

Effect of Low Level Laser Therapy: A Novel Approach to Diminish Pain Associated With Elastomeric Separators

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ABSTRACT

Background: Orthodontic pain usually appears hours after the force is applied. Methods employed for pain relief include nonsteroidal anti-inflammatory drugs, vibratory stimulation, chewing gum, anaesthetic gel, bite wafers, transcutaneous electrical nerve stimulation, and low level laser therapy. Aims and Objectives: To evaluate the effect of a single dose of low level laser therapy on pain associated with elastomeric separators. **Methods:** The sample comprised 30 patients. Elastomeric separators were placed mesial and distal to the permanent first molars in all quadrants. Both arches were divided into experimental and control sides. The experimental sides were treated with low-level laser therapy. The other side received placebo laser therapy without turning on the laser. A numeric rating scale was used to assess the intensity of spontaneous pain, pain after chewing, brushing, drinking water and warm drinks for five days. **Results:** There was a significant difference ($P < 0.05$) between the laser and the placebo groups on spontaneous pain perceived by the patients for all 5 days. **Conclusion:** A single application of laser with a gallium aluminium- arsenic diode laser with a 980-nm wavelength can reduce orthodontic pain associated with the placement of separators.

Keywords: Orthodontics; Laser therapy; Pain perception, Elastomeric Separators, Placebo.

INTRODUCTION

Orthodontic treatment with fixed appliance improves dentofacial esthetics as well as masticatory function, but it is also associated with discomfort and pain. It has been reported that more than 90% of orthodontic patients experience varying degrees of pain after the placement of elastomeric separators, initial wire insertions, and activations. The placement of separators is a part of routine fixed appliance therapy to create space for molar bands. This process causes displacement of teeth and the immediate release of biochemicals in the gingival fluid, followed by an increase in the level of prostaglandins E2 and interleukin-1 the next day.^[1-3]

It has been observed that, due to being mild to moderate and often transient pain, medications are not routinely prescribed in orthodontic practice, unless discomfort becomes intolerable. Moreover,

medications can produce side effects and are contraindicated for allergic patients. Of the several methods available to alleviate pain, nonsteroidal anti-inflammatory drugs (NSAIDs) have been commonly used. However, they come with a major drawback of hampering osteoclastic activity which reduces tooth movement rate. In addition, they can cause allergies, gastric ulcers and bleeding disorders. The alternatives employed for pain relief include vibratory stimulation, chewing gum, anesthetic gel, bite wafers, transcutaneous electrical nerve stimulation, and low level laser therapy (LLLT).^[4-7]

Low-level laser therapy (LLLT) has been reported to reduce inflammation and pain by reducing prostaglandin and interleukin production; and has, therefore, been proposed as an alternative analgesic in Dentistry. However, few clinical LLLT trials have been performed with clear methods, significant samples, homogeneous groups and a placebo group. Furthermore, it is not clear to what extent the use of pre-banding elastomeric orthodontic separators is perceived by patients as painful.^[6-10]

The aim of this study was to see the effect of a single dose of low level laser therapy on pain associated with elastomeric separators during

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chewing, spontaneous pain, brushing teeth, drinking water and hot drinks. After the placement of elastomeric separators for 5 days.

MATERIALS AND METHODS

The sample comprised 60 patients, divided in to laser group and placebo group of 30 each.

Inclusion criteria:

1. No history of orthodontic treatment
2. Healthy and complete dentition including permanent second molars
3. Good periodontal health
4. Tight proximal contacts of all permanent first molars

Exclusion criteria:

1. Root canal treatments
2. Gingivitis
3. Multiple missing teeth
4. Spacing between molars and premolars

Elastomeric separators were placed mesial and distal to the permanent first molars in all quadrants. Both arches were divided into experimental and control sides. The experimental sides were treated with low-level laser therapy on 3 points on the buccal mucosa, 20 seconds each with 980-nm gallium-aluminum-arsenic diode laser on continuous mode and power was set at 200 mW. The other side received placebo laser therapy without turning on the laser.

A numeric rating scale was used to assess the intensity of spontaneous pain, pain after chewing Brushing, drinking water ,warm drinks for the next 5 days.

Statistical Analysis:

The data were analyzed using SPSS software (version 20.0; IBM, Armonk, NY). Independent sample t tests and analysis of variance was used to evaluate the differences in the levels of pain during 5 days.

