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Postoperative complications at the palatal donor site following autologous soft tissue grafting: a systematic review

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Abstract

This systematic review analyzes postoperative complications at the palatal donor site following the harvesting of autologous soft tissue grafts in periodontal surgery. Although these grafts remain the clinical reference standard due to their effectiveness, their harvesting may be associated with donor-site morbidity, including pain, bleeding, partial necrosis, and sensory disturbances. A comprehensive search was conducted in PubMed, Scopus, and Web of Science, identifying 16 clinical studies published between 2019 and April 2025. The included studies comprised randomized controlled trials, prospective and retrospective clinical studies, and case series, with sample sizes ranging from 6 to 89 participants. Due to heterogeneity in study designs, outcome measures, and follow-up protocols, a qualitative synthesis was performed and a quantitative meta-analysis was not feasible. Postoperative pain was the most frequently reported complication and was commonly assessed using the Visual Analog Scale (VAS), although other instruments such as the Numeric Rating Scale (NRS) were also used. Several adjunctive strategies, including palatal stents, hyaluronic acid, platelet-rich fibrin (PRF), mucoadhesive dressings, and low-level laser therapy (LLLT), were reported to be associated with lower postoperative discomfort and favorable healing patterns. Bleeding was reported less frequently and was generally self-limiting, particularly when local hemostatic measures were applied. Sensory disturbances were typically mild and transient, resolving during routine follow-up. No serious infections or complications compromising patient health were reported. In conclusion, while morbidity at the palatal donor site is relatively common, it is generally mild and manageable. Certain adjunctive measures may help reduce postoperative discomfort and support healing; however, the overall strength of the available evidence remains moderate. These findings may help improve postoperative recovery and inform future clinical research.

Keywords Palate, Gingival Transplantation, Connective Tissue Transplantation, Postoperative Complications, Patient Reported Outcome Measures, Periodontal Surgical Procedures

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Introduction

Since the mid-20th century, numerous mucogingival surgical techniques have been developed and refined with the primary goal of correcting gingival recessions and increasing the width of keratinized tissue [1, 2]. More recently, these procedures have also been applied to alveolar ridge preservation, guided bone regeneration, and peri-implant soft tissue reconstruction [3, 4].

These interventions commonly involve autologous soft tissue grafts, particularly two techniques that are most frequently used in clinical practice: the free gingival graft (FGG), which includes epithelium and connective tissue and heals by secondary intention, and the subepithelial connective tissue graft (SCTG), which consists solely of connective tissue and allows primary healing through repositioning and suturing of the palatal flap. For SCTGs, several surgical approaches have been proposed and classified according to the number and configuration of incisions, [5, 6] with the aim of preserving a partial-thickness flap that can be repositioned and sutured after harvesting, thereby optimizing healing and minimizing postoperative complications.

Despite the emergence of alternative materials designed to avoid autologous tissue harvesting, the scientific literature continues to support autologous grafts as the clinical reference standard for increasing keratinized gingiva width and mucosal thickness [2, 7] and for ensuring long-term clinical stability [1]. However, the main drawback associated with these procedures is donor-site morbidity, which may include bleeding, necrosis, postoperative pain, and patient discomfort [8, 9].

Numerous studies have investigated these complications using both clinical parameters and patient-reported outcome measures (PROMs). In general, FGGs have been associated with greater postoperative discomfort and bleeding than SCTGs, although some studies have reported comparable morbidity between the two techniques. Nevertheless, other authors have suggested that donor-site morbidity may be more closely related to factors such as graft thickness or flap-related complications rather than graft type itself [10–13].

The present review focuses exclusively on complications occurring at the palatal donor site; outcomes at the recipient site are beyond the scope of this work. Complications at the palatal donor site have stimulated research into additional therapies aimed at improving wound healing, reducing morbidity, and enhancing the patient experience. Among the proposed strategies are hyaluronic acid, [14] enamel matrix derivatives, [15] electrotherapy, [16] resorbable sponges, [17] cyanoacrylate adhesives, [18] low-level laser therapy (LLLT), [19] and platelet-rich fibrin (PRF) [20].

Although several systematic reviews have evaluated the effectiveness of individual interventions in promoting healing and reducing postoperative discomfort [8, 9, 21–26], no previous review has explicitly and comprehensively focused on the incidence of complications at the palatal donor site, either with or without the use of adjunctive therapies.

Despite the clinical relevance of palatal donor-site morbidity, the available evidence remains fragmented, inconsistently reported, and lacks standardized outcome definitions. Therefore, the aim of this systematic review is to identify, analyze, and synthesize the available clinical evidence on postoperative complications occurring at the palatal donor site following autologous soft tissue graft harvesting, thereby facilitating clinical decision-making, supporting less invasive techniques, and improving the overall patient experience.

The primary outcomes of interest were postoperative pain, bleeding, healing characteristics, and sensory disturbances. Secondary outcomes included patient satisfaction, quality of life, and donor-site wound characteristics. The search period (2019–2025) was intentionally restricted to capture contemporary surgical approaches, the introduction of new adjunctive therapies, and the recent shift toward patient-reported outcome measures. Our working hypothesis was that specific clinical strategies may be associated with lower postoperative pain and higher patient satisfaction compared with conventional management.

Given that palatal donor-site morbidity directly influences patient comfort, adherence to postoperative instructions, and overall treatment acceptance, a clearer understanding of its incidence and management is highly relevant for daily periodontal practice. Identifying strategies that may reduce discomfort can support more predictable surgical planning and improve shared decision-making with patients.

Materials and methods

This systematic review was conducted in accordance with the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, to ensure transparency and methodological rigor throughout all stages of the review process. Prior to study selection, a detailed review protocol was developed following the methodological recommendations of the Cochrane Handbook for Systematic Reviews of Interventions.

The protocol was registered in the PROSPERO database (International Prospective Register of Systematic Reviews), maintained by the United Kingdom's National Institute for Health Research, under the affiliation of the University of York, Centre for Reviews and Dissemination. The protocol is publicly available at the following link: https://www.crd.york.ac.uk/PROSPERO/view/CRD420251050756.

Research question and PICO definitions

The research question was structured using the PICO framework (Population, Intervention, Comparison, Outcome), which facilitated a structured definition of the eligibility criteria and outcomes of interest.

The specific research questions addressed were:

(1) What is the incidence and severity of postoperative complications (pain, bleeding, necrosis, and sensory alterations) at the palatal donor site following autologous soft tissue graft harvesting?

(2) Which adjunctive clinical strategies have been investigated for their potential to reduce these complications compared to conventional management?"

Although most included studies did not include a formal comparison group, the PICO framework was applied to structure the research question and guide data extraction.

- Population (P): Patients undergoing periodontal surgery involving autologous soft tissue grafts.
- Intervention (I): Procedures using subepithelial connective tissue grafts (SCTG) or free gingival grafts (FGG).
- Comparison (C): Not applicable, as most studies were descriptive or single-arm clinical investigations.
- Outcome (O): Postoperative clinical complications at the palatal donor site (e.g., pain, bleeding, necrosis, wound dehiscence, sensory disturbances, infection).

Given the descriptive nature of the available evidence and the absence of comparable control groups in most studies, a qualitative synthesis was planned and quantitative meta-analysis was not considered appropriate.

Table 1 Search Strategies Focused on Complications (2019–2025)

Database	Search Strategy	Applied Filters
PubMed	(("soft tissue graft"[Title/Abstract] OR "connective tissue graft"[Title/Abstract] OR "free gingival graft"[Title/Abstract] OR "mucogingival surgery"[Title/Abstract]) AND ("periodontal"[Title/Abstract] OR "periodontal surgery"[Title/Abstract]) AND ("complication*"[Title/Abstract] OR "postoperative complications"[Title/Abstract] OR morbidity[Title/Abstract] OR pain[Title/Abstract] OR bleeding[Title/Abstract] OR infection[Title/Abstract] OR necrosis[Title/Abstract] OR paresthesia[Title/Abstract])) AND (humans[MeSH Terms]) AND ("2019/01/01"[Date - Publication] : "2025/04/30"[Date - Publication])	Language: English or Spanish; Humans; 2019–2025; Article types: Clinical studies (manual screening).
Scopus	(TITLE-ABS-KEY("soft tissue graft" OR "connective tissue graft" OR "free gingival graft" OR "mucogingival surgery") AND TITLE-ABS-KEY("periodontal" OR "periodontal surgery") AND TITLE-ABS-KEY("complication*" OR "postoperative complication*" OR morbidity OR pain OR bleeding OR infection OR necrosis OR paresthesia)) AND (PUBYEAR > 2018 AND PUBYEAR < 2026) AND (LIMIT-TO (LANGUAGE, "English") OR LIMIT-TO (LANGUAGE, "Spanish")) AND (LIMIT-TO (DOCTYPE, "ar"))	Language: English or Spanish; 2019–2025; Document type: Article.
Web of Science	TS=("soft tissue graft" OR "connective tissue graft" OR "free gingival graft" OR "mucogingival surgery") AND TS=("periodontal" OR "periodontal surgery") AND TS=("complication*" OR "postoperative complication*" OR morbidity OR pain OR bleeding OR infection OR necrosis OR paresthesia") AND PY=(2019–2025) AND LA=(English OR Spanish) AND DOCUMENT TYPES=(Article)	Language: English or Spanish; 2019–2025; Document type: Article.

Literature search strategy

A systematic literature search was conducted across three electronic databases: PubMed (MEDLINE), Scopus, and Web of Science, with the objective of identifying clinical studies reporting postoperative complications associated with autologous soft tissue graft harvesting in periodontal surgery. Grey literature (conference abstracts, theses, and non-indexed material) was not searched.

