EFFICACY OF THERMAL MASSAGE THERAPY IN CHRONIC LOW BACK PAIN

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ABSTRACT

Objective: *The effect of thermal massage therapy for 3 months duration of treatment on pain intensity, self-experienced disability and lumber fatigability was evaluated in 104 patients who suffered from chronic low back pain.*

Methodology: *The patients constituted 54 men and 50 women. They were divided according to the cause of back pain into discogenic group and mechanical group. The mean age was 52.9 ± 10.8 and the disease duration ranged from 3 months to 30 years (7.8±7.1). Before starting therapeutic intervention and after 3 months of treatment, the back pain intensity and functional disability were measured subjectively using the visual analog scale (VAS) and Oswestry low back pain disability score (ODS). However, the lumber endurance was measured objectively by spectral electromyography, mean power frequency slope (MPF slope).*

Results: *Analysis of the current study results with multivariate analysis of variance (MANOVA) showed that the back pain intensity, functional disability and lumber muscle fatigability in both discogenic and mechanical groups were similar at the baseline (before therapeutic intervention) ($p>0.05$). After treatment with the thermal massage bed and strengthening exercises for 3 months, the analysis showed a significant decrease in back pain intensity and disability and improvement of lumber muscle endurance in both groups ($p<0.05$) . Also, this improvement was more in the mechanical group than in the discogenic group ($p< 0.05$).*

Conclusion: *Our results demonstrate that the thermal massage rehabilitation program was more successful in reducing back pain and self-experienced disability and in improving lumber muscle endurance.*

INTRODUCTION

Many physical modalities are used in the treatment of chronic low back pain. Among these modalities, thermal therapy is the most common prescribed therapy for back pain and historically, it is the oldest measure to offer pain relief. Also, body tissues manipulation in the form of massage is one of the most effective and oldest remedies used in the treatment of back pain.

The therapeutic effects of heating includes reduction of pain and muscle spasm, increase in blood flow, relief of joint stiffness, assistance in resolution of inflammatory infiltrates, edema and exudates and detoxification of toxic materials inside the body *(Lerman & de Lateur, 1990). T*he effects of massage therapy include pain relief, sedation, muscle relaxation, improvement of blood circulation, and reduction of adhesions and mobilization of body fluids through mechanical, reflex, neurological and psychological mechanisms *(Salvo, 1999).*

Combination of heat therapy and massage in the form of thermal massage can be considered one of the most recent remedies applied for patients suffering from chronic back pain. It has been advocated during recent years that it is effective in decreasing back pain intensity and functional disability and in improving back strength, mobility and endurance *(Chang et al., 2002).*

The efficacy of thermal massage rehabilitation program formed of thermal massage therapy and strengthening exercises can be evaluated through subjective assessment of back pain intensity and functional disability and objective assessment of lumber muscle fatigability

Lumber muscle fatigue measurements are important in the assessment of lumber muscle functions in chronic low back pain cases *(Alaranata et al., 1994).* This is achieved through using spectral electromyography *(Lee C et al., 1997)*

Aim Of Work:

The purpose of the current study was to investigate the efficacy of thermal massage therapy on pain, self-experienced disability, and lumber fatigability in patients with chronic low back pain

MATERIALS AND METHODS

This study was conducted on 104 patients (54 males and 50 females) complaining of chronic back pain with pain duration ranging from 3 months to 30 years (7.8±7.1). The chronic back pain diagnosis included the criteria that patients had had back pain longer than 3 months *(Bigos et al., 1994).* They were recruited from the Armed Force Center for Physical Medicine, Rheumatology and Rehabilitation and Outpatient Clinic of the Rheumatology and Rehabilitation at Al-Hussein University Hospital. They were divided according to the cause of back pain into two groups. The first group included 44 patients who had discogenic back pain e.g. disc bulge and non-complicating disc protrusion. The second group included 60 patients who complained of mechanical back pain e.g. lumber spondylosis, ankylosing spondylitis and post-traumatic first degree spondylolisthesis.

Before and after starting therapeutic intervention with the thermal massage bed, the patients were assessed subjectively by recording pain intensity and self-experienced disability using the visual analogue scale *(VAS)* and Oswestry low back pain disability score *(ODS) (Wolfe, 1995*). The Oswestry questionnaire included 10 questions regarding back pain that induced disability in daily functions and life activities e.g. personal care such as dressing and washing, lifting, walking, sitting, standing, sleeping, sex life, social life and traveling. For each question, the subjects selected one number from the scale of 0 to 5, which best described their disabilities. In scale, 0 indicated no disability and 5 indicated total disability. After finishing the 10 questions the score is calculated as total score / total possible score x 100. With visual analog scale, each subject evaluated subjectively the back pain intensity by marking the pain intensity on a 100 mm horizontal line, with 0 mm denoting no pain at all and 100 mm the worst possible pain.

