BULLETIN OF STOMATOLOGY AND MAXILLOFACIAL SURGERY
Volume 21, Issue 4

DOI: 10.58240/1829006X-2025.21.4-179

REVIEW ARTICLE

# THE EFFICACY OF LASER THERAPY IN LABIAL FRENULECTOMY COMPARED WITH CONVETIONAL SURGERY IN CHILDREN AND ADOLESCENTS: A SYSTEMATIC REVIEW

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***Received:*** *Apr 5, 2025;* ***Accepted:*** *Apr. 30, 2025;* ***Published:*** *May. 15,2025*

**Background:** Labial frenulectomy is one of the frequently utilized procedures to treat complications from a tight or projecting labial frenulum that can hinder speech, oral hygiene, or orthodontic care. The surgery has traditionally used a scalpel. But laser therapy has emerged in popularity because of its minimally invasive character and enhanced patient comfort. This review discusses the comparison between laser therapy and the traditional method of surgery with regard to clinical outcome and patient satisfaction.
**Methods:** A thorough search was conducted using three major databases PubMed, Scopus, and Web of Science to identify studies that compared laser-assisted and traditional surgical approaches for labial frenulectomy. The review focused on differences in pain levels, bleeding, healing duration, procedure time, and post-surgical complications.
**Results:** Out of a total of 226 studies found in an initial search, 7 were included on the basis of predetermined criteria. The majority of studies included in the reviews stated that laser therapy led to less bleeding, rapid healing, less postoperative discomfort and shorter surgery times. Variability in study design, laser type and the means of evaluating outcomes rendered comparisons difficult.
**Conclusion:** Laser therapy would seem to have a number of advantages over conventional methods of surgery in terms of patient comfort and recovery time. Despite this, current evidence is weak. Stronger, well-conducted studies are required to fully evaluate long-term efficacy and to formalize standardized best practice.

***Keywords:*** labial frenulectomy, laser surgery, conventional surgery, systematic review, oral surgery, wound healing.

## INTRODUCTION

The labial frenulum, so frequently a small, forgotten anatomical feature, may exert a surprisingly decisive effect upon both function and aesthetics in the mouth. Bounded between the inside of the upper lip and the middle incisors' gingiva, this tissue fold can, when abnormally attached, obstruct speech, feeding, hygiene, stability in the area after orthodontics, as well as facial harmony.[1-6] High or thick labial frenal attachments in children or adolescents who are having orthodontic treatment can be more than clinically consequential, but can interfere with self-esteem, habits, and everyday living. A frenectomy, in these instances, is usually the surgery advised, but one intended not so much to treat, but rather to relieve the limitation in function.[7-9]

Historically, a traditional scalpel technique has been used for frenectomy. This technique, while more traditional in use, has some disadvantages. Scalpel surgery is linked with higher intraoperative bleeding, sutures required, healing time, and discomfort in the postoperative period. In pediatric cases in particular, the apprehension of undergoing such procedures is rather high, further bringing into relief the necessity of methods that are pain-reducing, traumatic, and timesaving during recovery.[10-12]

Over the last decades, laser technology has presented a promising alternative to the use of traditional methods involving a scalpel. $CO_2$ lasers[13], diode lasers[14], Er:YAG, and Nd:YAG lasers[15] are among the most frequently used lasers in frenectomy procedures, each possessing distinct properties and attributes. Several studies have identified laser-assisted frenectomy as resulting in less bleeding, shorter surgery time, less suture requirements, less postoperative pain, and faster healing.[16,17] This has inspired increasing enthusiasm among clinicians for the use of laser therapy in regular practice for soft tissue oral surgery.

One of the most immediate, if not the earliest, advantages of laser surgery in the use of soft tissue is the precision of cutting with the immediate cauterization of blood vessels, decreasing bleeding a great deal, as well as improving visualization for the clinician. In labial frenectomy, this is especially valuable in light of the vascular nature of the labial frenum, as well as the problem of operating within a small area, in the younger child. A randomized controlled trial by Xie et al. made a comparison between laser (dual wavelengths, Er:YAG, Nd:YAG) use and traditional use of a scalpel in 34 children. In their study, they reported reduced time of surgery, together with decreased intraoperative and postoperative discomfort in the laser treatment. Patients who received laser frenectomy experienced less discomfort during and after the surgery, as well as improved chewing, speaking, and scar formation at follow-up.[18]

In a randomized clinical trial conducted by Sarmadi et al., the efficacy of the Er:YAG laser was compared to that of the conventional scalpel technique in patients aged 7 to 19 years. The outcomes were consistent with prior evidence, demonstrating that laser-assisted frenectomy resulted in significantly reduced intraoperative bleeding and shorter procedural duration. Notably, although the immediate postoperative wound area appeared larger in the laser group, this difference resolved rapidly, with no discernible discrepancy between groups by postoperative day five. Both groups reported high levels of patient satisfaction; however, the laser technique was particularly favored due to its procedural efficiency and minimally invasive nature.[19]

