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Original contribution

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Keywords

Low back pain, electrotherapy, rehabilitation, Tabasco.

Electrical stimulation and Williams exercises for the treatment of lumbar disc herniation

Electroestimulación y ejercicio de Williams en el tratamiento de la hernia de disco lumbar

Abstract

Objective. To determine the decrease in pain due to lumbar disc herniation using electrostimulation compared to Williams exercises in patients attending the Social Security Institute of State Workers in Tabasco (ISSSTE) in May, 2016.

Material and methods. An observational, analytical, longitudinal, and prospective study was performed in patients with a diagnosis of lumbar disc hernia that came to the Social Security Institute of State Workers (ISSSTE) in May, 2016 with the objective of comparing the pain tolerance benefit of the Lumbar disc herniation in patients treated with electrostimulation and Williams exercise.

Results. Twenty-one patients with lumbar disc herniation treated with electrostimulation were evaluated, indicating an improvement in the tolerance to low back pain ($p \leq 0,05$).

Conclusion. The use of this electrostimulation offers an alternative for pain tolerance from the first clinical session.

Resumen

Objetivo. Determinar la disminución del dolor por hernia de disco lumbar mediante electroestimulación en comparación con los ejercicios de Williams en pacientes que asisten al Instituto de Trabajadores del Estado de la Seguridad Social en Tabasco (ISSSTE) en Mayo de 2016.

Material y Métodos. Se realizó un estudio observacional, analítico, longitudinal y prospectivo en pacientes con diagnostico hernia de disco lumbar que acudan al Instituto de Seguridad Social de Trabajadores del Estado (ISSSTE) en Mayo del 2016 con el objetivo de comparar el beneficio de tolerancia de dolor de la hernia de disco lumbar en pacientes tratados con electroestimulación y ejercicio de Williams.

Resultados. Se evaluaron a 21 pacientes con hernia de disco lumbar tratados con electroestimulación, denotando mejora en la tolerancia al dolor lumbar ($p \leq 0,05$).

Conclusión. El empleo de esta electroestimulación ofrece una alternativa para la tolerancia al dolor desde la primera sesión clínica.

Palabras clave

Hernia de disco lumbar, electroterapia, rehabilitación, Tabasco.

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Introduction

Lumbar disc herniation can be considered an adjacent mechanism for the release and alterations of biochemical compounds and not just from the inflammatory response, but there is also an increase in total cholesterol (p <0.001) and low-density cholesterol (LDL) (p = 0.001).[1] It is associated to certain causes such as male gender (OR: 2.93, 95% CI: 1.26-6.79, p <0.05), age over 25 years, obesity, sedentary lifestyle, smoking (OR: 4.15; 95% CI: 1.59-10.83, p <0.05), metabolic syndrome (OR: 1.66, 95% CI: 1.40-1.95, p <0.05),[3] together with certain hard labor activities and driving motor vehicles (OR: 1.7, 95% CI: 0.2-2.7).[4] The pathology can be seen from an age as early as 12 years, where a relative association with sports activities has been detailed.[5,6,7]

Within the treatment alternatives, intervention with physiatric activities to relieve symptoms has been described.[8,9] A sample of 22 subjects with disabling low back pain aged 51 ± 9.11 years who had two treatment sessions applied with interferential current, tetrapolar method, by means of 75 cm2 surface electrodes in a lapse of 25 minutes, showed an improvement in pain relief evaluated using the Visual Analogue Scale (VAS) (p = 0.017).[10]

In a randomized group, nerve root block therapy in patients with herniated disc and physiatric treatment showed pain reduction compared to subjects without physiotherapeutic intervention, both with a follow-up of six continuous months evaluated with the Back Pain Disability Questionnaire and Pain Scale.[11]

In addition to the above, various drugs applied as an epidural injection have been used to relieve pain in chronic spinal conditions,[12] such as percutaneous discolysis with ozone.[13]

In this area, the Yeung Nam University Medical Center evaluated pain reduction with gadolinium in 37 patients with radicular pain in the lower extremity, measured with the Disability Index Assessment Scale, denoting improvement after four weeks of follow-up (p<0.05),[14] and with nerve root block in patients with herniated disc.[15,16] If the conservative treatment is inefficient, the next step can be a laminectomy or facetectomy, with a surgical time oscillating around 4.29 ± 1.05 hours and a hospital stay of 9.09 ± 4.13 with a range of 1-20 days.[17]

Therefore, the objective of this study is to determine the reduction of pain due to lumbar disc herniation through the use of electrical stimulation compared to Williams exercises in patients at the Institute for Social Security and Services for State Workers in Tabasco (ISSSTE) in May of 2016.

