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Review

Palatal Graft Harvesting Site Healing and Pain Management: What Is the Best Choice? An Umbrella Review

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Abstract: The use of free gingival graft (FGG) and connective tissue graft (CTG) from the palate are among the most predictable periodontal and peri-implant plastic surgery procedures. However, palatal harvesting causes severe discomfort in the palatal area in patients undergoing harvesting. The aim of this umbrella review is to evaluate which products or techniques can result in fewer side effects and less morbidity in patients. Systematic reviews, with meta-analysis or not, about postoperative pain and wound healing in patients undergoing surgery to remove a free gingival graft or connective tissue graft from the palatal region, published only in the English language, were electronically searched for on BioMed Central, Scopus, MEDLINE/PubMed, the Cochrane library databases, and PROSPERO register. Of 1153 titles, only 7 articles were included in this review. The reviews included suggest that the more effective interventions for patient-reported outcomes, particularly for pain management, are cyanoacrylate adhesives, platelet-rich fibrin, hyaluronic acid, and the use of palatal stents. Low-level laser therapy also demonstrated good results in palatal wound healing speed after FGG procedures. Also, topical agents were also described. Future studies and more high-quality randomized clinical trials are needed to provide clear descriptions and standardized procedures of interventions to obtain clear results.

Keywords: free gingival graft; wound healing; palate pain; connective tissue graft

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1. Introduction

Periodontal and peri-implant surgery techniques that aim to increase the amount of tissue around the teeth or implants are becoming increasingly frequent in the dental field [1–4].

Maintaining an adequate thickness of the attached gingiva around the teeth and implants is of crucial importance both for the maintenance of periodontal health and for the stability of the peri-implant tissues, as well as having fundamental importance in the aesthetic field [5–8].

In the literature, many periodontal surgery techniques and different materials have been described that aim to increase the amount of attached gingiva and different techniques and materials in peri-implant surgery to increase the amount of keratinized tissue around implants [9,10].

One of the most used, most predictable, and most described techniques in the literature is surgery which involves the use of a free soft tissue graft taken from the palate with the overlying epithelium gingival graft (FGG) or only the connective tissue graft (CTG).

The use of free gingival graft (FGG) and connective tissue graft (CTG) are among the most predictable periodontal and peri-implant plastic surgery procedures, and the gold standard regarding the tissue to be grafted is the epithelium and/or the connective tissue taken from the palatal area [11,12].

However, palatal harvesting causes severe discomfort in the palatal area in patients undergoing harvesting [13].

After FGG and CTG, patients have a small percentage of postoperative complications, such as dentin hypersensitivity, bleeding, edema, pain, and delayed wound healing [14,15].

Postoperative pain is a negative patient experience that causes difficulty in swallowing and negatively influences patient compliance and confidence in treatment [16].

It is essential to seek the implementation of alternatives to stimulate the healing of the donor site surgical wound, allowing for the reduction in discomfort and postoperative drug consumption. In this context, numerous strategies have been developed to promote lower patient morbidity, and several materials have been proposed and described in the literature to try to accelerate the healing processes of palatal wounds after FGG or CTG harvesting [17,18].

Among the proposed materials, we find periodontal tablets [19], hemostatic agents, extracts of medicinal plants [20], and also bioadhesive materials, such as hyaluronic acid [14,21–23].

Alternatively, for postoperative control after palatal harvesting operations, we find the use of sutures, biostimulatory procedures such as the application of photobiomodulation [24], physical barriers such as resin or acetate stents [25], collagen sponges, platelet-rich fibrin (PRF) [26–29], and cyanoacrylate adhesives [30–32], as well as topical substances such as nonsteroidal anti-inflammatory stent sprays [33], simvastatin [34], erythropoietin, or ozone products [35–37].

The data in the literature are very varied and often unclear and conflicting; therefore, this review of reviews aims to identify which products or techniques are the best for patients and which can result in fewer side effects and less morbidity in patients compared to the main outcomes, such as postoperative pain and wound healing.

2. Materials and Methods

2.1. Study Protocol

The study protocol was conducted following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) flowchart [38].

This review was registered on the PROSPERO systematic review register (ID REGISTER: CRD42024520716), as recommended by Booth et al. [39], before the literature search, data extraction, and analysis.

Study selection strategies and question formulation record search were based on the PEO (Population–Exposure–Outcome) chart, a modified version of the PICO model [40,41].

The research question was set on the following:

P—Population: patient undergoing periodontal surgery with free gingival graft (FGG) or connective tissue graft (CTG).

