Effectiveness of transcutaneous electrical nerve stimulation and microcurrent electrical nerve stimulation in bruxism associated with masticatory muscle pain - A comparative study

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ABSTRACT

Objectives: To compare the effectiveness of transcutaneous electrical nerve stimulation (TENS) and microcurrent electrical nerve stimulation (MENS) on masticatory muscles pain bruxism patient.

Materials and Methods: A total of 60 subjects with the clinical diagnosis of bruxism were randomly allocated to two study groups. Group A received TENS (50 Hz, pulse width 0.5 mSec, intensity 0-60 mA for 20 minutes for a period of seven days) and Group B received MENS (0.5 Hz, intensity 1,000 μA for 20 minutes for a period of seven days). The outcome measures were assessed in term of Visual Analog Scale (VAS) and digital pressometer of 2 Kgf.

Results: The study showed significant change in intensity of pain as per VAS score ($P < 0.0001$) and tenderness as per digital pressometer ($P < 0.0001$).

Conclusion: MENS could be used as an effective pain-relieving adjunct to TENS in the treatment of masticatory muscle pain due to bruxism.

Key words: Bruxism, microcurrent electrical nerve stimulation, transcutaneous electrical nerve stimulation

Teeth-grinding during sleep and teeth-grinding in the waking state have been described in the dental literature as a single process, first as bruxomania,[1] later as bruxism.[2] This term is generally applied both to the clenching habit, during which pressure is exerted on the teeth and periodontium by the actual grinding or clamping of the teeth. Causes of bruxism are mild occlusal disturbance, gastrointestinal disturbances, subclinical nutritional deficiencies, allergy or endocrine disturbances and emotional tension.[3]

Most people unconsciously grind or clench their teeth now and then, so the key to diagnosis is not the presence or absence of the habit, but such things, for example, its frequency, destructiveness, social discomfort, or physical symptoms.[4] Moreover, some 80% to 95% of all bruxers are unaware of the habit or ashamed of it.[5]

Bruxism can create havoc on the oral structures causing wear of teeth, hypertrophy of masticatory muscle, particularly the masseter muscle, masseter muscle pain, and cause trismus that lead to breakdown of the periodontium in the presence of inflammation and internal derangement.[6]

The use of TENS is based on several interrelated theories on the mechanisms of pain transmission and blocking of those mechanisms. The first one being gate control theory. Second theory is related to endogenous release of morphine-like substances (endorphin) after electrical stimulation. A third way of action of TENS is related to automatic and involuntary contraction of muscles.[7]

MENS is a form of electrotherapy current that provides subthreshold or subminimal stimulation. MENS work on Arndt Schulz Law.[8] It is theorized that healthy tissue is the result of direct flow of electrical current throughout our body. Electrical balance is disrupted when the body is injured at a particular site, causing the electrical current to change course. The use of microcurrent over the injured site is thought to realign this flow, thus aid in tissue repair.[9]

Since long time, the condition has been treated with various physiotherapy treatment techniques. However, there was hardly any study carried out to find out the efficacy of two electrotherapy modalities in the treatment of the masticatory muscles pain with bruxism. MENS is a relatively new approach for pain relief and muscle healing in the field of physiotherapy, while TENS is used for pain relief since the sixteenth century.
This research study was carried out in an attempt to evaluate the efficacy of TENS and MENS and also to compare their effectiveness.

MATERIALS AND METHODS

A total of 60 patients (36 males and 24 females), referred to the physiotherapy department, KLES Prabhakar Kore Hospital and MRC, Belgaum with a clinical diagnosis of bruxism with masticatory muscles pain were selected according to the following criteria:

- clinical diagnosis of bruxism;
- muscle tenderness over masseter muscle;
- early morning temporomandibular joint stiffness and pain;
- duration of pain more than three weeks; and
- age ranged from 19 to 60 years.

Patients were excluded in case of:

- wearing any removable restoration;
- treated with analgesic and antiinflammatory drugs;
- having muscle pain without bruxism;
- presence of any tumor or cancer around jaws or infection.