The patients were assessed objectively by measurement of lumber muscle fatigability using spectral electromyography, the mean power frequency slope [MPF slope]. The 2 surface electrodes were attached bilaterally over the lumber paraspinal muscles at L5-S1, 2 cm lateral from midline of spinous processes and 2 cm inter-electrode spacing. The recording electrodes were placed parallel with underlying multifidus muscles and the reference electrodes were attached to the skin 9 cm lateral to recording electrodes.

Before recording the mean power frequency signals, the patients performed an isoinertial back extension endurance test. The patients were seated on the back extensor muscle training and measurement unit in which the load was placed on the weight stack with resistance mechanism created a

variable resistance (isoinertial loading) simulating the natural force output of the back extensor muscles. The patients performed upper trunk repetitive extensions against a movement bar at the rate of 30 repetitions per minutes. The test was continued up to 90 seconds or up to the limit of endurance if the patient was unable to finish the 90-seconds task. The signals were recorded with bipolar electromyography system *(MC-1M; DBC international Ltd, Vantaa, Finland)* at a rate of 1000 Hz through the recording electrodes. The percent of decreasing (sloping) of mean power frequency signals was determined using the Fourier transform algorithmus *(Lindstrom et al., 1970).* Here, a 1024-data point slide was overlapped over the whole recorded signal area with 512 point shift (50% overlap) and the percent of relative slope of MPF against time was used as an index of lumber muscle fatigability

After basic evaluation, the patients with back pain were treated with thermal massage rehabilitation program using thermal massage bed *(Model HY 5000 set, Migun Medical Instruments, Korea)* followed by strengthening back muscle exercises. During treatment, the patients stopped all other physiotherapy modalities or medications therapy.

The thermal massage bed (Fig. 1) is made up of 2 parts. The spine part contains jade probes slowly move from the top of cervical vertebrae to the last point of coccyx It follows the natural curvatures of the spine and come in contact with all pressure points created by body weight. The jade probes move either automatically or manually through remote control. The second part of the bed is the leg and feet part which is a fixed part and the patient's feet come in contact with fixed jade probes

The jade stone is a gemstone and its function is production of infrared rays of deep penetration [wave length from 4000 to 15000 nm to reach 7 cm below skin surface], generation of about 55% anions at high temperature to improve the blood circulation and to relax the muscle spasm. By its movement on the curves of the spine, it acts as massage for paraspinal muscles and causes correction of abnormal spinal curvatures as in scoliosis, kyphosis and ankylosing of the spine.

The patients were submitted to sittings of thermal massage and strengthening exercises every other day at the range of 25 to 30 sittings. Re-evaluation of patients with back pain was done after 3 months duration using the same measurements used at baseline.

Statistical Analysis:

Statistical analysis of the measurements was done using multivariate analysis of variance (MANOVA) either for the effects of treatment or for comparison between the discogenic and mechanical groups

Fig. (1) : Thermal massage bed (Model HY 5000 set)

RESULTS

Subject Characteristics:

One hundred and four patients with chronic low back pain (54 men and 50 women) were included in this study and were divided into 2 groups according to the cause of back pain. The first group included 44 patients who suffered from discogenic back pain (25 men and 19 women). The second group included 60 patients who suffered from mechanical back pain (29 men and 31 women). Both groups were similar in age and there was no significant difference between both groups in height, weight and pain duration according to table (1) ($p > 0.05$).

Variable		Discogenic group (n=44)	Mechanical group (n=60)	Value
Number	Women	19	31	
	Men	25	29	
Age (years)	Women	51.5 (10.1)	55.4 (9.5)	p>0.05
	Men	54.9 (9.7)	50.1 (12.5)	
Height (cm)	Women	162.2 (8.92)	173.5(7.1)	p>0.05
	Men	173.8 (8.49)	160.6 (4.73)	
Weight (kg)	Women	83.2 (8.42)	85.7 (7.37)	p>0.05
	Men	89.07(12.4)	83.3(14.43)	
Pain duration (years)	Women	10.1 (8.8)	7.06 (6.6	p>0.05
	Men	8.2 (9.4)	6.9 (7.4)	

Changes In Pain Intensity And Disability (Fig. 2):

At baseline, measurement of low back pain intensity on the visual analog scale (VAS) and functional disability on the Oswestry low back pain scale (ODS) in the discogenic group (25 males and 19 females) and mechanical group (29 males and 31 females) showed no significant differences between the two sexes within both groups (p>0.05) as in (table 2).

