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Literature Review

Perioperative outcomes of frenectomy using laser *versus* conventional surgery: a systematic review

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Abstract – Introduction: Frenectomy is an oral surgical procedure usually performed with a scalpel. Several authors recently reported the interest of laser, as a minimally invasive and efficient alternative tool to perform frenectomy. This study aimed to compare the perioperative management of patients requiring a frenectomy using scalpel *versus* laser. **Materials and methods:** A systematic review of the literature has been carried out from Pubmed and Scopus databases following PRISMA guidelines. PICO method was used to select the relevant articles. Clinical studies comparing the perioperative outcomes of patients requiring frenectomies using scalpel *versus* laser were included. **Results:** Ten articles involving 375 patients were included. Pre-operative parameter (anxiety before surgery) and per-operative data such as anesthesia, surgery duration, bleeding, suture and difficulty were assessed. The post-operative outcomes investigated were pain, analgesics use, functional discomfort, edema, healing and satisfaction of patients. Laser achieved satisfactory peri-operative outcomes such as shorter operative time, without suturing requirement, as well as less post-operative pain and functional discomfort. **Discussion:** The low number of eligible studies, the different type of lasers used and heterogeneity across the methodology of the selected studies were the limits of the study. **Conclusion:** Laser-assisted surgery became an attractive tool to perform oral soft tissue surgery.

Introduction

The oral cavity counts several anatomical conjunctive fallbacks connecting the lip and the cheek to the alveolar mucosa, the attached gum and the underlying periosteum. These usually present oral attachments, also called frenums, are mostly the maxillary labial frenum, the mandibular labial frenum, and the lingual frenum [1]. They consist of connective tissue, made of elastic and collagen fibers, eventually associated with muscular fibers. They have a physiological role as they limit and stabilize lingual and labial movements. However, a short frenum or aberrant frenum attachment can interfere with the oral functions such as elocution, lingual function, or with the maxillary bones development and growth. It may also interfere with a therapy (orthodontics, prosthesis), or with the periodontal health, sulcus strain resulting in biofilm accumulation [2,3]. Moreover short lingual frenum can also be responsible of ankyloglossia [4].

The frenectomy is a simple and commonly performed oral surgery procedure that is indicated in the pathological frenum cases described above. It differs from frenotomy by the complete excision of the frenum and its insertions [5]. This surgical procedure was usually performed using surgical blade. Patients who undergo frenectomy with this conventional technique often related pain, bleeding and discomfort. Most recently, laser intervention was proposed as a minimally invasive and efficient alternative procedure to realize such oral frenectomy [6,7] (Fig. 1).

Successful clinical outcomes using various types of lasers to manage oral soft tissue procedures are well described [8–10]. Furthermore, several authors reported the benefit of laser assistance to perform oral frenectomy, such as shorter operative time, hemostasis, or postoperative pain decrease. However, to date there is no consensus concerning its benefits for this application.

The main objective of this study was to perform a systematic review comparing the perioperative parameters of these two techniques.

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Fig. 1. Lingual frenectomy performed using laser.

Materials and methods

This review was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [11].

Study design

The search strategy was developed based on the PICO reporting system to answer our focused research question « Does laser improve the perioperative management of patients requiring a frenectomy compared to the conventional technique? ».

PICO question:

Patients: Patients with a short frenum which underwent frenectomy

Intervention: Frenectomy

Comparison: Conventional surgery with scalpel *versus* laser-assisted technique

Outcomes: peri-operative outcomes (Pre-operative fear and anxiety, per-operative time and bleeding, post-operative pain, edema, chewing and speech discomfort as well as complications)

Research strategy and selection criteria

An electronic search of the MEDLINE — Pubmed and Scopus databases was carried out. We searched for articles published in English up to and including January 2020, using the following search combination: « (frenectom*) AND (“surgical procedures, operative” [MeSH terms] OR “lasers” [MeSH terms]) ». Additional articles were also selected after manually screening the list of references of all publications included by the search.

The following eligibility criteria have been selected: Studies published in English and conducted on human subjects were included. Studies comparing the benefit of laser *versus* blade for oral frenectomy were considered. Only randomized or quasi-randomized prospective clinical trials were included.

