

Comparing Microcurrent Therapy Versus Ultrasound Therapy for Subjects with Chronic Temporomandibular Joint Dysfunctions

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Abstract

Background: This study was designed to compare the effectiveness of Microcurrent therapy versus Ultrasound therapy in subjects with Chronic Temporomandibular Joint Dysfunctions.

Purpose: To compare the effectiveness of Microcurrent therapy versus Ultrasound therapy using the McGill Pain Questionnaire.

Materials and Methods: This experimental study has been conducted from November 2022 to April 2023. A total of 24 adults with Chronic Temporomandibular Joint Dysfunctions have been selected using the inclusion and exclusion criteria. They have been split into 2 groups Group A (n=12) and Group B (n=12) were assigned. Group A got Microcurrent therapy, whereas Group B received Ultrasound therapy. The McGill Pain Questionnaire was used to evaluate the subjects.

Results: The mean value of Microcurrent therapy at the post-test was found to be higher than the mean value of Ultrasound therapy with a p-value of <0.0001.

Conclusion: The result suggests that Microcurrent therapy shows a significant effect in reducing pain in Chronic Temporomandibular Joint Dysfunctions when compared to Ultrasound therapy.

Key Word: Microcurrent Therapy, Temporomandibular joint dysfunction, McGill pain questionnaire, Ultrasound therapy.

Introduction

A general name for discomfort and dysfunction of the masticatory muscles and temporomandibular joints is temporomandibular joint dysfunction (TMD). The most noticeable characteristics are discomfort, restricted or limited jaw motion, and joint sounds when moving the jaw. The upper

and lower chambers of the maxillary joint cavity are separated by the joint disc. While the lower chamber predominantly serves as a hinge or pivot during the early opening, the upper chamber slides during the mouth's maximum openness. While the lower chamber predominantly serves as a hinge or pivot during the early opening, the upper chamber slides during the mouth's maximum openness. The

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temporomandibular joint is categorized as a gingival joint since it contains a moving hinge and socket. A fibrous connective tissue capsule that is connected to muscles and tendons encircles it.²

The primary symptom of temporomandibular joint illnesses is pain in the muscles of the masticatory system and the temporomandibular joint. The causes of TMJ discomfort are numerous. Even though age, gender, heredity, trauma, hypermobility, stress, parafunction, and occlusal abnormalities are all associated with the persistence of TMJ dysfunction-related pain. TMJ dysfunction has a multifaceted etiology. The dysfunction may be caused by biopsychosocial, biomechanical, neuromuscular, and neurological causes. Injury to the head, neck, or cervical spine is frequently regarded as a major risk factor.³

There was no statistically significant difference in the 1-year incidence of TMJ indications and/or symptoms between men and women, which was 12%. The greatest incidence rates were reported TMJ noises (10%) and clinically recorded TMJ discomfort (8%) respectively. At the follow-up, around 25% of individuals who had baseline TMJ indications and/or symptoms improved. Men and individuals with bilateral contacts in centric relation, a normal transverse intermaxillary relationship, and a stable mandibular position in centric occlusion were substantially more likely to have subjects with a non-symptomatic TMJ.⁴

Electric currents comparable to those produced by the body during tissue healing are used in microcurrent treatment (MCT). It could be especially helpful in situations when endogenous healing has not worked. MCT can aid in the healing of a range of bone and skin lesions. Microcurrent therapy (MCT) appears to play a crucial part in the healing process.⁵

An electrotherapy technique called microcurrent therapy (MCT) is used to alleviate musculoskeletal discomfort. MCT transmits tiny electric currents of around 1 mA over the skin without causing muscle contractions or other observable effects.⁶ Faster healing and better pain management are both possible with microcurrents. Millions of an ampere, or 10-6 amps, are used to quantify the strength of the microcurrent the devices deliver. In contrast to other

technologies where it may be felt, the microcurrent is below the threshold of feeling due to the low current. The duration of a microcurrent pulse is around 0.5 seconds, which is 2,500 times greater than that of earlier technologies. Small instruments called microcurrent tools are provided with vinyl/graphite gloves. The gloves' purpose is to give tactile sensitivity and power cells. However, gloves are typically no longer worn in current practice due to technological advancements. The equipment includes two wires that provide an alternating positive and negative square wave via the gloves to the sick tissue. A similar square wave with a slope of and a voltage is used by a microcurrent at a given frequency, but two channels are fed by four-body connections.⁷

Ultrasound is a technique that is frequently employed in physical therapy. Its heat and mechanical actions change cell signaling, plasma membrane permeability, ion and molecule flow, and other physiological processes that lead to damage healing. The third most often used physiotherapy technique is ultrasound treatment.⁸

Aim

This study aims to determine whether Microcurrent therapy has an effect on pain subjects with Chronic Temporomandibular Joint Dysfunction when compared to Ultrasound therapy.