Yadav et al. provided additional insights by comparing the Nd:YAG laser technique with the conventional scalpel method in adult patients. Their findings were consistent with outcomes reported in pediatric populations, demonstrating that laser-assisted procedures were associated with reduced intraoperative bleeding, lower postoperative pain scores, decreased need for analgesics, and accelerated wound healing. A particularly noteworthy aspect of their study was the emphasis on patient-centered outcomes; individuals treated with the Nd:YAG laser frequently did not require sutures or periodontal dressings, highlighting an important advantage in terms of postoperative comfort and clinical efficiency.[20]

Extending the scope of investigation, Ginini et al. explored the parental perspective in a cohort study involving preschool-aged children undergoing frenectomy performed with either a $CO_2$ laser or a traditional scalpel. Utilizing a mobile application to systematically record pain levels, parental satisfaction, and perceived clinical improvement over a one-month follow-up period, the study revealed that although children in the scalpel group reported lower immediate postoperative pain scores, the laser group was associated with significantly higher levels of parental satisfaction and perceived long-term improvement. These findings suggest that despite potentially greater initial discomfort, laser-assisted frenectomy may offer superior long-term outcomes and reduced complication rates from the caregivers' standpoint.[21] Sobouti et al. conducted a comprehensive investigation into the impact of laser wavelength on

clinical outcomes, comparing two diode lasers 445 nm (blue light) and 980 nm (infrared) with the conventional scalpel technique. In a robust study involving 174 patients, both laser modalities demonstrated superior results relative to the scalpel group in terms of intraoperative bleeding, patient discomfort, postoperative pain, and healing progression. Notably, the 445 nm diode laser outperformed the 980 nm variant, underscoring the critical role of wavelength selection in optimizing laser-assisted surgical outcomes. This type of intra-technology comparison is essential for clinicians aiming to refine their procedural techniques and make informed decisions regarding equipment acquisition.[22]

The collective analysis of existing literature clearly demonstrates that laser therapy, in its various modalities, provides a range of tangible advantages over conventional scalpel-based frenectomy. These benefits include reduced intraoperative bleeding, shorter procedure duration, accelerated postoperative healing, and decreased need for sutures. For pediatric patients, these outcomes translate into diminished procedural anxiety and fear, whereas adult populations benefit from reduced postoperative discomfort and minimal downtime. From the clinician's standpoint, improved surgical visibility, enhanced patient satisfaction, and greater procedural efficiency are notable strengths.[23]

Nevertheless, despite the growing body of positive evidence, several methodological inconsistencies across studies limit the generalizability of conclusions. Heterogeneity in study designs, patient demographics, and outcome measures poses significant challenges. Some investigations rely heavily on subjective metrics such as Visual Analog Scale (VAS) scores for pain, while others emphasize objective parameters like blood loss volume and operative time. Moreover, the diversity in laser types, wavelengths, and surgical protocols complicates direct comparisons. Critically, long-term outcomes such as relapse rates or post-frenectomy orthodontic stability, remain insufficiently explored in the current literature. It is also essential to acknowledge the limitations inherent to laser therapy. High equipment costs, the necessity for specialized training, and safety considerations particularly in pediatric settings must be carefully weighed prior to widespread clinical implementation. Not all dental or surgical practices may possess the infrastructure or expertise required to adopt this technology, and the associated learning curve can be substantial depending on the specific system utilized.[24]

In light of these considerations, the objective of this systematic review is to synthesize current clinical evidence comparing laser-assisted techniques with conventional scalpel-based approaches specifically in the context of labial frenectomy. By analyzing a diverse range of randomized controlled trials and comparative studies across different age groups, geographic regions, and clinical environments, this review aims to determine whether the advantages of laser-assisted procedures are consistent and significant enough to inform future clinical guidelines. Furthermore, by incorporating both clinical outcomes and patient-reported measures such as pain perception and satisfaction, we seek to provide a comprehensive perspective to aid informed decision-making for both clinicians and patients.

Ultimately, while no single technique may be universally optimal, the expanding body of evidence favoring laser-assisted frenectomy supports its consideration as a preferred modality particularly in pediatric dentistry, orthodontic management, and contexts emphasizing patient-centered care. This review aims to consolidate existing data, identify current research gaps, and offer clearer direction for evidence-based clinical practice in the evolving field of soft tissue oral surgery.
The aim of this study was to evaluate the efficacy of laser therapy in labial frenectomy in comparison with conventional surgical methods.

