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THE EFFECT OF SPLINT THERAPY AND ELECTRICAL STIMULATION ON TEMPOROMANDIBULAR DISORDERS

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ABSTRACT

Introduction and purpose: Temporomandibular joint (TMJ) facilitates the opening and closing movements of the lower jaw. One of the most common causes of orofacial pain disorder is TMD. The aim of this study is to compare the therapeutic effects of occlusal splint and transcutaneous electrical nerve stimulation (TENS).
Materials and methods: This study was conducted on 60 subjects: 20 in the control group who received related medication, 20 in the second treatment group who received dental splint along medication, and 20 in the third group who were treated with electrical stimulation along medication. We recorded pain before and after treatment. After collecting the data, we entered it into SPSS 21 and analyzed it using ANOVA and Tukey tests.
Findings: Average pain scores before treatment in medication, splint, and TENS groups were, respectively, 6.25 ± 1.65, 6.70 ± 1.65, and 6.50 ± 1.53, and after treatment, respectively, 2.70 ± 1.30, 2.10 ± 0.78, and 2.30 ± 1.03.
Conclusion: The results of this study showed that splint and TENS do not have significant differences in pain relief.

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Introduction

TMDs are one of the most common chronic orofacial pain conditions. The term refers to a series of disorders determined with pain around the ears and TMJ or in masticatory muscles area, restriction or distortion in the lower jaw, and sound in TMJ while the lower jaw works (1). In fact, one of the most common causes of chronic orofacial pain is a set of disorders called TMJ (2). Physical Therapy (PT) suggests a range of treatment options to manage the signs and symptoms of TMD, such as high-voltage electrical stimulation, TENS, acupuncture, laser therapy, and massage therapy. Another option is treatment with an occlusal splint, which is a muscle relaxant device used in dentistry (3).
In addition to pain, patients with TMD often have limited or asymmetric mandibular movements and joint sounds are frequently heard. Treatments commonly used for people with TMD are conservative treatments, definitive treatments including medication, occlusal splint, correction of occlusion, and a variety of physical treatments such as acupuncture and TENS (4).
Occlusal appliances are commonly used in the treatment of patients with TMDs, and it is reported that these appliances improve clinical signs and symptoms of these patients (5).
Although therapeutic effects of appliances are not completely understood, many factors such as removing or changing harmful effects of proprioceptive inputs due to occlusal contacts and decreased postural activity of elevator muscles have been discussed in this regard (6).
PT is an effective treatment method in the treatment of pain and TMJ disorders. One of these methods is using TENS. In this method, electric current is applied with less than 10 pulses per minute or as burst, which can stimulate release of endorphins

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and reduction of pain intensity. It also seems that by stimulation of sensory fibers, TENS stimulates tracts inhibiting pain-transmission and thus reduces pain (7).
According to the above, the aim of this study was to determine the success of splint and electrical stimulation in the treatment of TMDs and to find the most effective and best treatment for these patients with the lowest rate of relapse.

Methodology
This study was double-blind clinical trial. Population consisted of the patients referring to dental school and clinics in Zahedan for the treatment of their mandibular pain. None of the patients had received medical treatment and Helkimo Index was used for diagnosis of this disorder. According to similar studies (8,9), we calculated sample size at 95% level of confidence and test power of 80%, where 20 subjects were assigned to each group using simple random sampling making a total of 60: medication group (9 male and 11 female), splint (8 male and 12 female) and electric shock (7 male and 13 female). Inclusion criteria included age from 16 to 45, having all the natural teeth except the third molar, and class I parasite occlusion, and having occlusal interferences. Exclusion criteria included having a systemic joint or muscles diseases, the presence of TMJ organic waste, using antipsychotic medication during the past two weeks, orthodontic treatment, and having any denture. We first made coordination with the center for physiotherapy and surgical and prosthetic specialists to carry out this study. Then we held some briefing sessions for patients and got the consent of the ones willing to participate in the treatment using informed consent. Then we divided the patients, who completed the consent form and had the inclusion criteria, randomly to three treatment groups. The first group was the control group that only received medicine containing ibuprofen 400 mg and acetaminophen 325 mg. The second treatment group received medicine treatment with dental splinting. After obtaining jaw molds in the first session, registering central and lateral records to record on the articulator, and specifying the pain by the patient, in the next session, we delivered maxillary occlusal splint to the patient. Resetting it was done first every week until the end of the second week, after delivery of the splint, and then every two weeks until the end of the eighth week. Patients used splint twenty-four hours a day until the end of the sixth week and then began to use it less, so in the eighth week, patient used splint only during sleep. At the end of the eighth week, treatment outcome and pain reduction of this group were assessed by Visual Analogue Scale index. This criterion is scored from zero to ten based on observation, patient's statements, and physiological responses to patient. Zero represents the best state and the least pain, and 10 shows the worst. The third group was the patients who received medicine in addition to physical therapy by electrical stimulation like the previous groups.

