causes for seeking health care providers. It is one of the most common reasons of absenteeism from work, resulting in high costs in terms of expenditure on diagnosis and treatment and in days lost from work (El-Sayyad, 2006).

In the majority of cases, back problems tend to show the first symptoms before the age of twenty. Usually, the pain is acute and heals by itself in less than two months, but most of these cases will experience relapses with each episode becoming worse and worse. Approximately 5 to 10% of cases become chronic, lasting over two months and creating a major medical challenge (Leboeuf and Kyvik, 1998).

With careful analysis and with consideration of the anatomy of the vertebral column, the structure of its components and its variety of functions, it is clear that the causes of back ache are numerous. These causes are: sedentary life style, less physical activity among young people and adults, over weight and obesity which contribute to extra stress on the spine, poor postural habits, poor body mechanics in working procedures, certain repetitive motion, and the unavoidable accidents or trauma induced injury to the back (Fryomer and Selby, 1993).

Evaluation and treatment of low back dysfunction is still insufficient. Patients still have some degree of disability and pain even after rehabilitation (Difabio et al., 1996).

Physiotherapy is the most common method used to apply non-operative treatment and may include the use of modalities for pain relief, manual therapy, bracing, exercise, electrical stimulation and activity modification. Physiotherapy treatment is recommended to reduce pain, to restore range of motion and function, and to strengthen and stabilize the spine (Hall and Brody, 1999).

Positional release technique (PRT) is an osteopathic treatment technique first developed by Jones in 1981. Positional release (also known as strain counter-strain) is an indirect osteopathic technique, whereby dysfunctional joints and their muscle are moved away from their restrictive barrier into position of ease in the treatment of both musculoskeletal (D'Ambrogio and Roth, 1997).

The application of positional release technique for somatic dysfunction requires a practitioner to first palpate a tender point in the soft tissues. The patient's limb is then moved in such a way that the pain associated with pressure on the tender points is relieved by at least 70 percent to find position of ease (Wong and Schauer, 2004). Jones (1981) suggests a minimum period required to hold a position of ease as 90 seconds. It is theorized that the shortening or "folding-over" of aberrant tissue in positional release achieves its therapeutic modifications via both propriceptive and nociceptive mechanisms (Bailey and Dick, 1992).

Researches of various kinds of treatments show strong evidence that manual therapy has a positive effect on patients with long term low back dysfunction, but there is still no evidence for the best type of modality chosen (Harden et al., 2000).

Aim of work

To investigate the effect of therapeutic exercises with or without positional release technique in treatment of chronic mechanical low back pain.

Materials and Methods

This study was conducted in the outpatient clinic of physical therapy department in New EL Kaser El Aini teaching hospital to evaluate the efficacy of therapeutic exercises with or without positional release technique in treatment of CMLBP.

Design of study

Pre-test post-test design was used. Thirty two patients of both sexes with

low back dysfunction were randomly assigned in two groups with sixteen (16) subjects in each one.

Subjects:

Participants were identified and recruited over 10-month period. Thirty eight patients diagnosed clinically with chronic mechanical low back pain (according to location of trigger points at lower back muscles and aggravation of pain with back activities) were examined for eligibility in the study (Figure: 1)

