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Shortwave Diathermy: Atualization

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Editorial
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Editorial

Short wave diathermy (SWD) is a therapeutic modality that offers the body an increase in temperature, through the high frequency in electromagnetic irradiation, so as not to generate ionization to the tissues. This therapeutic modality works based on the principle that energy is transferred within the layers of deep tissues by a high frequency current and the generation of tissue heat. Therefore, there is an agitation of the molecules in response to an electric field, converting the kinetic energy into heat [1-4].

It uses radio frequency bands generally centered at 13.56 MHz, 27.12 MHz and 40.68 MHz, with the most commonly used frequency being 27.12 MHz with a corresponding wavelength of 11.6 m (1.5).

SWD effects can be divided into thermal and non-thermal. Thermal effects induce vasodilation, raise the pain threshold, reduce muscle spasm, accelerate cell metabolism and increase the extensibility of soft tissues, decrease tendon inflammation and chronic and acute pain and improve function. Athermal effects are probably the result of the cell's energy absorption from oscillating electric fields, inducing or increasing cellular activity. They include increased blood flow (when diathermy is applied to human tissue, thermal stress causes the cessation of neural activity of vasoconstriction, resulting in increased cutaneous vascular conduction, at least two independent mechanisms contribute to the increase in cutaneous blood flow during local warming: a quick response of the vasodilator system mediated by axonic reflexes and a slower one, derived from the local NO-dependent vasodilator system (production response), decreased joint pain and stiffness, reduced inflammation, faster resolution of edema and accelerated wound healing. Studies suggest that the temperature increase is above 2oC and promotes heating over all irradiated areas after the first 10 minutes of application, remaining unchanged until 20 minutes after the beginning of the application; These values remained high even 20 minutes after the end of the application [1-4].

Continuous short-wave diathermy (cSWD) is generally used for its thermal effects, while pulsed short wave diathermy (pSWD) for athermic effects. Recent studies have shown that pSWD can also induce an increase in tissue temperature that depends on the total average power delivered. The doubts raised about the real effects of athermic phenomena suggest that the clinical effects of SWD are mainly related to the increase in temperature. Pain reduction is one of the most important effects of diathermy, although the physiological basis is poorly understood. Heating can reduce pain, promoting vasodilation and efflux of the affected tissue from pain mediators, for example, bradykinin, serotonin and prostaglandins. Another possible mechanism of action is the inhibition of nociceptive transmission by activating A-alpha and A-beta fibers or by stimulating cutaneous thermoreceptors; this mechanism, known as gate control, blocks the transmission of pain when it enters the spinal cord. In addition, muscle spasm due to musculoskeletal pain is often reduced by heat and this, in turn, can contribute to the decrease in pain SWD improves cell healing processes, producing an overexpression of heat shock proteins (HSP), which contribute to the repair of intracellular proteins, and high levels of HSP increase the healing speed of cells and tissues [1-4].

For the use of healing wave diathermy in peripheral nerve injuries, the evidence is limited, the therapy has produced pain relief and improved function in patients with carpal tunnel syndrome, in addition, the median distal motor latency, the distal sensory latency and the speed of sensory nerve conduction were improved after application. The modulations indicate the frequency of 27.12 MHz for 15 or 20 minutes in applications of 2-3 times a week. It induced the regeneration of myelinated axons histologically and functionally, either in models of crushed nerve or models of nerve transection. In addition, it facilitated neural regeneration by inhibiting the inflammatory reaction and improving local blood circulation. Shortwave diathermy positively regulates the expression of brain-derived neurotrophic factor (BDNF) in the spinal cord and muscles, suggesting that BDNF expression may be involved in the regeneration process of the nerve treated by shortwave diathermy. Short-wave diathermy still positively regulates vascular endothelial growth factor (VEGF) mRNA expression in the spinal cord and muscle at the operated site. VEGF stimulates neurogenic, protective and neurotrophic activities, including the proliferation of astrocytes and Schwanm cells, and increased angiogenesis in a silicone sciatic nerve chamber, increased the proliferation and migration of Schwann cells, and played a significant role in the regeneration of peripheral nerve. Therefore, VEGF overload in the spinal cord can be transported anterograde to the injured nerve to promote nerve regeneration by direct action. The positive regulation of VEGF in the muscle can improve the nutrition of the target tissue, clear muscle atrophy and be transported retrograde to the injury site to accelerate nerve regeneration [5].