RESULTS

The mean age of the patients was 22.3 ± 5.9 years for laser group (18 men and 12 women). It was 21.8 ± 4.5 years for placebo group (16 men and 14 women) [Table 1 & Figure 1].

Table 1: Demographic characteristics of the study sample

Characteristic	Laser Group	Placebo Group
Mean Age	22.3 ± 5.9 Years	21.8 ± 4.5 Years
Males	18	16
Females	12	14

Data frequency distribution for age and sex was performed in a similar manner ($p > 0.05$), confirming the homogeneity of the sample. There

was a significant difference ($P < 0.05$) between the LLLT and the placebo groups on spontaneous pain perceived by the patients for all 5 days [Figure 2].

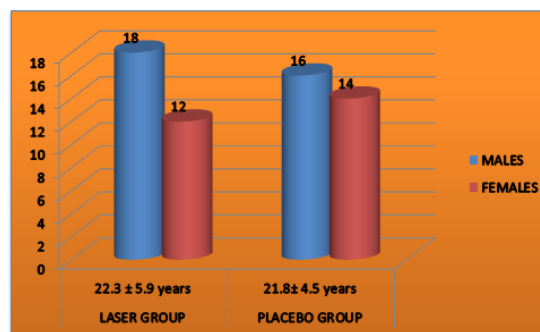


Figure 1: Demographic characteristics of the study sample

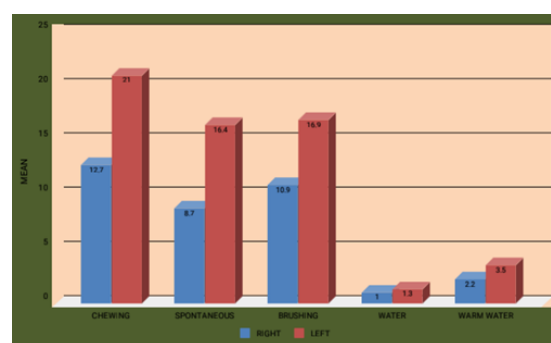


Figure 2:

The maximum intensity of discomfort was associated with chewing pain in the placebo group. The patients had maximum pain at 24 hours after the placement of the separators, and it declined significantly on the third day in almost all groups.

DISCUSSION

Pain perception depends on age, sex, and individual pain threshold. Therefore, to avoid individual variability, the split-mouth design was used. The laser used in this study was having infrared radiation with a wavelength of 980 nm. The reason for choosing this spectrum was the required depth of penetration into the soft tissues. Other lasers with a visible spectrum of light would have had more superficial effects. Phototherapy recommended for severe pain is 4 to 8 J per square centimeter; more than 20 J per square centimeter has bioinhibitory effects on cellular Activities.^[4-6] Fujiyama et al reported higher scores that reached 80, 12 and 24 hours after placing separators and when no laser was applied; and 40 when it was applied; however, no placebo group was used.^[8] A wide range of laser types, with different wavelengths and energy doses, can be found in the literature. AsGaAl diode laser, used in studies by Youssef et al, Tortamano et al and Lim et al, was also used in the present study.^[9-11]

Moreover, Harazaki et al used HeNe laser whereas Fujiyama et al used CO₂ laser. At lower wavelengths, for instance, 632.8 nm and 670 nm,^[11] no difference, in terms of pain intensity, was reported between groups with or without laser applications. Nevertheless, the use of high-level laser, with wavelength of 808 nm, revealed statistically significant pain reduction in some studies.^[12]

A systematic review has recently reported that nonsteroidal anti-inflammatory drugs (NSAIDs), such as COX-2 selective inhibitor, are still the best choice to reduce pain during orthodontic treatment, despite potential side effects.

Another recent study revealed that a single dose of Piroxicam, taken 60 minutes before separator placement, reduces pain.^[14]

Turhani et al. found that on assessing pain relief by single LLLT irradiation of banded teeth at 6, 30 and 54 h. They found that patients reporting pain at 6 and 30 h were lower in laser group which was statistically significant and concluded that LLLT was effective in orthodontic pain management.^[6]

This study investigated the efficacy of LLLT in the prevention of pain following the placement of Elastic separators during early orthodontic treatment. It was found that the laser-irradiated quadrant presented with less pain compared with the control quadrant in all cases studied.

CONCLUSION

A single application of LLLT with a gallium aluminium- arsenic diode laser with a 980-nm wavelength can reduce orthodontic pain associated with the placement of separators.

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