The Influence of Motorized Intermittent Lumbar Traction in Treatment of Mechanical Low Back Pain

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ABSTRACT

The study was undertaken to assess the efficacy of motorized intermittent lumbar traction on mechanical low back pain (LBP). Twenty male patients with at least three months suffering from (LBP) participated in this study. They were randomly assigned into two equal groups (A and B). Treatment of group (A) consisted of local heat application (hydrocollator pack) and therapeutic exercises program daily for five weeks. The same program was applied for group (B) in addition to intermittent lumbar traction (15 sessions) over five weeks. The two treatment groups had similar demographic and clinical base line characteristics. Dynamic radiography (Functional X Ray)to assess objectively lumbar range of motion (LROM) and pain visual analog scale (VAS) were used to assess the changes in functional outcomes pre and post treatment. The results at the end of treatment showed statistically significant improvements in both outcome measures (pain intensity & L.ROM) in groups A and B. However, group (B) showed valuable improvement which was statistically significant in relation to corresponding mean values of group (A). The results supported the hypothesis that intermittent lumbar traction combined with therapeutic exercises and local heat application is efficacious for patients with low back pain.

INTRODUCTION

Low back pain (L.B.P) in developed countries is one of the most common causes of disability, producing a large social and economic burden on society. Seventy to eighty percent of adults are affected at some time during their lives[28]. Epidemiological studies found mechanical L.B.P to be the fifth most common reason for visiting a physician. It is the most controversial back problem, in which instability has allowed progression of abnormal facet movement and associated hypertrophic disc. Pain typically extends from the back to the knee[3].

The efficacy of many physiotherapeutic interventions is questionable. One of the treatment options is traction. It can be combined with other treatment modalities such as massage, exercises, electrotherapy or cryotherapy[2]. Traction has benefited to a greater extent than manipulation and massage from technologic advances and from the measurable nature of its effects on the spine[21]. Lumbar traction has been advocated for the treatment of back and root pain resulting from degenerative disc disease and foraminal stenosis. It may be beneficial in treating joint hypomobility, contracted connective tissue adhesion, epiphyseal joint impingement and muscle spasm[20]. The supposed mechanical effects of traction are vertebral separation,

widening of the intervertebral foramen, flatting of lumbar lordosis and distraction of the apophyseal joint[6]. The purpose of the current study was to determine by using objective method (Dynamic X Ray), the effect of motorized intermittent lumbar traction on spinal mobility and also its effect on pain intensity for mechanical L.B.P.

PATIENT SELECTION

Twenty male patients diagnosed clinically and radiologically as mechanical L.B.P were selected from the out patient clinic in kasr El Aini hospitals.

The diagnosis of the patients was based on patient's history and clinical examination conducted by neurologist and confirmed by X ray and CT scane.

General characteristics of the patients were summarized in table (I).

INCLUSION CRITERIA

All the patients had suffered for at least three months, from mechanical L.B.P. with and without radiation. They had never before any form of lumbar traction.

EXCLUSION CRITERIA

- Those with evidence of underlying disease (such as: rheumatic disease, osteoporosis, spondylolisthesis, previous surgery or fracture, herniated disc, malignant disease, neuromuscular disease of the trunk).
- Any disease or malfunction of organs, extremities or else where that would hinder the treatment.
- If they were receiving treatment (other than medication) for L.B.P elsewhere at the moment of selection.
- Duration of L.B.P symptoms (less than three or longer than six months).
- If they were unable to lie down for 20 minutes.

INSTRUMENTATION

I- For assessment

a) Functional lateral Roentgenogram were taken and measured.

b) Pain intensity was measured by using visual analog scale (VAS) with a score (0) no pain, to (10) untolerable pain.

II- For treatment

a) Lumbar traction apparatus (ELTRAC 471, ENRAF). The equipment units were calibrated before starting the study.

b) Hydrocollator packs (ENRAF hot pack, al deft, Holand).

PROCEDURES

The physical examination of every patient was conducted by the author. The symptoms, history and VAS were obtained from each patient. Two interviews were performed for each patient, the first one was performed immediately before the treatment and the second was carried out after the completion of treatment. Every patient rated the present pain intensity on a scale of 10 mm. on a horizontal line, were (o) denote no pain at all and, 10 the worst pain. The outcome measurements were conducted pre and post treatment.

