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**Materials & Methods:** Twenty patients received TENS therapy and VAS was used to measure changes in pain during and after therapy. Also changes in mouth opening were recorded and analyzed.

**Results:** A significant improvement was observed regarding orofacial pain, muscles and TMJs tenderness and interincisal distance.

**Conclusion:** Transcutaneous electric nerve stimulation is superior in complete elimination of pain as well as in reduction of severity in temporomandibular joint dysfunction syndrome.

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# Effectiveness of Transcutaneous Electrical Nerve Stimulation in the Treatment of Temporomandibular Disorders - A Clinical Study

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## I. INTRODUCTION

Temporomandibular disorders (TMDs) are recognized as the most common chronic orofacial pain conditions confronting dentists and other health care providers.<sup>1</sup> TMDs refers to a cluster of disorders characterized by pain in the pre auricular area, the Temporomandibular joint (TMJ) or in the muscles of mastication, limitations or deviation in mandibular range of motion and noises in the TMJ during mandibular function.<sup>2,3</sup> Various treatment modalities have been tested over time e.g analgesic and anti inflammatory medications, muscle relaxants, massage therapy, occlusal splints, and cognitive behavioural therapies mainly aimed towards symptomatic relief of pain and discomfort. Transcutaneous electrical nervous stimulation (TENS) has been suggested as a treatment strategy in the therapy of TMD. TENS is a safe, non-invasive, reversible and effective therapy which has no potential adverse reactions. It is a method of applying low-voltage electrical current of varying frequency, intensity and pulse duration through the skin at various placement sites using surface electrodes for pain relief.<sup>4,5</sup> It's a safe, non invasive, effective and swift method of analgesia.

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TENS is regularly employed in patients with TMD, in view of its analgesic and muscle relaxing effect, with positive results. The literature demonstrates the importance of physical therapy in the treatment of Temporomandibular Disorders. Therefore, the aim of this study was to evaluate the effectiveness of Transcutaneous electric nerve stimulation (TENS) in patients with TMD.

## II. MATERIAL AND METHODS

This study was conducted in the department of Oral medicine & Radiology during a period from May 2013 to June 2014. Twenty patients with temporomandibular disorders irrespective of gender were recruited in this study. Pain assessment was done before and after intervention by using visual analogue scale and Maximum mouth opening (i.e. maximum interincisal distance) without pain (in mm). The scoring was recorded in such a way that a score of 1-3 was designated as mild pain, 4-6 as moderate pain and 7-10 as severe pain. Patients received Transcutaneous electric nerve stimulation quarterly during a period of 15 days for about 15-20 minutes per session. TENS therapy was given along with Visual analog scale of pain as well as mouth opening was noted at each visit i.e. 1<sup>st</sup> visit (Day 1), 2<sup>nd</sup> visit (Day 5), 3<sup>rd</sup> visit (Day 10) and 4<sup>th</sup> visit (Day 15). A standard Transcutaneous electric nerve stimulation unit (TENSSTIM Manufactured by Diabetik foot care India, Chennai.) was used. Patients were asked to inform the operator in case of any discomfort. Patients were asked to report after 15 days. Information so collected was analyzed using SPSS version 20.



## III. RESULTS

There were 9 males and 11 females in our study.

a) *Evaluation of the Visual Analogue Scale (VAS)*

*Table 1 a:* Comparison of pain intensity (VAS)

Group A n = 20	Day 1 M+SD	Day 5 M+SD	Day 10 M+SD	Day 15 M+SD	Pain Change	p Value
	3.8+1.2	2.75+0.72	1.75+0.72	0.8+0.83	3 (78.94%)	<0.001

n = No. of total patients

M + SD = Mean + Standard deviation

The mean pain score for 20 patients in was 3.8+1.2 at day 1, 2.75 + 0.72 at day 5, 1.75 + 0.72 at day 10 and at the end of 15 days, the mean pain score

reduced gradually to 0.8 + 0.83. The overall reduction in intensity of pain was 78.94%. The results were highly significant statistically ( $p<0.001$ ).

b) *Active range of motion (AROM)*

*Table 1 b:* Comparison of improvement in mouth opening

Group A n = 20	Day 1 M+SD	Day 5 M+SD	Day 10 M+SD	Day 15 M+SD	Change In MO	p Value
	40.05+5.61	40.50+4.79	40.75+4.29	40.95+4.03	0.9 (2.25%)	0.086

MO = Mouth opening

The mean mouth opening score for 20 patients was 40.05 + 5.61 at day 1, 40.5 + 4.79 at day 5, 40.75 + 4.29 at day 10 and at the end of 15 days, the mean mouth opening was improved to 40.95 + 4.03. The overall improvement in mouth opening was 2.25%. The results were not significant statistically ( $p>0.05$ ). However, out of 20 patients only 4 patients had reduced mouth opening (i.e.  $<38$ mm) and when only these 4 patients were analyzed, there was 14.87% improvement in mouth opening.