Material and Method

It was a comparative study conducted on 24 subjects with Chronic Temporomandibular Joint Dysfunction, aged between 20 - 40 was taken. Convenient sampling with a random allocation method was used in the study.

Study period: From November 2022 to April 2023

Inclusion criteria:

1. People of age between 20 - 40 years
2. Both male and female subjects were diagnosed with temporomandibular joint pain.
3. Limited mouth opening
4. Persistence of pain for at least 3 months

Exclusion criteria:

1. Recent fracture on TMJ joint.
2. Mouth Carcinoma, Mouth ulcer.
3. Metal implants in and around the mouth.

Outcome Measure:

Assessment was performed at baseline (before starting treatment) and after two weeks of study.

- McGill pain questionnaire was used to assess pain.

Procedure

Group A: Microcurrent Therapy.

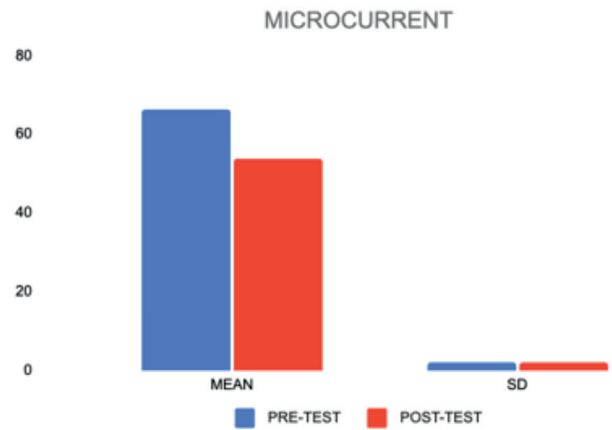
The participants were given Microcurrent therapy. During the application, a gel was used for the transmission of microcurrent on the subject’s skin for 2 weeks 6 sessions per week at a frequency of 0.3 Hz, with an amplitude of 40 µA for ten minutes. The treatment was provided in circular strokes using the direct contact method.

Group B: Ultrasound therapy.

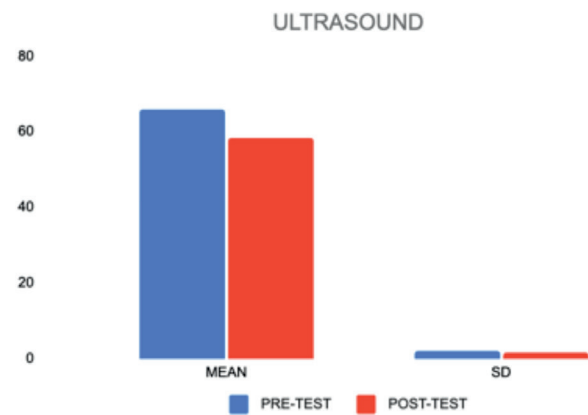
The participants were given Ultrasound therapy. During the application, a gel was used for the transmission of ultrasonic waves between the transducer and the subject’s skin for 2 weeks 6 sessions per week at 1.8 w/cm² for 10 min per session. A coupling agent was used in the ultrasound therapy. A Bionics Innovation Unit was used at a frequency of 1 MHz and wavelength of 1.5 mm in the continuous mode. The treatment was provided in circular strokes using the direct contact method.

Data Analysis

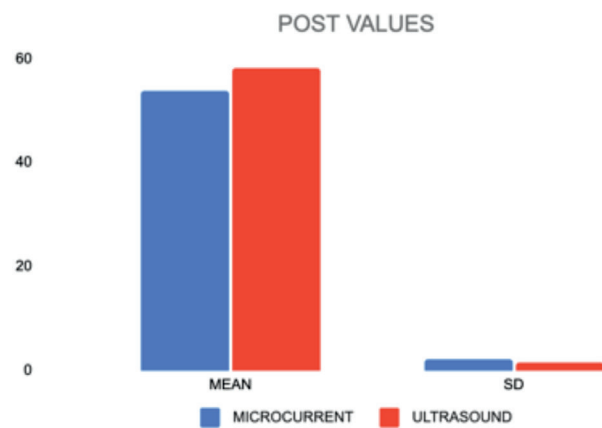
Using tabular and inferential statistics, the gathered data was evaluated. The mean and standard deviation (SD) were utilized for all parameters. The statistically significant differences between pre-test and post-test measures were examined using a paired t-test. When utilizing the unpaired t-test to look at significant changes in the experimental group, the significance level of $p < 0.0001$ was determined to be statistically significant.



Graph No. 1: Comparison of pre-test and post-test values of Microcurrent therapy using McGill pain questionnaire.



Graph No. 2: Comparison of pre-test and post-test values of Ultrasound therapy using McGill pain questionnaire.



