ARTÍCULO ORIGINAL/*ORIGINAL ARTICLE*
http://dx.doi.org/10.14482/sun.34.2.612.88

Impact of two therapeutic interventions in patients with non-specific low back pain

Impacto de dos intervenciones terapéuticas en pacientes con dolor lumbar inespecífico

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Abstract

Objective*: To evaluate the impact of two therapeutic interventions in patients with non-specific low back pain.*
Materials and methods*: Prospective study, in which in 20 subjects from both genders assigned through consecutive sampling of the two interventions: Group 1: 10 sessions of conventional physiotherapy treatment (CPT) (Ultrasound, TENS: Transcutaneous Electrical Nervous Stimulation y HWC: Hot Wet Compresses) and Group 2: 10 sessions of Motor Control Exercises (MCE). A numerical Pain Scale (NPS) was applied before and after each intervention.*
Results*: In the first group, it was found a 20% decrease the pain scores after 10 sessions compared with the baseline measurements (before the intervention) (p=0.03). Similarly, in the second group, pain score dimished 42% respect to baseline values at the end of the 10 therapeutic sessions (p = 0.03). When comparing the two interventions, the MCE were more effective than the CPT, even from the first treatment session (p <0.05).*
Discussion*: a significant reduction of pain was found in both groups, although this reduction was significantly in the group treated with MCE.*

Keywords: Physical Therapy Specialty, Low Back Pain, Exercise Movement Techniques, Exercise Therapy.

Fecha de recepción: 12 de julio de 2017
Fecha de aceptación: 3 de octubre de 2017

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Salud Uninorte
Vol. 34, N° 1, 2018
ISSN 0120-5552
eISSN 2011-7531

Resumen

***Objetivo**: Evaluar el impacto de dos intervenciones terapéuticas en pacientes con dolor lumbar inespecífico.*
***Materiales y métodos**: Estudio prospectivo, en 20 sujetos de ambos sexos asignados a través de muestreo consecutivo a una de las dos intervenciones: Grupo 1: 10 sesiones de tratamiento de fisioterapia convencional (TFC) (Ultrasonido TENS: eléctrica transcutánea nerviosa Estimulación y CHC: Compresa húmedo-calientes) y Grupo 2: 10 sesiones de ejercicios de control motor (ECM). Se aplicó la Escala numérica del dolor (NPS) antes y después de cada intervención.*
***Resultados**: en el primer grupo, se encontró una disminución del 20% de las puntuaciones de dolor después de 10 sesiones en comparación con las mediciones de referencia (antes de la intervención) (p = 0,03). De forma similar, en el segundo grupo, la puntuación del dolor disminuyó un 42% con respecto a los valores basales al final de las 10 sesiones terapéuticas (p = 0,03). Al comparar las dos intervenciones, los ECM fueron más efectivos que el TFC, incluso desde la primera sesión de tratamiento (p <0.05).*
***Discusión**: se encontró una reducción significativa del dolor en ambos grupos, aunque esta reducción fue significativamente en el grupo tratado con ECM.*

Palabras clave: Fisioterapia, Dolor lumbar, Técnicas de Ejercicio con Movimientos, Ejercicio terapéutico.

INTRODUCTION

Low back pain (LBP) is the most common musculoskeletal condition that affects the adult population, with a prevalence of up to 84% (1). It is one of the most common conditions that motivate individuals to seek medical attention. Low back pain is associated with loss of work productivity, poor quality of life and high medical expenses, and it is a substantial economic burden for society. (2-4). Low back pain is one of the main causes of work absence causing a considerable cost in societies (5), being the main cause of disability and loss of work in industrialized countries (6). According to the Global Burden of Disease Study, lower back pain ranks first among the leading causes of disability worldwide (7). Lumbar pain is defined as pain between the 12th rib and the lower gluteal fold with or without pain radiating to the leg. Chronic low back pain is usually defined by symptoms that persist for a period of more than 3 months (12 weeks). However, there is no precise definition of this pain in the literature (8).

Current evidence does not provide guidance in selecting an appropriate treatment approach or when specific treatments are warranted. There is no clarity about the best treatments, while many treatments are expensive and of unclear efficacy (9). The poor control of the pattern of activation of the deep muscles and an alteration of the trunk musculature, stability and control of altered vertebral column have been proposed as factors that contribute to the appearance of low back pain and its persistence (10-12). Therefore, treatment protocols that address the control and coordination of the lumbar muscles are believed to be effective in the treatment of Non-specific Lumbar Pain (NLBP) (13).