The patients were assigned randomly to two equal groups (A and B). Every patient was instructed to repeat the program of exercises twice at home every day for five weeks.

Group (A) received daily physical therapy program consisting of:

1- Heat in the form of hydrocollator of the lumbosacral back for (15) minutes.
2- Isometric exercises for the back, abdominal muscles (10 repetitions).
3- Mobilizing exercises from sitting on stool to improve overall spinal range of motion (10 repetitions).

Group (B) received the same program in addition to intermittent lumbar traction. It was administered for 20 minutes in the intermittend mode (four seconds hold, two seconds rest) and a force approximately 35% to 50% of body weight, every other day for five weeks according to Beurskens, et al., protocol[1].

The patient was asked to lay down on the traction table in a semifowler position .A canvas traction belts, were fitted around the iliac crest and the lower thoracic cage. The thoracic belt was placed firmly around the rib cage and secured by straps attached to the metal framework at the top of the table. It was necessary in some cases to insert pieces of sponge rubber under the thoracic belt particularly along the rib margin. After unlocking the sliding table top, the physiotherapist increased the traction force until the patient indicated that his tolerance for pulling was reached with a minimal traction force of 35% and a maximum of 50% of total body weight.

RADIOGRAPHIC TECHNIQUES AND INTERPRETATION

Dynamic radiographs in neutral position, maximum flexion, and maximum extension of the lumbar spine were taken for every patient as a reference standard for measurement of LROM. In agreement and with regard to Dvorak et al.,[9] and Saur et al.,[18] radiographs were taken laterally in the standing position. Interpretation of the radiographs was done by drawing a line at the upper edge of the sacrum and at the lower edge of T_{12}. Straight lines were drown perpendicular to these lines. Their point of intersection form an angle. LROM in flexion can be measured by subtracting this angle on the radiograph in neutral position LROM in extension is the difference between the angle in neutral from that extension measured in the same way.

STATISTICAL ANALYSIS

Data are presented as mean ± standard deviation. Pre and post treatment values were compared for each group by using student's t test for statistical significant independent t test was used to compare the post treatment of both groups. Chi square test was used to compare pre and post treatment pain intensity. Statistical significance was accepted at ($P< 0.05$). The percentage improvement of pain intensity was calculated.

RESULTS

In the present study the effect of intermittent lumbar traction on mobility and pain intensity in mechanical L.B.P was evaluated. General characteristics of both treatment groups were summarized in table (1). Inspection of the table revealed that both groups almost matched in relation to age, weight, height and duration of illness. Comparison between mean values of all measuring variables in both groups before starting the treatment indicated non significant difference ($P > 05$).

As revealed from table (2 & 3) significant changes were observed in the mean values of ROM in flexion, extension, and total

LROM at the end of treatment as compared with the corresponding mean values before starting the treatment in each group A & B ($P<0.05$).

Comparison between the mean values of total LROM on both groups at the end of treatment as seen in (table 4 & fig. 1) revealed that there was statistically significant difference in group (B) in relation to corresponding mean values of group (A).

Regarding pain, there was a significant change observed in the mean values of pain intensity at the end of treatment in both groups (A & B) comparing with the corresponding mean values before starting the treatment (table 5 & fig. 2). The percentage of improvement at the end of treatment in group A&B were 26% and 38% respectively.

Comparison of percentage of improvement of pain intensity in both groups (table 6 & fig. 3) indicated significant improvement in group B ($P < 0.01$).

Table (1): General characteristics of the patients in both groups.

	Group (A)	Group (B)
Total Number of patients	10	10
Mean age (year)	39.3	37.6
Mean weight (kg.)	75.3 ±3.6	73.5 ± 2.4
Mean height (cm.)	168.2 ± 1.2	169.3 ± 4.3
Duration of illness (week)	12.7 ± 3.8	13.2 ± 4.1

Table (2): The mean values of range of motion (R.O.M) during extension, flexion and total lumbar range of motion (TLROM) in degree pre and post treatment in group A.

	Extension		Flexion		TLROM	
	Pre	Post	Pre	Post	Pre	Post
Mean ($\bar{X}$)	9.2	10.1	34	37	43.3	47.1
SD	± 1.47	± 0.73	± 2.94	± 2.78	± 2.62	± 2.84
t. value	1.73		1.73		1.73	
P- value	0.05 *		0.01*		0.003*	

Significant * at 0.05

Table (3): Mean values of range of motion (in degree) during extension ,flexion and total lumbar range of motion (TLROM) pre and post treatment in group B.