The search was performed in April 2025 and was restricted to studies published between January 2019 and April 2025. Only free-text keywords were used, combined with Boolean operators, and included terms related to soft tissue grafting, periodontal surgery, and donor-site morbidity (e.g., "soft tissue graft," "connective tissue graft," "free gingival graft," "mucogingival surgery," "postoperative complications," "pain," "bleeding," "necrosis," and "infection"). MeSH terms were not applied.

The applied filters included studies conducted in humans, published in English or Spanish, and classified as original clinical research. The complete search strategies for each database are reported in Table 1.

In addition, a manual screening of the reference lists of all included articles was performed to identify any potentially relevant studies not retrieved through the electronic search.

Study selection and data extraction

Eligibility criteria were defined a priori. Studies were included if they met the following criteria:

(i) clinical studies conducted in adult human patients;
(ii) randomized controlled trials, prospective or retrospective studies, or case series including at least five patients;
(iii) use of SCTG or FGG techniques; and.
(iv) explicit reporting of postoperative complications at the palatal donor site, such as pain, bleeding, necrosis, delayed epithelialization, sensory disturbances, or infection.

Studies were excluded if they involved animal models or in vitro experiments, were case reports with fewer than five patients, or consisted of narrative reviews, systematic reviews, editorials, letters, or conference abstracts. Studies were also excluded if they did not report donor-site complications, did not specify the grafting technique used, or were unavailable in full text or published in languages other than English or Spanish. Inclusion and exclusion criteria are summarized in Table 2.

All records retrieved from the database searches were imported into EndNote 21 software, which was used for duplicate removal. Study selection was performed in two stages: an initial screening based on titles and abstracts, followed by full-text assessment of potentially eligible articles. Any disagreements during the screening process were resolved by consensus.

Relevant data were extracted from the included studies, including authorship, year of publication, study design, sample size, grafting technique, follow-up duration, reported donor-site complications, and patient-reported outcomes. Data extraction was initially assisted by an AI-based algorithm for the identification and preliminary categorization of study characteristics (study design, sample size, intervention type, and reported outcomes). All extracted variables, including complication type, follow-up duration, and patient-reported measures, were subsequently verified manually by an independent reviewer (O.F.A.) to ensure accuracy and consistency.

Table 2 Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Clinical studies in adult human patients.	Animal studies, in vitro studies, case reports (< 5 patients).
Randomized controlled trials, prospective studies, retrospective studies, or case series including ≥ 5 patients.	Narrative reviews, systematic reviews, editorials, letters, and conference abstracts.
Use of subepithelial connective tissue grafts (SCTG) or free gingival grafts (FGG).	Studies not reporting donor-site postoperative complications.
Studies reporting postoperative complications specifically at the palatal donor site (e.g., pain, bleeding, necrosis, sensory disturbances, delayed epithelialization, infection).	Studies not specifying the graft type or surgical procedure.
Articles published between 2019 and 2025 in English or Spanish.	Articles not available in full text or published in languages other than English or Spanish.

Risk of bias assessment

The risk of bias of the included studies was assessed according to study design. Randomized controlled trials were evaluated using the Cochrane Risk of Bias tool (RoB 2), while non-randomized studies were assessed using the ROBINS-I tool (Risk Of Bias In Non-randomized Studies of Interventions). Case series were appraised using the Joanna Briggs Institute (JBI) critical appraisal checklist, which is specifically designed for descriptive studies without comparator groups.

The use of different risk-of-bias tools was considered appropriate given the heterogeneity of study designs included in this review. Risk-of-bias assessments were performed independently by two reviewers, and any discrepancies were resolved through discussion and consensus. Risk-of-bias judgments were not pooled across study designs but were used to contextualize the strength and limitations of the available evidence.

Results

Study selection and characteristics

Within the framework of this systematic review, a rigorously structured search strategy yielded a total of 270 records: 60 from PubMed, 62 from Scopus, and 148 from Web of Science. After removing 99 duplicates, 171 unique records were obtained and subjected to an initial screening based on titles and abstracts. Of these, 136 studies were excluded for not meeting the predefined inclusion criteria. A total of 35 full-text articles were then assessed for eligibility. Nine studies were excluded because they were narrative or systematic reviews, and ten were excluded because they did not specifically report complications related to the palatal donor site. Ultimately, 16 studies met all methodological and thematic criteria and were included in the final analysis.

The detailed process of identification, screening, eligibility assessment, and inclusion is illustrated in the PRISMA 2020 flow diagram (Fig. 1).

The characteristics of the included studies—study design, sample size, grafting technique used, and follow-up duration—are summarized in Table 3.

A total of 16 studies published between 2019 and April 2025 were included, with sample sizes ranging from 6 to 89 patients. These studies evaluated various soft tissue grafting techniques in periodontal surgery, and several also analyzed clinical management strategies for the palatal donor site. Most studies were randomized controlled trials ($n = 9$) [27, 32, 34, 35, 38–42], followed by case series ($n = 5$)28–30,33,36, one prospective observational study [31], and one retrospective comparative study [37].

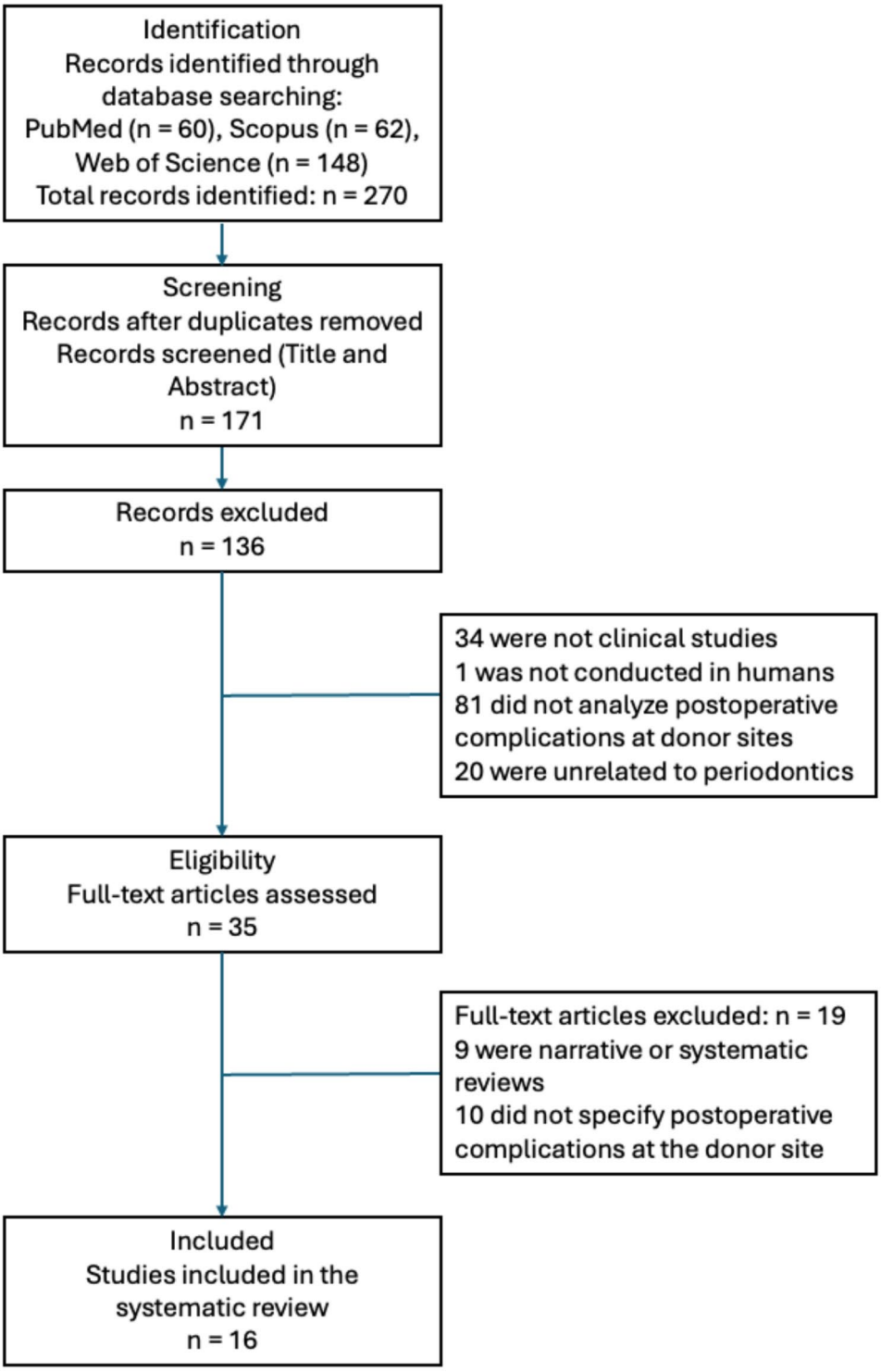

Fig. 1 PRISMA 2020 flow diagram for study selection. Flow diagram illustrating the identification, screening, eligibility, and inclusion process for studies analyzed in this systematic review, according to the PRISMA 2020 guidelines

Both free gingival grafts (FGG) [27, 28, 32–37, 41] and subepithelial connective tissue grafts (SCTG) [29–31, 37–40, 42] were employed, with procedural variations including the use of double-blade harvesting techniques [29, 42] or de-epithelialized grafts [31, 40, 42], as well as different methods for donor-site protection or treatment. Strategies aimed at improving healing and reducing postoperative complications included palatal stents [30, 32,