Screening of studies and data collection

Following the eligibility criteria defined beforehand, the article selection and the data extraction were independently performed by two independent reviewers (F.M and A.P.M). In case of disagreement, articles were discussed with a third reviewer (C.S) to decide the final outcome. First, the titles were studied, and duplicates were removed. Then titles and abstracts were screened in the first time according to the defined question “Does laser improve the perioperative management of patients benefiting a frenectomy compared to the conventional technique?”. If an article was prone to be selected, the full-text was read. Additional manual search was performed notably by screening the bibliographic references of the selected articles.

Data were finally extracted using structured generated tables. Collection of data such as the type of study, effective, study duration, laser properties, type of frenum and classification, frenectomy indication, judgment criteria and results were reported. Quality of the included studies was evaluated and ranked relying on the National Health and Medical Research classification (NHMRC) [12]. The methodological quality of the included studies was scored according to the Newcastle–Ottawa Scale (NOS) [13]. The NOS is a star rating system that allocates a maximum of nine stars across three categories: participant selection (four stars), comparability (two stars) and measurement of outcome in cohort (four stars) (Tab. I).

Analysis of the data

Data analysis was performed in a descriptive way, since the information obtained did not enable meta-analyses.

Results

Search outcomes

The research in the PubMed and Scopus database generated 155 potentially relevant articles, and 92 of them were selected after duplicates removal. After screening title and abstracts, eleven studies were retained for further investigation. Amongst these articles, six were included [14–19]. After a manual screening of the references of the articles included, four other articles were added [20–23]. Finally, ten articles met the eligibility criteria and they were included in this systematic review. The selection process is detailed in Figure 2.

Table I. Risk of bias summary: authors' assessment of each risk of bias item (Selection, Compatibility and Exposure), for each included study according to Newcastle-Ottawa scale.

Articles	Newcastle-Ottawa Scale		
	Selection (****)	Comparability (**)	Exposure (***)
Akpinar *et al.* (2016)	****	**	***
Bista *et al.* (2018)	****	**	***
Butchibabu *et al.* (2014)	***		***
Calisir and Ege (2019)	****	**	***
Haytac and Ozcelik (2006)	***		***
Júnior *et al.* (2013)	***		***
Kara (2008)	****	*	***
Patel *et al.* (2020)	***		***
Stojanovska *et al.* (2017)	***		***
Uraz *et al.* (2018)	***		***

Among these ten studies, five were performed in Turkey [14–16,18,19], two in India [22,23], one in Brazil [17], one in Nepal [20] and one in Macedonia [21]. They all have been published since 2006. Three different lasers were used: CO2 laser, ND-YAG and Diode Laser (Tab. II). These ten studies gathered 375 patients (from 10 and up to 89 patients per study), and the follow-up duration spanned between 7 days to 3 months (Tab. III). Ages varied from 8 to 51 years. All included studies investigated anterior labial frenectomy (*i.e.* maxillary and/or mandibular labial frenum). Two studies compared the conventional surgery to laser in the same patient by performing both labial frenectomy [14,15]. Frenectomy was mostly performed on frenulum with a papilla- or a trans-papillary attachment. When mentioned, the included studies referred to the classification of frenulum insertion described by Mirko *et al.* [3].

Pre-operative outcomes

Three studies investigated patient's anxiety or fear level prior to frenectomy. Medeiros Jùnior *et al.* found that most of the patients had moderate fear before frenectomy, whatever the technique used [17]. This is consistent with Stojanovska *et al.*, where no significant difference was observed regarding preoperative fear between groups [21]. Kara *et al.* also assessed patient's anxiety before frenectomy using VAS (0–10) [15]. In this study, the patients who required both maxillary and mandibular labial frenectomy were included, so they experienced "laser followed by conventional surgery" or "conventional surgery followed by laser". No significant difference was observed before the first intervention. However, patients who first experimented laser surgery were significantly less anxious before the second frenectomy compared to the group « surgery followed by laser».

Per-operative comparison

The following per-operative outcomes were compared: anesthetic use, bleeding, suture, surgery duration and difficulty experienced by the surgeon.

Contradictory findings were observed concerning anesthesia, which was investigated in three studies. The use of local anesthetics and their quantity were similar for both techniques in one study [17], whereas two other studies reported that significantly less patients required infiltrative local anesthesia with laser surgery [19,21].