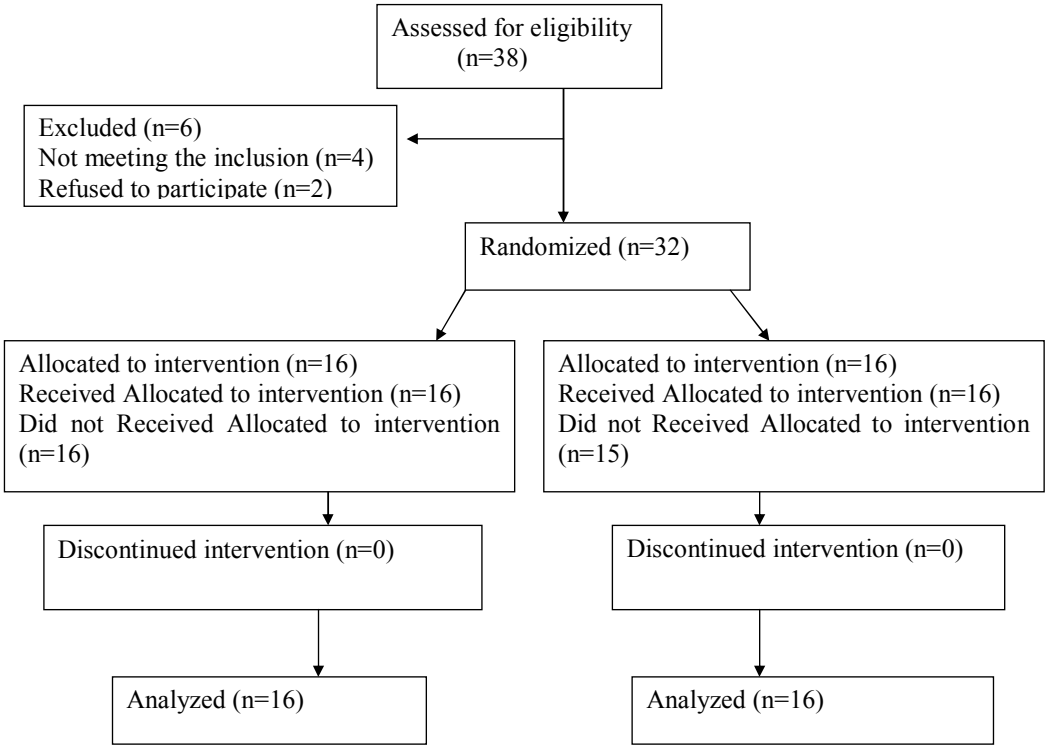

Figure 1: Participant flow diagram

Inclusion Criteria:

- Patients (office workers) had low back pain for 3 months ago.
- Patients had moderate disability care (20-40%) determined through Oswestry Low Back Pain Disability Questionnaire.
- Patients able to perform Range of movement (ROM) test of Lumbar Spine (flexion, extension and side binding) within limit of pain.

Exclusion Criteria:

- Pregnant women.
- History of previous back surgery.
- Current lower extremity symptoms.
- Cardiopulmonary disease with decreased activity tolerance.
- Neuromuscular disease like multiple sclerosis.

Thirty two patients (25 male and 7 female) was diagnosed as CMLBP, their age ranges from 20 to 45 years signed an informed consent and selected randomly (one by one for each group). Group A (Control) 16 patients received therapeutic exercises (stretching exercises and strengthening exercises for back and abdominal muscles), and Group B (experimental) 16 patients with therapeutic exercises positional release technique.

All patients were referred by orthopedic surgeons who are responsible for diagnosis of cases based on clinical and radiological examinations.

Instrumentations:

A- Instrumentations used for evaluation:

Patients were assessed just before and after the treatment sessions. The assessment procedures include the following items.

1- Pain assessment:

Pain assessed by Visual analog scale (VAS). VAS is a scale that allows continuous data analysis and uses a 10cm line with 0 (no pain) and 10 (worst pain) on the other end. Patients were asked to place a mark along the line to denote their level of pain (Marc A, 2001).

2- Functional disability:

Functional disability of each patient was assessed by Oswestry disability questionnaire .It is valid and reliable tool. It consists of 10 multiple choice questions for back pain, patient select one sentence out of six that best describe his pain. Higher scores indicate

great pain.[Scores (0-20%) minimal disability, Scores (20%- 40%) moderate, Scores (40% - 60%) severe, Scores(60%-80%) crippled, Scores (80% - 100%) patients are confined to bed] (Fair Bank and Ronald et al., 2000).

3- Range of motion assessment:

The inclinometer was used, it is a pendulum-based goniometry consisting of a 360 degree scale protractor with a counter weighted pointer maintained in a constantly vertical position, it's a hand held, circular, air or fluid disk, and it used to measure spinal motion (Jackson et al., 2006).

