

TRANSCUTANEOUS ELECTRICAL NERVOUS STIMULATION (TENS) IN THE MANAGEMENT OF CHRONIC LUMBAR PAIN: A SYSTEMATIC REVIEW OF THE LITERATURE

Yuri Borges Bitu de Freitas

Graduando em Medicina pela Pontifícia
Universidade Católica de Goiás (PUC-GO)
Goiânia Goiás
<http://lattes.cnpq.br/1656337426176041>

Weldes Francisco da Silva Junior

Graduando em Medicina pela Pontifícia
Universidade Católica de Goiás (PUC-GO)
Goiânia Goiás
<http://lattes.cnpq.br/4652720040860185>

Ana Beatriz Ferro de Melo

Graduando em Medicina pela Pontifícia
Universidade Católica de Goiás (PUC-GO)
Goiânia Goiás
<http://lattes.cnpq.br/1364252707215443>

Samyla Coutinho Paniago

Graduando em Medicina pela Pontifícia
Universidade Católica de Goiás (PUC-GO)
Goiânia Goiás
<http://lattes.cnpq.br/5410368046552333>

Caroline Dourado Pinheiro

Graduando em Medicina pela Pontifícia
Universidade Católica de Goiás (PUC-GO)
Goiânia Goiás
<http://lattes.cnpq.br/5799537480773558>

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Jordana Gonçalves de Miranda Amaral
Graduando em Medicina pela Pontifícia
Universidade Católica de Goiás (PUC-GO)
Goiania Goiás
<http://lattes.cnpq.br/8822965941182591>

Bruno Coelho Duarte Oliveira
Graduando em Medicina pela Pontifícia
Universidade Católica de Goiás (PUC-GO)
Goiânia Goiás
<http://lattes.cnpq.br/5731154544291672>

Giovanna Garcia de Oliveira
Graduando em Medicina pela Pontifícia
Universidade Católica de Goiás (PUC-GO)
Goiânia Goiás
<http://lattes.cnpq.br/0112040110213826>

Camila Puton
Graduando em Medicina pela Pontifícia
Universidade Católica de Goiás (PUC-GO)
Goiânia, Goiás
<http://lattes.cnpq.br/6738408323899864>

Laura Prado Siqueira
Graduando em Medicina pela Pontifícia
Universidade Católica de Goiás (PUC-GO)
Goiânia, Goiás
<http://lattes.cnpq.br/5739815378077956>

Alexandre Augusto de Andrade Santana
Graduando em Medicina pela Pontifícia
Universidade Católica de Goiás (PUC-GO)
Goiânia, Goiás
<http://lattes.cnpq.br/7288954710999190>

Ledismar José da Silva
Neurosurgeon, Master in Gerontology from
Universidade Católica de Brasília
Goiânia, Goiás
<http://lattes.cnpq.br/9162961462604842>

Abstract: Introduction: Chronic low back pain (LC) is a debilitating condition, associated with comorbidity and high health costs, and transcutaneous electrical nerve stimulation (TENS) is a non-pharmacological alternative used in the treatment of this pain. **Objective:** To review the current literature on the effectiveness of TENS in the management of chronic low back pain. **Methodology:** A systematic review of the literature was carried out in PubMed databases with the descriptors “(Transcutaneous Electric Nerve Stimulation OR TENS) AND Chronic low back pain”, only randomized studies and clinical trials from the last 5 years were selected (n=30). Studies that disagreed with the objectives were excluded (n=14). **Results and discussion:** A randomized study demonstrated that the use of TENS was effective in the treatment of patients with LC, so that analgesia induced by 30-minute applications had an average duration of 10.5 hours. In addition, two other studies agreed that TENS, for 2 hours/day for 3 months, corroborated the decrease in pain intensity in patients with LC. Regarding the long-term analgesic effects, a prospective study concluded that patients with LC, who used TENS 4 to 6 times a day for 2 weeks had a 28% reduction in pain intensity in the six months following therapy. In disagreement, another prospective, randomized study found that daily 1-hour sessions of TENS for three months did not show significant results in the management of CL after 6 weeks of the end of therapy (p=0.351). **Conclusion:** TENS proved to be effective in reducing short-term pain in patients with LC, however, the literature analyzed was uncertain about its use for long-term treatment, lacking studies of better methodological quality in this aspect. **Keywords:** Chronic low back pain, transcutaneous electrical nerve stimulation, TENS.