In addition to vertebral peripheral nerve injuries, SWD is also effective on injury to the cranial peripheral nerve, the facial nerve, the injury of which causes peripheral facial paralysis or Bell's palsy. due to the SW's ability to decrease pain, increase metabolic functions, improve microcirculation, avoid muscle and synkinesis contractures, with a significant improvement in the symmetry of voluntary movement in spontaneously unrecovered chronic Bell's palsy [6].

Also, with regard to the use of SWD in neural injuries, its effects on spinal cord injuries (SCI), the effects of athermic SWD treatment on somatosensory evoked potentials (SEPs) and motor evoked potentials (MEPs) and on limb movements have been studied. Which have shown significant improvement [7].

There is a general neglect of the scientific community for the use of SWD in musculoskeletal disorders, the only exception being osteoarthritis (AO). However, there is evidence to support the effectiveness of cSWD for a wide range of musculoskeletal pain, among which are lower back, musculoskeletal injuries. Its effectiveness is probably related to the reduction of pain, which in turn has an impact on quality of life, was related to the well-known physical effects of heat. Increased vasodilation and efflux of the affected tissue of pain mediators, associated with the muscle relaxing effect of heat; it also allows to adjust the heat penetration according to the affected structures (tendons, muscles, bone parts) and to modulate it based on the individual response [1].

Still in the case of OA, current studies suggest that both continuous and pulsed SWD reduce pain and improve functionality, pSWD is able to reduce inflammation and synovial thickness results in a reduction in joint stiffness and pain, other findings suggest that cSWD is also effective and that the positive effect on pain perception is achieved only when the treatment involves at least some degree of thermal sensation [2,8].

Another situation of musculoskeletal pain is enthesitis and epicondylitis, common situations in athletes and workers. In these cases, cSWD is effective in reducing pain and improving function [9].

Short-wave diathermy is often used to treat shoulder pathologies, particularly frozen shoulder and impact syndrome with an improvement in pain relief, activities of daily living and ROM. The addition of 27.12 MHz of continuous SWD (such as a daily 20-minute session, 5 days a week for 2 weeks, for a total of 10 sessions) to conventional therapies offers long-term benefits when compared to treatment without SWD, in terms of scores for pain at rest and activity, and scores for functional activities and scores for shoulder disability in impact syndrome patients without night pain [3].

There is a study on the therapeutic effects of SWD on COVID-19 pneumonia. The hypothesis is that the SWD can minimize pneumonic inflammation and shorten the positive to negative conversion time of the COVID-19 nucleic acid test [10].

In another spectrum, SWD was tested and approved in pain science, being able to cause muscle pain and hyperalgesia up to 60 minutes after its application, thus, this new model represents a promising tool for the investigation of muscle pain in humans. The main advantages of the model are non-invasiveness, the possibility of reliably controlling stimulation parameters and the convenience of the time interval in which pain and hyperalgesia develop [11].

The contrasting results point to the difficulty of obtaining homogeneous data in well-designed studies and call on the scientific community to address this issue, in view of the low cost and ease of use of the SWD. The main problems are the high variability in outcome measures, inconsistencies in reporting treatment dosage, high variability in treatment protocols, and lack of long-term follow-up studies. In clinical practice, the intensity and duration of hyperthermia used in a clinical setting is determined based on experience, because there are no standardized protocols for the treatment of SWD.

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