



TENS AND CYCLOBENZAPRINE IN TMDS - A COMPARATIVE STUDY

Dental Science

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ABSTRACT

Objective: The aim of this study is to analyze the effect of TENS and Cyclobenzaprine in the symptomatic relief of pain in temporomandibular disorders.

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

Results: TENS played a significant role in reducing pain and Cyclobenzaprine gave better results in improvement in mouth opening on comparison with TENS therapy.

Conclusion: Thus, we conclude that a therapeutic regimen that combines TENS + Cyclobenzaprine therapy is promising for the management of TMDS.

KEYWORDS

TENS, Cyclobenzaprine, Temporomandibular Joint Dysfunction Syndrome.

INTRODUCTION:

Temporomandibular disorders (TMDs) are recognized as the most common chronicorofacial pain conditions confronting dentists and other health care providers.¹ TMDs refers to a cluster of disorders characterized by pain in the preauricular 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.^{1,2}

Dentists who choose to manage TMDs must use a diagnostic classification based on established concepts of physiology and pathology. The goals for management of patients with TMDs include: reduce pain; restore normal jaw function; reduce the need for future health care and restore better quality of life.³ As the etiology of the TMD's is multifactorial and management of these is of prime importance to the dentist and more so to the oral physician, so as to have better compliance from patient pertaining to TMD management, a multidisciplinary approach should be followed which include behavioural therapy, drug therapy and physical therapy.⁴

Drug therapy includes: Analgesics, anti-inflammatory, muscle relaxants, adjuvant medications and anaesthetic blocks. Peripheral muscle relaxants are less effective than central agents. Centrally acting muscle relaxants with good efficacy are cyclobenzaprine and tizanidine. They are efficient for acute pain control.⁵ Cyclobenzaprine is a centrally acting skeletal muscle relaxant that is closely related in structure to the tricyclic antidepressants and was originally tested as an antidepressant.⁵ Clinically, Cyclobenzaprine has been widely used to treat fibromyalgia syndrome, chronic tension type headache, and muscle spasm of the cervical and lumbar region and particularly used to improve quality of sleep and to reduce pain. It also suppresses muscle spasm and so may prevent pain caused by myofascial pain without interfering with muscle function. Recent studies suggest that Cyclobenzaprine is a serotonin (5-HT₂) receptor antagonist that exerts its muscle relaxant effects due to central inhibition of serotonergic descending systems.⁵

Physical therapy includes: acupuncture, exercises, massages, thermal therapy, electric stimulation (TENS), ultrasound and low level lasers.⁶ TENS is a well-known physical therapy, which is useful for the relief of pain. With TENS, electrical stimulation is generated from a battery or electrically operated device and transmitted to pain areas via surface electrodes and reduce or eliminate pain.⁷ 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.⁷ It is widely used to relieve acute and chronic pain in various conditions like muscle and joint pain, back pain, lower and upper extremity pain, and head and neck pain, etc. The use of TENS in dentistry was first described in 1967 by Shane and Kessler, but it has yet to gain widespread acceptance in dentistry.^{1,7}

There are only few randomized controlled trials (RCTs) to compare the efficacy of therapeutic approaches to treat temporomandibular disorders.⁹ Keeping all these aspects in view we have designed a study to evaluate the effectiveness in pain as well as functionality of joints and restorability with TENS therapy and Cyclobenzaprine therapy in the management of TMDs.

MATERIALS & METHOD:

- This study was conducted in the department of Oral medicine & Radiology during a period from May 2013 to June 2014. Forty patients with temporomandibular disorders irrespective of gender were recruited in this study and divided into 2 groups.
- Group A - TENS therapy (N=20)
- Group B - Cyclobenzaprine therapy (N=20)
- TENS therapy was given for 20 minutes at each visit as maximum benefit is obtained after 15-20 mins of treatment. Prolonged treatment was avoided as it initiates a dull ache, which gradually increases in intensity. (Model - TENSSTIM, Manufactured by Diabetik foot care India, Chennai. Pulse frequency rate: 2 - 150 PPS (HZ), Pulse width duration: 250 micro seconds (fixed), Maximum Output: 20 milliamps. (60V) with 1000 ohm load.)
- TENS therapy was given along with Visual analog scale of pain as well as mouth opening was noted at each visit i.e. 1st visit (Day 1), 2nd visit (Day 5), 3rd visit (Day 10) and 4th visit (Day 15). 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.
- Tablet Cyclobenzaprine drug 10mg OD for 15 days was prescribed to the patients.
- Visual analog scale of pain and mouth opening was noted on 1st visit (Day 1) and 2nd visit (Day 15) only.
- All observations were carried out by the single observer and data collection was thus tabulated (Master chart - Annexure 4, 5 & 6) and subjected to statistical analysis [1] One-way Anova, paired t test and 'unpaired t test' for intergroup comparison and for intragroup comparison, [2] Chi-Square Test for Comparison of number of subjects with reduction in pain and improvement in mouth opening.