Materials y methods

An observational, analytical, longitudinal and prospective study was performed in patients diagnosed with lumbar disc herniation who attended the ISSSTE from May 2 to May 20, 2016 in Tabasco.

Obtaining a probabilistic sample for a finite population with a universe of 46 patients who agreed to participate in the study, with a confidence level of 95%, p=0.5 q=0.5, with a permissible error of 95%. Selected by systematic sampling.

We included individuals of legal age, with postero-lateral L4-L5 lumbar disc herniation who were diagnosed by anteroposterior and lateral radiography of the segment, as well as an MRI not older than three months at the time of the study. They had partial prolapse of the nucleus pulposus categorized as uncomplicated, lumbar instability associated with ligamentous alteration,[18,19] no alterations on the skin or protuberances, previous spinal surgeries. Individuals with a history of chronic medullary involvement and diagnosis of previous medullary section or peripheral nerve involvement, dermatological lesions, chronic renal

failure, cardiac pacemakers, previous epileptic symptoms and hyperuricemia were excluded.

The data collection was carried out through an 18-item questionnaire which included variables such as gender, age, electrical stimulation, and low back pain. We grouped the patients who had specialized treatment by elective measure in their own way who, after receiving an exhaustive explanation, chose to continue with the treatment: Group 1- patients treated with Chattanooga® electro-stimulator, interferential currents, analgesic modality, with dosage: 50/120, continuous cycle time, carrier frequency 10000Hz, used with ultrastim electrodes 5x5 cm. Group 2 - patients treated with Williams exercises, who agreed not to receive the previous treatment with prior informed consent. The treatment was applied in four sessions with a lapse of five days between each session in the rehabilitation area of the ISSSTE in Tabasco in May 2016. A pain scale was determined by the Visual Analogue Scale (VAS) with 10 points.

The data collection was processed and analyzed through statistical packages such as Microsoft Excel®, SPSS® version 23. Student's t-test was implemented considering the association of variables with a $p \leq 0.05$ as statistically significant.

This work aims to evaluate the use of electrical stimulation therapy in the improvement of low back pain in patients with herniated disc according to the guidelines of the general health law mentioned in its title fifth article 98 and 100. Research in human beings is based on the scientific and ethical principles that justify medical research, especially in regard to its possible contribution to the solution of health problems and the development of new fields of medical science.[20] The project was approved by the Ethics and Research Committee of the University of the Valley of Mexico, Campus Villahermosa.

Results

Twenty-one patients with lumbar disc herniation were evaluated, of which 12 were female (57%) and nine were male (43%), received electrical stimulation (Figure 1).

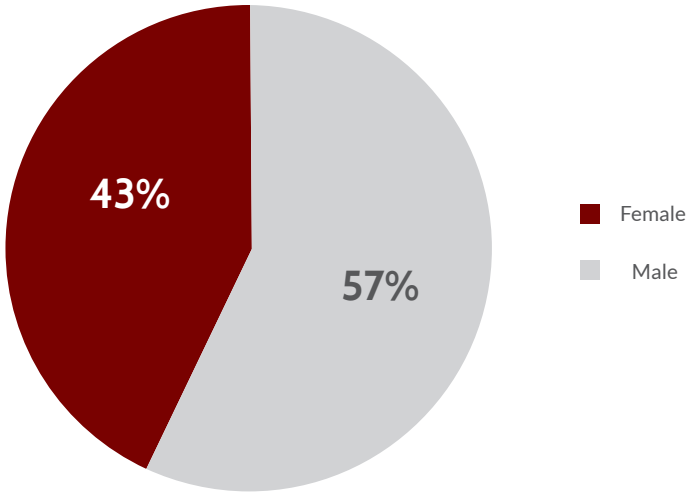
Twenty-one patients, of which 12% were male and 88% female, received Williams exercises and were evaluated (Figure 2).

The VAS results are presented in Table 1. An assessment of 7.90 ± 0.831 was obtained at the beginning and 1.10 ± 0.181 at the end, indicating a statistically significant improvement in pain tolerance after the application sessions ($p \leq 0.05$).

Table 2 shows the comparison of the end results of the two types of treatment. The electrical stimulation group had VAS final scores of 1.10 ± 0.181 while the patients treated with Williams exercises had final scores of 3.19 ± 0.981, finding a statistically significant decrease in pain when applying electrical stimulation with interferential current in analgesic modality ($p \leq 0.05$).

