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## Transcutaneous electric nerve stimulation (TENS) as pain management in TMD patients: A cross sectional study

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### Abstract

**Introduction:** The last decades have witnessed a paradigm shift in the number of people suffering from temporomandibular pain in the population. Changing trends of life has led to increase in pain in temporomandibular joint. This study is an effort to study the management of temporomandibular disorders by application of Trans Electric Nerve Stimulation (TENS) compared with control group among patients.

**Material and methods:** 122 patients were selected from dental outpatient department. Group A which comprised of 61 patients was subjected to TENS therapy and Group B which also comprised of 61 patients subjected to routine physiotherapy.

**Results:** A significant improvement was observed in both the TENS and routine physiotherapy group in terms of pain control. On comparative analysis, TENS therapy was found effective in management of pain in TMD patients.

**Conclusion:** TENS is useful for pain management in TMD patients.

**Keywords:** Temporomandibular disorder, temporomandibular joint, transcutaneous electric nerve stimulation, physiotherapy

### Introduction

Even though the temporomandibular joint disorder (TMD) viewed as one syndrome, current research supports that TMD is a cluster of related disorders in the masticatory system, that has many signs and symptom <sup>[1]</sup> such as tenderness in the muscle and Temporomandibular joint (TMJ), decreased mandibular range of motion, clicking, stiffness, pain or fatigue in facial muscles; ear symptoms like tinnitus, fullness, vertigo; sensation of variable bite changes; deviation to the affected site during opening; jaw catching during opening or closing <sup>[2]</sup> There are many controversies regarding etiology, diagnosis and treatment of TMDs. Currently the known etiologies are parafunctional habits, trauma, stress, systemic, hereditary, emotional and malocclusion along with a host of predisposing, activating and perpetuating factors <sup>[3]</sup>. Based on multifactorial etiology, treatment of the TMD usually involves more than one modality; main goal is pain reduction and restoration of normal jaw function. To achieve these goals a well-defined program has to be designed to treat the disorder, hence reducing the contributing factors <sup>[4]</sup>. Variety of treatment modalities have been proposed for TMDs, like physiotherapy, mechanical, physiological, psychological, and pharmacological, placebo and physical methods. Some of these methods were already evaluated and contradictory outcomes were observed. Physical therapy treatment is directed not only to the relief of pain, but more importantly, it restores the underlying casual factors of musculoskeletal balance in TMDs and also the normal mechanics at the TMJ itself. Transcutaneous electrical nerve stimulation (TENS) is one of the most effective physical therapy technique <sup>[5]</sup>. TENS works on the principle that, electrical stimulation is directed to pain areas via surface electrodes, and current passed through these areas which reduces or eliminates pain. It's a safe, non-invasive, effective and swift method of analgesia. By using TENS, potential adverse reactions of other methods of pain control are eliminated <sup>[6, 7]</sup>. It can be used effectively throughout all the stages of TMDs. It has been accepted that, physiotherapy plays an important role in all therapy. Currently various treatments are available to increase the mouth opening like unassisted mouth opening, finger assisted stretching exercises, spatulas, screws, wooden tongue depressor, etc.

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Physiotherapy therapy also contributes 30 to 40% of pain reduction [8]. There are very few studies regarding the evaluation and effectiveness of TENS in TMD. An effort was made to evaluate and compare the pain relieving effects and mouth opening between TENS therapy and physiotherapy in TMD patients.

**Materials and Methods**

The aims of this study was to determine and compare the effectiveness of active TENS and physiotherapy in the management of pain in TMD patients.

A hospital based cross sectional study was conducted among patients reporting to department of Oral Medicine and Radiology with complain of pain in preauricular region. The study recruited 122 participants. Total 122 patients, 61 received active TENS therapy and 61 received physiotherapy.

**Study Design:** Hospital based cross sectional study.

**Study settings:** Dept. of ODMR

**Study Subjects:** Among total of 122 patients enrolled in my study the age group ranged from 15-60 years. Number of patients in respective age group were as follows:

- Age group 15-20: 18 patients
- Age group 21-30: 42 patients
- Age group 31-40: 36 patients
- Age group 41-50: 22 patients
- Age group 51-60: 4 patients

**Inclusion Criteria:** Patients with TMDs pain, especially in the preauricular region during function and palpation, tenderness in one or more muscles of mastication,

**Exclusion Criteria:** Patients with clinical and/or radiographic evidence of organic changes in the TMJ, pain attributable to recent trauma, dental surgery, metabolic diseases, vascular disease, neoplasia, psychiatric disorders, heart diseases and cardiac pacemakers, pregnancy, bleeding disorders, neurological disease involving head and neck like Bell’s palsy, undiagnosed dental pain and patients who have been treated with TENS previously without any improvement in the condition.