RESULTS:**Group A. TENS Therapy****I.) Table 1a. Comparison of pain intensity (VAS) in Group A**

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 group A 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 ($p < 0.001$).

I.) Table 1b. Comparison of improvement in mouth opening in Group A

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 in group A 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. <38mm) and when only these 4 patients were analyzed, there was 14.87% improvement in mouth opening.

Group B. Cyclobenzaprine Therapy**I.) Table 2a. Comparison of pain intensity (VAS) in Group B**

Group A n = 20	Day 1 (M+SD)	Day 15 (M+SD)	Pain Change	p Value
	3.45 + 0.94	1.55 + 0.83	1.9 (55.07%)	<0.00

The mean pain score for 20 patients in group B was 3.45 + 0.94 at day 1 and at the end of 15 days, the mean pain score reduced gradually to 1.55 + 0.83. The overall reduction in intensity of pain was 55.07%. The results were highly significant statistically ($p < 0.00$).

ii.) Table 2b. Comparison of improvement in mouth opening in Group B

Group A n = 20	Day 1 (M+SD)	Day 15 (M+SD)	Change in MO	p Value
	39.9+6.98	40.95 + 5.28	1.05 (2.64%)	0.076

MO = Mouth opening

The mean mouth opening score for 20 patients in group B was 39.9 + 6.98 at day 1 and at the end of 15 days, the mean mouth opening was 40.95 + 5.28. The overall improvement in mouth opening was 2.64%. The results were not significant statistically ($p > 0.05$). However, out of 20 patients only 4 patients had reduced mouth opening (i.e. <38mm) and when only these 4 patients were analyzed, there was 18.42% improvement in mouth opening.

INTRAGROUP COMPARISON**Group A. TENS Therapy****I.) Table 3a. Intragroup comparison for Intensity of pain in group A**

TENS Therapy	VAS for pain at different visits	Mean	SD	p value
	VAS for pain at day 01	3.8	1.196	<0.001
	VAS for pain at day 05	2.75	0.716	
	VAS for pain at day 10	1.75	0.716	
	VAS for pain at day 01	3.8	1.196	<0.001
	VAS for pain at day 10	1.75	0.716	
	VAS for pain at day 15	0.8	0.834	
	VAS for pain at day 05	2.75	0.716	<0.001
	VAS for pain at day 10	1.75	0.716	
	VAS for pain at day 05	2.75	0.716	
	VAS for pain at day 15	0.8	0.834	<0.001
	VAS for pain at day 10	1.75	0.716	
	VAS for pain at day 15	0.8	0.834	

On intragroup comparison for intensity of pain in group A, there was gradual reduction in intensity of pain from day 1 to day 15. At the end of 15 days, the overall reduction of pain was 78.94%. The results were highly significant statistically ($p < 0.001$), as shown in Table 6a.

ii.) Table 3b. Intragroup comparison for mouth opening in group A

TENS Therapy	Mouth opening at different visits	Mean	SD	p value
	Mouth Opening at day 01	40.05	5.605	0.143
	Mouth Opening at day 05	40.5	4.796	
	Mouth Opening at day 10	40.75	4.290	
	Mouth Opening at day 01	40.75	4.290	0.104
	Mouth Opening at day 15	40.95	4.032	
	Mouth Opening at day 05	40.05	5.605	
	Mouth Opening at day 10	40.75	4.290	0.058
	Mouth Opening at day 05	40.5	4.796	
	Mouth Opening at day 15	40.95	4.032	
	Mouth Opening at day 10	40.05	5.605	0.086
	Mouth Opening at day 15	40.95	4.032	

On intragroup comparison for mouth opening in group A, there was marginal improvement in mouth opening from day 1 to day 15 and after 15 days, the overall improvement in mouth opening (i.e. 2.25%). The results were not significant statistically ($p > 0.05$), as shown in Table 6b.