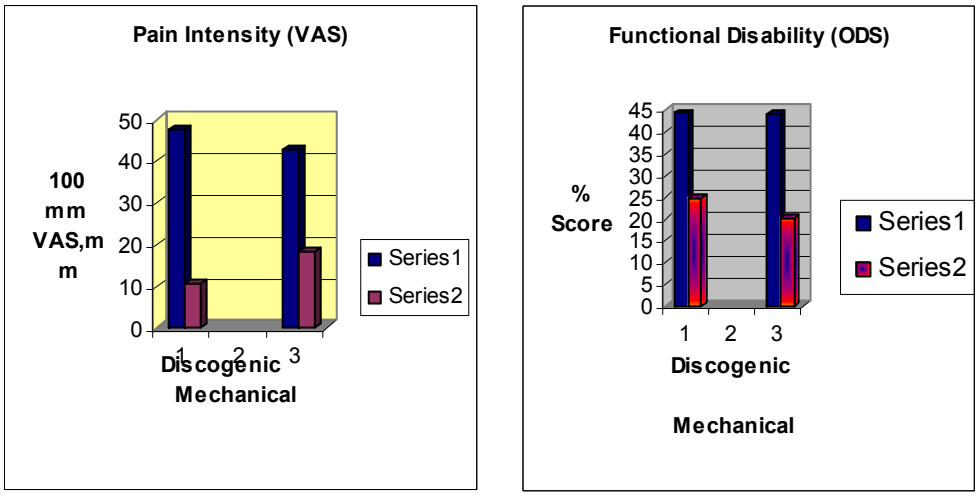

Fig.(2): Pain intensity and functional disability at baseline and after 3 months duration of treatment in discogenic and mechanical groups

Table (2): Outcome Variables in Discogenic and Mechanical Groups for Men and Women Separately at Baseline and After 3 Month's treatment.

	Variable		Discogenic group	Mechanical group	sex difference within groups
Baseline	Pain intensity (100 mm VAS, mm)	Women	44.6 (23.8)	43.8 (28.3)	p>0.05 NS
		Men	48.9 (27.4)	42.4 (19.3)	
	Functional disability (% score)	Women	52.4 (18.7)	44.9 (23.0)	p>0.05 NS
		Men	38.4 (18.0)	43.4 (22.1)	
	MPF slope (% decrease/ min)	Women	-24.2 (4.7)	-22.6 (4.1)	p<0.05 S
		Men	-23.9 (3.7)	-23.4 (4.5)	
After 3 months	Pain intensity (100 mm VAS, mm)	Women	22.8 (15.0)	19.1(17.4)	p>0.05 NS
		Men	18.7(12.8)	17.4 (12.2)	
	Functional disability (% score)	Women	29.7(18.0)	21.0 (11.1)	p>0.05 NS
		Men	20.8 (10.8)	19.3 (12.6)	
	MPF slope (% decrease/ min)	Women	-14.7 (2.9)	-12.3 (3.8)	p>0.05 NS
		Men	-14.7 (2.9)	-12.7 (3.8)	

After combination of pain intensity and functional disability data of men and women in both groups, analysis of these data showed no significant differences between both groups either in pain intensity (p= 0.963) or in disability (p= 0.082) as in (table 3).

Table (3): Outcome Variables in Discogenic and Mechanical Groups For Pooled Data At Baseline and After 3 Months treatment

Variable		Discogenic group	Mechanical group	Between group effect
Pain intensity (100 mm VAS) in mm	At baseline	47.8 (25.4)	42.8 (24.3)	p=0.963
	After 3 months	20.5 (13.7)	18.3 (15.1)	p=0.874
	Within group effect	p<0.05	p<0.05	
Functional disability (% score)	At baseline	44.4 (19.4)	44.2 (22.4)	p=0.082
	After 3 months	24.7 (14.8)	20.9 (11.7)	p=0.235
	Within group effect	p<0.05	p<0.05	
MPF slope (% decrease/ min)	At baseline	-24.0 (4.1)	-23.0 (4.3)	p=0.256
	After 3 months	-14.3 (3.5)	-12.5 (3.8)	p=0.044
	Within group effect	p<0.05	p<0.05	

After 3 months duration of treatment, statistical analysis showed significant decrease in back pain intensity and improvement of self-reported functional disability in each group separately (p<0.05) , but between both groups, there was no significant difference either in pain intensity reduction (p=0.874) or disability improvement (p=0.235) after treatment for 3 months as in {table 3}. Also, there was no difference between sexes within both groups (p>0.05) after treatment as in {table 2}

Changes in lumber fatigability (Figure 3):

The baseline measurements of lumber paraspinal muscle endurance were similar between both discogenic and mechanical groups (p=0.256) as in {table 3} and between sexes within mechanical group (p=0.338), but the lumber fatigability increased in women more than in men in discogenic group (p=0.040) as in table (2).