	Extension		Flexion		TLROM	
	Pre	Post	Pre	Post	Pre	Post
Mean $\bar{X}$	9.4	10.8	34.8	45.8	44.2	56.6
SD	± 0.84	±1.22	± 3.01	± 3.58	± 2.65	± 3.06
t. value	1.73		1.73		1.73	
P- value	0.004 *		0.000*		0.00*	

Significant * at 0.05

Table (4): Comparison between mean values of ROM at the end of treatment in both groups A and B during extension , flexion & total lumbar range of motion (TLROM).

	Extension		Flexion		TLROM	
	Group A	Group B	Group A	Group B	Group A	Group B
X ˙	10.1	10.8	37	45.8	47.0	56.6
t. value	1.73		1.73		1.73	
P. value	.07		0.00 *		0.00 *	

Significant * at 0.05

Table (5): Pain intensity pre and post treatment in both groups A&B.

	Group (A)			Group (B)		
	Pre	Post	Percentage of improvement	Pre	Post	Percentage of improvement
Mean	6. 3	3.7	26%	6.6	2.8	38%
S.D	2.0	1.9		1.2	0.7	
Chi-square	43.7			39.1		
p-value	0.01*			0.001*		

Significant * at 0.05

Table (6) comparison of percentage of improvement of pain intensity in both groups A & B.

	Group (A)	Group (B)
Mean value of improvement	26%	38%
Chi- square	34.91	
p-value	0.01*	

Significant * at 0.05

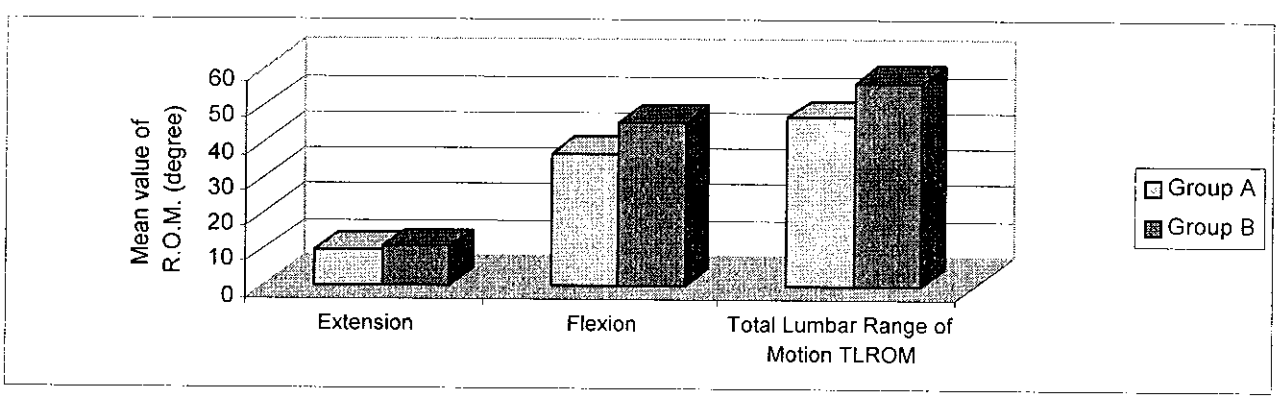

Fig. (1): Mean values of ROM at the end of treatment in both groups A & B.