E—Exposure: free gingival graft or connective tissue graft from the palate region

O—Outcomes: Postoperative pain, wound healing.

2.2. Search Strategy

Systematic reviews (with or without meta-analysis) in the English language concerning postoperative pain and wound healing in patients undergoing surgery to remove a free gingival graft or connective tissue graft from the palatal region were electronically searched until 1st March 2024 across the PROSPERO register and Scopus, MEDLINE/PubMed, the Cochrane Library databases, and BioMed Central, by two independent reviewers (F.D.A.; C. A.), combining the following keywords with Boolean operators:

("healing" OR "wound" OR "healing wound" OR "palatal healing" OR "palatal wound") AND ("free gingival graft" OR "connective tissue graft" OR "soft tissue graft" OR "palatal harvesting").

The following filters were applied: "Review on the Scopus database in English language; "Systematic Review (English)" on the MEDLINE/PubMed database; "Keywords" on the Cochrane library; no filters were applied on the BioMed Central database or on the PROSPERO register.

The data collection was carried out considering only the reviews published in the last 10 years.

2.3. Eligibility Criteria

The results were screened according to defined eligibility criteria, and inclusion and exclusion criteria were defined during the study design.

Inclusion Criteria:

- Systematic review about subjects undergoing periodontal surgery with a free gingival graft or connective tissue graft from the palatal region.
- Systematic review with or without meta-analysis.
- Only articles in the English language.
- Only reviews published in the last 10 years.

Exclusion Criteria:

- Not systematic review with or without meta-analysis.
- Review not in the English Language.
- Review published more than 10 years ago.

2.4. Study Selection

Citations included in this review were sorted using the Zotero reference management tool, and duplicates were eliminated. The remaining titles were selected by two independent reviewers (F.D.A; A.C.) who examined the abstracts, choosing the most relevant ones to include in the present umbrella review.

From the chosen abstracts, full texts were obtained and independently reviewed by the same authors (F.D.A; A.C.). Any disagreements were resolved by discussion, and in the case of doubts, a third author (F.G.) was consulted.

The bibliography lists of the included reviews were screened for relevant titles that could be included in this review.

2.5. Data Extraction and Collection

The data were extracted independently by two reviewers (F.D.A; A.C.), who then compared their results, and in the case of disagreement, a third author (F.G.) was consulted.

Of the systematic reviews with or without meta-analysis that were included in the present umbrella study, the following data were recorded:

- First author, year, journal, funding, quality of the study.
- Number and design of studies included in each systematic review.
- Characteristics of postoperative local interventions for the palate.
- Outcomes.
- Conclusions.

2.6. Data Synthesis

The data extrapolated from the reviews on the population under study, on the exposure and the results, were summarized by a short narrative summary. The data obtained were qualitatively summarized through a descriptive statistical analysis using Microsoft Excel 2019 software (Microsoft Corporation, Redmond, WA, USA).

2.7. Quality Assessment

The quality of the included systematic reviews was analyzed following the Assessing the Methodological Quality of Systematic Reviews (AMSTAR) 2 tool, accessible online on 22 November 2023 (https://amstar.ca), to assess the quality of systematic reviews of randomized trials and/or not randomized [42].

3. Results

3.1. Study Selection

Approximately 1493 records were obtained from the electronic search, and particularly, 50 were from BioMed Central, 450 from Scopus, 550 from PubMed, 441 from the Cochrane library databases, and 2 from the PROSPERO registry.

Duplicates were eliminated (340), resulting in 1153 title abstracts.

Of these 1153 title abstracts, only 27 abstracts met the inclusion criteria of this systematic review. From reading the full text, revisions were further excluded: n. 6 because they were not relevant; n. 4 because they did not meet the inclusion criteria; and 10 because they were not systematic reviews (Table 1).

A total of seven studies were finally included in the present systematic review (Figure 1).