Peri-operative bleeding was assessed in four studies. Bleeding was significantly lower using laser compared to the conventional technique [17,21,22]. Uraz *et al.* only mentioned that no bleeding occurred during the laser procedure, whereas no information was available for the "scalpel" group [19].

Assessment of the need for suturing was performed in three studies. They all showed that none of the patients treated by laser required suture, whereas suturing was always necessary in patients treated with blade [17,19,21].

Surgery duration was quantified in three studies. The operative time was significantly shorter using laser surgery in two studies [17,21], whereas one study did not show statistical significance [16].

Finally, Patel *et al.* assessed the technical difficulty experienced by the surgeon and reported that laser surgery was significantly easier [22].

Post-operative comparison

The following post-operative parameters were assessed: pain, analgesics use, functional complications (*i.e.* ability to speak or chew), edema and redness, healing and satisfaction of patients.

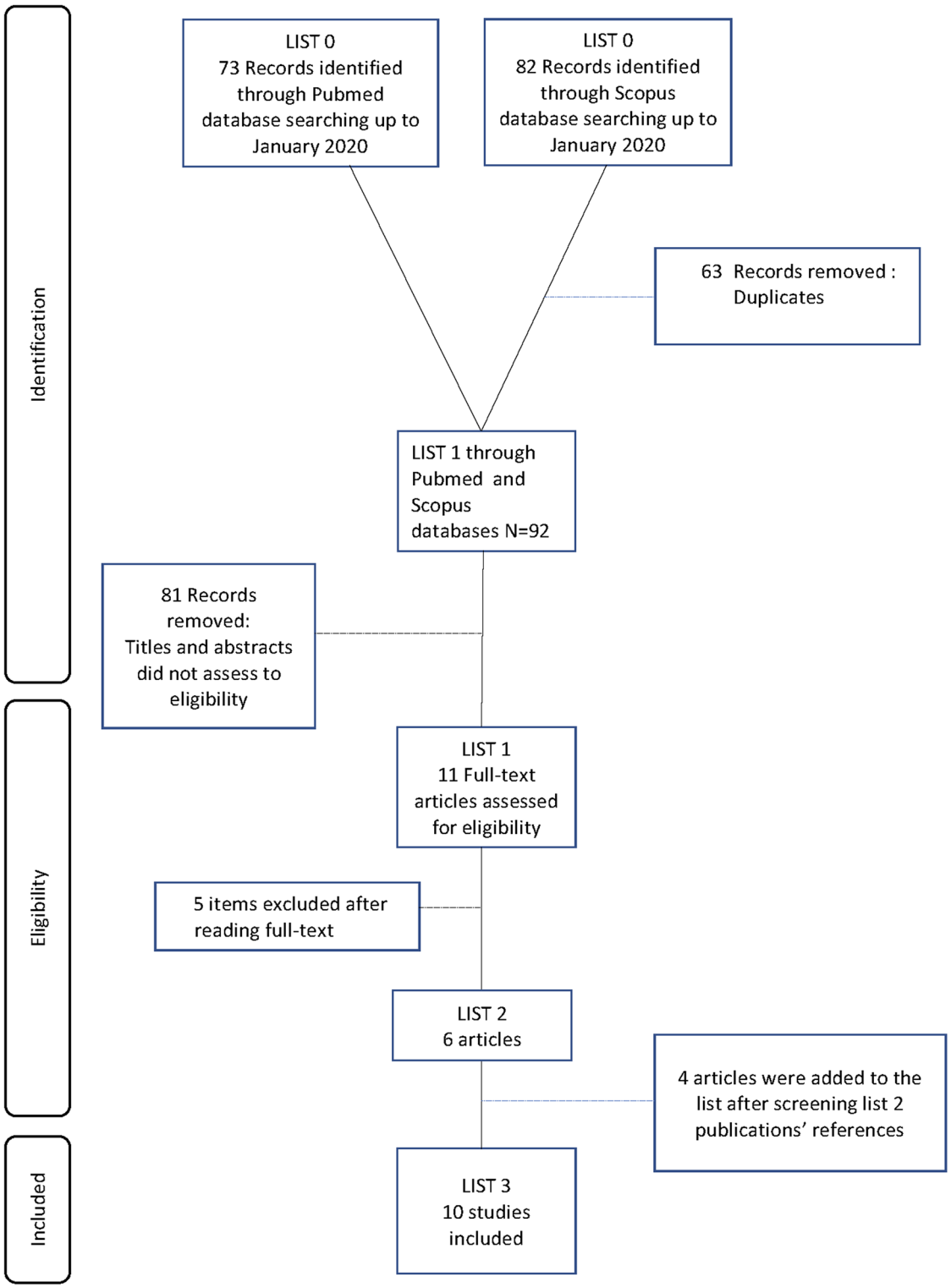

Fig. 2. Flow diagram of the screened publications.

