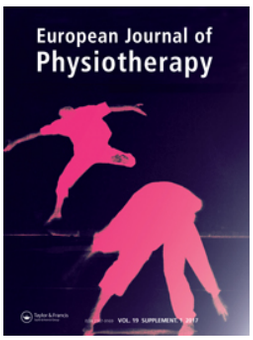

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ABSTRACT

Effects of percutaneous microelectrolysis (MEP®) on pain, rom and morning stiffness in patients with achilles tendinopathy

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Background

Achilles tendinopathy is the third most common disease in the musculoskeletal system. Histopathological evidence indicates that tendinopathies are typically degenerative lesions, presenting collagen fibre separation and disorganisation, mucoid substance increase, hyperplasia and presence of necrotic tissue. There is also an increase in fibroblasts and an absence of acute inflammatory cells. Normally, an intratendinous nodule can be found by palpation or diagnostic ultrasound at 2–6 cm from distal insertion.

This disorder is clinically characterised by pain and stiffness. These symptoms are initially present only in the morning, during the warm up, or after physical activities. In a later phase, pain is more persistent and, may appear during exercise, interfering with activities of daily living, and compromising ankle range of motion.

To assess the Achilles tendinopathy, the Victorian Institute of Sport Assessment-Achilles (VISA-A) questionnaire is often used. It is a validated questionnaire, simple, practical and easy to apply. It consists of eight questions to assess the severity of the tendinopathy symptoms, functional capacity and the ability to play sports. To assess Range of Motion (ROM), goniometry is often used. To assess pain, the Visual Analogue Scale (VAS) is often used.

Physical therapy plays an important role in symptom reduction and in function recovery. There are several methods suggested for tendinopathy treatment. The conservative medical treatment often consists of pain and anti-inflammatory drugs. There are many resources in physical therapy, including different electrotherapy modalities, such as ultrasound, low level laser therapy, iontophoresis and extracorporeal shock wave therapy.

In the last few years, new technologies have been proposed to treat tendinopathies. One of them is Percutaneous Microelectrolysis (MEP®). This technique employs a galvanic current up to 990 uA (microamperes), which is applied percutaneously with an acupuncture needle connected to the cathode.

In a histological research in animals, MEP® was applied in muscle tissue producing a high acute inflammatory response with a large number of inflammatory cells (mainly neutrophils), oedema and injury in muscle fibres. These effects are caused by the cathodic galvanic current that MEP® uses. Tissue destruction occurs through alkalosis, promoting new tissue formation due to the stimulation of inflammatory and regeneration phases. This treatment also produces a H_2 gas release, which is a powerful free radical inhibitor that promotes analgesia.

It is believed that the same effects can be found in tendinous tissues.

Purpose

The aim of this study was to evaluate the effects of MEP® on pain, range of motion (ROM) and matinal stiffness in patients with Achilles tendinopathy.

Methods

This randomised controlled clinical trial was carried out in Clínicas Integradas da Universidade Potiguar.

Twenty patients with Achilles tendinopathy that accepted to participate in this research were randomly divided into two groups:

Control Group (G1): (1) Warm up with a stationary bike for 10 min; (2) Stretching adductors, abductors, hamstrings and plantar flexors (3×30"), two minutes rest between sets; (3) Friction massage of the Achilles tendon; (4) Stretching of the plantar fascia; (5) Eccentric exercises for plantar flexors (3 sets $\times 15$ reps). The treatment was applied twice a week for a month (eight sessions in total).

Treatment Group (G2): Same protocol as G1, plus MEP® once a week. MEP® (Fisiomove) was used as follows: (1) Disinfection of the treatment zone with alcohol at 70%; (2) A 0.22×13 mm needle was introduced 11 mm, three times during each session, at different points in the Achilles tendon, in collagen fibres direction, with an initial intensity of 100 μA (microamperes); (3) The intensity was increased up to 450 μA (microamperes), achieving a current density of 5,86 mA/cm^2. MEP® was turned on for 20 s, followed by a 40 s resting time, totalling to 3 min.

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To assess the response to the treatments, the question related to morning stiffness in the VISA-A questionnaire, goniometry and Visual Analogue Scale (VAS) were used. VAS was assessed before and after each session.

Data was analysed using Paired and Independent T test, with a significance level of 5%, with SPSS 20.

Results

The intragroup statistical comparison showed that before and after 8 sessions, a significant reduction of morning stiffness duration in the Control Group (G1) ($p < .05$) and in Treatment Group (G2) ($p < .001$) was observed. The intergroup statistical comparison of the post-treatment results showed that the reduction was greater in the Treatment Group (G2) than in Control Group (G1) ($p < .001$).

In the comparison of the ROM variable, the intragroup analysis for Plantar Flexion-Pre vs. Plantar Flexion-Post, Eversion-Pre vs. Eversion-Post, in Control Group (G1) and Treatment Group (G2), the results were significant ($p < .05$). The intergroup comparison showed a significant difference for Plantar Flexion and Eversion ($p < .05$).

The statistical analysis in pain (assessed by VAS) showed that the difference between Control (G1) and Treated Group (G2) were not significant ($p = .059$) in the first three sessions. A significant difference was observed in session number 4 ($p < .05$), and in sessions 5, 6, 7 and 8 ($p < .001$).

Conclusions

Treatment Group with MEP® (G2) showed greater pain reduction, increased ankle ROM and decreased morning stiffness duration when compared to the Control Group (G1).

MEP® uses a low-intensity galvanic current (in the order of microamp) applied with an acupuncture needle connected to the cathode, in order to promote an electrochemical reaction in the area of the affected tissue. Collagen synthesis begins with the interstitial lesion and extends to the end of the healing phase, when tissue remodelling phase takes place. Previous studies have shown that MEP® causes a lesion in the tissue, triggering an inflammatory response, increasing the number of fibroblasts which produce collagen and elastic fibres. The alignment of collagen is also promoted and assisted by eccentric exercises. Collagen alignment leads to pain relief and functional improvement, consequently, MEP® could be useful to treat pain caused by tendinopathy.

Chemical substances present in reactive tendinopathies, such as Calcitonin Gene Related Peptide, Glutamate and Substance P, are acids. The cathodic electrolysis causes a pH increase (alkalosis) due to the Sodium Hydroxide production, and could be the reason of the short-term pain relief. Another mechanism of action that could explain the analgesic effect of MEP® is the Hydrogen release, which is a powerful free radical inhibitor. Free radicals such as reactive oxygen species (ROS), peroxi-nitrite and hydrogen peroxide are present in soft tissue lesions and cause pain.

Several authors provided suggestive evidence to support the usage of eccentric exercise for pain reduction in Achilles tendinopathy. However, in the present study better ROM and VISA-A results were found in the Treatment Group (MEP® associated with eccentric exercise), showing the beneficial effects of this technique.

The limitations of this study were the usage of evaluation methods considered to be subjective such as VAS and goniometry, as well as the absence of diagnostic ultrasound with elastography to quantify collagen changes.

For further studies in tendinopathies, it is suggested to analyse the cost-effectiveness ratio of this technique, and to compare the clinical results of MEP® with other commonly used modalities such as Extracorporeal Shock Wave Therapy (ESWT).

Implications

This study showed that MEP® is a promising technique for Achilles tendinopathies. The application of this therapeutic modality could favourably impact in the public health cost due to their simplicity.

Ethics approval

Clinical procedures started after the approval of the Research Ethics Committee of Universidade Potiguar (CEP/UNP) with protocol number 099/2011.

Disclosure statement

No potential conflict of interest was reported by the authors.

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