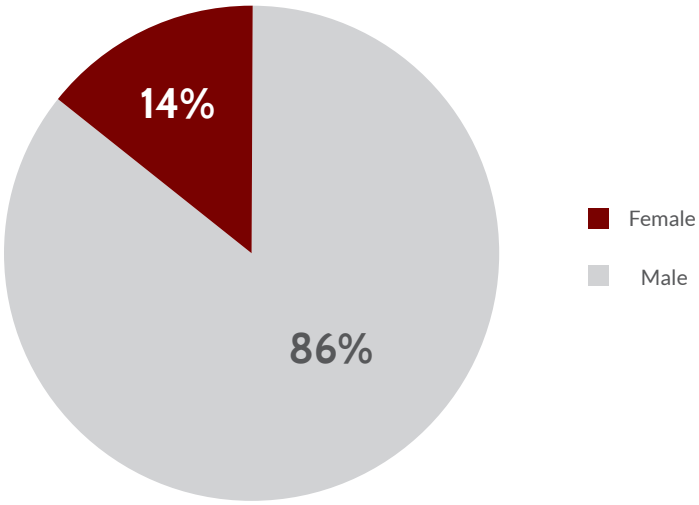
At the beginning of the study, the patients who received electrical stimulation reported pain at a score of 8 points on the VAS scale, at five days of application they reported 5.61, at day ten a score of 3.57, and at day fifteen a score of 1.09. Those who opted for treatment with Williams exercises had 7.9 points at the beginning of the study, 6.95 at five days, 5.38 at ten days, and 3.19 at fifteen days with a significant decrease of pain after five days of therapy ($p \leq 0.05$) (Figure 3).

Figure 1. Gender of patients with lumbar disc herniation receiving electrical stimulation (n=21).



Source: Electrical stimulation and Williams exercises in the treatment of lumbar disc herniation.

Figure 2. Gender of patients with lumbar disc herniation receiving Williams exercises (n=21).



Source: Electrical stimulation and Williams exercises in the treatment of lumbar disc herniation.v

Table 1. Final VAS results of the subjects treated with electrical stimulation.

Electrical stimulation	Mean ± Standard Deviation	p*
Start (day 1)	7.90±0.831*	0.000
End (day 15)	1.10±0.181	

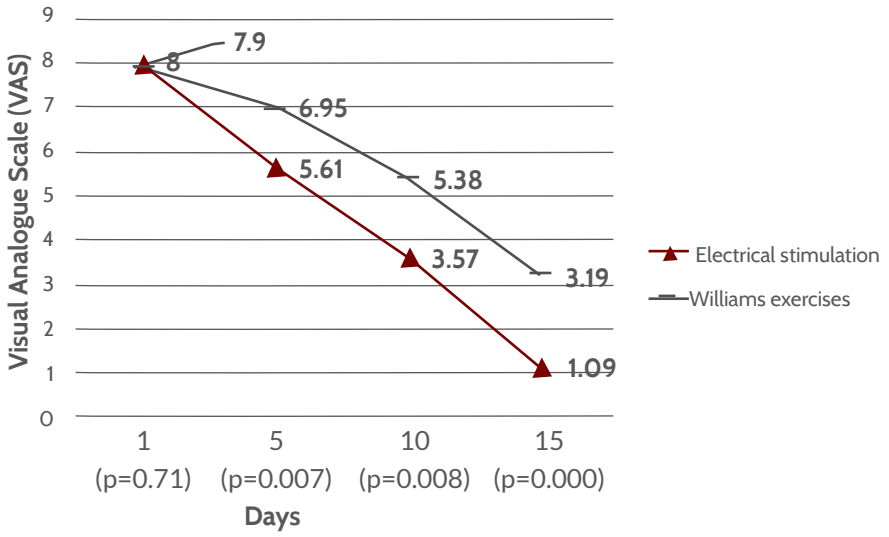
*Student's t-test results.
Source: Electrical stimulation and Williams exercises in the treatment of lumbar disc herniation.

Table 2. Comparison of the final VAS results of the physiatric therapies.

Treatment	Mean ± Standard Deviation	p*
Electrical stimulation	1.10±.831*	0.000
Williams exercises	3.19±.981	

*Student's t-test results.
Source: Electrical stimulation and Williams exercises in the treatment of lumbar disc herniation.

Figure 3. RVAS results of the patients at the beginning and at the end of the sessions of the physiatric therapies of electrical stimulation and Williams exercises.