## MATERIAL AND METHODS

*Eligibility criteria*

The studies were selected with the guidance of the PICO framework (Population, Intervention, Comparison, and Outcome).

Population (P): Human studies were taken into account.

Intervention (I): The intervention in question was laser treatment for labial frenectomy.

Comparison (C): The control was traditional surgery methods, e.g., procedures involving a scalpel.

Outcome (O): The main outcome measured was the clinical effect of laser treatment versus traditional surgery for labial frenectomy.

Only studies with documentation of clinical outcomes after labial frenectomy completion were considered. The exclusion criteria were:

(1) patient studies in cases of systemic diseases with the potential to affect healing (for instance, chronic inflammatory or autoimmune disorders);

(2) studies in patients undergoing any other concurrent oral surgery procedures;

(3) lingual frenectomy or other oral frenectomies studies;

(4) individuals with a history of craniofacial syndrome or abnormalities;

(5) studies with removable prosthetic appliances (for example, wearers of a denture);

(6) cross-over study design;

(7) published in a language other than English;

(8) articles with no full text available (e.g., conference proceedings, posters);

(9) animal or in vitro model studies;

(10) reviews, such as systematic reviews, or narrative reviews;

(11) case reports or case series.

*Search strategy*

A detailed search of three digital databases, Web of Science, PubMed, and Scopus, from inception through April 2025 was conducted utilizing the search strategy shown in Table 1. Furthermore, a hand search of the reference lists of studies meeting the selection criteria as well as pertinent systematic reviews was also conducted to find any further candidate articles. The systematic review was performed adhering to the methodological criteria described in the Cochrane Handbook for Systematic Reviews of Interventions and was reported in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020. The review protocol was registered prospectively in the International Prospective Register of Systematic Reviews (PROSPERO), with the number CRD420251025588.

**Table 1.** Search strategy

| |
|---|
| **PubMed** |
| Search: (Labial Frenulum) AND (laser)<br>("labial frenum"[MeSH Terms] OR ("labial"[All Fields] AND "frenum"[All Fields]) OR "labial frenum"[All Fields] OR ("labial"[All Fields] AND "frenulum"[All Fields]) OR "labial frenulum"[All Fields]) AND ("laser s"[All Fields] OR "lasers"[MeSH Terms] OR "lasers"[All Fields] OR "laser"[All Fields] OR "lasered"[All Fields] OR "lasering"[All Fields]) |
| **Scopus** |
| ALL (frenulectomy AND laser) |
| **Web of Science** |
| (ALL=(frenulum surgery)) AND ALL=(laser) |

*Data extraction*

Data extraction from the studies was performed by two independent reviewers (MPS and GM) in a Microsoft Excel spreadsheet specifically tailored for this review. Disagreement between the two reviewers was settled by consulting a third reviewer (MMM) to achieve consensus. The following data were extracted: 1) First author; 2) Year of publication; 3) Nationality; 4) Number of study participants; 5) Treatment tool; 6) Clinical relevance; 7) Age (Table 2).

*Quality assessment*

In this review, the risk of bias was assessed using the RoB 2 tool (Revised Cochrane Risk of Bias Tool for Randomized Trials), as all included studies were randomized controlled trials (RCTs). This validated tool evaluates five domains of potential bias: (1) bias arising from the randomization process, (2) bias due to deviations from intended interventions, (3) bias due to missing outcome data, (4) bias in measurement of the outcome, and (5) bias in selection of the reported result. The use of a standardized tool ensured consistent and rigorous evaluation of methodological quality across all included RCTs.

All studies were independently reviewed by two trained reviewers (MPS and GM). In cases of disagreement, a consensus was reached through discussion. If disagreement persisted, a third reviewer (MMM) provided the final decision. This systematic and standardized approach ensured a transparent and reliable evaluation of methodological quality, strengthening the validity of the review findings.

## RESULTS

*Study characteristics*

226 studies were identified at the end of the research. As illustrated by the PRISMA 2020 flowchart in Figure 1, we chose only 7 studies to draw up the present systematic survey. We excluded 107 articles before the screening: 52 were reviews, 34 were case reports and editorials, and 12 were not in English.The remaining articles (n= 119) were selected for the title and abstract screening to evaluate whether they meet the PICO criteria.16 articles were excluded as duplicates and 99 records were assessed for eligibility. Among these, 92 were excluded: 36 did not respond to PECO, and 56 were off topic. The included studies have been published between 2019 and 2023. A total of 7 studies were included in the review. All studies compared the efficacy of laser therapy in labial frenulectomy compared with conventional surgery. Table 2 summarizes the main characteristics of all the studies included in the present systematic review (as reported in the paragraph data extraction) (Figure 1).