After 3 months duration of treatment, there was significant reduction in lumber fatigability and MPF slope in both discogenic group (p=0.009) and mechanical group (p=0.000). This improvement of lumber fatigability was similar between sexes within groups (p>0.05) as in {table 2}, but it was increased more in mechanical group than in discogenic group (p=0.044) as in table (3).

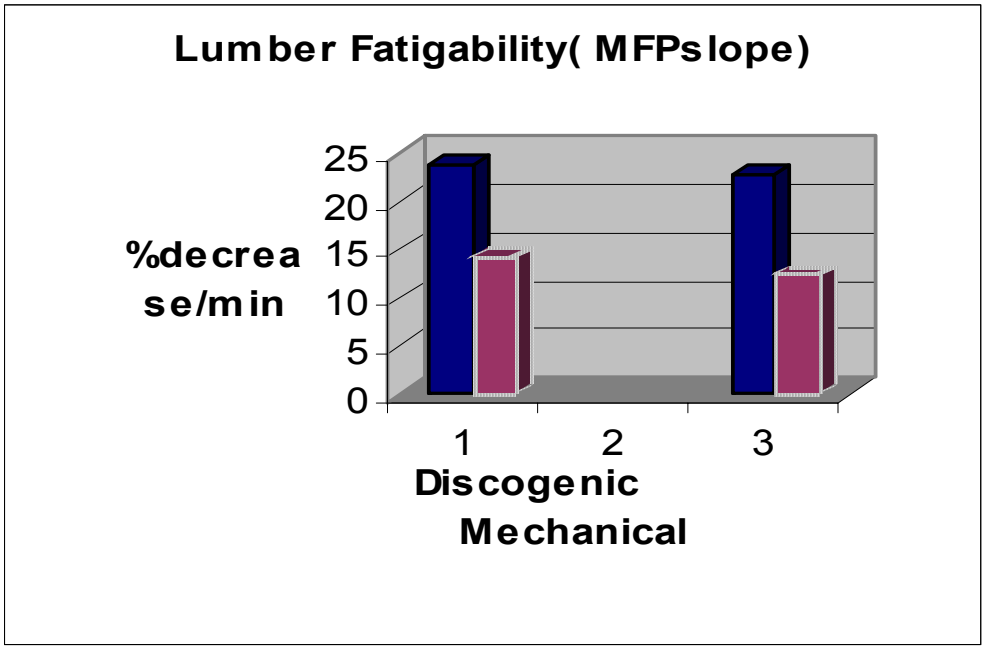

Fig. (3): Lumber fatigability at baseline and after 3 months duration of treatment in discogenic and mechanical groups.

DISCUSSION

The results of this study showed that the thermal massage rehabilitation program including treatment of back pain with thermal massage bed and strengthening exercises of back muscles for 3 months was effective in pain reduction and improvement of daily functions in patients with chronic low back pain. Also, it was effective in improving objectively assessed lumber paraspinal muscle endurance.

Thermal massage therapy was not mentioned in the United States Agency for Health Care Policy and Research as a treatment for low back pain *(Bigos et al., 1994).* In spite that fact, *Chang et al. (2002)* in their study on patients with chronic back pain in the University of Irvine, California, USA reported that thermal massage therapy was effective in decreasing back pain intensity and functional disability and in improvement of back strength, mobility and endurance.

Our study showed that the use of the thermal massage rehabilitation program for 3 months' duration results in improvement of lumber paraspinal muscle endurance capacity and lumber fatigability as measured with spectral electromyography (MPF slope). Those results were in accordance

with *Roy et al. (1995)* who measured spectoral electromyographic compression in patients with chronic back pain before and after 4-weeks active rehabilitation program and reported improvement of lumber paraspinal muscle endurance. Contrary to the current results, *Moffroid et al. (1993)* found no significant changes in spectral electromyographic compression in healthy women during 6 weeks thermal therapy and exercises program, but this program may not have been intensive enough to improve lumber endurance

In our study, the lumber muscle endurance improvement was associated with a decrease in back pain intensity in both discogenic and mechanical groups. But this improvement in patients with mechanical pain was more than in patients with discogenic pain and this is explained by the ability of the patients to exercise more effectively as the pain became less (as in mechanical group patients) during the test.