The double inclinometer technique (two inclinometers) was used for measuring lumber Range Of Movement (ROM)

1) Assessment of lumbar flexion

The starting position as the patient was instructed to stand erect with feet contact to each other. The examiner palpates two points on the spine S1 and T12.The inclinometers were placed (centered) on the two palpation points and calibrated to zero. The patient was instructed to slowly bend forward to end of range within limit of pain. The reading on each inclinometer was recorded. The top inclinometer measures total flexion, the bottom inclinometer measures sacral flexion. Total flexion minus sacral flexion is true flexion. True flexion is the measurement usually needed.

2) Assessment of lumbar extension:

Repeat flexion protocol for extension having the patient extend back for full extension or one inclinometer in mid of lumber spine L3.

3) Side bending:

One inclinometer was placed on sacrum for side bending, the patient was instructed to stand erect with feet slight apart, and the patient was instructed to slowly side as his hand contact to his ankle within limit of pain.

Treatment procedure:

Group (A):

Therapeutic exercises include:

- -Mild stretching exercises for 30 seconds for hamstring, calf muscles, and back muscles from long setting (El Naggar et al., 1991).
- -Strengthening exercises for back muscles, bridging and active back extension, (Jari et al., 2004) and abdominal muscles, sit up exercise,

and posterior pelvic tilt, (El Naggar et al., 1991), 12 sessions, 3 sessions per week for one month. Each exercise was done 3 times at session with hold for 6 seconds

Group (B):

1. Therapeutic exercises as group A.
2. Positional release technique: It's indirect (the body parts moves away from the resistance barrier, i.e. the direction of greatest ease) and passive (the therapist performs all the movement without help from the patient) method of total body evaluation and treatment using most severe tender points and position of comfort to resolve the associated dysfunction, It was done 3 times per session, for 12 sessions 3/week every other day for one month.

Posterior lumbar tender points are located on the spinous processes, in the Para spinal area or the tips of the transverse processes in attachment of the quadrates lamborum and hold 90 seconds for each one and repeat three times (D'Ambrogio and Roth, 1997).

- Location of tender points: These tender points are located on lateral aspect of transverse processes from L1 to L5pressure is applied interiorly and then medially (Figure 1).

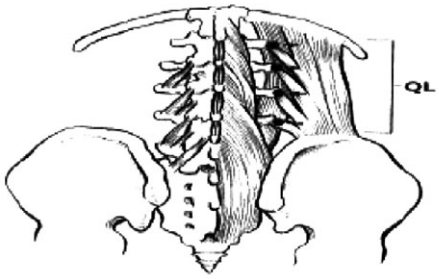

Figure (1): Quadratus lamborum muscle and its tender point adapted from (D'Ambrogio and Roth, 1997).

The patient was prone with the trunk laterally flexed toward the tender point side. The therapist was standing on the side of the tender point. The therapist placed his knee on the table and rests the patient's affected leg on the therapist's thigh. The patient's hip was extended and abducted, and slight rotation was used to fine-tune.

Statistical analysis

Descriptive statistics was used to give subject characters. Inferential statistics was used in form: Paired t-Test to examine the difference between two groups pre & post treatment. Unpaired t-Test to examine the difference between two groups post treatment. Level of significance for all tests were set at P value was 0.05.

Results

Table 1- Demographic data of patients.

Variables	Control group	Experimental group	t-test	P-values
Age (Year)	46.13±2.64	50.94±3.16	1.16	.2 (N.S.)
Weight (Kg)	86.31±2.79	81±2.33	1.46	.1 (N.S.)
Height (Cm)	169.63±9.11	169.88±3.29	.25	.9 (N.S.)

N.S: Non significant

A total of 32 patients participated in this study, they were assigned randomly into two groups; the control group which consisted of 16 patients with mean age of 46.13 (± 2.64) years, mean weight of 86.31 (± 2.79) kg, mean height of 169. 63 (± 9.11) cm. The experimental group consisted of 16 patients with a mean age of 50.94 (± 3.16) years, mean weight of 81 (± 2.33) Kg, mean height of 169.88 (± 3.29) cm. Using unpaired t-test showed that there were no significant differences between groups before treatment for these demographic data (Table 1).