Table 3 Characteristics of the Included Studies

Study	Study Design	Sample Size	Grafting Technique	Follow-up Duration
Alasfar et al. (2023) [27]	Randomized controlled trial (parallel, 2 groups)	22 patients (20 evaluated)	Free gingival graft with 10% turmeric gel or periodontal dressing (Coe-Pak)	Up to 2 months
Belkhede et al. (2019) [28]	Comparative case series	6 patients	Free gingival graft with donor site covered by gelatin sponge or PRF	4 weeks
Carranza et al. (2020) [29]	Case series	20 patients	Connective tissue graft harvested using the modified double-blade technique	3 weeks to 1 year
Chiu et al. (2020) [30]	Consecutive case series	8 patients	Connective tissue graft covered with light-cured resin palatal stent	1 month
do Nascimento et al. (2024) [31]	Preliminary prospective observational study	31 patients	Subepithelial connective tissue graft + coronally advanced flap	6 months
İşler et al. (2019) [32]	Randomized controlled trial (6 parallel groups)	60 patients	Free gingival graft donor site treated with PRF, Essix stent, ozone, LLLT, collagen sponge, or no treatment	14 days
Lafzi et al. (2019) [33]	Case series	10 patients (20 surgical sites)	Free gingival graft with low-level laser therapy (LLLT) on one side	30 days
Alpan et al. (2023) [34]	Randomized controlled trial (parallel)	60 patients (4 groups of 15)	Free gingival graft with topical application of HA, HOCl, or flurbiprofen at donor site	28 days
Mutallibli et al. (2024) [35]	Randomized controlled trial (parallel)	36 patients (3 groups of 12)	Free gingival graft with L-PRF, A-PRF, or palatal stent + periodontal dressing	1 month
Nabiyi et al. (2024) [36]	Triple-blind randomized controlled trial	39 patients (3 groups of 13)	Free gingival graft with mucoadhesive HA (0.2% or 0.8%) or no HA	42 days
Parlak et al. (2022) [37]	Retrospective comparative study	89 patients	Epithelialized gingival graft with donor site treated with: GS, GS + CY, GS + HA, or GS + HA+CY	28 days
Santamaria et al. (2023) [38]	Single-blind randomized controlled trial	60 patients (20 per group)	CAF alone, CAF + SCTG, CAF + L-PRF	6 months
De Carvalho et al. (2023) [39]	Split-mouth randomized controlled trial	12 patients (24 recessions)	TUN + thin (1 mm) vs. thick (2 mm) connective tissue graft	6 months
Tirone et al. (2021) [40]	Randomized controlled trial (parallel)	50 patients	Connective tissue graft with or without bipolar coagulation	7 days (clinical follow-up up to 3 months)
Yussif et al. (2021) [41]	Pilot randomized controlled trial (parallel)	24 sites (20 evaluated)	Free gingival graft with palatal protection using polypropylene mesh (test) or acrylic resin stent (control)	30 days
Zangrando et al. (2019) [42]	Split-mouth randomized controlled trial	21 patients (84 treated recessions)	CAF + graft harvested with double-blade scalpel (DBS) vs. de-epithelialized graft (DE)	6 months

35, 41], periodontal dressings [27, 34–36], and bioactive agents such as platelet-rich fibrin (PRF) [28, 32, 35, 38], hyaluronic acid [34, 36, 37], ozone therapy [32], bipolar coagulation [40], and various combinations of gelatin sponges with other biomaterials [28, 32, 34, 37].

Postoperative follow-up durations varied across studies, ranging from 7 days [40] to 6 months [31], with most studies following patients for 1 to 2 months. Some studies directly compared different therapeutic modalities applied to the palatal donor site, such as mucoadhesive hyaluronic acid gels at different concentrations36, low-level laser therapy (LLLT)33, or bipolar coagulation [40], whereas others were non-comparative. Additional studies focused on factors such as graft thickness [38, 39] or evaluated alternative surgical techniques, including tunneling or coronally advanced flaps (CAF), with or without adjunctive biomaterials [29, 31, 38, 39, 42].

Risk of bias assessment

A total of **nine randomized controlled trials (RCTs)** [27, 32, 34, 35, 38–42] were evaluated using the RoB 2 tool. Among these, five studies were rated as having a low overall risk of bias [34, 38–40, 42], reflecting robust methodologies, adequate blinding, and minimal loss to follow-up. Overall, methodological quality was considered moderate, with the majority of studies rated as low risk or presenting only minor concerns. Two studies showed some concerns [27, 32], mainly due to unclear randomization procedures or limited blinding of evaluators or participants. The remaining two trials were judged to have a high risk of bias [35, 41], primarily because of the absence of randomization or blinding, or reliance solely on self-reported outcomes (Fig. 2).

Domain-specific results for randomized trials are shown in Fig. 3, whereas Figs. 4 and 5 summarize the assessments for non-randomized studies and case series, respectively. Most randomized controlled trials

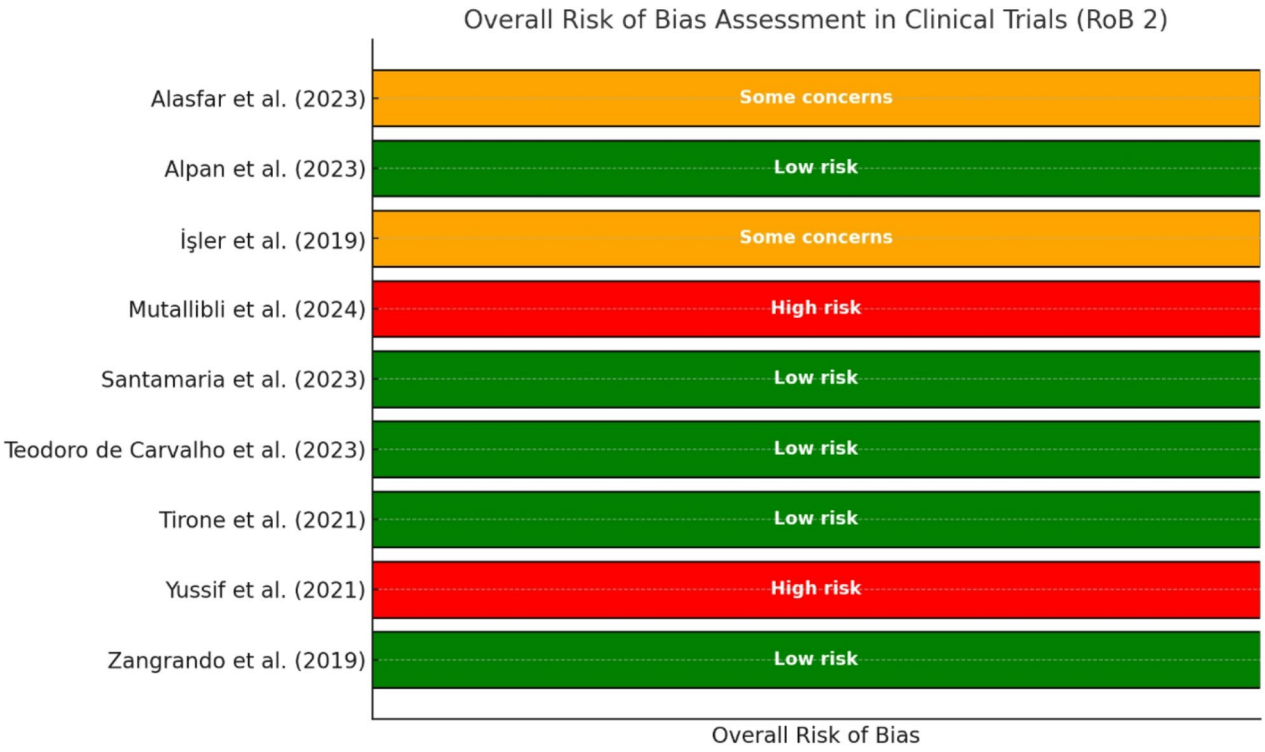

Fig. 2 Overall risk of bias in randomized controlled trials (RoB 2). Summary chart showing the overall risk of bias across all randomized controlled trials assessed with the Cochrane RoB 2 tool. Colors indicate the judgment assigned to each study: green (low risk), yellow (some concerns), and red (high risk)

[34, 38–40, 42] demonstrated an overall low risk of bias across all domains. The main sources of potential bias in other studies were related to randomization procedures [27, 41] or lack of blinding during outcome assessment [32, 35] which may have influenced subjective outcomes such as pain perception and patient satisfaction. The domains of missing outcome data and selective reporting were generally well controlled, with minimal attrition and comprehensive reporting of results. Overall, these findings suggest that the methodological quality of the included RCTs was acceptable, although caution is warranted when interpreting subjective outcomes.

The two non-randomized studies (one prospective and one retrospective) [31, 37] were assessed using the ROBINS-I tool. Both were considered to have a moderate overall risk of bias, mainly due to the potential influence of unadjusted confounding variables and the lack of blinding in outcome assessment. Nevertheless, participant selection and intervention classification were deemed appropriate, with complete clinical records and well-documented methodologies. Outcome measures were predominantly based on subjective, self-reported scales (e.g., pain), supporting a moderate risk-of-bias judgment in this domain.

The five included case series [28–30, 33, 36] were evaluated using the Joanna Briggs Institute (JBI) checklist. Four studies [29, 30, 33, 36] were rated as having good methodological quality, with detailed procedural descriptions, objective measurements, methodological consistency, and minimal loss to follow-up. One study [28] was rated as having moderate methodological quality, mainly due to the use of unvalidated subjective outcome measures and limited generalizability associated with a small sample size (Figs. 2, 3, 4 and 5).

Postoperative complications at the palatal donor site

Table 4 (Table S1) and Fig. 6 summarize the studies assessing postoperative complications at the palatal donor site following autologous soft tissue graft harvesting, together with the preventive or management strategies applied.