Lumber muscle fatigue measurement by spectral electromyography is important in the assessment of lumber muscle functions in chronic low back pain patients *(Alaranata et al., 1994).* The spectral electromyographic measurement reflects action potential changes that result from underlying accumulation of metabolic products e.g. lactate and extracellular K, during fatiguing *(Brody et al., 1991).* So, the spectral electromyography had been shown to be a highly repeatable and acceptable objective measurement of local muscle fatigability *(Moritani et al., 1986).*

Conclusion:

In conclusion, the thermal massage rehabilitation program used in our current study was effective in reducing back pain intensity, improving functional capacity and increasing lumber paraspinal muscle endurance. The endurance test (spectral electromyography) used in the current study is a valid and sensitive method for assessing lumber endurance during active back rehabilitation and in follow-up.

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تأثير العلاج بالتدليك الحرارى على مرضى آلام الظهر المزمنة

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مركز الطب الطبيعي و الروماتيزم و التأهيل الطبي للقوات المسلحة و قسم الروماتيزم و التأهيل، كلية الطب- جامعة الأزهر

الهدف: يهدف هذا البحث الى دراسة تأثير التدليك الحرارى على شده الألم و الإحساس بالإعاقة الوظيفية للجسم نتيجة الألم و إجهاد العضلات القطنية المصاحب لآلام الظهر المزمنة.

الطريقة: و قد أجري هذا البحث في كل من مركز الطب الطبيعي و الروماتيزم و التأهيل الطبي للقوات المسلحة وقسم الروماتيزم و التأهيل بمستشفى الحسين الجامعي، على عدد 104 مريضا بآلام الظهر المزمنة حيث تم تقسيم المرضى إلى مجموعتين: المجموعة الأولى و تشمل المرضى المصابين بآلام غضروفية نتيجة إصابات بالغضروف مثل البروز الغضروفي و الإنزلاق الغضروفي غير المصحوب بمضاعفات، و المجموعة الثانية و تشمل المرضى المصابين بآلام حركية نتيجة خشونة بالفقرات القطنية أو تيبس الفقرات أوإزاحة بالفقرات من الدرجة الأولى.

و قد تم علاج مرضى المجموعتين لمدة ثلاثة شهور باستخدام سرير التدليك الحراري و تمرينات تقوية عضلات الظهر(بمعدل 25 إلى 30 جلسة تدليك حراري وتمرينات تقويي عضلات الظهر لكل مريض خلال الثلاثه شهور).

وتم تقييم تأثير التدليك الحراري على ألام الظهر بعمل قياسات لشدة الألم و الإحساس بالإعاقة الوظيفية للجسم نتيجة الألم باستخدام مقياس الألم و مقياس أوسوستيري للإعاقة و كذلك قياس إجهاد العضلات القطنية المصاحب لآلام الظهر باستخدام جهاز رسم العضلات الطيفي و ذلك قبل البدء فى العلاج و بعد ثلاثة شهور من العلاج .

النتائج: و قد وجد أن كلا من قياسات الألم و الإعاقة الوظيفية قبل بدء العلاج لم تختلف إحصائيا بين مرضى المجموعتين ككل و كذلك بين الرجال و النساء فى أي من المجموعتين، ولكن بعد استخدام سرير التدليك الحراري وتمرينات تقوية عضلات الظهر وجد أن هناك انخفاضا ملحوظا فى شده الألم والإعاقة الوظيفية مع تحسن فى قوة تحمل العضلات بين مرضى المجموعتين بدرجة متشابهة. أما بالنسبة لإجهاد العضلات القطنية فقد وجد أنه في مرضى المجموعة الأولى يزيد في السيدات عنه في الرجال و ذلك قبل بدء العلاج، كما وجد أن هناك تحسنا فى إجهاد العضلات القطنية فى مرضى المجموعتين بعد ثلاثة شهور من العلاج، وإن كان التحسن فى إجهاد العضلات القطنية يزيد في مرضى المجموعة الثانية (مرضى الآلام الحركية) عن مرضى المجموعة الأولى (مرضى الآلام الغضروفية).

الاستخلاص: ويتضح من هذا أن استخدام التدليك الحراري فى علاج مرضى آلام الظهر المزمنة يؤدي إلى تحسن واضح في آلام الظهر و الإعاقة الناتجة عن تلك الآلام و إجهاد العضلات المصاحب لها.