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Research

Neurodynamic treatment did not improve pain and disability at two weeks in patients with chronic nerve-related leg pain: a randomised trial

Giovanni Ferreira, Fábio Stieven, Francisco Araujo, Matheus Wiebusch, Carolina Rosa, Rodrigo Plentz, Marcelo Silva

Universidade Federal de Ciências da Saúde de Porto Alegre, Porto Alegre, Brazil

KEY WORDS

Low back pain
Sciatica
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Slump test

ABSTRACT

Question: In people with nerve-related leg pain, does adding neurodynamic treatment to advice to remain active improve leg pain, disability, low back pain, function, global perceived effect and location of symptoms? **Design:** Randomised trial with concealed allocation and intention-to-treat analysis. **Participants:** Sixty participants with nerve-related leg pain recruited from the community. **Interventions:** The experimental group received four sessions of neurodynamic treatment. Both groups received advice to remain active. **Outcome measures:** Leg pain and low back pain (0, none, to 10, worst), Oswestry Disability Index (0, none, to 100, worst), Patient-Specific Functional Scale (0, unable to perform, to 30, able to perform), global perceived effect (–5 to 5) and location of symptoms were measured at 2 and 4 weeks after randomisation. Continuous outcomes were analysed by linear mixed models. Location of symptoms was assessed by relative risk (95% CI). **Results:** At 2 weeks, the experimental group did not have significantly greater improvement than the control group in leg pain (MD –1.1, 95% CI –2.3 to 0.1) or disability (MD –3.3, 95% CI –9.6 to 2.9). At 4 weeks, the experimental group experienced a significantly greater reduction in leg pain (MD –2.4, 95% CI –3.6 to –1.2) and low back pain (MD –1.5, 95% CI –2.8 to –0.2). The experimental group also improved significantly more in function at 2 weeks (MD 5.2, 95% CI 2.2 to 8.2) and 4 weeks (MD 4.7, 95% CI 1.7 to 7.8), as well as global perceived effect at 2 weeks (MD 2.5, 95% CI 1.6 to 3.5) and 4 weeks (MD 2.9, 95% CI 1.9 to 3.9). No significant between-group differences occurred in disability at 4 weeks and location of symptoms. **Conclusion:** Adding neurodynamic treatment to advice to remain active did not improve leg pain and disability at 2 weeks. **Trial registration:** NCT01954199. **[Ferreira G, Stieven F, Araujo F, Wiebusch M, Rosa C, Plentz R, et al. (2016) Neurodynamic treatment did not improve pain and disability at two weeks in patients with chronic nerve-related leg pain: a randomised trial. *Journal of Physiotherapy* 62: 197–202]**

Introduction

Low back pain is a highly prevalent and disabling condition that represents the major cause of years lived with disability in both developed and developing countries.[1] Among the wide array of clinical presentations, the prevalence of radiating leg pain can be up to 60% in primary care.[2] In addition, people with low back pain and radiating leg pain present higher levels of work-related disability, lower levels of quality of life and a poorer prognosis than those with low back pain only.[3]

To date, there is no consensus on the most appropriate management strategy for people with nerve-related leg pain. A recent network meta-analysis found that a range of widely used conservative treatments, such as acupuncture, exercise therapy, traction, passive physiotherapy modalities (eg, ultrasound and transcutaneous electrical nerve stimulation), and advice/education alone, were not effective in reducing leg pain compared with no treatment.[4] Despite the high risk of bias of several included studies, as well as moderate-to-high levels of between-study heterogeneity, this network meta-analysis provided evidence that commonly used conservative interventions were not capable of altering the natural history of leg pain. Therefore, other conservative treatment strategies should be investigated in this population as a research priority, given the cost-effectiveness of stepped-care approaches compared with direct referral for surgery.[4]

One conservative intervention that warrants further investigation is neurodynamic treatment. This approach has been considered to be effective for patients with signs of nerve mechanosensitivity,[5] which can be clinically assessed by provocative tests that challenge the ability of the nerve tissue to tolerate tension.[6] In neurodynamic treatment, specific positions, and active and passive movements of the lumbar spine and legs are used to mobilise structures around the nervous system and the nervous system itself.[7]

Despite the plausible biological rationale of this treatment approach,[8–10] little is known about its effects on patient-important

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outcomes, such as pain and disability. To date, two case series[5,11] and two randomised trials[12,13] have investigated the effects of neurodynamic treatment on nerve-related leg pain. However, case series are at high risk of bias and both trials enrolled participants likely to represent a mixed sample of acute, subacute and chronic pain, which may have influenced the outcomes due to differences in the expected prognosis of leg pain and disability. Moreover, the paucity of high-quality studies assessing the effects of this treatment approach was highlighted by a clinical practice guideline that recommended neurodynamic treatment for patients with chronic nerve-related leg pain based only on weak evidence.[14] As such, there is a need for a randomised trial to assess the effects of neurodynamic treatment in patients with chronic nerve-related leg pain.

Therefore, the research questions for this randomised trial were:

1. In people with nerve-related leg pain, does adding neurodynamic treatment to advice to remain active improve leg pain and disability?
2. Does it improve low back pain, function and global perceived effect?
3. Does it increase the proportion of participants whose leg pain centralises?