Pain was the most frequently reported adverse event. Most studies assessed pain intensity using the Visual Analog Scale (VAS). Several strategies were reported to reduce postoperative pain, including topical curcumin gel [27], hyaluronic acid [34, 36, 37], platelet-rich fibrin (PRF) [28, 32, 35, 38], low-level laser therapy (LLLT), palatal stents [30, 32, 35, 41], and mucoadhesive dressings [27, 28, 32, 34–37], although most studies did not include formal statistical comparisons. Some studies reported negligible pain levels [31], whereas others observed similar pain intensity across techniques [35, 39]. Higher pain levels were descriptively associated with the use of

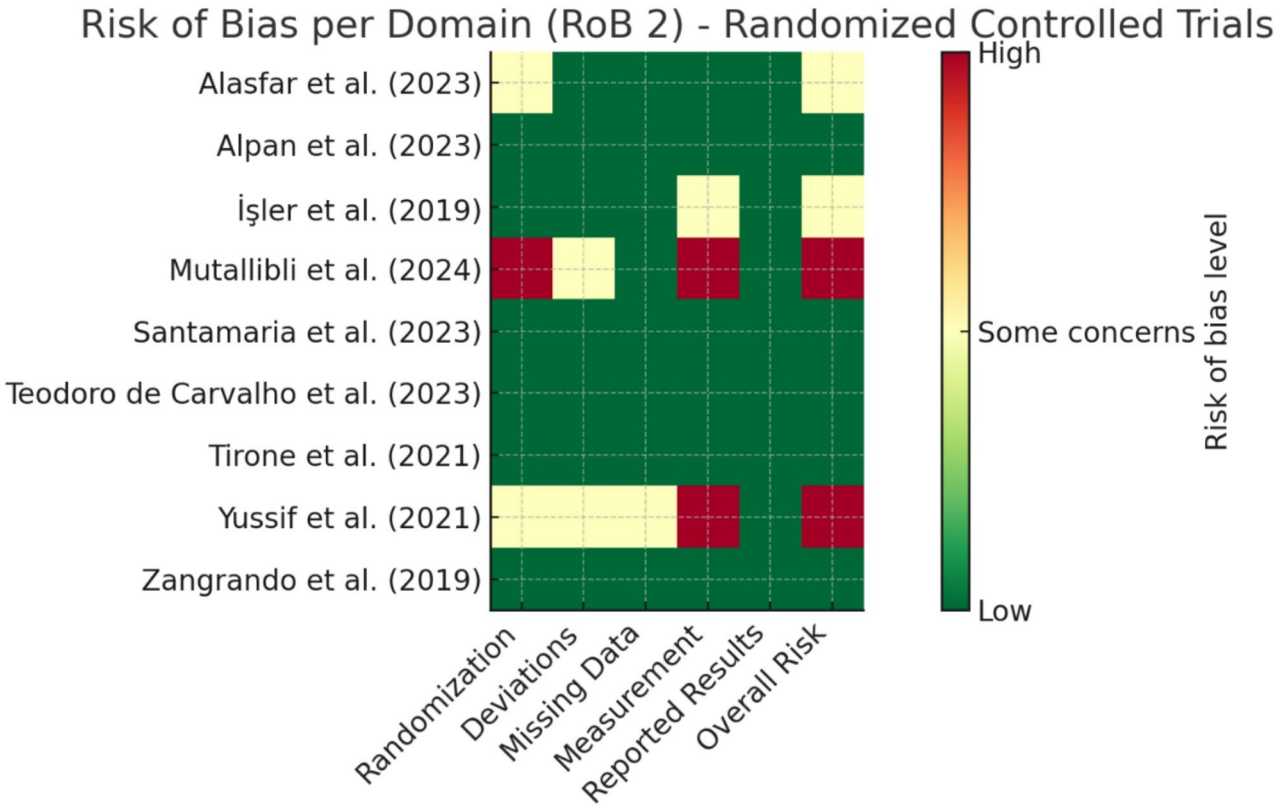

Fig. 3 Domain-specific risk of bias for randomized controlled trials. Distribution of risk of bias judgments across the five domains of the RoB 2 tool: (1) randomization process, (2) deviations from intended interventions, (3) missing outcome data, (4) measurement of outcomes, and (5) selection of reported results. Colors represent low risk (green), some concerns (yellow), and high risk (red)

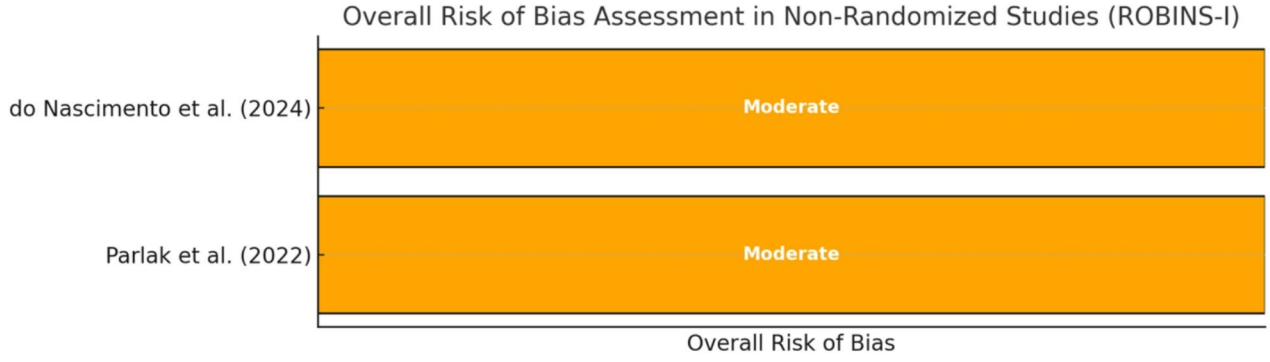

Fig. 4 Risk of bias in non-randomized studies (ROBINS-I). Overall assessment of risk of bias for the two non-randomized studies included in the review, as evaluated using the ROBINS-I tool. Levels of bias are indicated as low, moderate, serious, or critical

thicker grafts [39] or de-epithelialized grafts, compared with PRF alone without connective tissue [38].

Bleeding was reported less frequently than pain, with variability across techniques. In general, the use of polypropylene meshes, gelatin sponges combined with cyanoacrylate or hyaluronic acid, or palatal stents appeared to reduce the intensity and duration of delayed bleeding. Some studies reported no delayed bleeding events [30, 34], whereas Tirone et al. [40] documented 17 delayed bleeding events in 15 patients, with no differences between study groups.

No severe or clinically relevant infections were reported at the donor site in any of the included studies. Likewise, data on postoperative swelling were limited and mostly anecdotal. Specific complications such as partial flap necrosis [32], transient sensory disturbances [31], and mild functional discomfort [30] were also reported.

Several studies assessed wound healing using clinical indices, patient-reported esthetic outcomes, or time

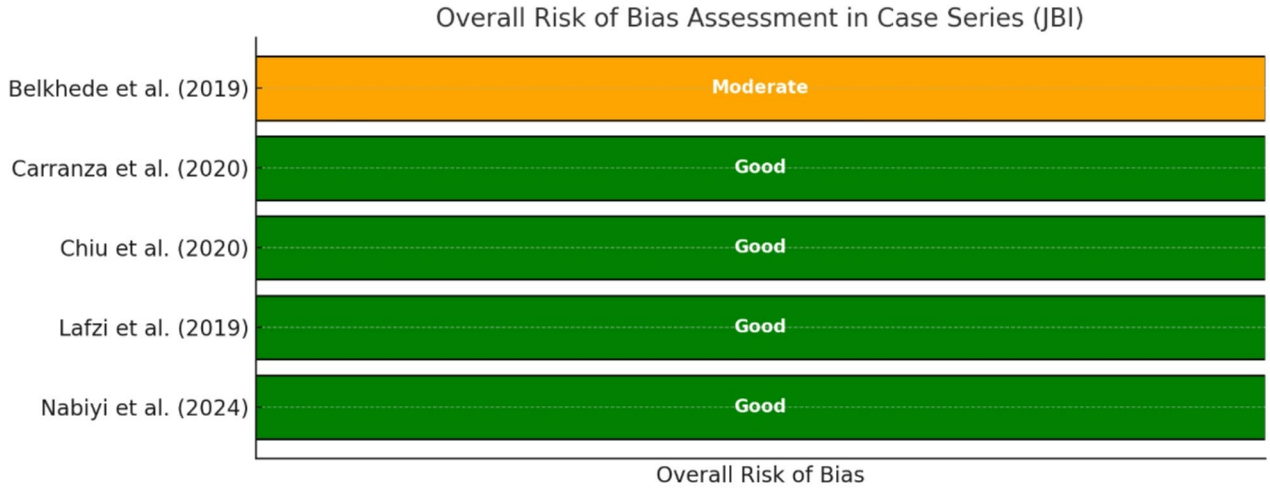

Fig. 5 Risk of bias in case series studies (JBI checklist). Summary of methodological quality for the five included case series, evaluated using the Joanna Briggs Institute (JBI) checklist. Green bars indicate compliance with methodological criteria; yellow bars indicate partial compliance; red bars indicate items not fulfilled

to re-epithelialization. The use of gelatin sponges, hyaluronic acid, palatal stents, or low-level laser therapy (LLLT) appeared to be associated with trends toward faster or more uniform healing, although statistical comparisons were rarely provided. In some cases, the control group demonstrated better epithelialization35, whereas in others, innovative approaches were described as yielding more favorable healing profiles based on qualitative assessments [41, 42].

Figure 7 graphically illustrates the frequency of the different clinical complications and donor-site outcomes reported across the included studies.

Specific donor site complications: incidence, duration, and clinical management

An analysis of the 16 included studies revealed data on specific postoperative complications reported at the palatal donor site following autologous soft tissue harvesting, including their frequency, duration, and the therapeutic strategies or follow-up approaches employed (Table 5/ Table S2 and Fig. 8).

