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Efficacy of laser irradiation in controlling postoperative pain following chemomechanical preparation of teeth

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ABSTRACT

Background: Postoperative pain following endodontic treatment, such as root canal therapy, is not uncommon, but it can vary widely from person to person. The present study was conducted to assess efficacy of laser irradiation in controlling postoperative pain following chemomechanical preparation of teeth.

Materials & Methods: 40 patients with apical periodontitis in single-rooted nonvital teeth of both genders were divided into 2 groups of 20 each. In group I, chemomechanical preparation followed by mock laser therapy was carried out in which laser tip was applied but not activated. In group II, chemomechanical preparation followed by a laser irradiation was applied and activated. Postoperative pain scores, percussion pain scores and rescue analgesic requirement were recorded.

Results: Out of 40 patients, males were 26 and females were 14. The mean pain score (VAS) at baseline in group I was 6.9 and in group II was 7.2, at 24 hours in group I was 4.6 and in group II was 4.2, at 48 hours in group I was 3.7 and in group II was 1.3 and at 72 hours in group I was 2.4 and in group II was 1.3. The difference was significant ($P < 0.05$). Percussion pain score (VAS) was 5.3 in group I and 2.8 in group II. Rescue medication requirement was seen in 12 patients in group I and 5 patients in group II. The difference was significant ($P < 0.05$).

Conclusion: During standard chemomechanical methods, intracanal laser irradiation with a diode laser can effectively minimize discomfort and improve patient comfort during endodontic treatment.

Keywords: endodontic treatment, Percussion, Postoperative pain

Introduction

Postoperative pain following endodontic treatment, such as root canal therapy, is not uncommon, but it can vary widely from person to person. Some individuals may experience minimal discomfort, while others may have more significant pain or sensitivity. The level of pain can depend on factors such as the extent of the initial infection or inflammation, the complexity of the procedure, and the individual's pain tolerance.¹

Inflammation in the surrounding tissues can cause pain and discomfort after the procedure. This inflammation is often a natural response to the trauma of the treatment and the presence of residual bacteria or irritants in the root canal system.² During root canal treatment, cleaning and shaping of the root canal system may cause irritation to the periapical tissues (tissues surrounding the tooth's root).³ This irritation can lead to postoperative pain. Diode lasers have gained popularity in dentistry, including in endodontic procedures, due to their precision, versatility, and potential to reduce postoperative pain and inflammation.⁴ Diode lasers can be utilized for adjunctive disinfection of the root canal system during endodontic treatment. By delivering energy in the form of laser light, diode lasers can penetrate deep into the dentinal tubules and help eliminate bacteria, fungi, and other microorganisms that may contribute to postoperative pain and inflammation.⁵ Improved disinfection can promote better healing and reduce the risk of postoperative complications. By reducing PGE2, bradykinin, acetylcholine, histamine, serotonin, and substance P, diode laser reduced pain and inflammation.⁶ It is still unclear if laser therapy can effectively reduce postoperative pain following endodontic treatment, despite studies that have been conducted to assess postoperative endodontic pain using lasers.⁷ The present study was conducted to assess efficacy of laser irradiation in controlling postoperative pain following chemomechanical preparation of teeth.

Materials & Methods

The present study consisted of 40 patients with apical periodontitis in single-rooted nonvital teeth of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. Patients were divided into 2 groups of 20 each. In group I, chemomechanical preparation followed by mock laser therapy was carried out in which laser tip was applied but not activated. In group II, chemomechanical preparation followed by a laser irradiation was applied and activated. Postoperative pain scores were evaluated at baseline, 24 hours, 48 hours, and 72 hours using the Visual Analog Scale. Percussion pain scores and rescue analgesic requirement were also recorded. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

Results

Table I Distribution of patients

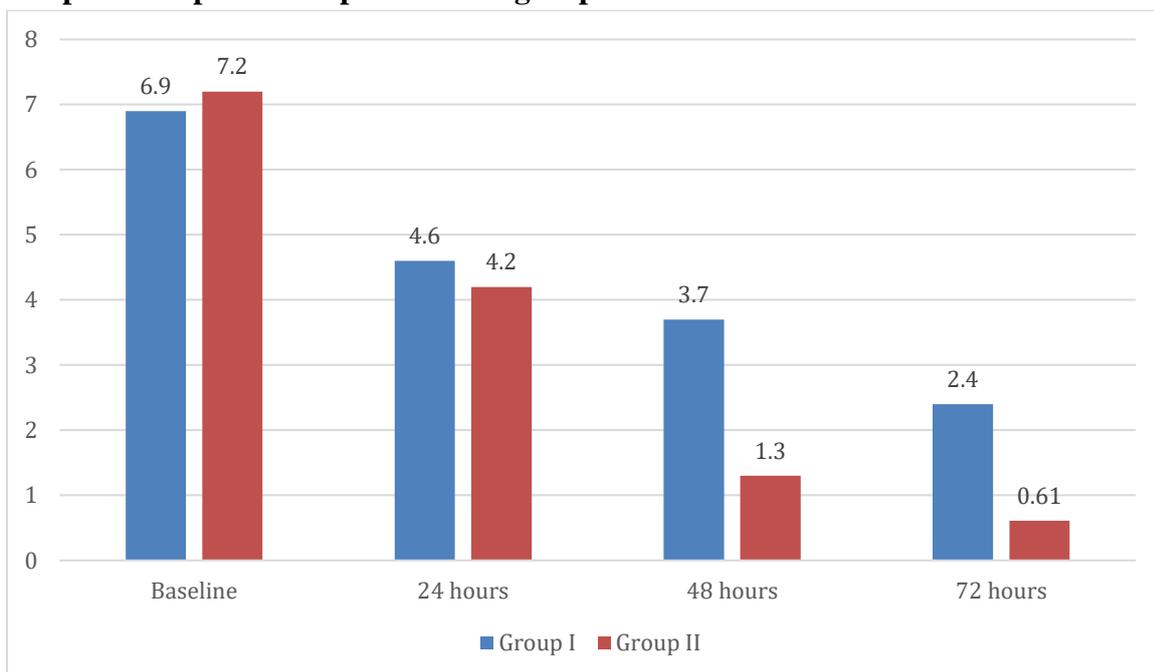
	Total- 40	
Gender	Male	Female
Number	26	14