Postoperative pain was assessed by all authors. The laser seemed to cause significantly less postoperative pain on the surgery day [14–16], one day [14–16,18,20,22,23], three days [16,21,23] and one week [15,18,22,23]. On the contrary, two studies failed to show a difference of post-operative pain between the two groups [17,19].

Six studies compared the use of analgesics postoperatively. Significantly less patients required analgesics after laser therapy in two studies [15,18]. Another study showed that patients required significantly less analgesics after laser surgery [20,22]. Uraz *et al.* observed similar results but did not mention if this decrease was statistically significant [19].

Table II. Laser properties in included studies.

1st Author, year	Laser type	Wavelength	Power	Frequency	Energy level	Pulse duration
Haytac *et al.* (2006)	*Laser CO2*	NS	7 W	20 Hz	NS	0.010 s
Kara *et al.* (2008)	Laser Nd-YAG	1064 nm	3.2 W	40 Hz	80 mJ	NS
Jùnior *et al.* (2013)	Laser Nd-YAG	1064 nm	4 W	40 Hz	40 mJ	10 s
Akpinar *et al.* (2016)	Laser Nd-YAG	1064 nm	4 W	40 Hz	100 mJ	150 µs
Uraz *et al.* (2018)	Laser Diode	980 nm	2.8 W	NS	NS	NA
Calisir *et al.* (2018)	Laser Nd-YAG	1064 nm	4 W	40 Hz	100 mJ	150 µs
Bista *et al.* (2018)	*Laser Diode*	940 nm	2 W	NS	NS	1.00 ms
Stojanovska *et al.* (2017)	Laser Diode	975 nm	6 W	50 Hz	NS	NS
Patel *et al.* (2015)	Laser Diode	980 nm	10 W	NS	NS	NS
Butchibabu *et al.* (2014)	Laser Diode	808 nm	1.5–2 W	NS	NS	NS

NA: Not applicable; NS: Not specified.

Only one study did not report significant difference regarding analgesic consumption [17].

Postoperative functional outcomes were investigated in eight studies and compared chewing/eating and speaking ability. Discomfort for eating or speaking was significantly lower in patients treated with laser the day of surgery [14–16], one day [14–16,18,23], three days [21,23] and one week postoperatively [15,18,23] compared to the conventional technique. Uraz *et al.* observed a significantly higher chewing discomfort in the scalpel group on the 1st and 2nd days, whereas they did not observed significant differences for speaking [19]. Finally, only one study reported similar functional discomfort during eating and speaking in both groups [17].

One study investigated post-operative edema [19]. No significant difference was evidenced between group for swelling and redness.

Comparison of wound healing was performed in only one study that showed statistically better wound healing using surgical blade after one week and one month [22]. Another study stated that a slower healing of the operative wound was registered in patients treated with laser whereas this data was not reported in the result section [21].

Postoperative complications were also assessed in only one study [17]. In this study, one blade-treated patient had post-operative hemorrhage, and two laser-treated patients suffered from superficial bone exposure. Furthermore, Akpinar *et al.* specified that postoperative bleeding was not observed in either groups [16].

Finally, two studies, in which patients experienced both techniques, investigated post-operative satisfaction. Kara *et al.* showed significant higher scores for satisfaction after laser surgery compared to conventional surgery, knowing that in this study each patient experienced both techniques [15]. Accordingly, Calisir *et al.* showed that significantly more patients preferred laser over conventional surgery [14].

Discussion

The objective of this study was to compare the peri-operative outcomes of frenectomy performed with laser *versus* conventional surgery.