Source: Electrical stimulation and Williams exercises in the treatment of lumbar disc herniation

Discussion

Martínez Pintor in 2011 stated that interferential currents provide a series of important advantages, both for the patient and for the therapist.[21] According to the results of our study, decreased back pain was observed with the use of electrical stimulation. The subjects treated for the first time with electrical therapy presented an improvement from the first session, while the patients who were given Williams exercises did not mention improvement on the first intervention. It should be mentioned that in order to observe more precise results in the use of rehabilitative techniques, the studies must be longitudinal. It is substantial to note, however, that an improvement in the patient's clinical condition may be there from the outset by employing physical therapies that include technology, providing significant support to the physiotherapist's exercises.

The electrical stimulation showed that, when applied from the start, it can contribute to the improvement of pain relief in those individuals where clinical conditions allow it. Zakharov & Shirokov in 2009 reported 22 patients aged 45.4 ± 6.2 years who underwent electrical stimulation for radiculopathy with compressions in L5 and S1 demonstrating the possibility that this therapeutic option optimizes the peripheral nerves.[22] Comparing the results, there is an observable

decrease in pain perception from first contact and all the way through subsequent sessions.

Physiatric options aimed at reducing pain have a fundamental characteristic in relation to spinal cord compression: in the beginning, a musculoskeletal adaptation can influence improvement of the compression given that the relaxation of the muscles helps improve muscle tone, adequate contraction, and gradual decompression of the affected area.

Calvo's study in 2012 at the Presidente Juárez Regional Hospital of the ISSSTE in Oaxaca included 26 patients diagnosed with lumbar disc herniation in L3-4, L4-5, and L5-S1 from July 2008 to June 2009. He implemented the use of interspinous spacers Lixus OXPEKK®-IG, reducing the pain according to the VAS from 8.7 at the start to 6.7 six months later, with a decrease of 0.5 points at month 24, reducing pain by 94%.[23]

Technology, with its wide range of alternatives, is very favorable in the treatment for pain relief, as long as whoever applies it takes into consideration the risks and benefits entailed and chooses the most appropriate one for their patient. An assessment of a group of subjects suffering from lumbar disc herniation grouped them into three sets. The first consisted of 20 individuals aged 58.4 ± 10.76 years, undergoing cosmogamma Cyborg laser treatment denoted as a gallium-aluminum-arsenide laser (GaAlAs laser) to provide a fiber output of at least 10W (± 10%). The second group included 25 patients aged 61 ± 10.47 years treated with Chattanooga ultrasound with 3 MHz for six minutes for the lumbar and paravertebral area. The third group had 20 individuals aged 54.6 ± 14.89 years named as a control group, which was maintained with a medical treatment plus modified pelvic tilt and straightening exercises with a follow-up of three months. After the follow-up, the group of patients with laser obtained a VAS score of 3.25, the ultrasound group 2.96, and the control 4.80, evidencing the benefit in pain tolerance ($p=0.013$) which can generate an improvement in mood, quality of life, and mental health ($p=0.020$).[24]

In comparison with our results, Williams exercises offer a great possibility of recovery and pain relief. However, when electrical stimulation was applied in a similar group, we found the patients perceived a decrease in pain yielding VAS values of 5.91 at five treatment sessions, culminating with 1.09 points at fifteen sessions ($p \leq 0.05$). These findings in the perceived reduction of pain by patients are similar to the use of electrical stimulation cited by other authors, where the time of use at the same frequency was similar, denoting the improvement referred to by the treatment. However, given that this area is still unknown to some sectors of the population, the use of these technologies are not always accepted by all affected patients.

There are several physiotherapeutic methods used for the relief of pain administered in combination with pharmacological products or their derivatives trying to control various musculoskeletal disorders, among which those related to the lumbar spine stand out. In addition to this, it is a priority to review the duration of the exercises for the improvement of pain and the consistent time for the evaluation, given that this is a substantial point to obtain exact information necessary for a recovery. If the exercises are performed incorrectly we may not reach the fundamental objective.[25]

Conclusion

The use of electrical stimulation therapy of interferential currents in analgesic modality in patients with lumbar disc herniation can offer improvement in the musculoskeletal quality of the individual, as well as their tolerance to pain. It should be mentioned that it must be used under specific standards and certain clinical specifications. It offers a range of possibilities for the rehabilitation of the condition, including complete improvement, and can help avoid lumbar surgery which, aside from entailing a painful recovery, is lengthy, and incurs a great cost to the health sector, to the patients, and to their families. However, re-education and prevention continue to be the primary means for care and reinforcement to avoid a relapse of these conditions.

Conflicts of interest
We declare that this research has no conflicts of interest.

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