INTRODUCTION

Chronic low back pain (LC) is a common condition that affects many individuals at some point in their lives, so it is estimated that between 5.0% and 10.0% of cases of this will develop into chronic low back pain (CLBP), which is experienced by 70% to 80% of adults at some time. (ANDERSSON, 1999; CROMBEZ et al., 1999) In this sense, this pain is defined as pain that persists for more than 3 months or more than the expected healing period and represents one of the most common and costly musculoskeletal problems in society. modern, so that it is responsible for high costs of treatment, sick leaves and individual suffering, as well as being one of the main reasons for seeking health services. (LIAO et al., 2009; MELLOH et al., 2008; ESTEBAN-VASALLO et al., 2009).

Furthermore, possible approaches to managing this pain are very variable. As a result, many physicians refer to non-steroidal anti-inflammatory drugs, opioids and neurotropic medications or steroid injections and surgery as main tools. (SALZBERG and MANUSOV, 2013) Recently, studies have explored evidence for the treatment of chronic low back pain (CLBP) with non-pharmacological means, which would involve minimal adverse events. At this juncture, the options would be behavioral therapies, exercises, spinal manipulation and low-level laser, transcutaneous electrical nerve stimulation (TENS), interferential currents and yoga. (CHOU et al., 2007) It is worth remembering, therefore, that the goals of treatment are, namely, pain relief, reduction of muscle spasm, increase in strength and range of motion, promotion of early return to activity and improvement of the general functional state. (KHADILKAR et al., 2008)

TENS concerns the therapeutic application of electrical stimulation transcutaneously,

that is, on the skin, and is mainly used to control pain in a wide variety of acute and chronic pain conditions. (APTA, 2011) Thus, TENS units generally use adhesive electrodes applied to the skin surface, with the aim of applying pulsed electrical stimulation that can be modified in relation to frequency, stimulation rate, intensity and duration. (JOHNSON and BJORDAL, 2011) In addition, TENS units provide electrical stimulation to the underlying peripheral nerves through electrodes placed on the intact surface of the skin, close to the source of maximum pain. (KHADILKAR et al., 2008) That said, it is believed that the induction of analgesia promoted by TENS is multifactorial and encompasses probable peripheral, spinal and supraspinal mechanisms. (SANTOS et al., 2013).

In view of the use of TENS mentioned above, it is used as a therapeutic adjuvant in the treatment of CL. From this perspective, this treatment is relatively safe, non-invasive and easy to use, as it can be conveniently self-administered by patients at home. Furthermore, TENS is a readily available adjunctive therapy that has been used and advocated clinically for many years to manage a variety of painful conditions, yet its effectiveness remains controversial. (GIBSON et al., 2019) Based on the above, the need to carry out a systematic review on the use of TENS for the treatment of CLD is confirmed.

METHODOLOGY

This is a systematic review of the literature based on the research question: "Is TENS a safe and effective therapeutic option in the management of chronic low back pain?"

For the development of the present study, all indexed full articles, of the clinical trial and randomized clinical trial type, written in English, Portuguese and Spanish, that related to the use of TENS in the population with

chronic low back pain, regardless of gender and of age, which were published between 09/2015 and 09/2020. Articles that were not completed or that did not fit the purpose of the study were excluded.

A search strategy was carried out in the database: PubMed (MedLine), based on the terms selected in the DeCS/MeSH platform. The descriptors used were: “(Transcutaneous Electric Nerve Stimulation OR TENS) AND Chronic low back pain”. The last search was performed in October 2020.

RESULTS AND DISCUSSION

A total of 184 studies were found in the electronic database search. After applying the filters, 154 were removed from the list. After reviewing titles and abstracts, 16 articles were excluded, so that 14 remained for full-text analysis. Of these, all were included in the qualitative analysis synthesis.

A randomized clinical trial selected 68 subjects with CLD, of which 35 were

randomly selected to use TENS every day for 3 months (experimental group) and the other 33 subjects did not use the device (control group). It was evidenced that high-frequency TENS can contribute to the decrease in DLC in these patients, since participants who used the device for at least 2 hours a day for 3 months showed significant reductions in DLC intensity ($P < 0,01$), in addition to improvements in pain catastrophizing ($P < 0.025$) compared to the control group. (JAMISON et al., 2019).