We outlined that studies focused on three key times to compare both methods: before, during and after the surgery, and post-operative pain was the most investigated parameter. Few studies investigated fear or anxiety prior surgery and they showed similar results whatever the technique used. Interestingly, this parameter was also investigated in a study conducted on patients who experienced both procedures (as they required both maxillary and mandibular labial frenectomy) [15]: the patients who first experimented laser surgery were significantly less anxious before the second frenectomy compared to the group « surgery followed by laser». Frenectomy is a procedure that mostly concerns infants or young children, thereby often causing anxiety or lack of cooperation. Several authors stated that using laser is a simple and safe treatment method to perform frenectomy, especially in children [6]. Indeed, our study highlighted the significant decrease of peri-operative bleeding using laser, so that no suture was necessary [17,19,21,22]. This could be explained by the coagulant effect of the laser [24]. As no sutures was required, the duration of the laser-based procedure should be reduced. This is consistent with two studies showing that surgery duration was significantly shorter with laser [17,21]. This is also supported by a recent meta-analysis performed on six studies by Protásio *et al.* which showed that the average operating time was significantly shorter when frenectomy was performed with a laser [25]. Furthermore, sutures are always required with the conventional technique and can cause more discomfort. In two studies patients experienced both laser and conventional surgery [14,15]: the satisfaction was significantly higher for the laser method compared to conventional surgery. This was mainly explained by the absence of suture and bleeding after laser treatment and less experienced pain [14].

Table III. Summary of the ten included studies comparing laser and conventional surgery to perform frenectomy.

1st Author / Study design	Patients (n per condition)	Frenum	Indication	Study duration	Evaluative parameters	Results
Haytac *et al.*/ Randomized controlled trial (II)	40 patients (NS)	Maxillary or mandibular labial frenum	Papilla attachment	*7 days*	– Postoperative: Pain: VAS (0–10)/Discomfort during eating and speaking: VAS (0–10)/Analgesics use: NS	Pain and discomfort were significantly lower in the laser group after 1 and 7 days. Analgesics used during the first postoperative week: 85% of patients treated by scalpel *versus* 33.3% of patients treated by laser.
Kara *et al.*/ Randomized controlled trial (II)	40 patients (Scalpel then laser: n = 20, Laser then scalpel: n = 20)	Both maxillary and mandibular labial frenum with 1 week interval	Periodontic: Papilla or transpapillary attachment	7 *days*	– Preoperative: Anxiety: VAS (0–10) – Postoperative: Satisfaction: VAS (0–10)/ Pain: VAS (0–10) /Discomfort during eating and speaking: VAS (0–10)/Analgesics use: NS	No significant difference before the 1st surgery/ Patients who first experienced laser were significantly less anxious before the 2nd surgery. Scores for satisfaction were significantly higher after laser surgery. The VAS scores for pain, chewing and speaking were significantly lower at 3 h, 1 day, and 1 wk postoperatively after laser surgery. 5% of patients in laser group required post-operative analgesics *versus* 92.5% of patients in the conventional group.
Jùnior R. *et al.*/ Intervention study (III-2)	40 patients (Scalpel: n = 22, Laser n = 18)	Maxillary or mandibular anterior labial frenum	Orthodontic, prosthetics, periodontic, speech: Gingival, papilla or transpapillary attachment.	15 days	Pre-operative: fear VNS (0–10) Per-operative: Anesthetic use: number of vial/ Duration: minutes /Bleeding: absent to abundant /Suture: yes/no Post-operative: Pain: VNS (0–10)/Analgesics use: NS/ Discomfort during eating and speaking: VAS (0–10)/ Complications	Pre-operative fear was similar in both groups. Similar quantity of anesthetic used. Laser significantly reduced bleeding and surgery duration (10.2 ± 1.8 *versus* 7.7 ± 1.9). Suturing was necessary in all patients in scalpel group versus 0% in laser group. No significant difference regarding postoperative pain, analgesic consumption and functional discomfort. Three patients experienced postsurgical complications (laser: 2; scalpel: 1).
Akpinar *et al.*/ Randomized controlled trial (II)	89 patients (Scalpel: n = 44, Laser: n = 45)	Maxillary or mandibular anterior labial frenum	Orthodontic, prosthetics, periodontic, speech	10 days	Per-operative: Duration: minutes Post-operative: Pain: VAS (0–100)/Discomfort during eating and speaking: VAS (0–100)/Bleeding: NS	Surgery duration was similar in both groups (9.93 ± 3.32 *versus* 8.84 ± 3.11) No post-operative bleeding observed in both groups. Pain and discomfort were significantly decreased in the laser group at day 1, day + 1 and day + 3.
Uraz *et al.* (2018)/ Randomized controlled trial (II)	36 patients (Scalpel: n = 16, Laser: n = 20)	Maxillary anterior labial frenum	Orthodontic, prosthetics and periodontic: Papilla attachment	3 months	– Per-operative: Anesthetic use: yes/no /Suturing: yes/no – Post-operative: pain: VAS (0–10)/swelling: VAS (0–10)/redness: VAS (0–10) /Discomfort during eating and speaking : VAS (0–10)/ analgesics use: (NS)	Anesthesia was necessary in all patients in scalpel group*versus* 40% in laser group. Suturing was necessary in all patients in scalpel group *versus* 0% in laser group. No significant differences for pain, swelling, redness or speaking. Chewing discomfort was significantly higher in the scalpel group on the 1st and 2nd days. Patients treated with laser required less analgesics.