However, it is important to consider that the pain is produced by the brain after a person's neural signature has been activated

and it concluded that the body is in danger and that action is required (40, 41), that is why that new clinical trials for the treatment of low back pain emphasize non-pharmacological approaches and indicates that drug treatments should be used only when other methods are unsuccessful. The American Medical School recommends treatments that include superficial heat, massage, acupuncture and manual manipulation (14). On the other hand, the prescription of bed rest, which in some cases may be excessive, has been also recommended, the use of therapies with non-ionizing physical modalities (thermal, electromagnetic and mechanical) (15), until surgical interventions, using techniques of advanced image, which as a whole produce high costs for health systems (16), even the direct and indirect costs derived from this musculoskeletal disease exceed those of highly prevalent diseases such as coronary heart disease (17).

For this reason, the objective of this work was to evaluate the impact of two therapeutic interventions in adults with nonspecific lumbar pain.

MATERIALS AND METHODS

A prospective intervention study was carried out before and after the test. Twenty subjects of both genders who presented the medical diagnosis of non-specific lumbar pain were taken by consecutive sampling, } by the specialist in orthopedic and traumatology deriving from a Pain and Spine Center of Cartagena, in the period between June and December of 2016.

Minors, pregnant women and those people with difficulties in understanding the language were excluded, people that had previously performed the therapy.

The written informed consent of each participant was obtained and the research committee approved all the study procedures, in accordance with the Declaration of Helsinki and current Colombian legal regulations. (Resolution 008430 of 1993 of the Ministry of Health).

The participants were randomly assigned to one of the two interventions of the study: Group 1:10 sessions of conventional physiotherapy treatment (CPT) and Group 2: 10 sessions of Motor Control Exercises (MCE). The Numeric Pain Scale (NPS) was applied before and after each intervention.

Through the Shapiro Wilk test, the hypothesis of normal distribution of the data was rejected. An analysis of Mann Whitney U test and rank test with Wilcoxon sign, served to estimate the differences between and intra groups, respectively. The data was tabulated and analyzed in the SPSS V.23 software for Windows.

Clinical and pain assessment

The following data was obtained from each patient: family and personal history; basic anthropometric measurement (weight and height) using standardized technique. The numerical scale of pain (NSP) was introduced by Downie in 1978 (18) and it is one of the most used scales. The patient must assign to his pain a numeric value between two extreme points (0 = Absence of Pain, 10 = Pain of Maximum Intensity). For the application of the scale, patients needed to be able to verbally list the number that defined their level of back pain (19, 20).

Interventions

1.- Conventional physiotherapy treatment (CPT)

Ultrasound (US) Continuous (Ultramax -CEC ®) of 1 MHz - 2 W / cm2 was applied for 15 minutes. After this, Transcutaneous Electrical Nerve Stimulation (TENS), Interferential (Combi 8 Max-Electro Stimulator -CEC ®) 4.000 Hz - 250 µs, for 20 minutes; then, finish with 15 minutes of Wet / Hot Compresses (HWC) (Chattanooga Hydrocollator- HotPac ®) at 60 degrees Celsius.

It is considered that ultrasound (US) can increase local metabolism and blood circulation, improve connective tissue flexibility, and accelerate tissue regeneration, which could reduce pain and stiffness in NLP, while improving mobility (21.22).

The first evidence-based guidelines for the treatment of low back pain did not recommend the use of US in the NLP. However, ultrasound is commonly used in routine clinical practice for musculoskeletal problems, such as back pain (23). Approximately 50% of physiotherapists in the United Kingdom, 65% of physiotherapists in the United States, and 94% of Canadian physiotherapists use the US in their daily practice. In the United States, 55% of primary care physicians recommend US as a form of treatment (24).

Table 1. Application parameters of physical modalities

Modality	Duration	Dosage		Objective
Ultrasound (US) Continuous (Ultramax -CEC ®)	15 min	1 Mhz	2 W/ cm2	Ability to penetrate the deeper layers of tissues and produce vascular changes.
Transcutaneous Electrical Nerve Stimulation (TENS) Interferential (Combi 8 Max-electroestimulador -CEC ®).	20 min	4.000 Hz	250 µs	Ability to penetrate the deeper layers of tissues reducing skin resistance, decreasing pain.
Wet / Warm Compresses (HWC) (Chattanooga Hydrocollator- HotPac ®)	15 min	60°C		Ability to penetrate the superficial and deep layers of tissues and produce vascular changes.

CEC ® Of. Central Córdoba - Argentina: Tel +54-03543- 440011/ 422492/ 422719/ 420986- Of. Buenos Aires-Argentina.