Pain was the most frequently reported complication and was addressed in several studies using topical or protective strategies. Alasfar et al. [27] reported a significant reduction in pain in the turmeric gel–treated group, with clinical improvement observed from the third postoperative day, although no statistical comparison was provided. Belkhede et al. [28] reported a trend toward reduced discomfort in patients treated with a gelatin sponge, evaluated up to four weeks post-surgery, based on descriptive findings.

Necrosis was reported in two studies. Carranza et al. [29] described mild necrosis in their case series, which resolved completely within three weeks through secondary-intention healing without additional intervention. İşler et al. [32] recorded a 3.3% incidence of partial necrosis, which was similarly managed with clinical follow-up and did not require further treatment.

Sensory disturbances were described in one study31, which reported that 18.4% of patients experienced numbness at the donor site, along with other symptoms such as hypersensitivity or electric-shock sensations. These alterations were monitored for up to six months and resolved without active intervention.

Functional complications, such as temporary speech discomfort, were reported in one study. Chiu et al. [30] observed transient speech difficulties in 50% of patients, which resolved spontaneously within a few days as patients adapted to the palatal stent.

Delayed hemorrhage and emergency visits were reported in two studies, totaling 17 events across 15 patients. Tirone et al. [40] documented 17 episodes of delayed bleeding in 15 patients, including seven emergency visits. Yussif et al. [41] reported a single case (5%) of delayed bleeding in the control group. In both studies, treatment was tailored to the patient's clinical needs, and no severe complications were reported.

Regarding epithelialization speed, Alpan et al. [34] observed a trend toward faster epithelialization in the group treated with hyaluronic acid compared with those receiving HOCl or flurbiprofen, although statistical confirmation was not provided. Mutallibli et al. [35] reported a slight delay in epithelialization in PRF-treated groups; however, complete healing was achieved in all patients by day 14.

Seven studies [33, 36–39, 41, 42] reported no clinically relevant complications at the donor site beyond the

Table 4 Summary of postoperative complications at the palatal donor site and associated findings. Detailed descriptions of individual study outcomes are provided in Supplementary Table S1

Study	Pain (VAS/assessment)	Delayed bleeding	Infection	Swelling	Other relevant findings	Follow-up (days)
Alasfar et al. (2023) [27]	Reduced pain with turmeric gel (days 3–7)	Not reported	Not reported	Not reported	Improved healing index and color match	7
Belkhede et al. (2019) [28]	Lower pain intensity and duration	None reported	Not reported	Not reported	Faster epithelialization with gelatin sponge	28
Carranza et al. (2020) [29]	Minimal pain, managed with NSAIDs	None reported	Not reported	Not reported	Minor flap necrosis; complete healing by day 21	21
Chiu et al. (2020) [30]	Very low pain (mean VAS 0.5)	None reported	Not reported	Not reported	Transient speech discomfort (50%), resolved spontaneously	14
do Nascimento et al. (2024) [31]	No pain reported (DN4)	Not reported	Not reported	Not reported	Transient numbness (18.4%), resolved during follow-up	180
İşler et al. (2019) [32]	Lower pain with PRF and LLLT	Not reported	Not reported	Not reported	Partial flap necrosis (3.3%)	14
Lafzi et al. (2019) [33]	Reduced pain at 24 h with LLLT	Not reported	Not reported	Not reported	Improved healing and color	30
Alpan et al. (2023) [34]	Lower pain in HA and flurbiprofen groups	None reported	Not reported	Not reported	Faster epithelialization in HA group	21
Mutallibli et al. (2024) [35]	Similar pain across groups	Not reported	Not reported	Not reported	Faster epithelialization in control group	14
Nabiyi et al. (2024) [36]	No significant pain differences	Not reported	Not reported	Not reported	No additional donor-site findings	42
Parlak et al. (2022) [37]	Lower pain with GS + CY and GS + HA+CY	Reduced	Not reported	Not reported	Improved healing and color in GS + HA+CY group	28
Santamaria et al. (2023) [38]	Higher pain with CAF+SCTG	Not reported	Not reported	Not reported	No additional donor-site complications	180
De Carvalho et al. (2023) [39]	Higher pain with thicker grafts	Not reported	Not reported	Not reported	No adverse donor-site events	180
Tirone et al. (2021) [40]	Mean VAS 3.37 ± 2.30	Yes (17 events/15 patients)	Not reported	Not reported	Seven emergency visits	7
Yussif et al. (2021) [41]	Lower pain in mesh group (VAS 1.6 vs. 7.1)	Reduced in mesh group	None reported	Not reported	Improved healing in mesh group	30
Zangrando et al. (2019) [42]	Lower pain with DBS vs. DE	Not reported	Not reported	Not reported	Improved esthetics in both groups	180
Study	**Pain (VAS 0–10)**	**Delayed Bleeding**	**Infection**	**Swelling**	**Other Findings**	**Follow-up (days)**
Alasfar et al. (2023) [27]	Significant reduction with turmeric gel (days 3–7)	Not reported	Not reported	Not reported	Improved healing index and color match	7
Belkhede et al. (2019) [28]	Lower intensity and duration with gelatin sponge	No delayed bleeding	Not reported	Not reported	Faster epithelialization with sponge	28
Carranza et al. (2020) [29]	Minimal, managed with NSAIDs	No delayed bleeding	Not reported	Not reported	Minor flap necrosis, full healing by day 21	21
Chiu et al. (2020) [30]	VAS 0–2 (mean 0.5)	No delayed bleeding	Not reported	Not reported	Speech discomfort in 50%, resolved in few days	14
do Nascimento et al. (2024) [31]	No pain detected (DN4)	Not reported	Not reported	Not reported	18.4% numbness; hypersensitivity; resolved	180
İşler et al. (2019) [32]	Lower pain with PRF and LLLT	Not reported	Not reported	Not reported	Partial necrosis (3.3%)	14
Lafzi et al. (2019) [33]	Reduced at 24 h with LLLT	Not reported	Not reported	Not reported	Improved healing and color	30
Alpan et al. (2023) [34]	Less pain in HOCl; HA and flurbiprofen effective	No delayed bleeding	Not reported	Not reported	Faster epithelization in HA group	21
Mutallibli et al. (2024) [35]	Similar across groups	Not reported	Not reported	Not reported	Faster epithelialization in control group	14
Nabiyi et al. (2024) [36]	No significant differences	Not reported	Not reported	Not reported	—	42

Table 4 (continued)

Study	Pain (VAS 0–10)	Delayed Bleeding	Infection	Swelling	Other Findings	Follow-up (days)
Parlak et al. (2022) [37]	Lower in GS + CY and GS + HA+CY	Less delayed bleeding in treated groups	Not reported	Not reported	Better healing and color in GS + HA+CY	28
Santamaria et al. (2023) [38]	Higher in CAF+SCTG	Not reported	Not reported	Not reported	—	180
De Carvalho et al. (2023) [39]	More pain with thicker grafts	Not reported	Not reported	Not reported	No adverse events	180
Tirone et al. (2021) [40]	Mean VAS 3.37 ± 2.30	17 delayed bleeding events in 15 patients	Not reported	Not reported	7 emergency visits	7
Yussif et al. (2021) [41]	Lower in mesh group (VAS 1.6 vs. 7.1)	Reduced delayed bleeding in mesh group	No infections	Not reported	Better healing in mesh group	30
Zangrando et al. (2019) [42]	Less pain in DBS vs. DE	Not reported	Not reported	Not reported	Improved esthetics in both groups	180

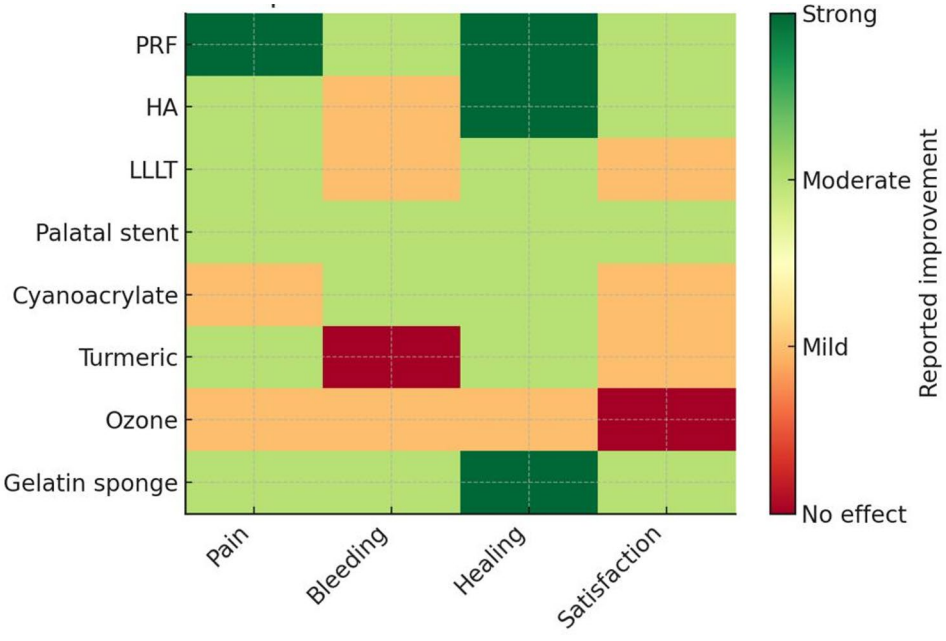

Fig. 6 Heatmap illustrating the reported magnitude of clinical improvement associated with different donor-site management strategies across the included studies. The x-axis represents clinical outcomes (pain, delayed bleeding, healing, and patient satisfaction), while the y-axis displays the adjunctive interventions assessed (PRF, hyaluronic acid, LLLT, palatal stents, cyanoacrylate, turmeric, ozone therapy, and gelatin sponge). Each cell reflects the qualitative magnitude of improvement reported in the corresponding outcome, based on study-level evidence. Color intensity denotes the reported strength of effect: dark green indicates strong improvement, light green moderate improvement, yellow mild improvement, orange minimal improvement, and red no measurable effect. This heatmap provides a comparative visualization of how different interventions may influence donor-site morbidity and patient-reported outcomes. Abbreviations: PRF, Platelet-Rich Fibrin; HA, Hyaluronic Acid; LLLT, Low-Level Laser Therapy