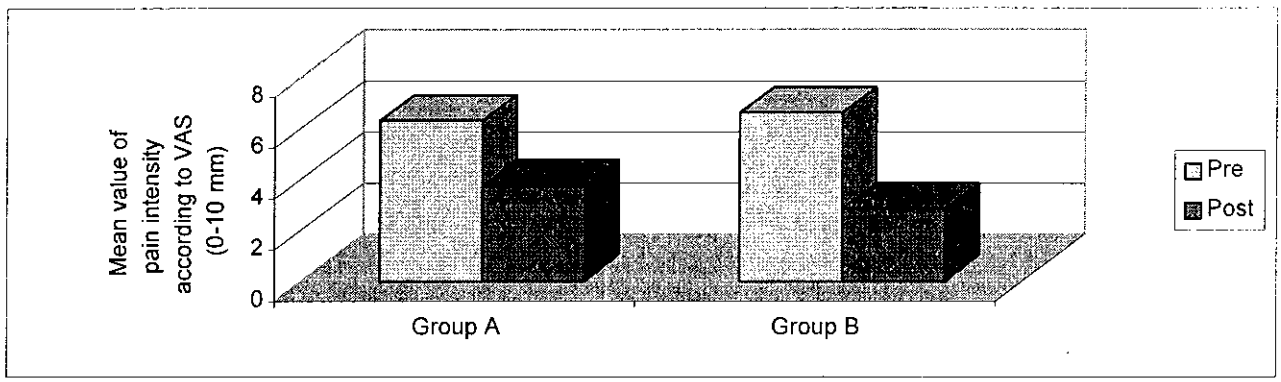

Fig. (2): The mean values of pain intensity pre and post treatment in both groups A & B.

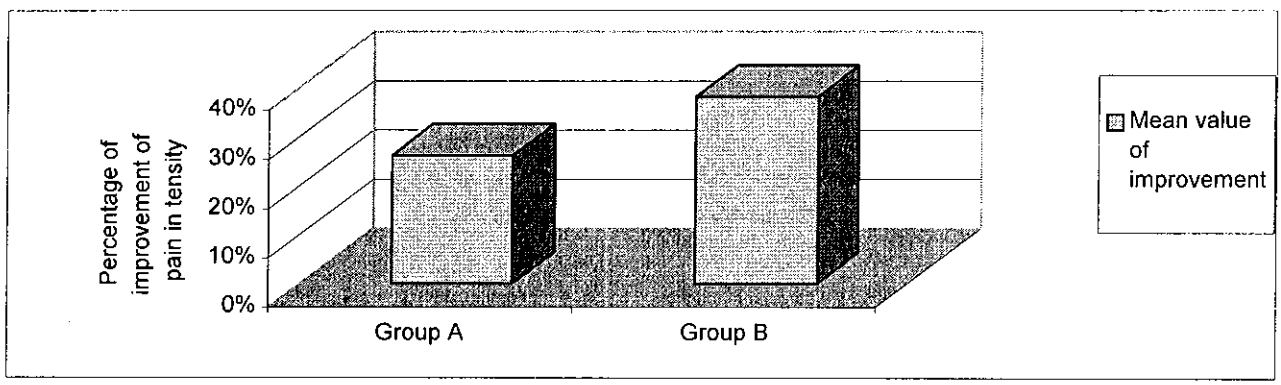

Fig. (3): The percentage improvement of pain intensity in both group A & B.

DISCUSSION

The result of the present study clearly proved the evidence of the combined effects of intermittent traction and physical exercise program with heat for improving LROM and reduce pain intensity in mechanical L.B.P.

Significant deficiency in mean values of LROM in flexion, extension were shown in both groups A & B before starting the treatment. Muscles weakness, spasm, pain all can contribute to decrease mobility. The improvement at the end of treatment in group (A) reflects the important role of exercises in the management of chronic LBP. This result came in agreement with the results of Waddell,[27] Tulder et al.,[23] and Velder & Mierau[26].

Hansen et al.,[11] concluded that isometric exercises for trunk muscles is more effective than intensive dynamic exercises program for treatment of chronic L.B.P. Hansen[11] added that patient treated with isometric trunk program responded significantly better than did men treated with a placebo control regimen. However there is strong evidence that exercise therapy is more effective than usual care by a general practitioner, and that exercises therapy and conventional physiotherapy are equally effective[15].

There is still conflicting evidence on the effectiveness of exercises for chronic LBP. The current results proved that exercises

therapy is not more effective than inactive treatment or other active treatment for L.B.P. This result is consistent with the finding reported by Tulder et al.,[23]. This contradiction may be due to unclear whether any specific type of exercises is more effective than another.

Intermittent form of traction was used in the present study instead of static form as it was claimed by Cyriax[8] that the intermittent form elicits a stretch reflex, while static form may cause fatigue of the muscles and allow the traction force to act on the joints. Rogoff[17] announced that patients are able to tolerate much higher forces when traction is applied intermittently.