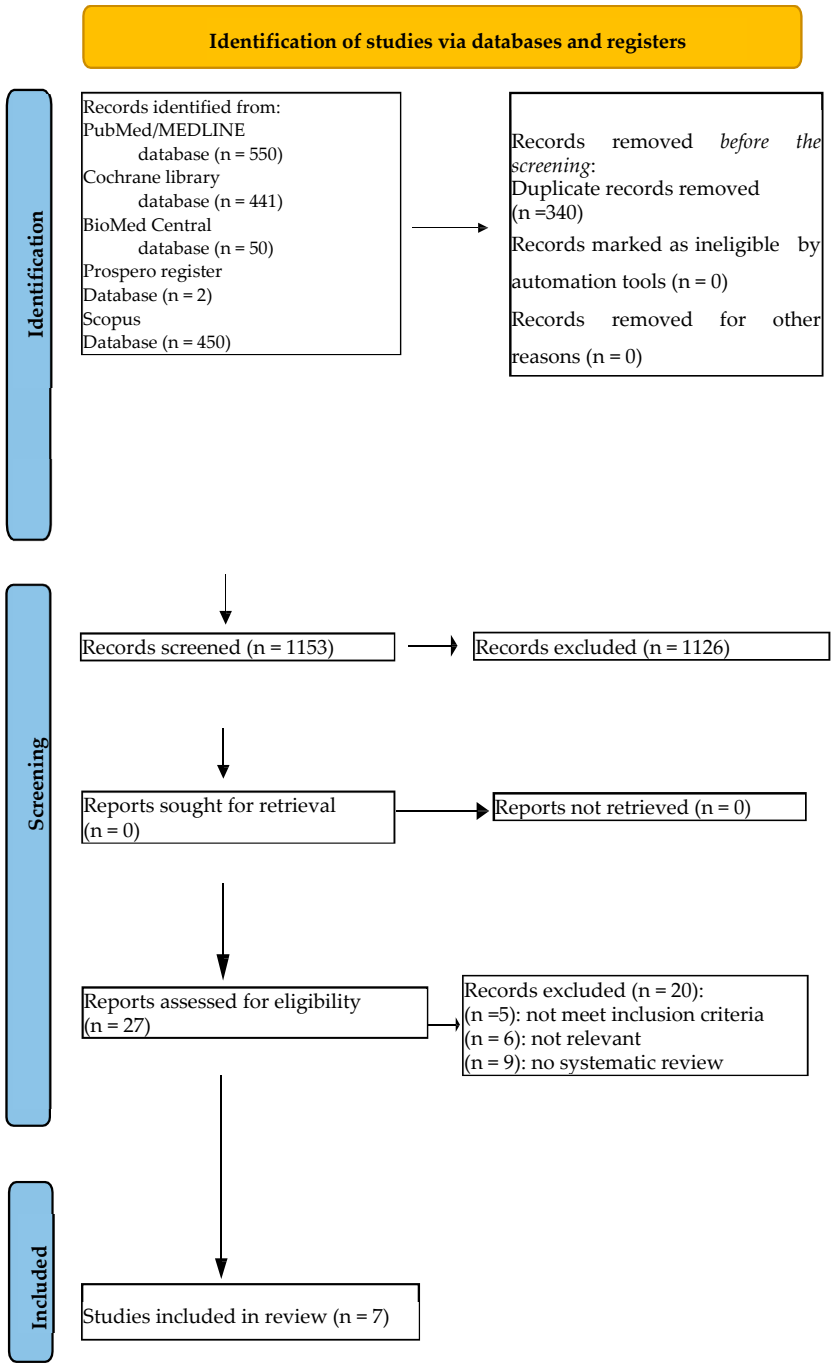


Figure 1. A PRISMA flowchart of the screening process.

Table 1. Excluded studies and motivation.

Authors, Year, Reference	Motivation
Karam (2015) [43]	Did not meet the inclusion criteria
Mancini (2023) [44]	No systematic review
Rodriguez (2023) [45]	No systematic review
Cheng (2015) [46]	Not relevant
Fernandes (2021) [47]	Did not meet the inclusion criteria
Ardila (2023) [48]	Did not meet the inclusion criteria
Lopez-Pacheco (2021) [49]	Did not meet the inclusion criteria
Jambhekar (2015) [50]	Did not meet the inclusion criteria
Rondone (2024) [51]	Not relevant
Daigo (2023) [52]	No systematic review
Castro (2016) [53]	Not relevant
Noelken (2023) [54]	No systematic review
Tavelli (2019) [55]	Not relevant
Stefanini (2023) [56]	No systematic review
Chambrone (2022) [57]	Not relevant
Tavelli (2023) [58]	No systematic review
Malpartida-Carrillo (2021) [22]	No systematic review
Puri (2019) [59]	No systematic review
Silva (2023) [60]	No systematic review
Chen (2023) [61]	Not relevant

This table shows authors, year, reference, and motivation for exclusion.

3.2. Studies' Characteristics and Qualitative Synthesis

Table 2 summarizes the features of the included reviews.