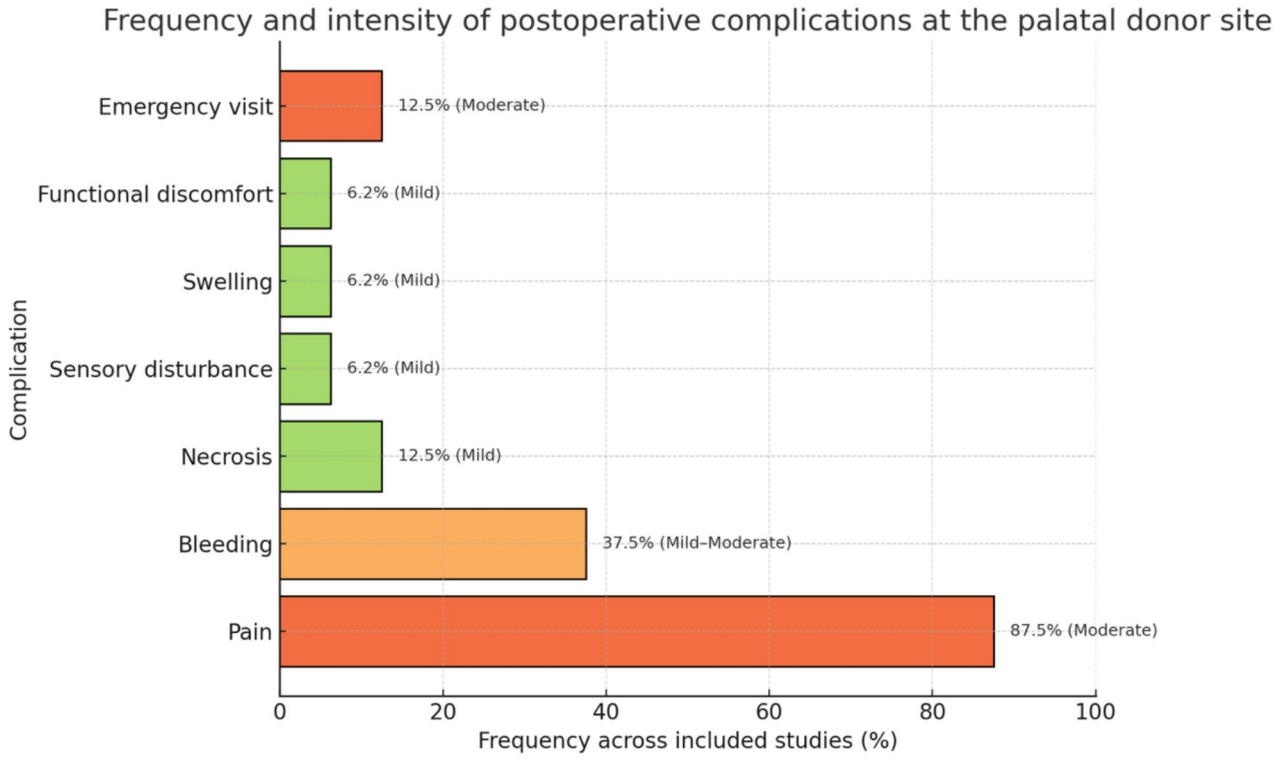

Fig. 7 Heatmap illustrating the qualitative magnitude of reported clinical improvement associated with different donor-site management strategies across the included studies. The x-axis represents clinical outcomes (pain, bleeding, healing, and patient satisfaction), while the y-axis displays the adjunctive interventions evaluated (PRF, hyaluronic acid [HA], low-level laser therapy [LLLT], palatal stent, cyanoacrylate, turmeric, ozone therapy, and gelatin sponge). Color intensity reflects the reported qualitative strength of effect: dark green indicates strong improvement, light green moderate improvement, yellow mild improvement, orange minimal improvement, and red no measurable effect. This visualization summarizes the comparative trends described in the literature regarding donor-site morbidity management

Table 5 Incidence, duration, and clinical management of palatal donor-site complications. Detailed study-specific data on incidence, duration, and management of donor-site complications are provided in Supplementary Table S2

Complication	Studies reporting (*n*)	Typical incidence/severity	Typical duration	Clinical management/outcome
Postoperative pain	16	Mostly mild–moderate; higher with thicker grafts or wider exposure	Peak during days 1–7; resolution by 7–14 days	Analgesics; adjuncts (HA, PRF, LLLT); mechanical protection (stents/meshes)
Delayed bleeding	4	Generally infrequent; occasional clinically relevant events	Usually early postoperative period	Local hemostasis; protective devices; emergency care rarely required
Infection	0	Not reported	—	—
Swelling	0	Rarely reported; anecdotal	—	—
Partial flap necrosis	2	Low incidence (≈3%)	Resolved within ~3 weeks	Clinical follow-up; secondary-intention healing
Sensory disturbances	1	Transient numbness/hypersensitivity (~18%)	Resolved within months	Observation; no active treatment required
Functional discomfort	1	Temporary (speech discomfort)	Few days	Adaptation; spontaneous resolution
Epithelialization delay	3	Minor delays in some groups	Complete healing by ~14 days	Conservative management; spontaneous resolution
Emergency visits	2	Uncommon; associated with bleeding	Early postoperative period	Targeted clinical management

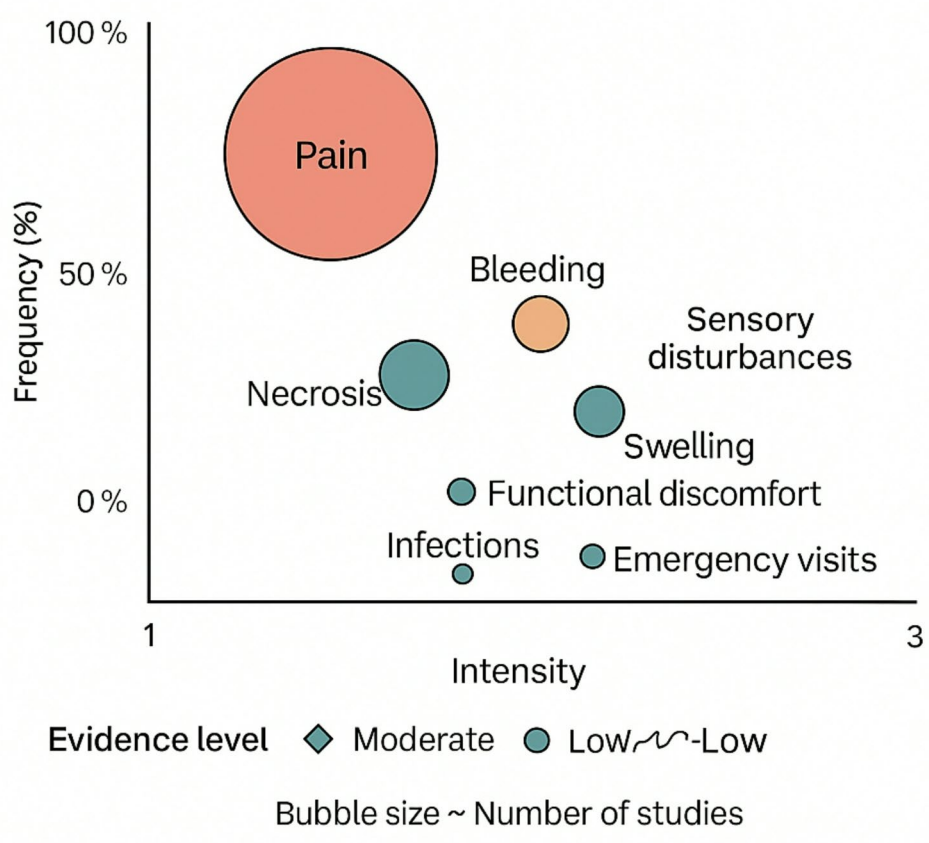

Fig. 8 Frequency and qualitative intensity of postoperative complications at the palatal donor site across the included studies. The x-axis represents the percentage of included studies reporting each complication, while the y-axis lists the specific postoperative complications (pain, bleeding, necrosis, sensory disturbance, swelling, functional discomfort, and emergency visits). Bar length reflects reporting frequency (%), and color shading indicates the reported qualitative intensity of each complication: green denotes mild severity, orange mild-to-moderate severity, and red moderate severity. Percentage values and qualitative intensity categories are displayed within each bar. This figure provides a visual comparison of the relative frequency and perceived clinical impact of donor-site complications following autologous soft tissue graft harvesting

expected mild postoperative discomfort, which resolved with standard clinical follow-up.

Postoperative pain perception at the palatal donor site

Postoperative pain at the palatal donor site was one of the most commonly evaluated outcomes across the included studies. The majority used the Visual Analog Scale (VAS) [27, 30, 32–42] as the primary measurement tool, while others employed the Numeric Rating Scale (NRS) [28], clinical observation, sensory questionnaires such as the DN4 [31], or analgesic consumption [29, 38] as indirect indicators of discomfort (Table 6).

