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## TENS in management of orthodontic pain: A review

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### Abstract

Pain occurring during different stages of Orthodontic treatment has been well defined in the literature. Many techniques have been used to manage orthodontic pain including both pharmacological and non-pharmacological means. One of the non-pharmacological means for pain management is TENS (Transcutaneous Electrical Nerve Stimulation) which has been widely used but its application in orthodontics has been poorly described. Only three studies have been retrieved upon a PubMed search. These clinical studies are presented in a chronological order in present review. TENS application can become an affluent option in treatment of orthodontic pain.

**Keywords:** Transcutaneous electrical nerve stimulation, orthodontic pain, pubmed

### 1. Introduction

Pain is a reaction to noxious stimuli and is very discomforting experience. Pain is associated with most of the orthodontic procedures such as placement of separators, placement of initial alignment and levelling wire, headgear or facemask application<sup>[1]</sup>. The fear of pain from these orthodontic procedures is one of the most common reason for not undergoing orthodontic treatment. Orthodontic pain is perceived as discomforting pain in affected teeth<sup>[2,3]</sup>. The prevalence of Orthodontic pain is about 72–100% and it is triggers on application of orthodontic force<sup>[4-6]</sup>.

#### 1.1 Orthodontic Pain

When orthodontic force is applied, pain starts to begins after 12hours, reaches to its maximum limit after 1 day, and then decreases after 3-7 days<sup>[7, 8]</sup>. Many pharmacological and non pharmacological methods have been used in managing orthodontic pain. NSAIDS have been most commonly employed in treating orthodontic pain<sup>[9, 10]</sup>. Non pharmacological methods employed are chewing gums, bite wafers, Low level laser therapy, vibration and gene therapy<sup>[11-19]</sup>.

TENS has been another non pharmacological method of alleviating pain<sup>[20]</sup>.

TENS produces electrical stimulus that has faster speed than pain impulse and reaches the substantia gelatinosa in the dorsal horn to shut the gate for pain impulses resulting in decrease in pain intensity. The TENS also produces activation of opiate-like peptides, such as endorphins<sup>[21]</sup>. Many studies have been conducted using TENS for managing pain in dentistry<sup>[22-24]</sup>.

### 2. Searching pub med for articles

A large number of studies describing non pharmacological methods for managing orthodontic pain have been published. Very sparse literature has reported the application of TENS in orthodontic patients. PubMed database search revealed only three clinical articles which describe the successful usage of TENS for relieving orthodontic pain<sup>[25-27]</sup>.

In 1986, the first study regarding this topic was conducted<sup>[25]</sup>. In this study TENS therapy was used to alleviate periodontalpain associated with placement of orthodontic separators. 45 patients (27 men and 18 women) with mean age was 28 years. Randomly the patients were assigned following 5 groups comprising 9 patients per group – intraoral TENS application (Group 1), extraoral TENS application (Group 2), intraoral placebo application (Group 3), extraoral placebo application (Group 4) and control group(Group 5).

Group 1, 2, 3 and 4 underwent one, two and three days treatment programme.

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Periodontal separation was done using separators on both right and left maxillary first molars (mesial and distal interdental sites). Visual analogue scale (10 cm) was used for assessment of pain every 12 hours for 4 days. Patients who underwent TENS therapy had less experience of pain after 24hour, 36 hour and 48 hour. Control group experienced pain throughout the assessment period of 60 hours. This study concluded that TENS is an efficient method for managing pain of periodontal separation produced by separators.

In 2018, a clinical study was performed to evaluate and compare the effect of using TENS therapy and piroxicam on the degree of pain produced by placement of orthodontic separators [26]. The sample consisted of 60 subjects of age range 18 to 30 years who had to undergo fixed orthodontic treatment. 1 hour before placement of separators, 30 subjects in Group I received 20 mg of piroxicam and the other 30 subjects in Group II received TENS therapy immediately after separator placement.