Table 2. The characteristics of the studies included in the present systematic review: author, year, reference, journal, meta-analysis; number and design of included studies; type of materials used; outcomes; conclusions.

Author, Year Reference Journal Meta-Analysis	Number and Design of Included Studies	Type of Materials Used	Outcomes	Conclusions
Al-shibani, 2019 [62] *J. Investig. Clin. Dent.*; systematic review	4 RCTs 32–52 participants with a mean age of 27–42 years	LLLT (test group) Nothing or placebo surgery (control group)	Tissue thickness, wound area, postoperative discomfort, pain assessment (by the patient) through the visual analog scale (VAS)	All studies showed that LLLT effectively improved clinical outcomes, including postoperative discomfort, tissue thickness, remaining wound area, and visual analog assessment at follow-up.
Ameida, 2023 [63] *Braz. Dent. J.*; systematic review and meta-analysis	16 RCTs 613 participants	PRF, LLLT, PRF + butyl-cyanoacrylate adhesive, butyl-cyanoacrylate adhesive, gauze compression with 15% ferric sulfate solution, PRP, LLLT + acrylic stent, PRF + periodontal dressing, HA + periodontal dressing, plastic composite retainer, ozone, collagen membrane + aluminum foil template, collagen sponge + cyanoacrylate adhesive dressing, fibrin glue, herbal ointment + periodontal dressing, EMD, latex membrane, propylene mesh	pain assessment (by the patient) through the visual analog scale (VAS), consumption of analgesics	The methods that best reduced pain perception were platelet-rich fibrin, hyaluronic acid, and autologous fibrin glue. Only two of his RCTs included in the meta-analysis reported an increased intake of analgesic drugs by participants in the control group. Therefore, despite the use of drugs for pain management, the control group showed a decrease in VAS scores, demonstrating that the method of improving wound healing is superior to the use of analgesics for pain management. Other studies found no differences between groups, or the authors did not report on pain medication use.

Table 2. *Cont.*

Author, Year Reference Journal Meta-Analysis	Number and Design of Included Studies	Type of Materials Used	Outcomes	Conclusions
Meza-Mauricio, 2021 [64]; *Clin. Oral Investig.*; systematic review	8 RCTs 292 participants within the age range of 18–78	PRF (test group), wet gauze compression gelatin sponge, sterile tamponade, collagen dressing, oxidized regenerated cellulose (control group),	WHS, pain assessment (by the patient) through the visual analog scale (VAS), control of postoperative bleeding	The use of PRF membranes may improve postoperative discomfort (pain), wound healing, and postoperative bleeding. In addition, PRF membranes improve wound healing and patient quality of life.
Gusman, 2021 [65]; *J. Clin. Exp. Dent.*; systematic review and meta-analysis	6 RCTs, 247 patients with a mean age of 34.79 ± 7.87	PRF, PRF + butyl-cyanoacrylate, PRF + non-eugenol periodontal pack, (test group) sterile wet gauze pressure, gelatin sponge, butyl-cyanoacrylate, non-eugenol periodontal pack (control group)	Complete wound epithelialization (H_2O_2-bubbling), pain assessment (by the patient) through the visual analog scale (VAS),	The use of PRF for wound healing at the palatal FGG donor site can reduce postoperative pain and improve wound epithelialization.
Veríssimo, 2021 [66]; *J. Mater. Sci. Mater. Med.*; systematic review	4 RCTs donor area, 2 RCTs recipient area, 323 participants with a mean age of 44.8 years	Cyanoacrylate, cyanoacrilate + hemostatic sponge (test group) conventional suture thread, 7–0 microsurgery sutures, sterile gauze pad, hemostatic sponge, periodontal surgical cement (control group)	visual analog scale (VAS), consumption of analgesics, healing effects, graft area, keratinized tissue, and gingival recession	The cyanoacrylate-based adhesives showed the following: less postoperative discomfort, lowered analgesic consumption, and reduced perception and experience of pain. It did not affect the healing process and promoted a better epithelialization response with less graft contraction compared to sutures. Additionally, cyanoacrylate eliminates the need for suture removal, reducing the number of follow-up visits and contributing to shorter surgical times. These properties of cyanoacrylates mean that cyanoacrylates can be used alone or in combination with other techniques and substances as an alternative to traditional sutures in free gingival grafts in both donor and recipient areas. As this information was only presented in one of her studies, hemostatic activity could not be confirmed.
Zhao, 2021 [23]; *Lasers Med. Sci.*; systematic review and meta-analysis	13 RCTs 8 RCTs donor area	LLLT	Pain assessment (by the patient) through the visual analog scale (VAS) and consumption of analgesics, complete wound epithelialization, remaining wound area, and stained surface area.	It seems that LLLT accelerated palatal wound healing after FGG. PBM promotes wound healing post-surgery.