Table 2- Comparison between groups before treatment.

Variables	Control group	Experimental group	T	P-values
Pain Severity	6.62±.42	7.37±.32	-1.39	1.7 (N.S.)
Function disability	19±1.29	21.18±1.27	-1.2	.24 (N.S.)
Flexion	29.06±.06	25.62±2.32	1.12	.2 (N.S.)
Extension	9.81±.47	12.06±1.22	-1.17	.08 (N.S.)
Right side bending	8.93±.8	8.81±.75	.11	.9 (N.S.)
Left side bending	9.68±.68	8.12±.12	1.39	.1 (N.S.)

N.S: Non significant

Unpaired t-test was used was used to detect differences between groups before treatment. There was no significant differences between groups regarding pain severity, functional disability, lumbar flexion, lumbar extension, lumbar right bending, and lumbar left bending (Table 2).

Table 3- Post treatment inter group difference:

Variables	Control group	Experiment group	T	P-values
Pain Severity	**5.56±.44**	**3.13±.25**	**4.73**	**.001****
Function disability	**16.18±1.31**	**13.25±.88**	**1.85**	**.05****
Flexion	**34.37±2.32**	**45.63±2.73**	**-3.13**	**.04***
Extension	**9.85±.34**	**12.63±.89**	**-2.9**	**.009****
Right side bending	**11.56±.8**	**12.19±.08**	**-.6**	**.5**
Left side bending	**11.37±.66**	**12.06±.73**	**-.6**	**.4**

*Significant at the .05 level ** Significant at the .01 level

Unpaired t-test was used to detect differences between groups after treatment. There was significant difference in favor of experimental group than control group of: pain severity, functional disability, lumbar flexion, lumbar extension, but no difference regarding lumbar right bending and lumbar lift bending (Table 3).

Discussion

Chronic mechanical low back pain (CMLBD) is one of the most common causes of inappropriate back function. Positional release technique has been reported to be effective in the treatment of patients with back pain. This study was conducted to examine the effect of therapeutic exercises with or without positional release technique in treatment of chronic mechanical low back pain patients.

The findings of this study demonstrated that the experimental group that received therapeutic exercises and positional release technique showed greater improvement in pain threshold, functional disability and active lumbar range of motion in both flexion and extension but no improvement in right and left side bending than the control group.

1- Therapeutic exercises:

The improvement may be attributed to the effect of therapeutic exercises used in this study in the form strengthening and stretching exercises of the back muscles. This finding has been supported by (Bentsen et al., 1997; Liddle et al., 2004; Jari et al., 2004 and Jemmett, 2003)

Strengthening exercises for lower back muscles increased the strength of weak muscles which increased the stability of the spine which helped in reduction of pain level (Bentsen et al., 1997).

The significant reduction of pain level may be due to the effect of stretching on paravertebral muscles and other back soft tissues which reduced muscle tension and relieved the compression on muscles nociceptors and on nerve root and broke the vicious circle. Also, it decreased cellular connective tissues in paravertebral muscles and decreased muscle stiffness which lead to reduction of pain (Liddle et al., 2004). Jari et al., (2004) reported that increased trunk flexion range of motion after flexion and extension exercises due to increased flexibility and mobility of the trunk.

The patient's functional activities improved as the pain decreased and the lumbar ROM increased. In addition, the exercise program aimed to increase individuals' confidence in the use of their spine and overcome the fear of physical activity (Jemmett, 2003).

2- Positional release technique:

To examine the analgesic effects

of positional release technique (PRT), comparison between pre and post results of pain assessment using visual analogue scale for the (CMLBP) patients in the experimental group was done. The results showed a highly significant decrease in low back pain at the end of treatment program.

The analgesic effect of positional release technique could be attributed to Bailey and Dick (1992). He proposed a nociceptive hypothesis that tissue damage in dysfunctional muscle can be reduced by the positional release mechanism utilized by PRT. They suggested that relaxation of the damaged tissues may be achieved by placing patients in a position of ease which may advance local perfusion of fluids (i.e. blood and lymph) and enhance the removal of sensitizing inflammatory mediators.