Group B Cyclobenzaprine Therapy**I.) Table 4a. Intragroup comparison for Intensity of pain in group B**

Cyclo-benzaprine Therapy	VAS for pain at different visits	Mean	SD	p value
	VAS for pain at day 01	3.45	0.945	<0.00
	VAS for pain at day 15	1.55	0.826	

On intragroup comparison of intensity of pain in group B, there was gradual reduction in intensity of pain in VAS for pain from day 1 to day 15. At the end of 15 days, the overall reduction of pain was 55.07%. The results were highly significant statistically ($p < 0.00$), as shown in Table 7a.

ii.) Table 4b. Intragroup comparison for mouth opening in group B

Cyclo-benzaprine Therapy	Mouth opening at different visits	Mean	SD	p value
	Mouth opening at day 01	39.9	6.980	0.076
	Mouth opening at day 15	40.95	5.276	

On intragroup comparison for mouth opening in group B, there was marginal improvement in mouth opening from day 1 to day 15 and after 15 days the overall improvement in mouth opening in group B was 2.64%. The results were not significant statistically ($p > 0.05$), as shown in Table 7b.

DISCUSSION:

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.¹⁰ 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.¹¹ It is widely used to relieve acute and chronic pain in various conditions like back pain, neck pain, phantom limb pain, extremity pain etc. 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 decreases in myoelectric activity.¹²

It is known that skeletal muscles are major sources of generally diffuse and under diagnosed pain. Cyclobenzaprine is a centrally acting

skeletal muscle relaxant that is closely related in structure to the tricyclic antidepressants. It acts primarily within the central nervous system at brainstem level through a poorly defined mechanism. Recent studies suggest that Cyclobenzaprine is a serotonin (5-HT₂) receptor antagonist that exerts its muscle relaxant effects due to central inhibition of serotonergic descending system. It relieves skeletal muscle spasm of local origin without interfering with muscle function and shown to be effective for the relief of muscle spasm associated with acute, painful musculoskeletal conditions.⁵

In present study, the intensity of pain for patients in group A (TENS therapy) 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 2a. The efficacy of TENS therapy in reducing TMD pain observed in present study is similar to the observations made by Wessberg GA et al¹³, Moger G et al¹⁴, Tosato JDP et al¹⁵ and Kato MT et al⁷. 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 marginal after therapy and overall improvement in mouth opening was 2.25%. The results were not significant ($p > 0.05$) statistically as shown in Table 2b. However, in this group; out of 20 patients only 4 patients had reduced mouth opening before treatment (i.e. < 38 mm) 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 al¹⁶ and Moger G et al¹⁴.

The intensity of pain for patients in group B was reduced gradually after therapy and overall reduction in intensity of pain was 55.07%. The results were highly significant ($p < 0.001$) statistically as shown in Table 3a. This statistical difference could be attributed because patient of this group were evaluated only on 1st visit (i.e. day 1) and last visit (i.e. day 15). The efficacy of Cyclobenzaprine therapy in reducing TMD pain observed in our study is similar to the observations made by Herman CR et al⁵ who stated that Cyclobenzaprine is more effective than clonazepam or a placebo for the management of TMDs. Singh H et al¹² observed reduction in TMJ pain who were given placebo drug named "Myolax", whereas in present study Cyclobenzaprine was prescribed (OD, 15 days) in which there was highly significant reduction in the pain.

The maximum mouth opening without pain for patients in group B was improved marginally over 15 days therapy and overall improvement in mouth opening was 2.64%. The results were not significant ($p > 0.05$) statistically as shown in Table 3b. However, in this group; out of 20 patients only 4 patients had reduced mouth opening before treatment (i.e. < 38 mm) and when only these 4 patients were analyzed, there was 18.42 % improvement in mouth opening. Cyclobenzaprine showed better results in improving mouth opening compared to TENS therapy. When intergroup comparison for pain reduction was done in three groups, it was observed that the mean pain reduction in the group A (i.e. 78.94%) > group C (i.e. 57.14%) > group B (i.e. 55.07%) at the end of the 15 days therapy. When intergroup comparison for improvement in mouth opening was done there was marginal improvement in mean mouth opening score in three groups, though it was observed that the mean mouth opening improvement in the group C (i.e. 4.63%) > group B (2.64%) > group A (2.25%). However out of 60 patients only 14 patients had reduced mouth opening (i.e. < 38 mm) and when only these 14 patients were analyzed, it was observed that the mouth opening improvement in the group C (i.e. 19.35%) > group B (18.42%) > group A (14.87%) at the end of the 15 days therapy.

Hence, oral health care professionals whenever encountering management of TMDs, it is preferred that aggressive, nonreversible 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-centered treatment.

Thus, results from our study justify the use of TENS therapy and Cyclobenzaprine therapy in the management of TMD patients. TENS played a significant role in reducing pain and Cyclobenzaprine give better results in improvement in mouth opening on comparison with TENS therapy.

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