Table 2. *Cont.*

Author, Year Reference Journal Meta-Analysis	Number and Design of Included Studies	Type of Materials Used	Outcomes	Conclusions
Escobar, 2021 [30]; *Clin. Oral. Investig.*; systematic review	4 RCTs (3 RCTs FGG e 1 RCT CTG) 254 participants with a mean age of 47.88 years	Cyanoacrylate tissue adhesive, PRF + cyanoacrylate, wet gauze, hemostatic sponge, periodontal dressing, hemostatic sponge + cyanoacrylate tissue adhesive	Pain assessment through the visual analog scale (VAS) and consumption of analgesics, willingness for retreatment, WHS	Concerning FGG, it seems that cyanoacrylate tissue adhesive has more beneficial effects than wet gauze and sutures in postoperative pain. Additionally, cyanoacrylate tissue adhesives appear to enhance the effectiveness of hemostatic sponges, thereby contributing to reducing postoperative pain and analgesic consumption. There appear to be no significant differences in postoperative pain, or analgesic consumption, compared with sutures for CTG when comparing cyanoacrylate tissue adhesive with sutures.

Abbreviations: RCT—randomized controlled trial; VAS—visual analog scale; PRF—platelet-rich fibrin; PRP—platelet rich; LLLT—low-level laser therapy; HA—hyaluronic acid; EMD—enamel matrix derivative; WHS—wound healing score; FGG—free gingival graft; CTG—connective tissue graft.

All studies were published in the English language between 2019 and March 2023.

3.3. Data Extraction and Synthesis

Detailed findings related to the main outcome, as well as pain and wound healing, are synthesized in Tables 3 and 4, and Figure 2 illustrates the most effective interventions for wound healing and pain control.

Table 3. The characteristics of the studies included in the present systematic review about postoperative pain.

Outcome	Author, Year	Type of Materials Used	Main Result(s)
Pain assessment (by the patient) through the visual analog scale (VAS)	Al-shibani, 2019 [62]	LLLT	There was a significantly lower score on the VAS for discomfort for the LLLT group compared to the control group.
	Ameida, 2023 [63]	PRF, LLLT, PRF + butyl-cyanoacrylate adhesive, butyl-cyanoacrylate adhesive, gauze compression with 15% ferric sulfate solution, PRP, LLLT + acrylic stent, PRF + periodontal dressing, HA + periodontal dressing, plastic composite retainer, ozone, collagen membrane + aluminum foil template, collagen sponge + cyanoacrylate adhesive dressing, fibrin glue, herbal ointment + periodontal dressing, EMD, latex membrane, propylene mesh	Methods to improve wound healing significantly reduced VAS scores compared to natural healing 7 days after the removal of free gingival grafts.

Table 3. *Cont.*

Outcome	Author, Year	Type of Materials Used	Main Result(s)
	Meza-Mauricio, 2021, [64]	PRF	The PRF group showed lower pain levels than various control groups (oxidized regenerated cellulose, wet gauze compression, gelatin sponge, and untreated) 7 days after the surgery in five studies ($p < 0.05$). However, three studies showed comparable VAS scores without statistical differences at the same time of follow-up.
	Gusman, 2021 [65]	PRF, PRF + butyl-cyanoacrylate, PRF + non-eugenol periodontal pack	Five studies observed a reduction in postoperative pain at different times. Only one study observed no difference in postoperative pain by using PRF.
	Veríssimo, 2021 [66]	Cyanoacrylate, cyanoacrilate + hemostatic sponge	Five studies observed that cyanoacrylate-based adhesives positively influenced pain, postoperative discomfort, and analgesic consumption.
	Escobar, 2021 [30]	Cyanoacrylate tissue adhesive	Using cyanoacrylate tissue adhesive with a suture-stabilized hemostatic sponge resulted in the lowest level of postoperative pain (maximum score of 0.5 on the SEA scale) compared to other methods. This was significantly lower ($p < 0.01$) than using a suture-stabilized hemostatic sponge alone (maximum SEA score of 1.9). It also caused less pain than both periodontal dressing with sutures (maximum VAS score of 1.7) and cyanoacrylate tissue adhesive with sutures (maximum VAS score of 1.9). Additionally, cyanoacrylate tissue adhesive with platelet-rich fibrin suggested less pain (maximum VAS = 2.0) than cyanoacrylate alone (maximum VAS = 4.53) ($p < 0.05$) and wet gauze (maximum VAS = 6.10) ($p < 0.001$). It is relevant to mention that cyanoacrylate tissue adhesive alone (maximum VAS = 4.53) promoted less pain than wet gauze (maximum VAS = 6.10) ($p < 0.05$), and cyanoacrylate tissue adhesive associated with suture (maximum VAS = 1.9) demonstrated less pain than suture alone (maximum VAS = 2.9) ($p < 0.01$).