The measurement of the lumbar ROM of the present study was very consistent as the mobility of the spine was objectively evaluated by using dynamic radiography. The use of Roentgenograms to study flexion and extension motion of the lumbar vertebrae has been widespread[13]. Such measurements are used to detect the functional limits of the spine and to follow therapeutic response[5,14]. Concerning the method of radiological examination the investigator in the present study decided to use a standing position of the patient due to feasibility in a clinical setting as well as in private practice. The decision was also influenced by the fact that this method is widely used among clinicians and radiologists. It is also considered as active functional movement without weights or additional stress.

As it was proved previously that there is an association between measures of spinal mobility and back pain,[22] the investigator used VAS to asses back pain .

The mechanical effects of lumbar traction are well documented in the literature. In contrast, studies of the clinical effectiveness of traction offer conflicting results, with some studies supporting the use of traction, and others reporting equivocal findings[16]. Comparisons between these studies are difficult because of differences in the definitions used for back pain, in the choice and definition of traction performed, and in the

Two trials evaluating the effect of intermittent motorized traction yielded scores fewer than 50 points (34 and 25 respectively). Trial scores were between (0-100), increasing with quality. In the first, Coxhead et al.,[7] compared intermittent motorized traction alone, or with exercises manipulation or corset (n=161) and no intervention, exercises, manipulation or corset m= 161. No significant difference was found at four weeks. Lidstron & Zachisson,[12] found a significant difference at three weeks when compared intermittent motorized traction (58-95 Kg) combined with isometric abdominal exercise and massage, (n=20)or with hot packs and rest n = 20 and hot pack massage combined with mobilization (n=21).

Recently Werners et al.,[28] found no significant difference in the outcomes of management using a standard protocol for motorized traction with massage and using interferential therapy.

In the current study although the investigator used a control group (A), placebo group was not used because complete blinding was difficult to achieve in view of the sensation differences in treatment, and the unintended communication between patient and examiner. Therapeutic trials often attempt to blind both patient and investigator to the true nature of treatments received, thus reducing the influences of conscious or subconscious prejudices. There is evidence

that the use of a placebo has effects in the management of LBP[10].

In the present study the improvement seen in traction group may be attributed to several explanations: Flatting of the lumbar Lordosis with distraction of the vertebral bodies and increase intervertebral disc height, stretching of the spinal ligaments and muscles, widening of intervertebral foramina and separation of facets of the apophyseal joints[6].

Traction as a therapy also exert a beneficial effect on some patients by its stretching influence on the mechano receptors present in the discs, ligaments and apophyseal joints. In this regard, it is possible that traction achieves its effect by releasing an entrapped interarticular meniscus or fold of capsule or synovial membrane that may block apophyseal joint movement[4,24].

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الملخص العربي

تأثير شد الظهر المتقطع في علاج آلام الظهر الناتج عن خلل ميكانيكي

الهدف من الدراسة هو تقييم تأثير شد الظهر المتقطع على شدة الألم ومدى الحركة في المرضي الذي يعانون من آلام أسفل الظهر الناتج من خلل ميكانيكي .
وقد أجريت هذه الدراسة على عشرين مريضا من مرضى آلام أسفل الظهر تم اختيارهم من مستشفى القصر العيني وتم تقسيمهم عشوائيا إلى مجموعتين متساويتين (أ – ب) . وأستخدم في علاج المجموعة الأولى برنامج من التمرينات العلاجية مع الحرارة الموضوعية والمجموعة الثانية تم علاجها بنفس البرنامج مع إضافة الشد المتقطع .
وقد تم تقييم جميع المرضى في المجموعتين (أ–ب) قبل وبعد الانتهاء من العلاج بقياس شد ة الألم ومدى الحركة في اسفل الظهر وتم قياس مدى الحركة في اسفل الظهر باستخدام الأشعة المتحركة أثناء الثني والفرد في الظهر .
وقد أشارت النتائج بعد تحليلها في نهاية المدة المقررة للعلاج إلى تحسن ذو دلالة إحصائية في المجموعتين (أ–ب) وبمقارنة التحسن في المجموعتين بعد العلاج أظهرت النتائج وجود فروق ذات دلالة إحصائية بين المجموعتين (أ–ب) لصالح المجموعة (ب) .
لذلك نوصي باستخدام الشد المتقطع مع التمرينات العلاجية والحرارة لعلاج هذه الحالات لما له من آثار إيجابية .