These patients received bilateral TMJ treatment through the external skin surface in ten sessions, each session lasting 30 minutes, with a frequency of 80 Hz. Then at the end of therapy sessions, like the first group, level of pain relief was assessed by visual analogue scale criteria. We recorded all data obtained in the information form, analyzed them by SPSS 21 statistical software, and used ANOVA and Tukey tests to check the normal distribution of data.

Findings

Table 1: Mean pain before and after treatment

	Group 1 (medication)	**Group 2 (medication+ splint)**	**Group 3 (medication + TENS)**	**P-value**
Before treatment (Mean ± SD)	1.65±6.25	1.65±6.70	1.53±6.25	0.679
After treatment (Mean ± SD)	1.30±2.7	0.78±2.10	1.03±2.30	0.2
Diff (Mean ± SD)	0.60±-3.55	1.27±-4.6	0.95±-4.20	0.005

According to Table 1, results showed that in all three groups, medication, medication and splinting, and medication and TENS, pain mean has reduced after treatment, but this pain reduction before and after treatment has no significant differences among the groups (P=0.2 and P=0.679).

Table2: Tukey comparative test

Dependent variable (I) group (J)group		**Mean difference (I-J)**	**Sig**
Before treatment	TENS medicine	-0.250	**0.877**
	splint	-0.450	**0.655**
	TENS medicine	0.250	**0.877**
	splint	-0.200	**0.919**
	medicine splint	0.250	**0.655**
	TENS	0.200	**0.919**
After treatment	TENS medicine	0.400	**0.463**
	splint	0.600	**0.183**
	TENS medicine	-0.400	**0.463**
	splint	0.200	**0.823**
	medicine splint	-0.600	**0.183**
	TENS	0.200	**0.823**
Diff	TENS medicine	0.65	**0.1**
	splint	1.05	**0.004**
	TENS medicine	-0.65	**0.1**
	splint	0.4	**0.408**
	medicine splint	-1.05	**0.004**
	TENS	-0.4	**0.408**

Table 2 and Tukey test showed that pairwise comparison of groups before and after treatment had no statistically significant differences. Nevertheless, given the values of Diff, we found that splint and medication are more effective than TENS (P=0.004).

Discussion and conclusion

We conducted this study to compare the therapeutic effect of occlusal splint and TENS on 60 patients in three groups. The results of this study showed that occlusal splint and TENS improve patients' pain, but the two methods have no significant difference in pain relief. The results of the study showed pain relief in both splint and TENS methods, which is similar to the results by Moystad et al. (10), List et al. (11), and Mehta et al. (12). Although they did not compare these two methods, they reported pain relief in each of these methods. Alvarez-Arenal et al. (2002) conducted a study entitled “The effect of occlusal

splint and TENS on signs and symptoms of TMDs in patients with bruxism" on 24 patients and observed that splint and TENS have no significant differences in symptom relief and symptoms of patients that corresponds with the results of the present study (13). Singh et al. (2014) conducted a study entitled "Assessing the effects of electrical stimulation and placebo on pain and TMDs" on 40 subjects with TMDS in India and observed that the difference between drug treatment and TENS in pain relief is meaningful. This is not consistent with the present study that could be due to different stimulation time, different frequency, and the type of medicine used (9). Puri et al. (2015) conducted a study entitled "Conventional and TENS therapy in the treatment of Myogenous TMD on 60 patients. The results showed that both conventional and TENS treatments are effective in eliminating pain in patients with MPDS, and treatment with a combination of the two approaches is more effective, and it could be claimed that this corresponds with the results of this study (14). Although the results showed no significant differences in pain relief by splint and TENS methods, both methods reduce pain in patients with TMDs and can be used as complementary treatments alongside drug treatment and help patients quicker recovery.

According to the results, we suggest that in future studies other physical therapy methods with the abovementioned methods be compared with more samples. It also recommended that in future studies, splint and TENS effects on other signs and symptoms such as dysfunction and maximum opening of mouth be addressed.

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