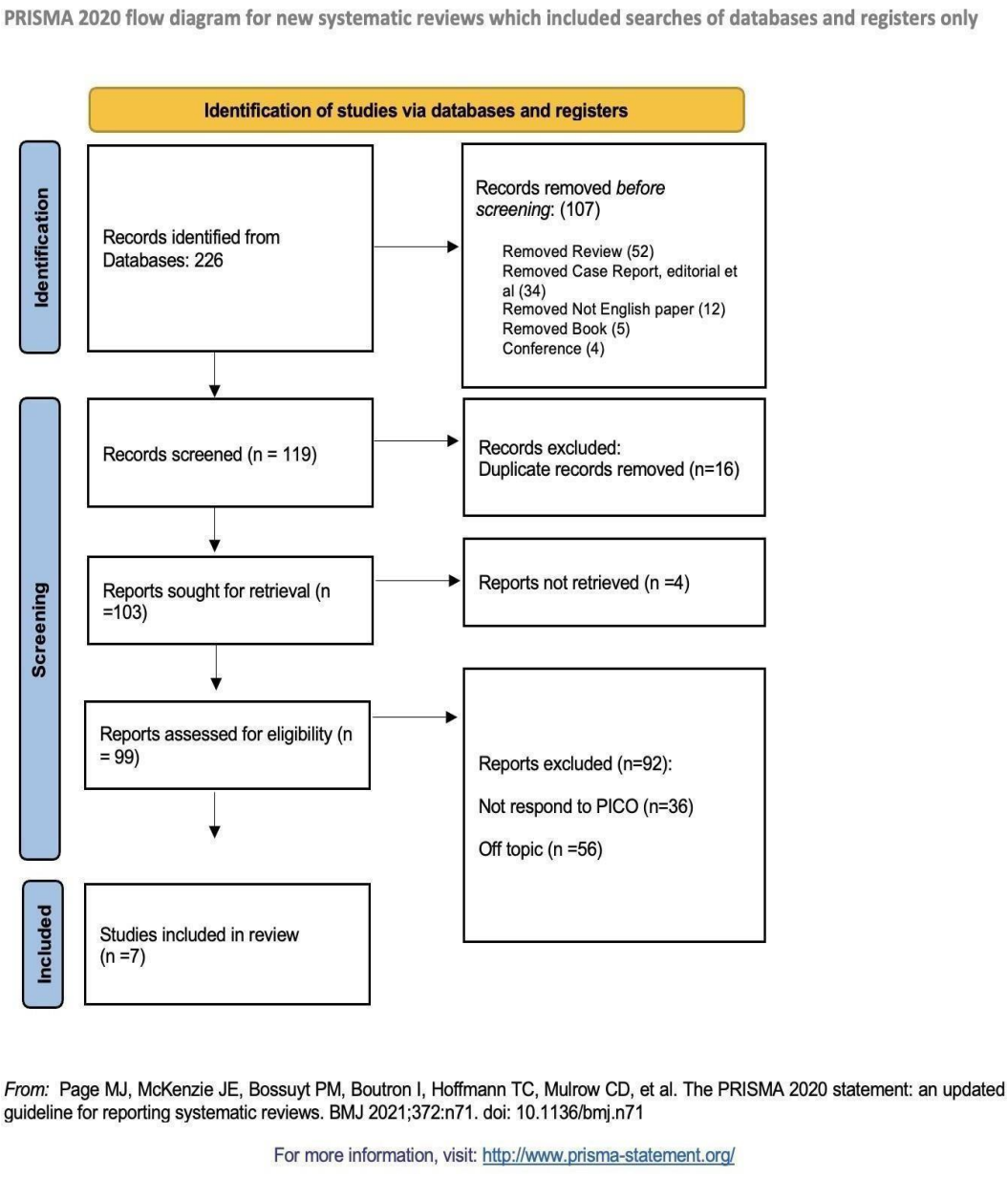


**Figure 1.** PRISMA 2020 Flow Diagram of Study Selection

**Table 2. Data extraction**

| First author | Year of publication | Nationality | Number of study participants | Treatment tool | | Clinical relevance | Age |
|---|---|---|---|---|---|---|---|
| Xie L | 2022 | China | 34 | Er:YAG and Nd:YAG laser vs scalpel | | Laser reduced surgical time, pain, and improved healing | 5-10 |
| Sarmadi R | 2021 | Sweden | 40 | Er:YAG laser vs scalpel | | Laser caused less bleeding and similar satisfaction | 7-19 |
| Ginini JG | 2023 | Israel | 49 | CO2 laser vs scalpel | | Laser gave higher satisfaction despite more initial pain | 2-6 |
| Yadav RK | 2019 | India | 20 | Nd:YAG laser vs scalpel | | Laser showed less pain and bleeding, comparable healing | |
| Sobouti F | 2024 | Iran | 174 | 445 nm & 980 nm diode laser vs scalpel | | 445 nm diode laser had best healing and least pain | Average of 18.6 |
| Calisir M | 2018 | Turkey | 40 | Nd:YAG laser vs scalpel | | Laser provided lower pain and better patient comfort | Average of 22.6 |
| Kara C | 2008 | Turkey | 40 | Nd:YAG laser vs scalpel | | Compared patient perceptions between techniques | Average of 16.45 |

