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INPLASY

Postoperative Pain and Wound Healing Following Pediatric Oral Soft-Tissue Surgery: A Network Meta-Analysis of Scalpel and Energy-Based Techniques

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ADMINISTRATIVE INFORMATION

Support - King Khalid University.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 20 January 2026 and was last updated on 20 January 2026.

INTRODUCTION

Review question / Objective In pediatric patients undergoing oral soft-tissue surgery, how do scalpel and energy-based surgical techniques (laser and electrosurgery) compare in terms of postoperative pain and wound healing?

Rationale Conventional scalpel surgery and energy-based techniques are widely used for pediatric oral soft-tissue procedures, but their relative effectiveness for postoperative pain and wound healing remains unclear. Network meta-analysis enables simultaneous comparison and ranking of these techniques to support evidence-based clinical decision-making.

Condition being studied Pediatric oral soft-tissue surgical procedures, including frenectomy, frenotomy, and gingivectomy, performed to correct functional or developmental abnormalities affecting feeding, speech, oral hygiene, and oral development.

METHODS

Search strategy Search terms combined keywords and controlled vocabulary related to pediatric populations, oral soft-tissue surgery, surgical techniques, and outcomes. Key terms included: pediatric, oral soft-tissue surgery, frenectomy, frenotomy, gingivectomy, scalpel, laser, diode laser, CO_2 laser, Nd:YAG laser, electrosurgery, postoperative pain, and wound healing.

Participant or population Infants, children, and adolescents (≤18 years) undergoing oral soft-tissue surgical procedures.
Studies including young adults were considered only when procedures, anatomical context, and

outcome measures were directly transferable to pediatric oral soft-tissue surgery and were required to preserve network connectivity.

Intervention Energy-based soft-tissue management techniques, including:
Diode laser
CO_2 laser
Nd:YAG laser
Electrosurgery.

Comparator Conventional scalpel surgery and other eligible energy-based soft-tissue techniques.

Study designs to be included Randomized controlled trials (RCTs) and prospective comparative clinical studies.Retrospective studies were generally excluded; however, selected retrospective studies were included when necessary to preserve network connectivity and when methodological quality was acceptable.

Eligibility criteria Randomized controlled trials and prospective comparative studies involving pediatric patients (≤18 years) undergoing oral soft-tissue surgery (frenectomy, frenotomy, gingivectomy) comparing scalpel and/or energy-based techniques (laser or electrosurgery) and reporting postoperative pain and/or wound healing outcomes.

Information sources PubMed (MEDLINE), Scopus, Web of Science, ScienceDirect, and the Cochrane Central Register of Controlled Trials were searched from inception to December 2025, with manual screening of reference lists.

Main outcome(s) Postoperative pain, assessed using validated pain scales (e.g., Visual Analogue Scale, Wong–Baker Faces Scale, or equivalent).
Wound healing, assessed using clinical healing indices, healing time, or standardized postoperative healing scores.

Additional outcome(s) None.

Data management Extracted data included study characteristics, participant demographics, surgical indications, intervention details, outcome measures, and quantitative outcome data.

Quality assessment / Risk of bias analysis Randomized controlled trials were assessed using the Cochrane Risk of Bias 2 (RoB 2) tool.
Non-randomized studies were assessed using the ROBINS-I tool.

Strategy of data synthesis Both frequentist and Bayesian frameworks were applied. Treatment effects were expressed as standardized mean differences with corresponding 95% confidence or credible intervals.
Treatment ranking was performed using surface under the cumulative ranking curve (SUCRA) values.

Subgroup analysis No formal subgroup analyses were planned.

Sensitivity analysis Sensitivity analyses were performed using alternative statistical frameworks (frequentist and Bayesian) to assess robustness of findings.

Language restriction Only English articles were included.

Country(ies) involved Saudi Arabia, Usa, Armenia.

Other relevant information None

Keywords Pediatric oral surgery; Soft-tissue surgery; Laser surgery; Electrosurgery; Network meta-analysis; Postoperative pain; Wound healing.

Dissemination plans Results will be submitted for publication in a peer-reviewed international dental journal and presented at relevant academic and clinical conferences.

Contributions of each author
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