Graph No. 3: Comparison of post-test values of Microcurrent therapy and Ultrasound therapy using McGill pain questionnaire.

Results

The results of the study demonstrated significant improvements in pain reduction for individuals with Chronic Temporomandibular Joint Dysfunction who underwent either Microcurrent therapy or Ultrasound therapy. The Pre-test to post-test analysis revealed a substantial decrease in pain intensity, as assessed by the McGill Pain Questionnaire for both groups.

Comparing the post-test values of the McGill Pain Questionnaire for Group A and Group B. The mean McGill Pain Questionnaire was significantly higher in Group A (53.75) compared to Group B (58.25), indicating a more pronounced improvement in pain relief in Group A.

Discussion

The purpose of this study was to compare the effectiveness of Microcurrent therapy shows a significant effect in reducing Chronic Temporomandibular Joint Dysfunction when compared to Ultrasound therapy.

In this study, 24 subjects were assigned, 12 were in Group A and 12 in Group B. Group A received Microcurrent for 6 sessions/week, and Group B received Ultrasound 6 sessions/week for a duration of 2 weeks.

The outcome measures were the McGill pain questionnaire performed at baseline and after 2 weeks of study.

According to Graph no.3, the present study shows improvement in both the groups i.e. Microcurrent therapy and ultrasound therapy for all measured variables but Microcurrent shows more effectiveness in reducing pain.

The orofacial region is a source of trigeminal discomfort. First-order neurons of the trigeminal nerve produce increased pain signals that are projected onto the tripartite ganglia at the peripheral nociceptors of the orofacial region after absorbing repetitive noxious stimuli or severe uncontrolled inflammation. Ganglia of the trigeminal nerve like dorsal root ganglia in function. Second-order neurons in the caudal trigeminal nucleus of the brainstem are then the recipients of pain signals. Second-

order neurons are found in the caudal nucleus of the trigeminal nerve, which mimics the dorsal horn of the spinal cord. There are three sets of nuclei in the brainstem that make up the trigeminal nucleus. The pars oralis and the pars interpolaris are the first and second central nuclei of CN V, respectively. Both deliver tactile signals to the orofacial region. The caudate nucleus of the caudal section or caudate nucleus of the trigeminal nerve, which transmits pain sensation in this afflicted location, is the third spinal nucleus.⁹⁻¹¹

According to a clinical investigation, people with TMJ discomfort may have fewer neurons on either side of the brainstem, especially in the ventromedial rostral area, which is in charge of descending pain pathways or pain modulation. Therefore, in individuals with severe TMJ dysfunction, the decrease of neurons in descending pain modulation may enhance pain perception.¹²⁻¹⁵ Microcurrents at a certain frequency have been shown to enhance muscle regeneration. Transcutaneous delivery of low-intensity direct current (DC) and/or alternating current (AC) using frequency-controlled adhesive electrodes in the microampere (A) range is known as microstimulation. The current must be low enough to elicit intercellular modulations, such as increased protein synthesis and high levels of adenosine triphosphate (ATP), but not exceed a particular intensity (for example, over 1000 A), which results in a decrease in ATP production. Preclinical and clinical research has demonstrated that MS triggers cellular tissue regeneration, such as tendon scarring. physiological restoration following a cycle of ongoing stress. The benefits of multiple sclerosis have also been shown to last for a longer period; interestingly, the number of DOMS rose without regard to treatment.¹⁶

Saranya B et. al, the study concluded that the effect of Microcurrent is effective in improving functional mouth opening and showed better and immediate effects in the relief of pain.¹⁷

Bavarian R et. al, study concluded that microcurrent is an effective treatment that can be used to reduce pain in patients with temporomandibular pain.¹⁸

Sarnaik R et. al, the study concluded that the microcurrent also enhances circulation at the cellular

level. Consequently, as the blood flows more actively through the pain area, it supplies more oxygen and promotes a faster and more natural healing process.¹⁹

Conclusion

In conclusion, this study provides evidence for supporting the effectiveness of Microcurrent therapy as a management strategy for Chronic Temporomandibular Joint Dysfunction. The findings demonstrate significant improvements in pain relief following the intervention. These positive outcomes align with recent research emphasizing the benefits of Microcurrent therapy. Microcurrent therapy shows a potential increase in relieving pain. Further research and long-term follow-up studies are necessary to validate these results and assess the long-lasting effects of Microcurrent therapy in the management of Chronic Temporomandibular Joint Dysfunction.

Ethical clearance: The ISRB committee of a private hospital and institution in Chennai has provided its clearance for the conduct of human research that complies with all applicable national laws, and institutional regulations. (Application Number 03/059/2022/ISRB/SR/SCPT)

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Conflict of interest: Nil

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