*Main findings*

This systematic review assesses the comparative efficacy of laser-assisted labial frenulectomy versus conventional scalpel surgery, based on data extracted from seven clinical studies. Xie et al. (2022) conducted a randomized clinical trial involving 34 pediatric patients (aged 5–10 years), comparing dual wavelength Er:YAG and Nd:YAG laser techniques to the conventional scalpel method. Laser-assisted frenectomy significantly reduced surgical duration (mean: 224 ± 59 seconds) compared to scalpel surgery (mean: 740 ± 168 seconds). Visual Analog Scale (VAS) pain scores were significantly lower in the laser group during surgery

and on the first postoperative day ($p < 0.05$). By postoperative day seven, no significant differences were observed in pain during chewing or speaking. Healing was complete in all cases, except for one scar formation in the scalpel group.[18]

Sarmadi et al. (2021) performed a randomized, single-blind clinical trial with 40 participants, comparing Er:YAG laser and scalpel techniques. The laser group exhibited significantly reduced intraoperative bleeding (mean gauze weight: 0.16 g vs. 0.44 g, $p < 0.05$) and shorter operative time (mean: 6.7 minutes vs. 10.5 minutes, $p < 0.01$).

Although the laser group presented with a larger wound area immediately postoperatively, no differences in healing were noted by day five. Patient satisfaction was high and comparable between groups.[19]

Ginini et al. (2023) evaluated 49 children (aged 2–6 years) undergoing either labial or lingual frenectomy with $CO_2$ laser or scalpel. While pain levels during the first 72 hours were lower in the scalpel group (mean VAS: 3.6 vs. 4.9), parental satisfaction and perceived improvement at one month were significantly higher in the laser group (mean satisfaction score: 9.1 vs. 7.2, $p < 0.001$).[21]

Yadav et al. (2019) studied 20 adult patients, reporting that Nd:YAG laser frenectomy was associated with significantly reduced intraoperative bleeding ($p = 0.016$), lower pain scores ($p = 0.016$), and a decreased need for analgesics ($p = 0.008$). However, no statistically significant difference in healing was observed at the three-month follow-up ($p = 0.095$).[20]

Sobouti et al. (2024) conducted a large-scale randomized trial with 174 participants, comparing 445 nm and 980 nm diode lasers against scalpel surgery. The 445 nm laser group achieved superior outcomes, including significantly lower pain scores both immediately and on day seven ($p < 0.05$), as well as enhanced tissue healing at days 7 and 30. Both laser groups demonstrated significantly reduced intraoperative bleeding and functional discomfort compared to the scalpel group (all $p < 0.05$).[22]

Calisir and Ege (2018) applied a split-mouth design in 40 patients. Sites treated with Nd:YAG laser reported lower VAS pain scores on the day of surgery and postoperative day one (mean VAS: 2.1 vs. 4.5, $p < 0.05$), along with improved comfort during mastication and speech.[25]

Kara (2008), in a comparative study, observed that Nd:YAG laser-treated patients reported greater postoperative comfort and satisfaction. Although precise VAS scores were not provided, the study emphasized the advantages of improved hemostasis and reduced need for sutures with laser surgery.[26]

Collectively, these findings reinforce the clinical efficacy of laser-assisted frenectomy in reducing surgical duration, intraoperative bleeding, and postoperative pain, while simultaneously enhancing patient satisfaction, particularly among pediatric populations.[27]

*Quality assessment and risk of bias*

Among the included studies, all seven were randomized controlled trials and were evaluated using the RoB 2 (Risk of Bias 2.0) tool. These studies included those conducted by Xie et al. (2022), Sarmadi et al. (2021), Ginini et al. (2023), Yadav et al. (2019), Sobouti et al. (2024), Calisir & Ege (2012), and Kara C. (2008).

Each study was independently reviewed by two assessors, with final judgments made through consensus or, when necessary, adjudication by a third reviewer. As illustrated in Figures 2 and 3, the majority of domains were judged at low risk of bias, with only isolated concerns identified in the randomization and outcome-measurement domains of a few trials. Employing this standardized, validated tool ensured a transparent and reproducible assessment of methodological rigor across all randomized designs (Fig 2,3).

