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Journal of Oral Medicine, Oral Surgery, Oral Pathology and Oral Radiology

Journal homepage: www.joooo.org

Review Article

Transcutaneous electrical nerve stimulation therapy in the management of temporomandibular joint disorders

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ARTICLE INFO

Article history:
Received 01-09-2024
Accepted 17-09-2024
Available online 15-10-2024

Keywords:
Transcutaneous electrical nerve stimulation (TENS)
Temporomandibular joint disorders (TMD)
Trigger points
Physical therapy

ABSTRACT

A collection of illnesses known as temporomandibular joint disorders (TMD) impact the masticatory system, which includes the temporomandibular joint (TMJ) and the masticatory muscles, functionally. Transcutaneous electrical nerve stimulation (TENS) is one of several known aetiologies that have unique therapy options. A review of TENS use in TMD patient care is included in the current paper. Among the effective therapy modalities for treating TMD is transcutaneous electrical nerve stimulation. It involves carefully exposing the skin's surface to electrical current, which relaxes tense muscles and lessens discomfort.

1. Introduction

A collection of conditions affecting the masticatory muscles, the temporomandibular joint (TMJ), and related structures are together referred to as temporomandibular joint disorders (TMDs).[1] Numerous studies have demonstrated the effectiveness of some treatment resources that may reduce discomfort and restore the function of the masticatory muscles. Transcutaneous electrical nerve stimulation (TENS) is one of them that merits special attention since it is safe, helps patients with TMD with discomfort, and reduces electromyographic activity (EMG) of the masticatory muscles during rest.[2] Orthopaedic stability, intraoral appliances, behavioural therapy, placebo, and medication containing analgesics, muscle relaxants, and antidepressants are just a few of the many therapies for TMD that have been suggested. Transcutaneous Electric Nerve Stimulation is an additional management option (TENS). It is a technique for treating pain that involves applying an electronic gadget to the skin surface that generates biphasic electrical pulses that pulse. TENS is a pain management technique that involves applying electrical stimulation to the skin. It is a well-known type of physical therapy that helps with pain management. It is a quick, easy, safe, non-invasive way to relieve pain without the risk of side effects that come with other techniques.[3]

2. Etiopathogenesis of Temporomandibular Disorders

In addition to a number of predisposing variables that may either cause or prolong the illness, a number of factors, including muscular hyperactivity, trauma, mental stress, and malocclusion, may influence the course of TMD.[4] In recent years, occlusal variables have been extensively studied as potential etiologic or risk factors for TMD. The idea that unfavourable occlusal contacts may result in neuromuscular alterations led to the widespread use of occlusal treatments, including occlusal splints, orthodontic therapy, and occlusal adjustment of natural teeth.[5] Owing to the complex aetiology of these issues, many modalities are typically used in treatment to enhance any beneficial effects.

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https://doi.org/10.18231/j.jooo.2024.033

These modalities may include physical therapy, medication therapy, and counselling.

Physical therapy aims to:

a) Increase the patient's knowledge of the reason behind the symptoms; b) relax the muscles; c) lessen hyperactivity in the muscles and restore joint and muscle movement; d) soothe pain, spasm, and oedema; and e) permit the return of normal function. Acupuncture, physical therapy, massages, electric stimulation (TENS), ultrasound, and low-level laser have all been utilized as therapies. Numerous therapeutic approaches have demonstrated efficacy in mitigating pain and reinstating the masticatory system's functionality. One such therapy option that deserves special attention is transcutaneous electrical nerve stimulation (TENS). Not only is transcutaneous electrical nerve stimulation safe to employ, but it also lessens pain and the electromyographic (EMG) activity of the masticatory muscles.[6]

3. Application of Tens in the Management of TMD

The primary method of TENS therapy involves using a device to deliver low voltage, pulsed electrical current in the form of a two-phase, symmetric or asymmetric wave that is balanced into a negative peak and a positive square semi-wave. The goal of applying it to the skin's surface via electrodes is to induce pain alleviation and relax tense muscles.[7] For a variety of painful disorders, transcutaneous electrical nerve stimulation offers an affordable, secure, and non-invasive therapeutic option.[8] Silicone-based electrodes with self-adhesive or gel application mechanisms are also possible. They are positioned inside the same dermatome, myotome, and/or myofascial trigger points, either at the source of the pain or in close proximity to it. In order to further lessen pain and/or keep the pain-free state, they might also be positioned along peripheral nerve pathways.

