Efficacy of adjuvant laser therapy in reducing postsurgical complications after the removal of impacted mandibular third molars

A systematic review update and meta-analysis

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ABSTRACT

Background. The authors updated a previously published systematic review to assess the effects of low-level laser therapy (LLLT) on reducing complications after the removal of impacted mandibular third molars.

Types of Studies Reviewed. The authors searched for randomized clinical trials in which the investigators evaluated the efficacy of LLLT compared with that of placebo or no treatment. Two reviewers independently screened studies, extracted data, and assessed risk of bias. The authors used random effects model meta-analysis and the Grading of Recommendations Assessment, Development and Evaluation approach to rate the certainty of evidence.

Results. The authors included 21 studies. There was low-certainty evidence that LLLT results in less pain at 2 days after surgery (mean difference [MD], −1.42 on a 10 point scale; 95% confidence interval [CI], −2.18 to −0.67) and moderate certainty that it results in negligibly less pain at 7 days (MD, −0.59; 95% CI, −0.96 to −0.22); moderate-certainty evidence that LLLT has a negligible benefit on reducing trismus at 2 days (MD, −3.42 millimeters; 95% CI, −5.34 to −1.50) and at 7 days after surgery (MD, −2.30 mm; 95% CI, −3.96 to −0.64); lastly, there was moderate-certainty evidence that LLLT results in less postoperative swelling at 2 days (standardized MD, −0.82; 95% CI, −1.28 to −0.35) and low-certainty evidence that LLLT results in negligibly less postoperative swelling at 7 days after surgery (standardized MD, −0.17; 95% CI, −0.4 to 0.07). Low-quality evidence suggests that LLLT will not cause adverse effects.

Conclusions and Practical Implications. LLLT probably has negligible benefits but may not result in adverse events. Evidence does not support the use of LLLT in clinical practice to reduce complications after impacted mandibular third-molar surgical extractions.

Key Words. Impacted mandibular third molar; systematic review; postsurgical complications; pain; swelling; trismus.

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The removal of impacted mandibular third molars (IMTMs) is globally the most commonly performed surgical procedure in oral and maxillofacial surgery.[1,2] The most frequently reported complications associated with the surgical removal of IMTMs include postoperative pain, swelling, and trismus, and other rare adverse outcomes may include sensory nerve injury, alveolar osteitis, mandibular fractures, or infections.[3,4] Although IMTM surgical removal can cause patients a great deal of discomfort, particularly within the first week after surgery, researchers and oral surgeons have not yet reached consensus on which is the best perioperative treatment to minimize these complications.[5-12] A variety of perioperative actions are used in clinical practice to lessen the common complications after IMTM

Supplemental material is available online.

surgical extraction, and they range from premedication to different surgical techniques, postoperative actions, and recommendations for postoperative management. Investigators have reviewed thoroughly the effectiveness of corticosteroids[7,13] and nonsteroidal anti-inflammatory drugs,[5,12,14,15] and they have clear implications for reducing complications after IMTM surgical removal.

Adjunctive laser therapy can be applied intra- or extraorally at varied doses, wavelengths, and frequencies to initiate different biostimulatory, anti-inflammatory, and ablation effects.[16] Given laser therapy's potential benefits in creating an analgesic effect and stimulating wound regeneration,[17,18] investigators have studied many applications of low-level laser therapy (LLLT) in dentistry and oral surgery. Investigators have proposed laser therapy as an option for treating a wide array of syndromes and diseases, ranging from dentin hypersensitivity[19-23] to oral mucositis,[24,25] and they also have explored its indications for minimizing complications after surgical extraction of IMTMs.

Although investigators have studied the administration of adjuvant laser therapy after surgical IMTM removal in 2 previous systematic reviews,[26,27] the results have been variable. Therefore, there is no clear consensus about whether adjunctive laser therapy is effective in minimizing commonly experienced postsurgical complications such as pain, swelling, and trismus.

In the first systematic review, published in 2012,[27] we examined the effect of LLLT on reducing the most common complications after IMTM surgical removal, and we concluded there was not enough evidence to support the use of laser therapy over no active treatment on the basis of the certainty in the evidence included in the review. In this review, we stressed the need to conduct well-designed studies to reach a definitive conclusion about the effects of LLLT. The authors of a 2015 systematic review[26] found LLLT effective in reducing pain, swelling, and trismus compared with results with placebo laser irradiation in the first 3 days postoperatively. This review, however, has some methodological limitations. Although the authors of these 2 previous reviews[26,27] have summarized systematically the effects of LLLT on postoperative complications after IMTM removal, the authors of both reviews noted that poor methodological and reporting quality of randomized clinical trials (RCTs) in this area has resulted in low certainty in the evidence and a high degree of uncertainty about whether LLLT is an effective and safe treatment modality. In addition, since the publication of these past reviews,[26,27] investigators in a number of RCTs published in 2016 have evaluated the effectiveness of LLLT on reducing postsurgical complications after IMTM extraction,[28-32] warranting a systematic review update. Our aim in this study was to update a systematic review published by our team in 2012[27] and evaluate the effects of LLLT for reducing postoperative complications in patients undergoing surgical removal of IMTMs.

METHODS

We performed this review update in accordance with the methods outlined in the initial review[27] and followed the previously developed protocol. Several authors from the first systematic review, including content experts and methodologists, assisted in the review update. This review is reported according to the guidelines from the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement.[33,34]

Eligibility criteria. We included RCTs in which the investigators compared the effects of LLLT with the effects of placebo or no treatment for reducing the severity of postsurgical complications after IMTM removal, with a minimum follow-up of 24 hours. The intervention of interest was the administration of any regimen of LLLT after the surgical removal of IMTMs. We used the same definition of LLLT outlined in the first review: irradiation intensity low enough that its effects result from direct irradiation rather than heating.[35] We included all trials in which the investigators reported results of any of the outcomes of interest: pain, swelling, trismus, and adverse effects. We placed no restrictions on patients' characteristics, type or regimen of laser treatment, or methods used to measure outcomes of interest. We excluded studies that involved only simple third-molar removal[36] and those in which the investigators compared different laser therapies without a placebo arm.[37]

Literature search. We duplicated the search strategy outlined in the first systematic review.[27] We searched MEDLINE, Embase, and the Cochrane Central Register of Controlled Trials (Appendix 1, available online at the end of this article). We searched ongoing trials by using free-text terms in the World Health Organization International Clinical Trials Registry Platform, ClinicalTrials.gov, and the National Institutes of Health clinical trials registries. We also searched the online databases of oral and maxillofacial surgery journals as we had in the initial systematic review search strategy.[27] We performed all searches from January 1, 2011, the date of the last search of the first systematic review, to February 10, 2017. We updated the searches before submitting this review for publication in May 2017. We scanned reference lists of relevant articles to search for other potentially eligible studies, as well as online abstract indexes of the conference proceedings from the American Association of Oral and Maxillofacial Surgeons and the International Association for Dental Research annual meetings. We also searched for grey literature by using the first 300 hits in Google Scholar and Open Grey. We placed no restrictions on language or publication status.

ABBREVIATION KEY. **APDT:** Antimicrobial photodynamic therapy. **GRADE:** Grading of Recommendations Assessment, Development and Evaluation. **IMTM:** Impacted mandibular third molar. **LLLT:** Low-level laser therapy. **RCT:** Randomized clinical trial. **VAS:** Visual analog scale.