**Data Collection Tool:** Visual Analogue Scale (VAS) was

used to measure the change in pain and tenderness in muscles of mastication & Temporomandibular joint, during and after TENS therapy along with mouth opening.

**Statistical Analysis:** Statistical Data analysis was done using Paired-t test and unpaired t-test.

**Methodology:** Patients being treated with some other therapy were considered provided a washout period of at least one week were considered for the study. Selected Patients were randomly assigned to one of the following two groups: Group A [n = 61], who received active TENS therapy and group B [n = 61] who received physiotherapy. Then they were subjected to digital panoramic and TMJ radiographs for the radiographic evaluation to rule out pathologic conditions in the maxilla, mandible, TMJ, and dentition.

**TENS Therapy:** Conventional KODYs TENs XL unit [high frequency & low intensity]. Amplitude of 0 -80 Hz [above threshold], Current at low intensity, Pulse width [duration] of 1-11 microseconds, and Pulse rate [frequency] of 0 -11 Hz when stimulus intensity is set high which was comfortable for the patient was set. At baseline and every treatment visits, all the participants made to sit in upright position, surface electrodes were placed on sigmoid notch area and back of the neck to complete the circuit, TENS therapy was given for 45 minutes for active TENS therapy. Whereas 61 patients were given physiotherapy. The following parameters were recorded at the baseline visit, 1 day after the first sitting of TENS therapy, 1 day after the second and third sitting of TENS therapy, later at the follow-up visit [1 week after the 4th sitting of TENS therapy]. Then analyzed the type of pain (continuous or intermittent), intensity of pain on Visual Analogue Scale (VAS), muscles and joints tenderness and mouth opening without pain.

**Results**

Active TENS therapies have shown significant improvements in the intensity of pain, muscles and TMJs tenderness and interincisal distance. Physiotherapy therapy also showed same results but to the lesser extent. Treatment results were grossly subjective, based primarily on the patient's comparison of the pre-treatment and post treatment signs and symptoms, and their status 1 week later.

**Table 1:** Comparison of mean pre-treatment VAS score and mouth opening in study and Physiotherapy group

SL. No.	VAS score	Study group N=61		Control group (n=61)		‘t <sub>38</sub> ’ Value	P Value	significance
		Mean	SD	Mean	SD			
1.	VAS score	5.72	0.91	5.70	0.98	0.15	0.89	Not significant
2.	Mouth opening	26.60	2.22	27.50	2.87	0.13	0.92	Not significant

[Table 1]: Comparison of pain intensity and mouth opening before starting the TEN’S therapy, found was not significant ( $p > 0.05$ ), in both the study and physiotherapy groups.

Comparison of pre and post treatment VAS score in study and physiotherapy groups

**Table 2:** Comparison of pre and post treatment VAS score in study and Physiotherapy groups

Sl. No.	Group	Pre-treatment		Post treatment		‘t <sub>19</sub> ’ value	P Value	Significance
		Mean	SD	Mean	SD			
1	Study group (A)	5.72	0.91	0.15	0.37	25.52	0.0001	Significant
2	Physiotherapy group (B)	5.70	0.98	1.20	0.41	17.54	0.0001	Significant

[Table 2]: Reduction in the intensity of pain was noted in each interval of TENS therapy in both study and physiotherapy groups. When compared from pre-treatment pain to post treatment, patients were completely free of pain in both the

groups, and the difference was statistically significant [ $p < 0.05$ ].

Comparison of pre and post treatment mouth opening in study group A and physiotherapy groups B.

**Table 3:** Comparison of pre and post treatment mouth opening in study and Physiotherapy groups

Sl. No		Pretreatment		Posttreatment		't <sub>12</sub> ' value	P Value	Significance
		Mean	SD	Mean	SD			
1	Study group (A)	26.60	2.26	36.70	2.87	9.95	0.0001	Significant
2	Physiotherapy group (B)	28.50	2.87	33.35	2.70	8.83	0.0001	Significant

[Table 3]: Both study and control group showed significant ( $p < 0.05$ ), increase in the mouth opening in each interval.

Comparison of Mean VAS Score in Study and control group at the end of treatment

**Table 4:** Comparison of mean VAS score in study and control group at the end of treatment

Sl. No		Pre-treatment		Post treatment		't <sub>12</sub> value	P Value	Significance
		Mean	SD	Mean	SD			
1	Study group (A)	26.60	2.26	34.71	2.86	9.94	0.0001	Significant
2	Physiotherapy group (B)	27.50	2.87	32.34	2.71	8.82	0.0001	Significant

(Table 4): Mouth opening also showed mean score of 34.71 in study group and 32.34 in physiotherapy group. The difference between the groups was statistically significant ( $p < 0.05$ ).