Table I shows that out of 40 patients, males were 26 and females were 14.

Table II Comparison of pain in both groups

Period	Group I	Group II	P value
Baseline	6.9	7.2	0.83
24 hours	4.6	4.2	0.92
48 hours	3.7	1.3	0.01
72 hours	2.4	0.61	0.02

Table II, graph I shows that mean pain score (VAS) at baseline in group I was 6.9 and in group II was 7.2, at 24 hours in group I was 4.6 and in group II was 4.2, at 48 hours in group I was 3.7 and in group II was 1.3 and at 72 hours in group I was 2.4 and in group II was 1.3. The difference was significant ($P < 0.05$).

Graph I Comparison of pain in both groups**Table III Comparison of percussion pain scores and rescue medication requirement**

Parameters	Group I	Group II	P value
percussion pain score (VAS)	5.3	2.8	0.02
rescue medication requirement	12	5	0.01

Table III shows that percussion pain score (VAS) was 5.3 in group I and 2.8 in group II. Rescue medication requirement was seen in 12 patients in group I and 5 patients in group II. The difference was significant ($P < 0.05$).

Discussion

Diode lasers have been shown to have biostimulatory effects on tissues, promoting cellular repair, regeneration, and healing.⁸ After completion of endodontic treatment, diode lasers can be used to irradiate the periapical tissues surrounding the treated tooth, potentially accelerating the healing process and reducing postoperative pain and discomfort. This biostimulatory effect may also help mitigate inflammation and enhance tissue repair.^{9,10} Diode lasers can be

employed for desensitization of dentin surfaces and periapical tissues, which may help alleviate postoperative sensitivity and discomfort.¹¹ By selectively targeting and sealing off dentinal tubules, diode lasers can reduce dentin permeability and hypersensitivity, providing patients with greater comfort and improved quality of life following endodontic procedures.¹² The present study was conducted to assess efficacy of laser irradiation in controlling postoperative pain following chemomechanical preparation of teeth.

We found that out of 40 patients, males were 26 and females were 14. Rao et al¹³ compared postoperative pain after chemomechanical preparation with placebo and laser irradiation in nonvital teeth having symptomatic apical periodontitis in sixty (n = 30) participants. In group 1, chemomechanical preparation followed by mock laser therapy was carried and in group 2, chemomechanical preparation followed by a laser irradiation was applied and activated. Postoperative pain scores, Preoperative and postoperative percussion pain scores were recorded. There was significant reduction in pain scores in the laser group as compared to placebo group at all time points. There was also significant difference in the preoperative and postoperative percussion pain scores. 9 and 3 subjects required rescue medication in Groups 1 and 2, respectively.

We found that mean pain score (VAS) at baseline in group I was 6.9 and in group II was 7.2, at 24 hours in group I was 4.6 and in group II was 4.2, at 48 hours in group I was 3.7 and in group II was 1.3 and at 72 hours in group I was 2.4 and in group II was 1.3. We found that percussion pain score (VAS) was 5.3 in group I and 2.8 in group II. Rescue medication requirement was seen in 12 patients in group I and 5 patients in group II. Wang et al¹⁴ in their study sixty-six extracted human single-rooted teeth were instrumented up to size 60 K-file, and then randomly divided into three groups of 22 teeth each. Groups 1 and 2 were irradiated with a diode laser at 5 W for 7 sec using fibers of diameters 550 and 365 microm, respectively. Group 3 was not irradiated, and served as a control. The rise in temperature on root surfaces of the teeth in groups 1 and 2 were measured by thermography. Six teeth in each group were bisected longitudinally and observed morphologically. Other teeth were obturated and immersed in rhodamine B solution, and the degree of apical leakage was evaluated longitudinally and transversally. A maximum temperature rise of 8.1(degrees)C was recorded in group 1. The smear layer in the laser-treated groups was evaporated and removed, resulting in clean root canal walls, which was significantly superior to the control group ($p < 0.05$). After obturation, the laser-treated groups showed significantly less apical leakage than the control group ($p < 0.05$).

Conclusion

Authors found that during standard chemomechanical methods, intracanal laser irradiation with a diode laser can effectively minimize discomfort and improve patient comfort during endodontic treatment.

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