This result also supported by Cleland et al (2005) who produced evidence of increased pain free grip strength and decreased pain scores after treatment applied to the area of lateral epicondyle and the cervicothoracic spine.

This was supported by a study done by (Wong and Schauer, 2004). The study examines the reliability, validity and effectiveness of strain counter-stain, the experimental design employed a convenience sample of 49 volunteers with bilateral hip tender points. They found significant pain decrease in both muscle groups demonstrated with the VAS at end of treatment after application of strain counter-stain.

These findings were supported by Collin (2007) who reports on the case of 14 years with grade II ankle sprain, and the benefits recorded by way of the analgesic effect of PRT in improving function. A decrease of two points on a numeric pain rating scale was reported for overall pain after two months as was as decrease in tenderness for 10 out of 13 tender points. This analgesic effect was considered clinically significant and was suggestive of the need for more formal investigation.

Concerning lumbar range of motion, there was significant increase at lumbar flexion, extension, Rt side bending and Lt side bending after treatment of patients by PRT, In comparison between two groups there was significant increase in lumbar flexion and extension post treatment in experimental than controlled but no significant in Rt side bending and Lt side bending between them.

As LBD seems to be due to tight and contracted muscles, where muscle fibers respond to trauma or abnormal stress by releasing calcium from the sacroplasmic reticulum or through the injured sacrolemma, which causes uncontrolled shortening activity and increased metabolism, this sustained muscle contraction decreases the blood supply, leading to an accumulation of waste products, and eventual muscle fatigue and also to the stimulation of the nociceptors which leads to more severe pain. This can lead to a self perpetuating circle where shorting of the muscle leads to loss of sarcomeres, increase the proportion of the collagen in the muscles which aggravates pain and increases muscle stiffness, thus decreasing active lumbar ROM (Hong, 1996).

This was supported by a study done by (Eisenhart, 2003) who evaluate the efficacy of osteopathic manual therapy (OMT) for patients with acute ankle sprain (OMT include myofacial release, stretch and positional release). Patients in the OMT study group had a statistically significant improvement in edema, pain and trend toward increased ROM immediately following intervention with OMT.

In contrast, (Trevor et al., 2005) provides study to investigate the effect of positional release therapy (PRT) technique to increase hamstring flexibility, Hamstring flexibility was assessed before and after each technique by measuring the popliteal angle during maximal active knee extension performed in sitting, A blinded evaluator measured popliteal angles on digital photographs using a standard protractor. The finding suggested that the PRT technique is not effective to increase knee extension in healthy subjects who have decreased hamstring flexibility.

From all of the above, it was approved that application of (PRT) is effective as a treating method for (CLBD) patients owing to its analgesic effects so it helps in reducing pain and functional disability and improving lumbar range of motion.

To examine the effect of the (PRT) on reducing functional disability, comparison between pre and post results of functional disability using Oswestry disability questionnaire for the (CLBD) patients of experimental group there was highly significant decrease in functional disability at the end of the treatment.

These findings were in agreement with Lewis and Flynn (2001) who reported on four case studies of patients with low back pain treated with PRT protocols. The authors detected improvements in the outcomes measured for disability levels (Oswestry Low Back Pain Disability Questionnaire) and pain (Mc Gill Pain Questionnaire) in all cases.

This was supported by a study done by Dardinski et al. (2000) who founds in a retrospective review of 20 patients suffering from chronic localized myofascial pain, the use of the PRT could be beneficial in reducing pain and improving function.

Positional release technique decreases joint and muscle pain, decreases joint swelling and stiffness and so increase mobility and a quality of life (D'Ambrogio and Roth, 1997).

The improvement in functional ability for (CMLBP) patients in this study could be attributed to analgesic effect of PRT which lead to decrease pain and improve back functions.

Conclusion

Positional release technique is effective in reducing pain, functional disability and improving lumbar range of motion in patients with chronic mechanical low back pain.

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