Accordingly, relating another type of TENS, a randomized crossover study concluded that the use of TENS-acupuncture is effective in the treatment of patients with CLD, as it induced a significant pain reduction in the studied group ($p = 0.003$). Analgesia induced by 15-minute and 30-minute applications had, respectively, an average duration of 9 hours and 10.5 hours. However, this 90-minute difference observed between the two groups was not

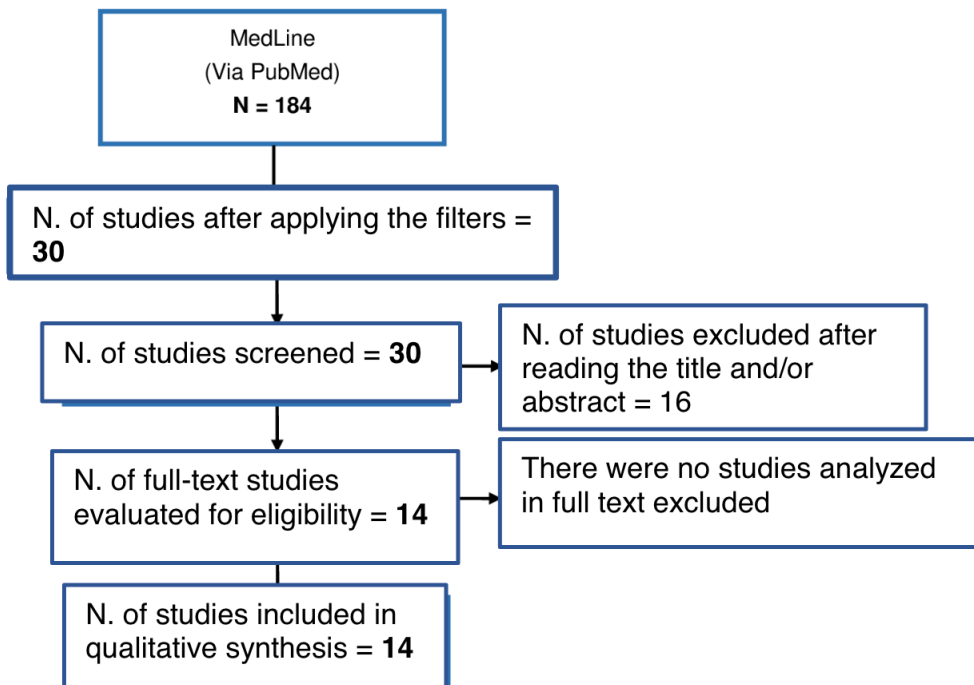


Figure 01: Flowchart of the methodology used to prepare the systematic review.

considered clinically significant ($p = 0.55$), which suggests that healthcare professionals can expect the same analgesic result with the use of 15-minute or 30-minute applications for individuals. with DLC. (TOUSIGNANT-LAFLAMME et al. 2017).

Regarding the type of pulse used in TENS, fixed or adjusted, a randomized clinical trial carried out at the University Hospital El-sahel in Egypt analyzed forty-five patients with CLD, who were divided into three equal groups. The ages of the participants ranged from 20 to 50 years. Group A received TENS with fixed pulse amplitude for 40 minutes, group B received TENS with adjusted pulse amplitude for 40 minutes (adjusted every 5 minutes), and group C received exercise only. The treatment sessions were applied three times a week for 4 weeks for the three groups, and the evaluations were carried out before and after the treatment. When analyzing the results, a significantly greater reduction in pain was observed in groups A and B when compared to group C, and there was no significant difference between fixed-pulse and adjusted-pulse TENS. (ELSERTY; KATTABEI; ELHAFEZ, 2016).

In accordance with this study, Moore (1997) concluded that the use of TENS is more effective than placebos in reducing chronic pain in long-term therapy. Thus, it is possible to infer that the preliminary nature of the previous study limited the duration of treatment, which may make it difficult to detect possible side effects of prolonged use in the treatment of pain, as well as not perceiving changes in clinical factors associated with pain, such as mood and quality of life.