Transcutaneous Electrical Nerve Stimulation (TENS) is a non-invasive therapeutic modality that was implemented more than 30 years ago, together with existing physical agents used in medicine and physiotherapy for the treatment of low back pain. The TENS units stimulate the peripheral nerves by electrodes placed on the surface of the skin; they have well-tolerated intensities and can be self-administered (25-27). For the management of NLP, the CTP, consisted in the use of physical non-ionizing modalities, such as: US and TENS, Wet / Warm compresses (HWC), with the parameters described in table 1, recommended by the medical literature and in rehabilitation (28).

2.- Motor Control Exercises (MCE)

A protocol of motor control exercises was carried out taking into consideration the guide-

lines and fundamentals described by Carolyn Richardson, Paul Hodges, Julie Hides (29, 30) for the activation of the lumbar stabilizing muscles. These exercises were prescribed in a progressive manner and named as follows: Spinal Swing, Abdominal Sink, Palms Down, Elbows Down. Palms down Leg extended, Disturbances.

The etiology of NLBP is complex, and the causes are not clearly known. Research indicates that weakness and loss of motor control of the deep muscles of the trunk, such as deep lumbar (DL) and transverse abdomen (TrA) multiplicity is common in subjects with NLBP (29). Hodges et al., (30) and Ferreira et al., (31) demonstrated that individuals with NLBP are more likely to have a delay in recruitment and insufficient control of TrA.

Table 2. Periodization of the Motor Control Exercises (MCE)

Ejercicio	Dosage	Description	Progression
Spinal Oscillation	5 minutes	Quadruped position and makes repetitive movements towards anterior / posterior avoiding flexion and maximum extension.	Session 1 to 10
Abdominal Sinking	10 seconds/ 10 repetitions/ 3 series.	Supine cubitus, knees in 45 °, sink the abdomen and maintain.	Session 1 to 5
Palms Down	10 seconds/10 repetitions/ 3 series.	Supine cubitus, knees in 45 °, sink the abdomen and maintain with the palms doing inferior pressure.	Session 1 to 10
Elbows Down	10 seconds/10 repetitions/ 3 series.	Supine cubit, knees in 45 °, with its elbows in 90 ° will make inferior pressure.	Session 3 to 10
Palms down Leg outstretched	10 seconds/10 repetitions/ 3 series.	Supine cubit, knee in 45 ° attached to his contralateral and the other fully extended. With the palms he will perform a lower pressure.	Session 3 to 10
Disturbance	10 seconds, 10 repetitions, 3 series	External forces will be applied to the therapist's arm, causing small imbalances. (Palms down-Elbows down).	Session 5 to 10

The MCE performed in patients pretends to maintain postural control in their activities of daily living. At the beginning the exercises are directed to the isometric postural stabilization in a determined area, to progress towards the control of postures, movements of the trunk and extremities in daily activities (32), as described in Table 2 and shown in Fig. 1, 2 and 3.

Figure 1. Motor Control Excersises. Spinal oscillation

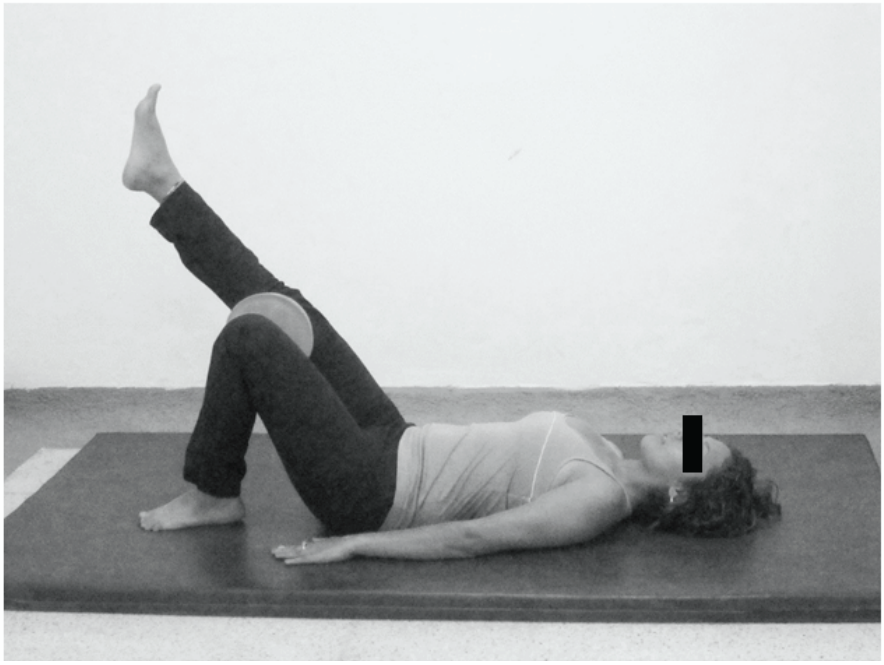

Figure 2. Motor Control Excersises. Palms down leg outstretched

Figure 3. Motor Control Excersises. Disturbance

RESULTS

The average age of the participants was 41.8 ± 12.8. In general terms, there were not between-group differences regarding baseline anthropometric variables and the pain scores (Table 3).