Table III. (continued).

1st Author / Study design	Patients (n per condition)	Frenum	Indication	Study duration	Evaluative parameters	Results
Calisir *et al.*/ Randomized controlled trial (II)	40 patients (Scalpel then laser: n = 20, Laser then scalpel: n = 20)	Both maxillary and mandibular labial frenum with 2 weeks interval	Orthodontic, prosthetics, periodontic and speech: Papilla attachment	10 *days*	– Postoperative: Pain: VAS (0–10)/Discomfort during eating and speaking: VAS (0–10)/Patient preference (laser *vs* blade)	Significant less pain and discomfort at speaking at day 0 and day 1 after laser surgery. No significant difference for all parameters after 3, 7 and 10 days. Significantly more patients preferred laser over conventional surgery.
Bista *et al.*/ Randomized controlled trial (II)	20 patients (Scalpel: n = 10, Laser: n = 10)	Maxillary anterior labial frenum	Placek insertion type III or IV	*7 days*	– Postoperative: Pain: VAS (0–10)/Analgesic use: NS	Pain was significantly lower at d + 1 after laser surgery, whereas no significant difference was observed after 7 days. Number of analgesics used was significantly lower after laser surgery.
Stojanovska *et al.*/ Intervention study (III-2)	36 patients (Scalpel: n = 18, Laser: n = 18)	Maxillary anterior labial frenum	Orthodontic, periodontic: Placek insertion type III or IV	3 days	– Pre-operative: Fear: NRS (0–10) – Per-operative: Anesthetic: yes/no,/Duration: minutes/ Bleeding: absent to intensive/ Suturing: yes/no – Post-operative: Pain: NRS (0–10)/discomfort during eating and speaking: NRS (0–10)	Pre-operative fear was not different between groups. Significantly less patients required anesthetic infiltration and surgery duration was significantly shorter with laser (11.6 ± 2.3 *versus* 6.1 ± 1.9 min). No intra-operative bleeding in 83.3% of patients treated with laser *versus* 0%. Suturing was necessary in all patients in scalpel group *versus* 0% in laser group. Post-operative pain and discomfort were significantly lower after 3d in laser group.
Patel RM. *et al.*/ Randomized controlled trial (II)	20 patients (Scalpel: n = 10, Laser: n = 10)	Maxillary anterior labial frenum	Papilla or transpapillary attachment	3 months	Per-operative: Bleeding: none to severe/Surgical difficulty for the surgeon: 1–4 score Post-operative: Pain: VAS (0–10)/Analgesic use: NS/ Wound healing: 1–4 score	Perioperative bleeding was significantly increased with scalpel and laser surgery was significantly easier. Pain at day 1 and 7, and analgesics use were significantly lower in the laser group. Scalpel group showed significantly better healing at day 7 and 1 month, without significant difference after 3 months.
Butchibabu *et al.*/ Randomized controlled trial (II)	10 patients (Scalpel: n = 5, Laser: n = 5)	Maxillary anterior labial frenum	Papilla or transpapillary attachment	7 days	Post-operative: Pain: VAS (0–100)/discomfort during eating and speaking: VAS (0–100)	Post-operative pain and discomfort were significantly lower in the laser group after 1,3 and 7 days.

h: hour; NRS: Numeric Rating Scale; NS: not specified; VAS: visual analog scale (cm); VNS: visual numeric scale; wk: week.