Overall, most studies reported low to moderate pain levels, particularly when adjunctive treatments were applied at the donor site. Several studies [27, 28, 32–34] reported reduced pain during the early postoperative period when anti-inflammatory agents, biomaterials, or physical therapies such as low-level laser therapy were used, although statistical comparisons were not consistently available. For example, Lafzi et al. [33] reported lower pain levels at 24 h in the laser-treated group.

With respect to pain duration, most studies indicated that discomfort peaked within the first 3–7 postoperative days and gradually resolved by the second postoperative week. Some authors [29, 30] described rapid resolution within a few days, often before the end of the first postoperative week, particularly when protective palatal stents or surgical techniques promoting primary closure were used.

Studies by Santamaria et al. [38] and Zangrando et al. [42] documented higher pain levels, especially in groups receiving thicker grafts or leaving a larger palatal area uncovered.

Factors most frequently associated with lower pain perception included the use of topical anti-inflammatory agents (such as turmeric, hypochlorous acid, or hyaluronic acid) [27, 34, 36, 37], mechanical protection of the donor site via stents or meshes [30, 32, 41], and the

Table 6 Patient-Centered Outcomes: Pain and Discomfort

Study	Pain Assessment Method	Pain Level (VAS 0–10/NRS)	Duration (days)	Pain Reduction (yes/no)	Follow-up (days)
Alasfar et al. (2023) [27]	VAS	Lower in turmeric group from day 3	3–7 days	Yes	7
Belkhede et al. (2019) [28]	NRS	Lower in gelatin sponge group	7–14 days	Yes	28
Carranza et al. (2020) [29]	Clinical observation	Minimal; managed with NSAIDs	Mainly first 24 h	Yes	7
Chiu et al. (2020) [30]	VAS	0–2 (mean 0.5)	Resolved by day 14	Yes	14
do Nascimento et al. (2024) [31]	DN4 and sensory tests	No pain detected	Not applicable	Yes (no pain)	180
İşler et al. (2019) [32]	VAS	Lower in PRF and LLLT groups	Up to day 14	Yes	14
Lafzi et al. (2019) [33]	VAS	Significantly lower at 24 h in irradiated group	First 24 h	Yes	30
Alpan et al. (2023) [34]	VAS	Significantly lower in HOCl group	3–7 days	Yes	21
Mutallibli et al. (2024) [35]	VAS	Similar between groups	First 7 days	No (no difference)	14
Nabiyi et al. (2024) [36]	VAS	Similar between groups; gradual decrease	Up to day 14	NO (no difference)	42
Parlak et al. (2022) [37]	VAS	Lower in GS + CY and GS + HA+CY	First 4 days	Yes	28
Santamaria et al. (2023) [38]	VAS+ analgesic use	Higher in CAF + SCTG group	First 7 days	No	180
De Carvalho et al. (2023) [39]	VAS (7 days)	Similar between both groups (28–46 mm)	First 7 days	No	180
Tirone et al. (2021) [40]	VAS (7 days)	3.37 ± 2.30	First 7 days	No (risk factors only)	7
Yussif et al. (2021) [41]	VAS	Mesh: 1.6; Stent: 7.1	Mesh: 2–4 days; Stent: 4–7 days	Yes	30
Zangrando et al. (2019) [42]	VAS (7 days)	Higher in DE vs. DBS	First 7 days	No	180

Table 7 Patient Satisfaction and Postoperative Outcomes

Study	Satisfaction Assessment Method	Satisfaction Level	Factors Associated with Satisfaction	Follow-up (days)
Chiu (2020) [30]	Verbal reports during follow-ups	Very high (all patients satisfied)	Minimal pain; absence of bleeding, rapid epithelialization	30
İşler (2019) [32]	OHIP-14 (Turkish version)	Higher satisfaction in PRF and LLLT groups	Reduced pain, faster recovery	14
Alpan (2023) [34]	VAS for pain, chewing, burning, esthetics	Higher in treated groups, especially HA	Less pain; better epithelialization; improved esthetics	28
Mutallibli (2024) [35]	OHIP-14	High satisfaction across all groups	Mild pain; rapid epithelialization	14
Santamaria (2023) [38]	VAS for discomfort + analgesic consumption	High in CAF and CAF + L-PRF	Lower pain; reduced morbidity	180
Teodoro de Carvalho (2023) [39]	Direct question (preferred side)	50% preferred each group	Similar clinical outcomes between groups	180
Yussif (2021) [41]	6-item binary questionnaire	High in both groups	Less pain; improved wound protection	30
Zangrando (2019) [42]	VAS for esthetics	High satisfaction in both groups	Enhanced esthetic appearance at 6 months	180

application of bioactive materials (such as PRF, cyanoacrylate, or hyaluronic acid) [28, 32, 35, 36, 38]. In contrast, individual factors such as male sex and smoking were associated with higher pain levels and increased analgesic consumption [40].

Patient satisfaction and postoperative outcomes

Patient satisfaction was assessed in eight studies using various methods, including standardized questionnaires such as the OHIP-14 [32, 35], visual analog scales [34, 38, 42], verbal reports during follow-up visits, and direct questioning30,39,41 (Table 7).

Despite the heterogeneity of assessment tools, results were consistent across studies, with overall satisfaction levels reported as high (Fig. 9).

In general, patients reported greater satisfaction when postoperative pain was mild, healing was rapid, and the esthetic appearance of the donor site was favorable. For example, Chiu et al. [30] found that all patients were satisfied following the use of a protective palatal stent. Similarly, İşler et al. [32] and Mutallibli et al. [35] reported trends toward higher satisfaction in groups treated with PRF, LLLT, or less extensive palatal exposure compared with control groups, based on descriptive outcomes.

Alpan et al. [34] and Yussif et al. [41] also observed improved satisfaction associated with the application of bioactive topical agents or protective devices, emphasizing the positive impact of these strategies on the overall patient experience. In studies with mid-term follow-up

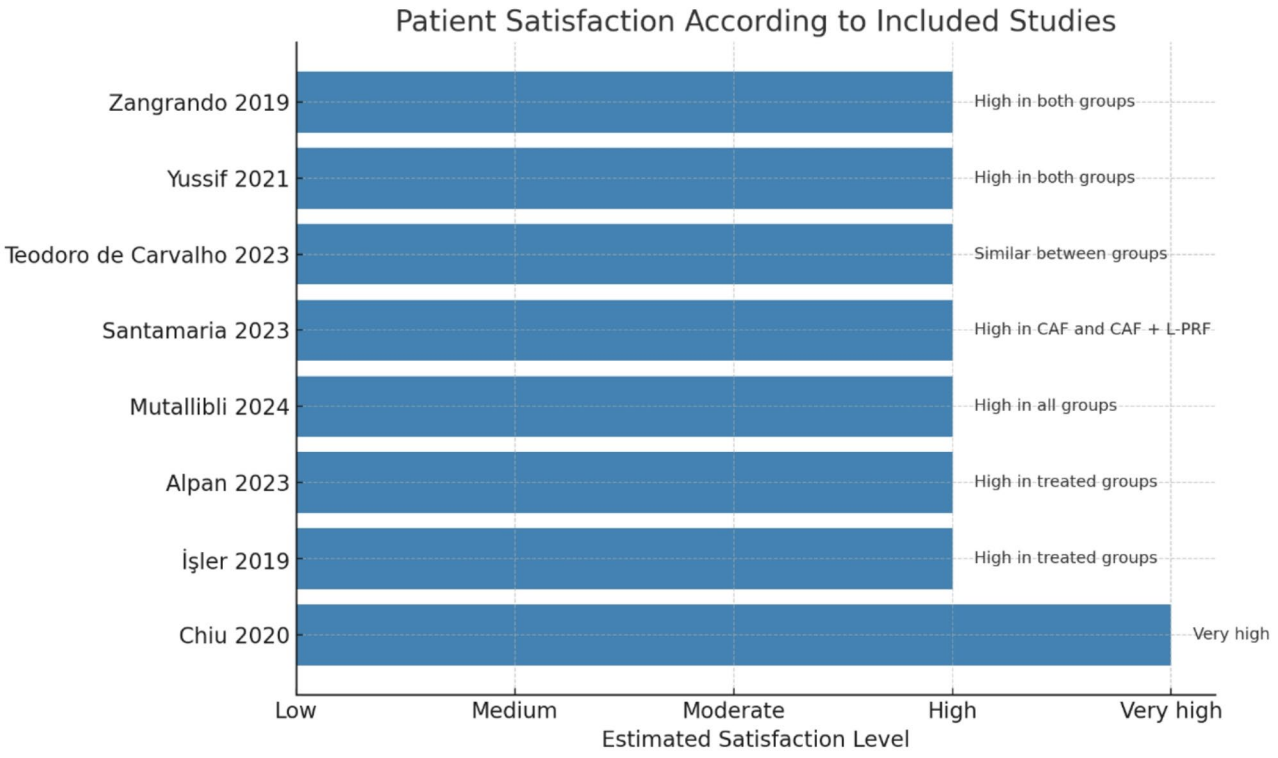

Fig. 9 Bubble plot illustrating the relationship between frequency, qualitative intensity, and evidence level of postoperative complications at the palatal donor site across the included studies. The x-axis represents the qualitative intensity of each complication (1 = mild, 2 = mild-to-moderate, 3 = moderate), while the y-axis shows the percentage of studies reporting each complication. Bubble size is proportional to the number of studies describing the complication. Color coding reflects the overall level of evidence supporting the finding (diamond = moderate evidence; circle = low or very low evidence). This visualization summarizes the relative prevalence, perceived severity, and strength of supporting evidence for complications such as pain, bleeding, necrosis, swelling, sensory disturbances, infections, functional discomfort, and emergency visits. Abbreviations: L-PRF, Leukocyte-Platelet-Rich Fibrin; CAF, Coronally Advanced Flap

[38, 39, 42], patient satisfaction remained generally high throughout follow-up periods of up to six months, particularly when clinical differences between techniques were minimal and the esthetic appearance of the donor site was favorably rated.