Yet, in the first group (n = 10; 7 women and 3 men), a decrease in pain was found after 10 sessions of treatment (20% decrease, compared with the baseline, p = 0.03) (Table 4).

Table 3. Anthropometric and pain results. Baseline. (n = 20)

Variable	Group 1 n=10	Group 2 n=10	Value P
Age	41,8±12,8	38,8±12,8	0.63
Weight	67,8±11,0	66,6±9,1	0.85
Size	1,65±0,07	1,65±0,04	0.73
BMI	24,8±2,9	24,3±3,5	0.57
NSP	8,0±0,81	7,1±1,3	0.16

BMI: Body Mass Index; NSP: Numerical Scale of Pain.
Data presented in Average ± DE. Differences evaluated by analysis of variance.

A similar change was found in the second group (n = 10, 4 women and 6 men), the participants presented significant changes in pain (42% decrease), at the end of the 10 sessions of treatment, compared to the baseline, p = 0.003 (Table 4).

When comparing the two interventions, conventional physiotherapy treatment (CPT) manages to significantly reduce pain according to NPS. However, the Motor Control Exercises (MCE) were more effective, even from the first treatment session, p <0.05 (Table 5).

Table 4. Differences in NPS in the study groups. (n = 20)

Group	Baseline	10 Session	Z	Value p
1	8.0±0.8	6.4±0.9	-2.97	0.03
2	7.1±1.3	4.1±2,1	-2.82	0.00

Data presented in Average ± DE. Differences evaluated with Test of the ranges with Sign of Wilcoxon.

Table 5. Differences between groups in the NPS according to treatment sessions. (n = 20)

Variable	Group 1 (n=10)	Group 2 (n=10)	P. U Mann-Whitney	Value p
10 Session	6.4±0.9	4.1±2.1	18.5	0.01

Data presented in Average ± DE. Differences evaluated by analysis of Mann-Whitney

DISCUSSION

The study executed by Cairns et al., 2006 (33) showed that specific spinal stabilization does not provide additional benefits in terms of physical function, pain, psychological distress and quality of life compared to the conventional physiotherapy group in patients with recurrent LBP and in patients with LBP. Although both groups had clinically significant improvements in function and pain reduction, there were no statistically significant differences between groups. Even so, in general there were a greater percentage of improvements in the group that received conventional physiotherapy than in the specific stabilization group with fewer treatment sessions and in a shorter period of time, even if it was not statistically significant.

In our case, the results of the NPS in the first group showed a significant improvement after 10 sessions of treatment (20% decreases). Our findings coincide with the reports of Durmus et al., in 2010 (34) and Ebadi et al., in 2012 (35), who found a significant reduction of low back pain in the groups that received treatment with electrotherapy and US more than in a program of supervised exercises, respectively. However, the efficacy of these therapeutic modalities in musculoskeletal conditions remains controversial (36). On the other hand, in the second group, treatment with MCE significantly reduced pain in the study population (42% decreases). Data that coincide, with the reports of experimental studies and well designed clinical trials, which have recently demonstrated the usefulness and effectiveness of treatment with MCE in subjects with low back pain (37,38),

achieving changes in the timing of activation and loss of co-contraction and feed-forward mechanisms (3).

In conclusion, it was found in this study that the greatest NLBP reduction occurred in the group of subjects treated with MCE. For its part, we believe it is important to point out that NLBP is not as closely associated with the spinal load and vertebral pathology as previously thought. Rather, chronic low back pain is associated with a complex combination of physical, psychological, lifestyle, cognitive factors, social factors and neuro-physiological factors (changes in the peripheral and central nervous system).

This study shows the same trend as in other studies on MCE in pain reduction, in which they have shown significant changes, so future studies with larger samples and other types of studies are recommended, in order to offer greater evidence about the effectiveness of physiotherapy in the NLBP.

Financing and Conflict interests.

The authors declare no conflict of interest or funding for the study.

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