Patient’s consent was taken and the intensity of pain on the affected side was measured in terms of Visual Analog Scale (VAS). All patients were instructed to mark the intensity of pain over the affected side of masseter muscle and tenderness was measured using digital pressometer of about 2 KgF before the beginning of the treatment. The patients were randomly divided into two groups: A and B, each containing 30 persons. Patients of group A were with TENS for seven days. Carbon electrodes (40 x 54 mm²) were placed over the affected side of masseter muscle with frequency operating at 50 Hz, with pulse width of 0.5 mSec., whereas the intensity was as per the patient’s tolerance for 20 minutes per day [Figure 1]. Patients of group B were treated with MENS, frequency of 0.5 Hz and intensity was as per the patient’s tolerance for 20 minutes per day [Figure 2]. At the end of the seventh day of treatment, all patients were evaluated for their pain profile using VAS and tenderness by using digital pressometer of 2 KgF and the results of the two groups were compared. Statistical analysis of the results was performed using Statistical Software, namely SPSS 15, Stata 8.0, MedCalc 9.0 and Systat 11.0. Demographic data of patients (sex, age, pain, and tenderness) were analyzed using the r-test. Probability values of less than 0.05 were considered significant.

RESULTS

There was highly significant change in pain relief in Group B as per VAS score \( (P \leq 0.0001) \) and significant change in tenderness in Group B \( (P = 0.0495) \) compared to Group A.

Pain relief was found better with MENS therapy, which was considered statistically significant at \( P \leq 0.0001 \) [TENS Group (3.38 ± 1.25) vs. MENS Group (3.91 ± 0.83)].

Tenderness in pretreatment and posttreatment of MENS groups showed significant improvement [(341.67 ± 145.08) vs. (873.33 ± 271.25)].

DISCUSSION

There was statistically significant difference \( (P < 0.0001) \) in the pain relief in terms of the visual analogue scale score and tenderness by the digital pressometer reported by the patients obtained with the help of MENS treatment for seven days in subjects reported with masticatory pain secondary to bruxism compared to the subjects treated with TENS. This suggests that pain reducing or electro analgesic effect of MENS is possibly better than TENS. The precisely cause and effect or why there was difference in pain relief obtained with these two modalities was beyond the limits of this study, but it is likely that the better electroanalgesia effect of MENS
could be attributed to the difference in parameters of these two modalities, such as intensity, frequency, waveform, pulse width, intensity, and modulation besides mechanism of action. It has been reported that TENS produces electroanalgesia by means of release of endorphin, encephalin or gate control, but on the contrary MENS produces electroanalgesia by means of Wedensky-inhibition,\textsuperscript{10} Arndt Schulz principle\textsuperscript{8} or endorphin release. Becker’s theory\textsuperscript{11} and Nordenstrom\textsuperscript{12} theory stated that whenever pathology of tissue occurs there will be an increase in the resistance in the area that will be highly positively charged.

Thus, the nutrients in this area will be lost. MENS decreases the resistance and therefore nutrients are supplied to tissue where repair takes place. It is interesting to notice that MENS has got cellular level effect which is not there in case of TENS. Hence it is believed that MENS aids in tissue repair following injury.

There is no other similar study reported in the literature which could allow us to compare our results.

Pain relief percentages in Group A were 44.2 and in Group B were 54.7, which showed that there was significant improvement in those patients who were treated with MENS modality.

Tenderness reduction percentages in Group A were 134.4 and in Group B were 155.6, which showed that there was significant improvement in those patients who were treated with MENS modality. Therefore, from the clinical implication point of view, we believe that MENS could be a better modality in the treatment of Bruxism owing to its electroanalgesic and tissue repair action.

Limitations of this study included a small sample size, no long term follow up, nonrandom sample, and inclusion of patients who have had taken TENS or MENS treatment in the past.

Hence, from this study, new and unanswered questions raised were: For how many days the electro analgesia obtained by these modalities will last and if these subjects are treated for long-term then will they get cured of their bruxism, especially if they are treated with MENS for sufficient period of time.

**CONCLUSION**

MENS could be used as an effective pain-relieving modality adjunct to TENS in the treatment of masticatory muscle pain due to bruxism.

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