Post-operative pain was the most investigated criteria to compare laser and conventional surgery. Most of the included studies showed that laser caused significant less post-operative pain, and five articles reported significantly less analgesics consumption. These results are supported by Tuncer *et al.* who stated that pain decrease and discomfort may be due to the protein coagulum that forms on the wound surface during laser surgery, acting as a biological dressing and sealing the extremities of the sensory peripheral nerves [26,27]. It has also been suggested that its thermal effect acted on post-operative bacteremia [28], as well as on the pathogenic microbial population associated with periodontitis [29], thereby reducing post-operative discomfort. In our study, functional discomfort was assessed in eight studies. Among them, seven studies reported that post-operative discomfort during eating and/or speaking was significantly lower after laser therapy. The sutures may also contribute to this increased discomfort after conventional surgery [30]. These results are consistent with Protásio *et al.* who also reported better results after frenectomy concerning pain as well as discomfort during speech and chewing in patients treated with laser compared to scalpel [25].

One study compared post-operative wound healing after both conventional and laser surgery. Scoring of wound healing was significantly better seven days and one month after conventional surgery, without significant difference after 3 months. Unfortunately, this was the single study to investigate this parameter, which prevents us from drawing conclusions. Similarly, postoperative complications were also assessed in only one study [17].

All the studies included were performed on maxillary and/or mandibular anterior labial frenum to compare both techniques. Patients were referred for orthodontic, prosthetics or periodontal reasons and speech difficulties. Most of the patients had a frenum with a papilla or a transpapillary attachment. None of the included study was conducted on the lingual frenum. It would be interesting to perform similar randomized controlled trial to assess the benefit of laser for lingual frenectomy. Lingual frenectomy are often performed in pediatric patients. Early interventions can be necessary for babies encountering breastfeeding difficulties as well as during early childhood mostly for speech impediments [30–32]. A shorter intervention time, a limited use of anesthetics, the absence of intraoperative bleeding and the absence of suture would be interesting to perform such procedure in infants, thus suggesting that laser could also provide a safe and effective tool in this indication [6,7,33,34].

Most of the results obtained in this systematic review are consistent with other studies performed in oral surgery [8,35,36], and are also supported by studies performed in other surgical specialties. Kim *et al.* reported a significant shorter procedure time to excise epidermal cysts on the face after CO2 laser excision compared to scalpel [37] in a survey conducted on 120 patients. Kaviani *et al.* conducted a survey on 60 patients to investigate whether the laser is superior to conventional surgical techniques for minor breast surgery. This randomized clinical trial showed a lower requirement for local anesthetic as well as a significant decrease of per-operative bleeding using laser [38]. Diode laser also appears to be an efficient and safe alternative to cold scissors to perform office hysteroscopic metroplasty for septate uterus [39].

Finally, there were some limitations related to the present study that must be mentioned. Firstly, we observed substantial heterogeneity across the methods of the selected studies. Indeed, three types of laser were used, and various parameters were evaluated to assess their benefits, thereby making it difficult to compare studies. A wide heterogeneity among the age of participants was observed depending on the included studies and ranged from 8 to 51 years. Moreover, some of the included articles showed low level of evidence due to the limited number of patients included per condition and lack of statistical significance. Some criteria were not investigated in a sufficient number of studies to draw conclusions. Another identified drawback of this systematic review was the considerable use of subjective assessment criteria. However, this systematic review has provided some evidences on the peri-operative outcomes of frenectomy that could be potentially improved by laser surgery.

Conclusion

Laser-assisted surgery became an attractive tool for the surgery of oral soft tissues. The laser is a promising alternative to conventional surgery to realize frenectomy and to achieve satisfactory peri-operative outcomes. Indeed, several studies now support its benefits such as less peri-operative bleeding, shorter operative time, less pain and analgesics consumption, as well as a decrease of functional discomfort while chewing and speaking. However, further well-designed studies with larger samples and a standardized methodology are required to confirm our observations and to provide a higher level of evidence on laser benefits.

Conflicts of interests

The authors declare the absence of conflict of interest.

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