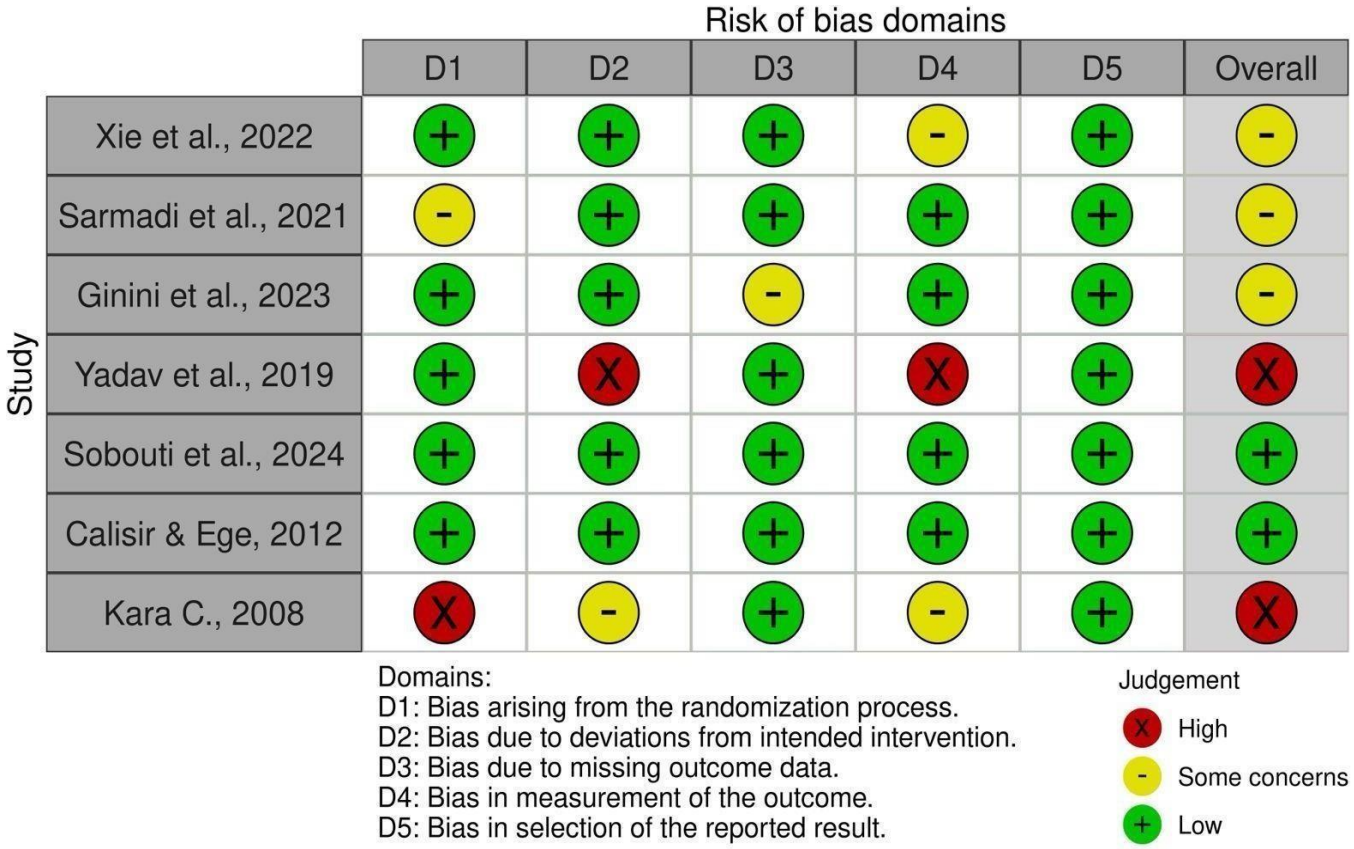


**Figure 2.** RoB 2 Domain-Specific Risk of Bias Judgments for Included Studies

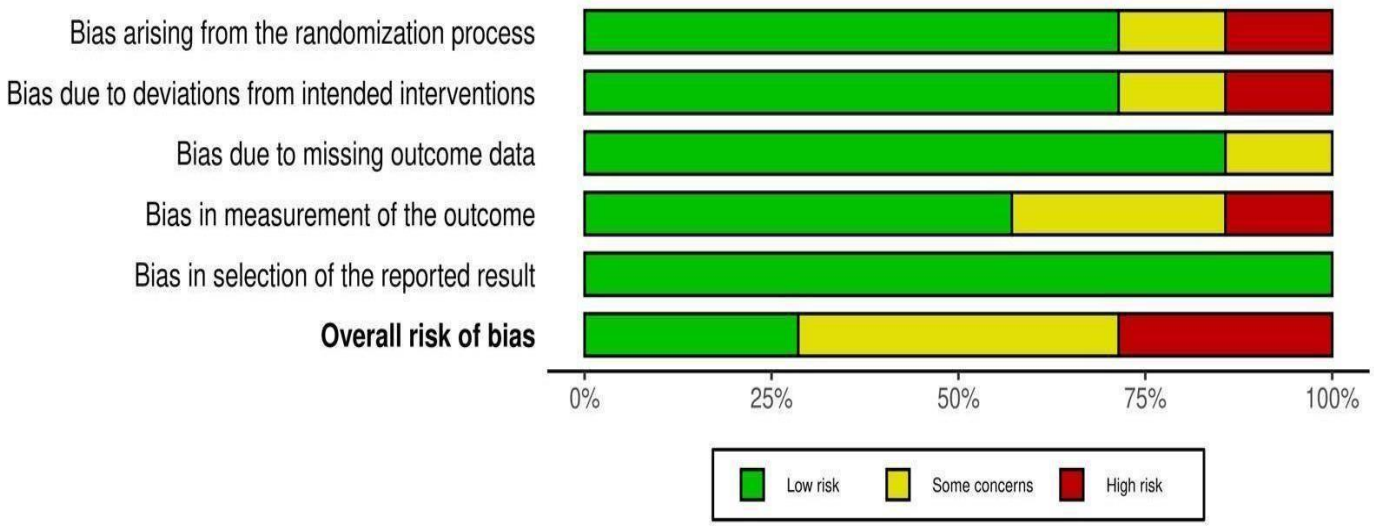


**Figure 3.** Proportion of Studies at Low Risk, Some Concerns, and High Risk by RoB 2 Domain and Overall

## DISCUSSION

This systematic review investigated the clinical effectiveness of laser-assisted labial frenectomy against traditional scalpel surgery, relying purely upon evidence drawn from seven original studies [24]. The evaluation of outcomes measured operative time, bleeding during surgery, postoperative pain, healing, and patient satisfaction show consistent benefit from laser-assisted approaches, especially in pediatric groups.

Ling Xie et al. (2022) reported a randomized clinical trial in 34 age-matched pediatric subjects in the age range of 5–10 years, comparing a dual-wavelength laser treatment (Er:YAG and Nd:YAG) with the control scalpel treatment. The results show quite evidently that laser surgery decreases surgery time remarkably (mean: 224 ± 59 seconds) when compared with the scalpel treatment group (mean: 740 ± 168 seconds). Further, intraoperative pain as well as first postoperative day pain was lower in the laser group ($p < 0.05$). By the seventh postoperative day, no difference existed between groups in terms of pain experienced during mastication or speech. Healing was also consistently achieved, with a solitary instance of scar formation in the control scalpel group. The results indicate that dual-wavelength laser treatment not only streamlines the surgery in terms of efficiency but also minimizes immediate postoperative discomfort (Ling Xie et al., 2022).[18]

In a randomized and single-blinded study similar in design, Sarmadi et al. (2021) contrasted laser surgery with the use of a scalpel in a cohort of 40 patients. They noted a reduced intraoperative bleeding in the laser group by gauze weight (0.16 g for laser vs. 0.44 g for scalpel; $p < 0.05$). In addition, the laser group's mean procedure time