Simon et al. (2015), in their age-stratified dose-response study, tested whether the response to high-frequency, high-intensity TENS differed by age group among individuals with axial DLC. We selected 60 participants (20 young, 20 middle-aged and 20 elderly)

who underwent four 20-minute sessions of high-frequency, high-intensity TENS over a period of two to three weeks. It was found that all groups, on average, experienced episodic axial relief from DLC, through improvement in resting pain, movement-evoked pain, and reported disability. However, older adults were given a higher TENS amplitude across all sessions to achieve similar responses to younger adults, finding that age-related neuroplastic changes in the pain system may not be severe enough to render modulation obsolete. non-pharmacological pain.

Also, Sayilir and Yildizgoren (2017) in their randomized single-blind study, limited by being in a small sample and in a single center, aimed to compare the use of TENS with the use of diadynamic currents (DD) in relieving the symptoms of patients DLC. The first was applied for 30 minutes using electrodes while the second was applied for 8 minutes following the power tolerated by the patient, and they were submitted to a visual analogue scale (VAS) for pain, Roland Morris Disability Questionnaire (RDQ), Index of Oswestry deficiency (ODI) and Schober values to assess low back pain. Thus, it was concluded that both groups showed significant improvements in VAS and RDQ after one month of use of the therapies (both with $p < 0.05$), emphasizing that there was no report of any adverse effects secondary to the treatments used.

In line with this, another comparative study, with 150 patients, equally divided into three groups, evaluated the effectiveness of TENS with interferential current therapy (IFC) in the management of patients with nonspecific CLBP, with treatments being performed over a period of two weeks, in ten 30-minute sessions. It was concluded that both patients treated with TENS and those treated with IFC had reduced pain intensity (visual analogue pain scale and Roland

Morris questionnaire), improved disability and reduced consumption of medications such as non-steroidal anti-inflammatory drugs, steroids (NSAIDs) and analgesics, compared with the control group. (FACCI et al. 2011)

A prospective, randomized, multicenter, single-blind study, with the objective of evaluating the effectiveness of TENS in patients with CLD, concluded that the use of TENS did not present a significant efficacy, either after 6 weeks ($p = 0.351$), in the results evaluated primary outcomes, or 3 months ($p = 0.816$), after using treatment in 4 sessions for 1 hour per day on secondary outcomes. The study involved 236 patients randomly selected from 21 pain centers located in France. Of these patients, 117 were in a group using active TENS and the other 119 in false TENS. (Buchmuller et al., 2012).

According to Carroll et al. (2000), TENS is widely used in UK pain clinics, where it is often used as a first-line treatment for various chronic pain conditions. However, in several studies analyzed, TENS did not show positive results for the effective control of pain, which emphasizes the need to consider some relevant factors, such as licensing, regulation and monitoring of this equipment. Furthermore, it has been suggested that some patients may need to use TENS for up to nine hours a day to achieve adequate levels of pain relief, which could be one of the reasons for the negative results of the above study.

Furthermore, Pallet et al. (2013) states that the analgesic efficacy of TENS is uncertain and that, in forty years of studies, there is no definitive conclusion due to divergent results on the subject, which requires trials with a more robust methodological quality and with greater device standardization capability. Thus, an alternative was presented by Donaldson et al. (2008) and Stone et al. (2003) when pointing out that some

electronic data recording devices, such as TLOG and TSCORE, are accurate, reliable and acceptable to monitor the fidelity of the implementation of TENS and its relationship with pain management.

CONCLUSION

In view of the above, it is concluded, therefore, that the application of TENS presented benefits in relation to DLC in different ways, that is, in high frequency, through which a reduction in the intensity of this pain was obtained, in situations of rest, in evocation by movement and related to disability, including, and reduction of catastrophizing of this. Furthermore, it was also manipulated in fixed and adjusted pulses, which resulted in a significant decrease in pain, and positive repercussions similar to the use of DD currents were seen, with significant improvement in pain.

While there was a majority of positive outcomes in the selected studies, uses without final significance were also seen. However, in these, still, there were no sequels or damages of this use, which denoted the importance of adequacy of the use of TENS, that is, verification of the licensing, regulation and monitoring of the machines and period of time in application by the patients.

Finally, it is essential to point out that the use of TENS requires systematization, with, for example, the standardization of machines and the aforementioned aspects of employment, such as a more evident significance in a large-scale study, with the aim of having, in the future,, defined and useful use for LC control. In this context, as previously mentioned, TLOG and TSCORE were alternatives found for monitoring the implementation of TENS and its relationship with pain management.

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