## IV. DISCUSSION

TMD is a collective term that includes a number of clinical complaints involving the muscles of mastication, the Temporomandibular joint (TMJ), or associated orofacial structures. TMDs are a major cause of nondental pain in the orofacial region and are considered a sub classification of musculoskeletal disorders. In many TMD patients the most common complaint originates from the muscles of mastication rather than from the TMJ. Therefore, the terms TMJ dysfunction or TMJ disorder are inappropriate for many complaints arising from the masticatory structures. It is for this reason that the American Dental Association adopted the term "Temporomandibular disorder".<sup>6</sup>

Several factors may influence TMD evolution, such as muscle hyperactivity, trauma, emotional stress and malocclusion, together with several predisposing factors which may trigger or perpetuate the disorder.<sup>7</sup> Pain, muscle tenderness, or alterations of the mandibular movements are the cardinal symptoms of TMJ pain dysfunction. For the treatment of such TMJ pain dysfunctions, a wide variety of therapeutic modalities have been offered, but there is still scarcity of

randomized controlled clinical studies, to suggest appropriate management of TMDs. Various therapies appear to result in similar improvements in pain and dysfunction and caution is urged with regard to use of invasive and other irreversible treatments, particularly in the initial management of TMD subjects.<sup>8</sup>

A variety of therapeutic modalities offered to the individuals with TMDs include Counseling and self care therapy, behavioral/relaxation techniques, psychological like placebo, intraoral appliances, physical therapy like moist heat, ultrasound, microwave laser, exercise & TENS therapy and pharmacotherapy like analgesics, muscle relaxants and antidepressants method. An alternative mode of management is Transcutaneous Electrical Nerve Stimulation (TENS), which is a non-invasive analgesic technique that is used to relieve nociceptive, neuropathic & musculoskeletal pain. TENS delivers electricity across the intact surface of the skin to activate underlying nerve.<sup>7</sup> 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.<sup>9</sup> It is widely used to relieve acute and chronic pain in various conditions like back pain, neck pain, phantom limb pain, extremity pain etc.<sup>8</sup> TENS used in dentistry aims at controlling chronic pain in selected cases & relaxing masticatory muscle. According to some authors it has been observed that at rest muscular TMD patients have higher myoelectric activity and TENS application has promoted pain relief with simultaneous decrease in myoelectric activity.

In present study, the intensity of pain for patients was reduced gradually over 15 days of therapy and overall reduction in intensity of pain was 78.94%. The results were highly significant ( $p<0.001$ ) statistically as shown in Table 1a. The efficacy of TENS therapy in reducing TMD pain observed in present study is similar to the observations made by Wessberg GA et al<sup>10</sup>, Moger G et al<sup>1</sup>, Tosato JDP et al<sup>11</sup> and Kato MT et al<sup>4</sup>. So, TENS has good success rate immediately after treatment, effective in reducing pain sensitivity in TMD patients and it was found that TENS was effective for decreasing the symptoms of TMD patients.

The maximum mouth opening without pain for patients in group A was improved marginally after therapy and overall improvement in mouth opening was 2.25%. The results were not significant ( $p>0.05$ ) statistically as shown in Table 1 b. However, in this group; out of 20 patients only 4 patients had reduced mouth opening before treatment (i.e. <38mm) and when only these 4 patients were analyzed, there was 14.87% improvement in mouth opening. The efficacy of TENS therapy in improving mouth opening observed in present study is similar to the observations made by Mehta et al<sup>12</sup> and Moger G et al<sup>1</sup>.

Thus, results from our study justify the use of TENS therapy in the management of TMD patients. TENS played a significant role in reducing pain as well as improvement in mouth opening.

Hence, oral health care professionals whenever encountering management of TMDs, it is preferred that, Aggressive, non reversible therapy for TMD should be avoided and the main emphasis should be on reversible therapy that facilitates the musculoskeletal system's natural healing capacity and patient-centred treatment. Thus, the results of the present study are encouraging; as use of TENS has shown favourable results in pain management as well as in mouth opening.

## V. CONCLUSIONS

TENS therapy provided a relief in the intensity of pain as well as improvement in the mouth opening. As an Oral physician our role is not only to give symptomatic treatment to the patient but also ensure that the patient leads a pain free and restorability of normal function for better quality of life which can be achieved only when improvement of both signs and symptoms pertaining to TMDs are managed by proper analysis, treatment planning, management and patient cooperation. Thus, we conclude that TENS is a promising therapeutic regimen for the management of TMDs. However, further studies with variation and the larger sample size are suggested to validate the same.

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