Abbreviations: RCT—randomized controlled trial; VAS—visual analog scale; PRF—platelet-rich fibrin; PRP—platelet rich; LLLT—low-level laser therapy; HA—hyaluronic acid; EMD—enamel matrix derivative.

Table 4. The characteristics of the studies included in the present systematic review of wound healing.

Outcome	Author, Year	Type of Materials Used	Main Result(s)
Wound healing	Al-shibani, 2019 [62]	LLLT	The analysis of the follow-up data demonstrated a statistically significant decrease in wound healing for all study groups.
	Meza-Mauricio, 2021 [64]	PRF	In six studies, PRF promoted faster wound healing compared to control groups during the first 2 weeks ($p < 0.005$). However, no significant difference was observed in the third week after surgery when PRF was compared to collagen dressing and oxidized regenerated cellulose (2 studies).
	Gusman, 2021 [65]	PRF, PRF + butyl-cyanoacrylate, PRF + non-eugenol periodontal pack	All studies examining palatal wound epithelialization, regardless of the analytical method, showed that PRF led to complete healing in a shorter period compared to the respective control group.
	Veríssimo, 2021 [66]	Cyanoacrylate, cyanoacrilate + hemostatic sponge	In most studies, the cyanoacrylate group showed either less graft retraction ($p < 0.05$) or improved epithelialization, indicating better tissue healing compared to other groups. In contrast, two studies showed similar results between the tested groups (conventional suture and cyanoacrylate).
	Zhao, 2021 [23]	LLLT	Four studies reporting the results at donor sites after FGG showed a significantly higher percentage of complete epithelial healing at day 14 in the test groups, while at day 21, no difference was found between the test and control groups.
	Escobar, 2021 [30]	Cyanoacrylate tissue adhesive	The use of cyanoacrylate tissue adhesive with a hemostatic agent, like platelet-rich fibrin, resulted in more complete epithelialization at weeks two and three compared to cyanoacrylate and wet gauze. Additionally, cyanoacrylate tissue adhesive combined with a hemostatic sponge and suture (mean score: 9.0 ± 0.7) achieved better healing outcomes than a hemostatic sponge with suture alone (mean score: 6.8 ± 1) (p-value < 0.001).

Abbreviations: RCT—randomized controlled trial; VAS—visual analog scale; PRF—platelet-rich fibrin; LLLT—low-level laser therapy; HA—hyaluronic acid.

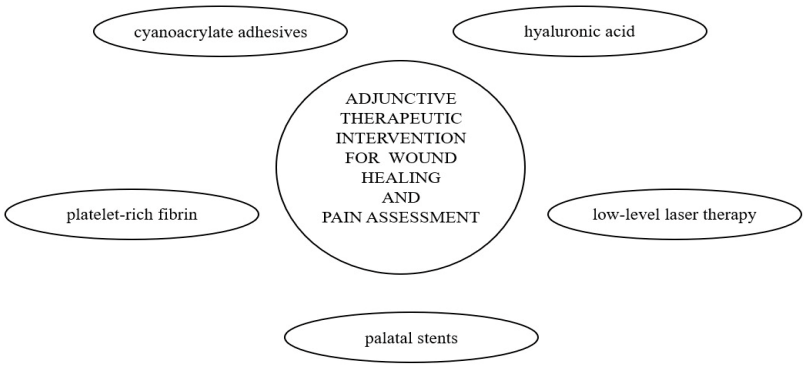


Figure 2. This figure illustrates the adjunctive therapeutic interventions for wound healing and pain control.

3.3.1. Pain Assessment

The VAS and the analgesic intake are the main methods that have been used by several authors to compare the intensity of postoperative pain.

