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Effect of low-intensity laser treatment on pain after extraction of impacted mandibular third molars: a randomised, controlled, clinical trial

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Abstract

Extraction of impacted third molars is painful, so we have evaluated whether low-intensity laser could reduce the pain. Sixty patients were randomly allocated to five groups that were treated with laser immediately after extraction. Postoperative pain was evaluated after two and seven days. The Shapiro-Wilk test was used to assess whether the distribution was normal, and as it was skewed, the Kruskal-Wallis test, ANOVA and the Student-Newman-Keuls test for multiple comparisons were used to compare the groups. The Wilcoxon test was used for comparisons of pain (measured by visual analogue scale (VAS) and numerical rating scale (NRS) 101 between the second and seventh postoperative days). Probabilities of less than 0.05 were accepted as significant. We conclude that a single session of low intensity laser had no significant effect on the amount of pain under the conditions investigated.

Keywords: Laser; inflammation; healing; tooth extraction; randomized clinical trial

Introduction

The extraction of impacted third molars is one of the most common operations in dentistry, and is painful.[1–3] Corticoids and non-steroidal anti-inflammatory drugs are often prescribed after extraction, but some have side effects such as gastrointestinal problems and allergic reactions, which has led to the search for a viable alternative.[2–5]

Treatment with low-intensity laser is able to modulate the inflammatory response of injured tissues without side effects.[1,4,6] While its exact analgesic mechanism has not yet been fully clarified, the reduction of pain is thought to be related to changes in the synthesis, release, and metabolism of substances such as serotonin and acetylcholine centrally as well as the modulation of inflammation locally with action on mediators, such as histamine and prostaglandins.[2,7–9] Laser also induces analgesia by stimulating the synthesis of endogenous endorphins (β-endorphin), diminishing the activity of type C nerve fibres and bradykinin, and altering the threshold of perception of pain.[2,7–11]

Although research workers have faith in the effects of laser on postoperative inflammation, the lack of standardisation

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Table 1
Details of groups studied.

Group	Number	Wavelength (nm)	Route
1	10	660	Intraoral
2	10	808	Intraoral
3	10	660	Extraoral
4	10	808	Extraoral
5	20	None	Controls

Table 2
Radiometric and spectral measures of laser treatment.

Variable	Red laser	Infrared laser
Centre wavelength (nm)	652	808
Spectral band width (FWHM) (nm)	5	2.6
Operating mode	Continuous wave	Continuous wave
Radiation power (mW)	100	100
Polarisation	Random	Random
Diameter of aperture (cm)	0.094	0.094
Irradiance at aperture (mW/cm^2)	3537	3537
Beam profile	Multimode	Multimode
Size of beam spot at target (mW/cm^2)	0.02827	0.02827
Irradiance at target (mW/cm^2)	3537	3537
Duration of exposure (seconds)	30	30
Radiant exposure (J/cm^2)	106	106
Radiant energy (J)	3	3
Number of points irradiated	4	4
Area irradiated (cm^2)	0.113	0.113
Technique of application	Contact	Contact
Number of sessions	1	1
Total radiant energy (J)	12	12

of the sample, methods, and radiance in studies hinders the assessment of the actual effects of the treatment.[1,5] In a recent systematic review of the effects of low-intensity laser after the extraction of impacted mandibular third molars, the authors stated that the standardisation of methods and doses is essential to the proper evaluation of the outcomes, and that there is as yet no scientific evidence to confirm that low-intensity laser is capable of reducing the pain, swelling, and muscle spasm that follows this procedure.[1]

The visual analogue scale (VAS) and the numerical rating scale (NRS) 101 are often used to assess pain, the VAS being more often used to measure postoperative pain after extraction of third molars.[1,3,12–14] However, the NRS 101 may be more useful,[3,15] because it is easier to use either written or orally, and printed copies of the VAS must be exactly the same size (10 cm) as it measures pain as 0 = no pain, and 10 = the worst pain imaginable.[16,17]

The aim of the present study was to evaluate the effects of low-intensity laser on pain after the extraction of impacted third molars using the VAS and NRS 101.

Patients and methods

We organized a randomised, controlled, double-blind, clinical trial, the complete protocol for which has recently been published.[17] This study has received approval from de UNINOVE Human Research Ethics Committee (protocol number 15410 and 34248) and is registered with both the World Health Organization (Universal Trial Number U1111-1129-9338) and Brazilian Registry of Clinical Trials (RBR-6XSB5H). Sixty patients who required extraction of mandibular third molars were randomly allocated (using raffle numbers) to five groups immediately after the extraction (Table 1). Table 2 shows the dosimetric variables used to maintain a total radiant energy of 12 J[3,15,17–20] and a radiant power of 100 mW[12,17,19,20] based on a review of previous publications.

Intraoral radiance[17] was applied by positioning the tip of the laser directly in contact with four points (30 seconds/point) in the area of the surgical field: first, in the region of the sutures (middle of the bone),[13,17] secondly, on the cervical third of the lingual face, thirdly, on the middle third of the lingual face, and lastly, on the apical third of the lingual face. Extraoral radiance[17] was applied by positioning the tip of the laser in contact with the skin at four points (30 seconds/point) on the masseter muscle:[17,20] first, in the inferior region near the mandibular insertion, secondly, in the middle inferior region, thirdly, in the middle superior region, and lastly, in the superior region near the insertion of the zygomatic arch. Placebo radiance was applied at the same sites.[17]

A single examiner made the preoperative evaluation and gave the laser treatment. The teeth were extracted by two specialists. The patients were unaware of whether or not they were being given laser treatment, as the laser operator positioned the tip on all introral and extraoral points in all patients and the same sound was emitted from the device whether it was in active or placebo mode. All patients used protective eyewear.[17]

After two and seven days the patients were evaluated by two raters (after a calibration exercise) for the measurement of postoperative pain.[17] Both raters were unaware of the allocation of the patients to the different groups. Factors related to the extraction, patients, and calibration of the examiners were also evaluated to assess possible influences on the outcome. The following factors relating to the extraction were analysed: position of impacted tooth (Winter and Pell & Gregory scales), degree of surgical difficulty (Prant scale modified by Amarillas-Escobar),[12] number of cartridges of anaesthetic used, bleeding during extraction and suturing, duration of operation, coincidence/non-coincidence between surgeon's dominant hand and the side of the patient being operated on, development of haematoma or ecchymosis, and number of days that analgesic was required.[12,21–24] Agreement between the raters was evaluated using the intraclass correlation coefficient.[17,25]