Based on pulse frequencies, transcutaneous electrical nerve stimulation devices are divided into two categories: high frequency (> 50 Hz) and low frequency (< 10 Hz). The majority of the devices used in dentistry settings combine low- and high-frequency currents. Devices with a high frequency range of 50–150 Hz operate with a more centralized mechanism of action and low intensity, targeting chronic pain relief. Low frequency devices are primarily designed for muscle relaxation because of their peripheral mechanism of action. The devices' intensity can be changed to suit the sensitivity of the patient, prevent muscle spasms, and attain hypo- or paraesthesia in the affected area. According to studies, intensities between 10 and 30 milliamps are suitable and cause few fasciculations.

Moreover, it is discovered that pulse durations ranging from 40 to 75 microseconds are efficient. TENS is mostly used in dentistry to relax the masticatory muscles and, in specific situations, control chronic pain.[9] Various explanations explain the beneficial effects of TENS. According to one idea, TENS causes the motor nerves to be directly stimulated, which causes the masticatory muscles to contract rhythmically. This results in less interstitial oedema and toxic build-up, as well as enhanced blood flow and oxygen delivery to the muscles. The overall effect is a reduction in masticatory muscle soreness and fatigue.

In 1965, a different theory known as the "gate of pain theory" was put out to explain electroanalgesia.[10] As per the notion, a gate situated in the dorsal horn of the spinal cord regulates the nociceptive entrance via tiny diameter afferent neurons. Large diameter peripheral afferents stimulated tactilely or under pressure by electric impulses may limit sensory neuron stimulations to spinal and supraspinal regions, so closing the gate. TENS would therefore function across both central and peripheral pathways.[11]

TENS is a non-invasive, safe, and reasonably priced therapeutic technique that can be used to treat a number of painful diseases.[7] Electrodes can be self-adhesive or made of silicone with a layer of gel applied between them and the skin. They are placed on myofascial trigger points, acupuncture points, within the same dermatome, myotome, or as near as feasible to the maximum pain site, depending on where the pain originates. Another possibility is to position them along the peripheral nerve route that is involved in the initiation and/or maintenance of pain. Their placement will be determined by the pain results acquired.

4. Discussion

A study35 that examined 25 papers regarding the effectiveness of TENS for treating various forms of pain was conducted between 1975 and 1990. The result was that this kind of therapy could be applied as a supplement to manage pain. Additionally, they point out that it is challenging to compare TENS research due to significant variations in experimental models and methods; additionally, the mean number of patients was lower in studies that were deemed successful, which should theoretically lessen the relevance of those findings.[12]

Treatment for TMD with transcutaneous electrical nerve stimulation, either alone or in conjunction with other modalities, has been found to be successful. A pilot study was carried out to assess the effectiveness of TENS and electromyographic biofeedback in bruxism patients.[13] The scientists came to the conclusion that while both treatments caused the masticatory muscles to relax, TENS was superior at lowering the masseter muscle's electromyographic activity. According to a different study, using TENS in conjunction with interocclusion devices (IOD) caused the jaw to shift in space.[14] This new occlusion greatly enhanced the strength and quality of the bite, increased the efficiency of the majority of the muscles assessed ($p < 0.05$), and lessened pain.

According to Moger et al.'s study,[15] which had 45 TMD patients, TENS therapy was effective in reducing pain, particularly chronic and muscle pain. According to

LeResche et al.,[16] there may be a connection between TMD and the metabolic processes that are regulated by the estrogen receptors found in women's TMJs and ligament laxity. Estrogens would work by altering the activity of neurons in the limbic system, making people more alert to pain inputs.

Because TENS has a good analgesic and muscle-relaxing effect, it is frequently used with patients who have TMD. In 1997, Bassanta, Sprosser, and Paiva[17] treated 26 patients with TENS therapy who showed symptoms of myofascial dysfunction, restricted mouth opening, and bilateral discomfort or soreness in the temporalis and masseter muscles. The scientists came to the conclusion that the treatment encouraged muscular relaxation and decreased the perception of pain through electromyographic and electrophysiological studies.

5. Conclusion

For well-chosen patients, TENS is an alternate form of treatment for pain and TMD. Controlled randomized studies in certain populations are necessary to identify patients and disorders amenable to this sort of treatment because TMD groups are not all the same. It's also important to determine which face pain conditions would benefit from adjuvant TENS therapy. At the moment, clinical expertise and the management of TENS by medical practitioners are major factors in the decision to employ it. The most crucial thing for the doctor to remember is that TENS therapy is merely a temporary symptomatic treatment and not a definitive or drastic way to manage the TMDs.

6. Source of Funding

None.

7. Conflict of Interest

None.

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Cite this article: Pendharkar SS, Jain S. Transcutaneous electrical nerve stimulation therapy in the management of temporomandibular joint disorders. *J Oral Med, Oral Surg, Oral Pathol, Oral Radiol* 2024;10(3):178-180.