Al-shibani described that there was a significantly lower score on the VAS for discomfort for the LLLT group compared to the control group at the donor site [62]. Ameida, in the meta-analysis review, showed that the VAS score also decreased with the use of autologous or xenogenic biomaterials, approximately 7 days after surgery [63].

Meza-Mauricio and Gusmann, however, underlined that in most of the studies considered, PRF demonstrated lower pain levels compared to various control groups (oxidized regenerated cellulose, wet gauze compression, gelatine sponge, and untreated) 7 days after surgery [64,65].

Escobar and Verissimo described how cyanoacrylate-based adhesives (either single or with a suture-stabilized hemostatic sponge) produced the lowest level of postoperative pain compared to other methods [30,66].

3.3.2. Wound Healing

Wound healing is assessed by the complete re-epithelialization of the wound.

Al-shibani described that there was a significantly lower score on the VAS for discomfort for the LLLT group compared to the control group at the donor site [62]. Research indicates that LLLT produces the disinfection of the tissue surface and minimizes the risk of bacteremia, as well as edema, swelling, and scarring [65].

Also, PRF and LLLT appear to have beneficial effects on the speed of healing of the donor site and the re-epithelization of the surgical wound, as described by many authors [23,27,29,62].

Escobar and Veríssimo described that the use of cyanoacrylate tissue adhesive showed either less graft retraction or improved epithelialization, indicating better tissue healing [30,66].

3.4. The Quality Assessment of the Included Studies

Most of the studies were judged to be of low quality or moderate quality, through the Assessing the Methodological Quality of Systematic Reviews (AMSTAR) 2 tool, as illustrated in Table 5 [42].

Table 5. Level of evidence of systematic reviews with meta-analysis included according to AMSTAR 2 tool.

Level	Description	Al-Shibani	Escobar	Veríssimo	Gusman	Meza-Mauricio	Ameida	Zhao
High	No or one non-critical weakness: the systematic review provides an accurate and comprehensive summary of the results of the available studies that address the question of interest							
Moderate	More than one non-critical weakness: the systematic review has more than one weakness but no critical flaws. It may provide an accurate summary of the results of the available studies that were included in the review	✓				✓		

Table 5. *Cont.*

Level	Description	Al-Shibani	Escobar	Veríssimo	Gusman	Meza-Mauricio	Ameida	Zhao
Low	One critical flaw with or without non-critical weaknesses: the review has a critical flaw and may not provide an accurate and comprehensive summary of the available studies that address the question of interest		✓	✓	✓			✓
Critically low	More than one critical flaw with or without non-critical weaknesses: the review has more than one critical flaw and should not be relied on to provide an accurate and comprehensive summary of the available studies						✓	

The risk of bias is also associated with the fact that some of the reviews considered include the same studies. Furthermore, the lack of standardization between the various authors contributes to increasing this risk.

4. Discussion

Seven systematic reviews were included.

These reviews included adjunctive studies evaluating interventions to stimulate healing or protect the harvested palate of patients undergoing gum grafting.

In recent years, there has been a notable increase in interest in this topic [67–73].

Overall, all reviews highlighted common characteristics that are desirable for a substance or intervention to be used in the postoperative management of the palatal wound [72,74–77]. Among these characteristics, the antibacterial properties stand out, to avoid contamination by bacteria and the subsequent infection of the wound, but also the hemostatic ones, to avoid copious bleeding from the palatal donor site [78,79]. Rigorous plaque control should be adhered to after periodontal surgery, using mouthwashes with antibacterial action and avoiding brushing the area for 2 weeks, then using a post-surgical toothbrush for 2 weeks. Furthermore, among other characteristics described, we can accelerate the epithelialization of the wound and the ability to reduce pain [80]. The purpose of this study is to identify which products or techniques are the best and which can result in fewer side effects and less morbidity in patients concerning postoperative pain and wound healing.

The reviews included suggest that the more effective interventions for patient-reported outcomes, particularly for pain management, are cyanoacrylate adhesives [30,63,65,66,81,82], platelet-rich fibrin [27–29,48,63–65,82–84], hyaluronic acid [85–87], and the use of palatal stents in combination with various therapeutic substances [25,63,88]. Low-level laser therapy (LLLT) has also demonstrated good results in palatal wound healing speed after FGG procedures [23,24,62,63,89].

Topical agents, such as ibuprofen, have also been described as spray [33] or spray with hypochlorous acid (HOCl) [90] but only with an analgesic action and not influencing the speed of re-epithelialization.

Pain management and wound healing are the two aspects analyzed in the review and go hand in hand since the wound healing of the palatal mucosa after FGG harvesting also reduces postoperative pain.