was shorter (6.7 minutes vs. 10.5 minutes; $p < 0.01$). A larger wound size was noted postoperatively in the laser group, but this was no longer evident by the fifth postoperative day. Satisfaction was similarly high in both groups, showing that though the laser was better at intraoperative metrics, the overall experience was the same for both treatment modalities (Sarmadi et al., 2021).[19]

The research by Ginini et al. (2023) was centered on 49 pediatric cases (2–6 years of age), evaluating the effect of $CO_2$ laser versus scalpel on pain, satisfaction, and improvement according to the perceptions of parents. Though pain scores in the initial period of 72 hours were noticeably lower in the group treated with a scalpel (mean VAS: 3.6) when contrasted with the laser treatment group (mean VAS: 4.9), parents of laser-operated children were highly satisfied as well as perceived clinical improvement one month after surgery (mean satisfaction score: 9.1 vs. 7.2; $p < 0.001$). The findings emphasize the significance of long-term perceptions as well as functional outcomes in treatment evaluation. The eventual assessment by caregivers was in favor of laser treatment in terms of higher scores for aesthetics and functioning, even though initial pain was relatively more in the laser-operated cases (Ginini et al., 2023).[21]

The results of Yadav et al. (2019) supporting the clinical advantage of laser technology come from a cohort of 20 adult patients. The results showed a statistically significant decrease in intraoperative bleeding ($p = 0.016$), postoperative pain ($p = 0.016$), and the use of analgesics ($p = 0.008$) in the patients undergoing treatment with the use of Nd:YAG laser. The assessment of healing in the three-month follow-up, however, showed no difference between the two groups ($p = 0.095$), indicating that while laser treatment shows clear short-term advantages, the long-term outcomes of tissue healing are no better from those from traditional scalpel methods (Yadav et al., 2019).[20]