### Discussion

Joint pain and sounds are the most common complains in the TMDs. Joint pain originates from the elongation or compression of muscles attached to the temporomandibular joint (TMJ), discal or capsular ligaments and retrodiscal tissues. Alteration in the muscular activity and consequences for the movements are frequent signs in TMD patients, generally related to pain. Pain is the most frequent symptom and often accompanies the condition which can compromise mandibular movements and lead to a reduction in quality of life in the TMD patients<sup>[11]</sup>. Different therapeutic procedures such as occlusal splint, orthodontic treatment, biofeedback sessions etc, have been used to diminish the pain in TMD patients<sup>[12]</sup>. But classical massage and the application of transcutaneous electric nerve stimulation (TENS) proved to modify the muscular activity of the TMJ<sup>[13]</sup>. Not invading the tissues of the face, jaw, joint or involves surgery<sup>[14]</sup>. There will be no permanent changes in the structure or position of the jaw or teeth in TENS therapy<sup>[15]</sup>. It produces electro analgesia, probably by one or of the following mechanisms like presynaptic inhibition in the dorsal horn of the spinal cord, endogenous pain control by releasing endorphins, enkephalins, dynorphins and direct inhibition of an abnormally excited nerve and restoration afferent input<sup>[16]</sup>. It's widely used to relieve acute and chronic pain in various conditions like head and neck pain like neurogenic pain, musculoskeletal pain, muscle and joint pain in temporomandibular joint disorders<sup>[5]</sup>. In this study only patients with pain without radiographic evidence of TMJ pathology were included. In current days, physiotherapy represents as one of the best investigated model<sup>[17]</sup>. Placebos are also used in randomized control trails (RCTs) to be compared with the "real" drug, device, procedure, or behavioural manipulation<sup>[18]</sup>. The common age of occurrence of TMD was reported to be in the second to fourth decades of life. Age of subjects in the present study is consistent with other studies conducted by the authors like, Okeson JP *et al.*<sup>[19]</sup> The efficacy of active TENS therapy in group A [study], showed decrease in the TMD pain similar to the study conducted by Moystad A *et al.*<sup>[9]</sup> List T and Helkimo M *et al* reported 57% reduction in pain following TENS therapy in patients with myogenic craniomandibular disorders.<sup>[23]</sup> Mehta N *et al* observed 57% reduction in pain following TENS therapy in patients with joint or muscle pain.<sup>[24]</sup> However, Wessberg GA *et al*, observed 95% success rate immediately after TENS therapy and 86% success rate in 1 follow up

therapy in 21 patients treated for myofascial pain dysfunction<sup>[5]</sup> Giessler PR and McPhee PM, reported that 63.6% of patients with joint and muscle pain were pain-free after TENS therapy<sup>[7]</sup> Where in our study we found 75% success rate. The difference in the success rate could be attributed to the disparity between the samples with regard to differences in biological, psychological, and social components affecting the TMDs, as well as stimulation parameters used in the TENS therapy. However in the group B [physiotherapy], our results are similar to the observations made by McNeely ML *et al*, who found the significant reduction in pain following physiotherapy<sup>[9]</sup> Where Mehta N *et al* reported 4.5% and 14.3% reduction in muscle joint pain following TENS therapy<sup>[24]</sup> Transcutaneous Electric Nerve Stimulation in patients with internal derangements of TMJ found improvement in mouth opening, which was consistent with our study<sup>[25]</sup> Increase in the interracial distance in the patients with orofacial pain after TENS therapy was found by Mehta *et al* and Thiemi Kato *et al* which is similar to our observation; however, in contrast to present study, they did not find any improvement in placebo group<sup>[25]</sup> Significant pain reduction (mean- 0.15) in study group, and increase in the mouth opening (mean-36.70) observed in study group is greater than placebo TENS therapy groups (mean-1.2 and 33.35). Similar to our observation, various authors have found the strong tendency among patients with TMDs responded positively to the active than placebo TENS therapies<sup>[9, 22]</sup>. The significant reduction in patients with TMD pain in our study could be attributed to TENS therapy.

### Conclusion

This study justifies the use of TENS therapy as an adjuvant modality in controlling pain associated with TMD's. Pain reduction and improvement in the mouth opening are the main goal in the treatment of TMDs; we found encouraging results in our study. Active TENS therapy showed favourable results in pain management in TMD patient, especially in muscular or chronic pain and mouth opening, as compared to the physiotherapy. Accordingly we would like to justify that, the use of this TENS therapeutic regimen in the management of TMDs; however, small sample size requires replication of these findings in a larger sample of patients for the better results. The most important factor that has to be borne in mind by the clinician is that TENS therapy is only an initial symptomatic approach and not a definite or radical means of managing the TMDs.

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