It is important to look for methods that can accelerate wound healing, to also reduce pain; in fact, some topical agents, such as ibuprofen spray or hypochlorous acid (HOCl) spray have been shown to reduce the perception of pain but not increase the speed of re-epithelialization [62–65].

The effects of the other methods appear to have mixed results [62–65].

4.1. Pain Assessment

Postoperative pain measurements were performed using different methods, such as the visual analog scale (VAS) and the amount of analgesics taken in the postoperative period (up to 7 days after surgery) [91–94].

The authors of the various studies also considered the VAS and the intake of analgesics among the main methods used to compare the intensity of postoperative pain.

The studies included in the reviews analyzed in this review demonstrated conflicting results on postoperative pain management.

Many studies have analyzed pain control during the first week but also in the first 14 days after FGG surgery which is also the most delicate week for postoperative pain control and wound healing [66].

The application of cyanoacrylate tissue adhesive appears to reduce postoperative morbidity after an FGG or a CTG thanks to the protection of the palatal wound during the healing. Cyanoacrylate tissue adhesive maintains its adhesive qualities in the presence of moisture. Furthermore, it has bacteriostatic, biodegradable, and hemostatic properties that have been related to cyanoacrylate tissue adhesive [60,95–100].

Additionally, cyanoacrylate tissue adhesive with platelet-rich fibrin suggested less pain than cyanoacrylate and wet gauze alone. It is important to remember that cyanoacrylate tissue adhesive alone caused less pain than wet gauze, just as cyanoacrylate tissue adhesive combined with suture demonstrated less pain than suture alone [30].

It seems that the use of PRF has better results for pain levels compared to other control groups (oxidized regenerated cellulose, wet gauze compression, gelatine sponge, and untreated) 7 days after surgery [64].

Ozcan has demonstrated that PRF associated with cyanoacrylate obtained better analgesia results up to day 6 of follow-up. However, there were no significant differences between the PRF and cyanoacrylate groups [82].

Tavelli demonstrated that hemostatic sponges associated with cyanoacrylate give the best postoperative pain comfort from the 1st to the 14th day with the lowest use of analgesics compared to the control group compared to sutures alone [70].

Palatal coverage seems to give better results regarding postoperative pain management regardless of the protection of the palatal wound [30,62–66].

4.2. Wound Healing

Wound healing is assessed by the complete re-epithelialization of the wound.

Numerous studies have shown that LLLT produces disinfection of the tissue surface and minimizes the risk of bacteremia, as well as edema, swelling, and scarring [95,96].

Furthermore, PRF and LLLT appear to have beneficial effects on the speed of healing of the donor site and on the re-epithelialization of the surgical wound, to determine a faster re-epithelialization of the surgical wound, as described by many authors [23,27,29,62,82,83].

4.3. Limitation of This Review

However, this study has limitations as the quality of the systematic reviews and meta-analysis was assessed using the Assessment of Methodological Quality of Systematic Reviews (AMSTAR) 2 tool and showed low quality.

This is due to the lack of standardization of the procedures used in the various studies of the reviews considered.

Furthermore, pain is a subjective parameter, and although it represents a serious discomfort for patients after FGG and CTG procedures, it is not easy to standardize.

Furthermore, the sample size of the studies was found to have considerable variations, and even some clinical studies did not show any information on the sample size, compromising the validity and reliability of the studies themselves.

Furthermore, there are other confounding factors to consider in the included studies, such as pain caused by the graft recipient site, the operator experience that could influence the outcomes considered in this review, and the smoking habit, drug intake, and systemic diseases that can influence the wound healing [101,102].

Another consideration is that in the included reviews, studies involving both FGGs and CTGs were considered. The CTG is harvested using a single incision which aims to completely close the wound through primary intention healing.

This approach has been associated with a significant reduction in morbidity, discomfort, and pain [64,65].

5. Conclusions

Considering what emerged from this review, various techniques and materials contribute to improving and accelerating the healing of the palatal donor site and reducing postoperative pain.

It is very important to try not to underestimate these aspects as poor management could negatively affect the patient's compliance, compromising the success of the therapy.

However, the included reviews showed different levels of evidence and different evaluation methods.

Future studies and high-quality randomized clinical trials are needed to provide clear descriptions and standardized intervention procedures to achieve clear outcomes. Additionally, studies should carefully consider potential confounding factors, such as graft size and other sources of pain unrelated to palatal wounds.

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