Qualitative synthesis of findings

A qualitative synthesis was performed to integrate the primary outcomes reported across the included studies. Despite the methodological heterogeneity, consistent patterns emerged. Pain was the most frequently reported postoperative complication at the palatal donor site and was typically described as mild to moderate in intensity, mainly limited to the first postoperative week.

Adjunctive interventions such as hyaluronic acid, platelet-rich fibrin (PRF), palatal stents, cyanoacrylate dressings, and low-level laser therapy (LLLT) were frequently reported to be associated with reduced postoperative pain, although most studies did not provide formal statistical testing.

Bleeding was reported less often and was generally self-limiting, particularly when protective mechanical barriers (e.g., stents or meshes) or topical hemostatic agents (e.g., gelatin sponges combined with cyanoacrylate or hyaluronic acid) were used. Transient sensory alterations and flap necrosis were rarely reported and typically resolved without additional intervention.

Overall, patient satisfaction was consistently high across studies and appeared to be greater in studies reporting effective pain control and favorable healing outcomes. Based on the available evidence, the overall strength of support for these findings can be considered moderate, mainly due to the lack of standardized outcome measures and limited blinding in some trials.

Discussion

The findings of this systematic review partially support, but do not fully confirm, the initial working hypothesis. Overall, the results suggest that specific clinical strategies may be associated with an improved postoperative experience, although their effectiveness appears to vary across clinical contexts.

In contrast to previous systematic reviews, which primarily focused on single adjunctive interventions or recipient-site outcomes, this review offers an updated synthesis of the clinical complications associated with

the palatal donor site in periodontal procedures involving autologous soft tissue grafts. The results suggest that, while these grafts remain the gold standard for increasing mucosal thickness and soft tissue volume, postoperative complications—particularly pain—represent a significant limitation to their clinical application.

Pain consistently emerged as the predominant postoperative complication. In general, patients described mild to moderate discomfort, primarily concentrated within the first postoperative week, which aligns with previous findings reported by Zucchelli et al. [13] However, the variability observed among patients and across studies may be attributed to differences in the surgical technique, clinician experience, graft size, extent of the donor site, and protective measures employed.

In this review, several therapeutic strategies were reported to reduce postoperative pain. Several studies [32, 34] suggested that the topical application of biomaterials such as hyaluronic acid, hypochlorous acid, or PRF was associated with lower pain levels compared to control groups without additional protection, although most did not report statistical comparisons. Similarly, Lafzi et al. [33] found that low-level laser therapy (LLLT) was associated with reduced pain perception within the first 24 h, although statistical comparisons were not provided. These findings partially support the working hypothesis, indicating that targeted clinical strategies may contribute to improve postoperative outcomes, although their effectiveness cannot be considered definitive and may depend on specific clinical contexts.

On the other hand, studies such as those by Tirone et al. [40] and Zangrando et al. [42] observed higher postoperative pain levels associated with bulkier grafts or greater surgical exposure of the donor site, highlighting the importance of careful surgical planning to minimize patient discomfort. These observations suggest that surgical factors may play a more influential role in donor-site morbidity than adjunctive therapies alone.

Although less frequent, bleeding was occasionally reported as a self-limiting complication. Tirone et al. [40] documented significant episodes of delayed hemorrhage in up to one-third of patients, underscoring the need for stricter hemostatic protocols. In contrast, Yussif et al. [41] showed that mechanical protection using palatal stents or specific dressings significantly appeared to reduce the incidence of bleeding, although comparative statistical analyses were generally not reported.

Notably, none of the included studies reported clinically significant infections at the donor site, which may be attributed to effective preventive measures, including rigorous pre- and postoperative oral hygiene, proper surgical technique, and rapid wound healing.

Patient satisfaction, assessed mostly through validated tools such as the OHIP-14 and visual analog scales, was generally high and appeared to be influenced by effective pain management, accelerated healing, and favorable esthetic outcomes. Several studies [30, 34, 38] highlighted the potential positive impact of adjunctive interventions on the overall patient experience. However, other reports [35, 39] found high satisfaction regardless of the intervention, suggesting that non-clinical factors—such as patient expectations, communication, and postoperative follow-up—may also influence satisfaction outcomes.

From a clinical perspective, the most consistent trends across the included studies suggest that certain adjunctive measures may offer practical benefits for managing the palatal donor site. Hyaluronic acid, platelet-rich fibrin (PRF), low-level laser therapy (LLLT), and the use of protective palatal stents appeared to provide the most reproducible improvements, particularly in terms of reducing early postoperative pain. Hyaluronic acid and PRF were also frequently associated with more favorable epithelialization patterns, whereas palatal stents and gelatin-sponge–based dressings showed the clearest qualitative reductions in delayed bleeding. However, these observations were primarily descriptive rather than statistical, and the magnitude of benefit varied across studies. Therefore, these adjuncts should be interpreted as potentially useful supportive measures rather than as definitively superior alternatives. Their clinical application may be best considered on a case-by-case basis, taking into account graft thickness, donor-site extent, and patient-specific factors such as tolerance, healing capacity, and esthetic expectations.

The overall methodological quality was moderate, with recurring limitations related to randomization and blinding. These shortcomings may introduce performance and detection bias, particularly in subjective outcomes such as pain or satisfaction.

The domain-specific assessment showed generally acceptable risk levels across most domains. However, some trials displayed high or unclear risk in the randomization and outcome measurement domains, mainly due to inadequate allocation concealment, absence of blinding, or reliance on patient-reported measures. These methodological limitations may have introduced detection and performance bias, potentially influencing the magnitude of perceived treatment effects. Although such biases do not invalidate the findings, they reinforce the need for cautious interpretation.

The main limitations of this review include considerable clinical and methodological heterogeneity, small sample sizes, and the predominance of subjective outcomes, which precluded quantitative meta-analysis. Variations in surgical techniques, assessment tools, and follow-up durations underscore the need for future studies to adopt more standardized and homogeneous protocols.

In addition to these aspects, several methodological factors warrant further consideration. First, there was substantial heterogeneity across studies regarding surgical techniques, graft dimensions, protective measures, and postoperative protocols, which limits the comparability of findings. Second, outcome definitions were not standardized; pain, bleeding, epithelialization, and satisfaction were assessed using different scales, time points, and qualitative descriptors, restricting the ability to synthesize results across trials. Third, many included studies had relatively small sample sizes, reducing statistical power and increasing susceptibility to random variation. Fourth, follow-up periods were often short and primarily focused on early healing, preventing the identification of late-onset complications such as persistent sensory disturbances or esthetic changes. Finally, the literature search was time-restricted (2019–2025), which may have excluded earlier relevant evidence and introduced the possibility of publication bias.

Moreover, many studies included relatively short follow-up periods—generally under six months—which were sufficient to assess acute complications such as pain or bleeding, but inadequate for identifying late-onset events like persistent sensory disturbances, gingival retraction, or esthetic changes. Future research should therefore prioritize longer follow-up durations, larger sample sizes, and the use of standardized, validated outcome measures, ideally through multicenter trials to generate more robust and generalizable conclusions.

Despite these limitations, this systematic review provides clinically relevant insights into the management of the palatal donor site. The results suggest that implementing specific preventive and therapeutic protocols may help reduce morbidity and improve patient comfort, without implying definitive superiority of any single approach. Continued research focusing on patient-centered outcomes and standardized assessment tools will be essential to optimize surgical techniques, postoperative care, and the overall patient experience in periodontal procedures involving autologous grafts.

Conclusions

Within the limitations of this systematic review, the findings indicate that postoperative morbidity at the palatal donor site following autologous soft tissue graft harvesting is common, with postoperative pain being the most frequently reported complication. Pain was generally described as mild to moderate in intensity and predominantly limited to the first postoperative week, although its magnitude varied according to surgical technique, graft characteristics, extent of palatal exposure, and patient-related factors.

Several adjunctive strategies, including hyaluronic acid, platelet-rich fibrin (PRF), low-level laser therapy (LLLT), and protective palatal stents, were reported to be associated with reduced postoperative discomfort and, in some cases, more favorable early healing patterns. However, these associations were largely based on descriptive findings, and the available evidence does not allow definitive conclusions regarding the superiority of any specific intervention. Therefore, such adjunctive measures should be regarded as supportive options rather than universally effective solutions, and their clinical use should be individualized.

Overall patient satisfaction was consistently high across studies, particularly when pain control was effective and healing outcomes were favorable. Nevertheless, the inconsistent use of validated patient-reported outcome measures (PROMs) limits comparability and highlights an important gap in the current evidence base.

Future research should prioritize standardized and validated assessment tools for pain, epithelialization, sensory disturbances, and patient-centered outcomes, as well as larger sample sizes and longer follow-up periods, to enable more robust comparisons and potentially allow quantitative synthesis.

Palatal donor-site morbidity is common but typically manageable with appropriate surgical technique, protective measures, and postoperative care, and careful clinical planning remains essential to minimize patient discomfort and optimize the overall treatment experience.

Supplementary Information

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Supplementary Material 1.

Authors' contributions

O.F.A. and J.F.F. wrote the main manuscript text.N.Q.L. and J.M prepared all figures.N.LV.H. contributed to data analysis and interpretation.All authors reviewed and approved the final version of the manuscript.

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Data availability

The datasets generated and/or analysed during this systematic review are included in this published article and its supplementary information files. No additional raw data were generated in the course of this study. For any further details or clarifications regarding the data used, the corresponding author can be contacted upon reasonable request.

Declarations

Ethics approval and consent to participate

Not Applicable.

Consent for publication

not applicable'.

Competing interests
The authors declare no competing interests.

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