Pain was assessed following separator placement on a 10-cm VAS wherein a mark at 0 cm was considered as no pain and 10 cm as maximum pain. In Group I subjects, 2 separators were placed in each quadrant 1 hour after the piroxicam administration. The patients allotted to group II were given TENS therapy. TENS electrodes were placed over the painful region on the cheek corresponding to the molar region on the left and right sides, in the upper and lower arches and a frequency of 50 Hz with a pulse width of 0.5 msec at 0 to 60 mA was used.

The intensity was increased to the point where the patient experienced maximum comfort. Each subject underwent this treatment for 20 minutes after which the pain was assessed on clenching/fitting back teeth together and on chewing, at intervals of 2, 6, 24 and 48 hours after separator placement.

The results showed that the pain experienced by subjects in the piroxicam group increased gradually from 2 to 48 hours but in the TENS group, the VAS scores decreased significantly after 6 hours itself and the difference was statistically significant.

This study chose Piroxicam over ibuprofen as it has a longer mean half life which prolongs its duration of action and permits once-daily dosing. But being a NSAIDs, it interferes with tooth movement due to the inhibition of cyclooxygenase activity and thus prostaglandin production. Thus this study

concluded that TENS therapy is an inexpensive, noninvasive method of alleviating both acute and chronic pain with no inhibition of orthodontic tooth movement. This study concluded that both TENS therapy and piroxicam can effectively control orthodontic pain arising from placement of separators and thus TENS can substitute analgesics in relieving pain.

A recent study evaluated effectiveness of new portable TENS device in controlling orthodontic pain and the duration of pain relief following TENS application [27]. This study comprised Sixty-five patients with moderate to severe crowding, ranging in age from 10 to 57 (mean age 21), from three private orthodontic practices in Cranston and Newport, Rhode Island, and Vancouver, British Columbia.

All the patients were in the leveling and alignment phase (first six months) of orthodontic treatment. Also included were patients who experienced immediate pain following orthodontic adjustment. 45 patients were included in the active treatment group and rest 20 to the control group. The patients were informed that they would be evaluated for reduction in pain after application of mild electric current. This study used a portable TENS device, the Dental Pain Eraser, which had a one-button operation, with one output for a safe and stable range of stimulation. The device generated a biphasic, symmetrical pulse with a net neutral charge and a maximum current of 10mA.

The control group underwent same mechanical application of the device with no current. The TENS device was applied in each patient immediately after orthodontic wire activation or adjustment. The time required to achieve comfort was recorded and the patient rated the pain intensity after TENS application and after 24 and 48 hours on a numeric rating scale (NRS), using whole numbers from 0 to 10.

Patients who were given the active TENS treatment reported significantly lower NRS scores when compared with the control group. Pain was diminished within one minute after application in 55% of the active TENS patients, and 29% experienced a reduction in one to two minutes. This study demonstrated that portable TENS delivery with the Dental Pain Eraser is an effective method for reducing orthodontic pain immediately following any causing discomfort. Thus TENS application can bring about improved Quality of life without the need of analgesics.

**Table 1:** Shows summary of the publications (PubMed) on application of TENS for managing orthodontic pain.

Authors	Year	Country	TENS	No of patients	Age range years	Pain assessment	Measurement period
Peter M. Roth and William James Thrash	1986	USA	An Alpha-Stim model 2000* Current frequency of 0.5 Hz with an intensity of 500 mA for 20 minutes.	45	22-41	VAS	Every 12 hours for 4 days
Asavari L Desai <i>et al.</i>	2018	India	The TENS unit comprised of amplitude knobs, pulse, an on/off switch, a 3-volt battery, and a pair of electrodes. A frequency of 50 Hz with a pulse width of 0.5 msec at 0 to 60 mA was used	60	18-30	VAS	2, 6, 24 and 48 hours
Cosmo Haralambidis	2019	USA	Portable Dental Pain Eraser maximum current of 10mA	65	10-57	numeric rating scale (NRS),	(0, 24, or 48 hours).

### 3. Conclusion

1. An assessment of the published literature demonstrates a very sparse clinical studies employing TENS in management of orthodontic pain.
2. Thus, further investigation of application of TENS in various orthodontic procedures such as activation of archwire in initial levelling and alignment stage, separator placement, usage of orthopaedic appliances and

debonding is highly required.

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