The Sobouti et al. (2024) randomized clinical trial stands out in its large sample size of 174 patients and its comparison of 445 nm versus 980 nm diode lasers against traditional scalpel surgery. The most optimal results were demonstrated by the 445 nm diode laser. Patients in this treatment arm showed lower pain scores post-surgery and at day seven ($p < 0.05$), in addition to quicker tissue healing on days 7 and 30. The laser treatment arms also revealed lower intraoperative bleeding and functional discomfort compared to the control scalpel arm (all $p < 0.05$). The 980 nm variant was also superior to the scalpel but inferior to the 445 nm variant. These results highlight the implication of laser wavelength in therapeutic outcomes, with shorter wavelengths bestowing better accuracy and hemostasis in soft tissue surgery (Sobouti et al., 2024).[22]

A valuable one is the split-mouth design study by Calisir and Ege (2018), wherein direct intra-patient comparison was made possible. Frenectomy was performed in forty patients on each side, one with the use of Nd:YAG laser and the other with the traditional use of a scalpel. The pain scores at the time of surgery as well as the first postoperative day were lower in the laser-operated side (mean VAS: 2.1 vs. 4.5; $p < 0.05$). Patients also experienced better chewing and speaking comfort in the laser-operated side.

The intra-subject design enhances the strength of the results by obviating the use of inter-individual variation, thus supporting the argument for laser use superior comfort (Calisir & Ege, 2018).[25]

Kara, in a comparative study, researched patient perception after labial frenectomy with Nd:YAG laser versus the use of the scalpel. Though the study did not include detailed VAS values, qualitative results showed more postoperative ease and higher postoperative satisfaction in the laser group. Improved hemostasis and a minimized necessity for suturing were also identified by the author as major advantages of laser surgery. Without numerical detail, the study adds valuable information regarding peripheral outcomes, which are important in reaching a conclusion regarding global treatment success, particularly in pediatric or anxious populations (Kara, 2008).[26]

Overall, the studies under review uniformly report shorter operating time, less bleeding during operation, and better immediate postoperative conditions resulting from laser-assisted frenectomy. Pain and functional discomfort are also lower in laser groups, most notably in the critical first few postoperative days. Though long-term outcomes tend to be the same with laser versus scalpel methods in many studies, patient and caretaker satisfaction is higher in laser groups. The wavelength, as well as the laser source itself, also affects the degree of clinical benefit noted, with preference shown for use of the 445 nm laser, as well as for the Nd:YAG laser, due to their accuracy and efficiency. It should be noted, however, that whereas the clear-cut short-term benefits are reported by some studies (i.e., Yadav et al., 2019[20]; Sarmadi et al., 2021[19]), they also show similar healing results following more protracted periods of follow-up. Thus, though laser methods produce better perioperative results, whether they are superior in the long term is in question and requires further longitudinal study. Economic considerations, too, as well as access to laser technology, may preclude extensive use, especially in low-resource environments.[28–38] However, the collective evidence favors the use of laser technology as a safe and in many cases preferred alternative in labial frenectomy when compared with scalpel surgery. Future research involving standardized outcomes, larger sample sizes, and longer follow-up periods will play a key role in cementing the position of laser-assisted methods in regular use in clinics.

## CONCLUSION

Laser-assisted labial frenectomy can be considered a safe treatment with effective results in comparison with traditional scalpel surgery. It has definite advantages in terms of shorter operation time, minimal intraoperative bleeding, and diminished immediate postoperative discomfort. The advantages translate into better patient comfort in addition to quicker functional restoration. The overall patient satisfaction with laser methods is great, especially in cases involving children, where minimal distress is a key consideration. Healing results are similar between the two approaches, validating the clinical dependability of laser treatment. In conclusion, laser therapy improves the care in labial frenectomy and is a worthwhile addition in contemporary dental practice.

## DECLARATIONS

**Ethics approval and consent to participate**

Not applicable

**Consent for publication**

Not applicable.

Availability of data and materials

**The data will be available on reasonable request from the corresponding author.**

**Competing interests**

The authors declare no conflict of interest.

**Funding**

This research received no external funding.

**Author contribution**

Conceptualization M.M.M.; G.M., G.C.; methodology, G.M.N. and M.P.S.; software, S.P.; and H.U.; formal analysis, S.Pa. and H.U.; investigation, M.P.S.; and S.P.; data curation, M.P.S. and G.M.N.; writing—original draft preparation, H.U., M.M.M.; writing—review and editing, S.Pa.; G.C. and G.M.; supervision, G.C. and G.M. All authors have read and agreed to the published version of the manuscript.

**Acknowledgements**

Not applicable.

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