Method

Design

This study was a prospectively registered, parallel-group, randomised, controlled trial. This trial was reported according to the recommendations of the Consolidated Standards of Reporting Trials (CONSORT) statement.[15] The study protocol was published previously.[16]

At baseline, the presence of neuropathic pain was assessed by the Leeds Assessment of Neuropathic Symptoms and Signs (LANSS) score, in which a score $\geq$ 12 indicates the presence of neuropathic pain.[17] A neurological examination, comprising manual muscle strength testing of the lower limbs, patellar and Achilles reflexes and sensation, was carried out and participants with at least one positive neurological finding were classified as having nerve root compromise. Fear-avoidance beliefs were assessed using the Fear-Avoidance Beliefs Questionnaire (FABQ), and pain catastrophising was evaluated using the Pain Catastrophising Scale (PCS). Medication intake was also recorded.

Following baseline assessment, participants were randomly assigned to neurodynamic treatment or advice to remain active. Randomisation followed a 1:1 ratio and was stratified by current leg pain intensity in two strata (pain ranging from 3 to 6, and pain ranging from 7 to 10 on a scale from 0, no pain, to 10, worst imaginable pain). Within each stratum, allocations were arranged in blocks of six, randomised by shuffling, and sealed in sequentially numbered, opaque envelopes by a researcher not involved in assessment or treatment provision. Each envelope was opened only after the enrolled participant completed all baseline assessments.[18]

Participants, therapists and centres

Participants were recruited from the community through advertisements in local newspapers and social media between March 2015 and March 2016. Although recruitment from secondary healthcare facilities was planned and described in the study protocol,[16] no participant was recruited from such facilities due to lack of referrals. Adults aged 18 to 80 years with chronic unilateral nerve-related leg pain (ie, leg pain for at least 12 weeks) radiating below the gluteal fold were included. Participants had to report a leg pain intensity of at least 3 on an 11-point numerical pain rating scale (NPRS), and their leg symptoms had to be reproduced by the slump test and changed by structural differentiation (ie, releasing of cervical flexion or ankle dorsiflexion).[19] Current low back pain was not a necessary criterion for an individual to be included. Participants were excluded if they had signs of cauda equina syndrome, bilateral leg pain, positive crossed Lasègue sign, previous surgery in the lumbar spine or in the symptomatic leg, inflammatory arthropathies, fractures or malignancy. Those with workers compensation claims or on physiotherapy treatment at the time of baseline assessment were also excluded. Participants who met all eligibility criteria and provided informed consent entered the trial.

A physiotherapist with 2 years of clinical experience who attended a 40-hour course of management of neuromusculoskeletal disorders with neurodynamic techniques provided treatment to all participants. All treatment sessions were provided in a private physiotherapy practice located in Porto Alegre, Brazil.

Intervention

Participants in both groups received advice to remain active, which was delivered in a face-to-face format. The advice focused on two aspects: that prolonged rest, avoidance of daily-life activities and excessive muscle bracing during movement would have harmful effects; and that light activities and movements would be beneficial for pain. At the baseline assessment, participants were advised to maintain their usual activities. In addition to this advice, participants randomised to the experimental group received the neurodynamic treatment and a home exercise program.

Neurodynamic treatment consisted of passive or active movements, which aimed to desensitise the overly sensitised nervous system by restoring its ability to tolerate external forces such as movement and compression.[20] Participants received four treatment sessions over 2 weeks (two sessions per week) with each treatment session lasting up to 25 minutes. On the first appointment, participants were informed that nerve sensitisation was playing a role in their leg symptoms and that the treatment goal was to desensitise it. This educational component was applied in a previous trial.[21]

Participants received grade III lumbar foramen opening mobilisations and neurodynamic sliders. Reproduction of the participant's symptoms was not allowed during the treatment, but a mild pull sensation was tolerated. The lumbar foramen-opening mobilisation was performed for two sets of 30 oscillations at 0.5 Hz, with the participants in side lying (painful side uppermost) and hips flexed. If the participant's symptoms did not worsen after two sets of mobilisation, both legs were draped over the side of the table in order to increase the foramen size, and one additional set of 30 oscillations was performed.

For the neurodynamic sliders, participants were initially positioned in side lying (painful side uppermost) and a combination of hip and knee flexion followed by hip and knee extension was performed for two sets of 30 repetitions. If symptoms did not worsen, a progression was added: the participants executed one set of 30 repetitions of an active sliding technique in slump sitting, which combined neck flexion and knee flexion with neck extension and knee extension. It has been shown that this exercise produces a great amount of nerve excursion.[6] During the active sliding technique in slump sitting, the participant was instructed to extend the knee up to the onset of symptoms.

The lumbar foramen opening technique was designed to reduce pressure over the sensitised nervous system.[22] The sliding techniques were implemented with the aim of generating nerve excursion (elongation of the nerve bed at one joint is simultaneously counterbalanced by a reduction in the length of the nerve bed at an adjacent joint). Neurodynamic sliding may reduce intraneural oedema and venous congestion.[5] Furthermore, apart from mechanical effects, neurophysiological effects have also been described, such as the ability to inhibit temporal summation, reflecting the ability of neurodynamic techniques to decrease hyperexcitability of the dorsal horn.[23] A video demonstration of