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Platelet-Rich Fibrin Versus Collagen Matrix For Gingival Recession: A Systematic Review and Meta-Analysis

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ABSTRACT: Root coverage with a connective tissue graft needs a palatal wound. Platelet-rich fibrin (PRF) and collagen matrices avoid it, but no review has pooled trials comparing them. We searched PubMed, Scopus and Cochrane CENTRAL on 18 October 2026 for randomized trials of RT1–RT2 recession with at least 6 months of follow-up. Risk of bias (RoB 2) and certainty (GRADE) were rated. Mean differences were pooled with random-effects (REML) models and Hartung–Knapp–Sidik–Jonkman (HKSJ) intervals, and split-mouth trials were analysed as paired data. PRF instead of collagen and PRF added to collagen were analysed separately. The review was unregistered, had no protocol and was self-funded. Seven trials were included. In five trials (158 patients or sites), PRF instead of collagen gave 14.7 percentage points more mean root coverage (95% CI 8.9 to 20.5; low certainty; modified HKSJ interval 5.2 to 24.1) and 0.44 mm less residual recession (95% CI −0.59 to −0.30; moderate certainty). Keratinized tissue width and gingival thickness did not differ, and attachment level was inconsistent. In two split-mouth trials (37 patients), PRF added to collagen did not change recession depth (MD −0.05 mm; 95% CI −0.78 to 0.68; very low certainty). Five of seven trials had a high risk of bias. PRF may give more root coverage than collagen, but the trials are small, mostly at high risk of bias, and the interval is wide. PRF added to collagen showed no clear benefit. Sixteen trials without usable results were unclassified. Assessor-blinded 12-month trials are needed.

1. INTRODUCTION

Gingival recession is common. It exposes the root surface, and patients notice it first as dentine hypersensitivity, an uneven smile line or a tooth that is harder to clean (Kassab and Cohen, 2003). The Cairo classification now grades these defects by interproximal attachment loss, and RT1–RT2 lesions carry the best prognosis for coverage (Cairo et al., 2011). For these defects, a coronally advanced flap (CAF) combined with a subepithelial connective tissue graft (CTG) remains the reference treatment. Systematic reviews and a network meta-analysis agree on this point (Buti et al., 2013; Cairo et al., 2014; Chambrone and Tatakis, 2015). The weakness lies elsewhere. Harvesting the graft adds a palatal wound, longer chair time and more postoperative pain, and the palate holds only so much tissue (Wessel and Tatakis, 2008). When several adjacent teeth need coverage, that limit becomes real. So clinicians look for substitutes. Two have gained the most ground. The first is the xenogeneic collagen matrix. These resorbable porcine scaffolds sit under the flap and act as a space-filling, cell-guiding framework. Compared head to head with CTG, they give somewhat less root coverage but shorten surgery and reduce morbidity (Atieh et al., 2016; Cardaropoli et

al., 2012; McGuire and Scheyer, 2010). Product design varies widely, from bilayer matrices such as Mucograft® to volume-stable, cross-linked matrices and thin resorbable membranes. The second is platelet-rich fibrin. PRF is drawn from the patient's own blood and centrifuged without anticoagulant, giving a fibrin network that traps platelets and leukocytes (Choukroun et al., 2006; Dohan et al., 2006). As that network remodels, it releases growth factors over roughly one to two weeks. Several variants now exist. Leukocyte-PRF (L-PRF), advanced PRF (A-PRF) and injectable PRF (i-PRF) differ in centrifugation speed, time and final consistency (Ghanaati et al., 2014; Miron et al., 2017). PRF is cheap and fully autologous. It does not, however, maintain space. The two materials therefore offer different things: one gives structure, the other gives biology. Which matters more for root coverage is not obvious, and the literature has mostly sidestepped the question. Earlier meta-analyses tested PRF against CAF alone, CTG or enamel matrix derivative (Miron et al., 2020; Moraschini and Barboza, 2016). A recent meta-analysis of A-PRF pooled only two trials against a collagen membrane, both using a tunnel approach (Saleh et al., 2024). The one review devoted to PRF versus collagen identified six RCTs but synthesized them narratively, judging pooling unfeasible because PRF type, membrane source and surgical design differed (Bhagwat et al., 2025).

That heterogeneity is real, but it can be handled. Subgroup and sensitivity analyses can test whether it changes the answer, instead of abandoning quantitative synthesis altogether.

This systematic review and meta-analysis therefore asked one focused question (PICOS). In systemically healthy adults with RT1–RT2 buccal gingival recession (P), does PRF used as the graft (I), compared with a collagen matrix or resorbable collagen membrane placed under the same flap (C), change root coverage and soft-tissue outcomes at 6 months or later (O), in randomized controlled trials (S)? A second comparison examined PRF combined with collagen against collagen alone.

2. MATERIALS AND METHODS

2.1 Protocol and Registration

The review is reported according to the PRISMA 2020 statement (Page et al., 2021). The review was not registered, and no protocol was written before data extraction began. Section 2.11 lists the methodological decisions that were made or changed while the review was under way.

2.2 Eligibility Criteria

The eligibility criteria follow the PICOS framework (Table 1).

Table 1. Eligibility criteria for the review

PICOS element	Inclusion	Exclusion
Population	Systemically healthy adults (≥18 years) with RT1 or RT2 (Miller Class I–II) buccal recession; single or multiple defects	Smokers of >10 cigarettes/day; uncontrolled systemic disease; RT3 defects; previous surgery at the site
Intervention	Platelet-rich fibrin prepared without anticoagulant (L-PRF, A-PRF, i-PRF or liquid PRF, T-PRF), used as the graft or to enrich a collagen scaffold	PRP, CGF, and platelet-rich fibrin matrix (PRFM) prepared with anticoagulant and calcium chloride
Comparator	Xenogeneic collagen matrix or resorbable collagen membrane placed with the same flap design	Different flap designs between arms; CTG, EMD, amnion or other grafts as comparator
Outcomes	Mean root coverage (primary); secondary outcomes in Section 2.6	No extractable outcome
Study design	Parallel-group or split-mouth RCTs with ≥6 months of follow-up	Non-randomized studies, case series, animal or in vitro studies; follow-up <6 months

Comparison 1 tested PRF against collagen directly. Comparison 2 tested PRF-enriched collagen against the same collagen used alone. The two comparisons answer different clinical questions and were never pooled together.

2.3 Information Sources and Search

MEDLINE via PubMed, Scopus and the Cochrane Central Register of Controlled Trials (CENTRAL, Cochrane Library) were searched on 18 October 2026, with no date or language limits. CENTRAL holds records from trial registries and conference abstracts as well as journal articles; ClinicalTrials.gov and the WHO ICTRP were not searched directly. We also screened the reference lists of included trials and earlier reviews (Bhagwat et al., 2025; Miron et al., 2020; Moraschini and Barboza, 2016; Saleh et al., 2024) and ran supplementary web searches; the last of these was run on 5 October 2026. Web of Science, trial registers and regional repositories were not searched (Section 4.4). The strategy was written by the authors and was not peer reviewed with the PRESS 2015 checklist (McGowan et al., 2016). Full strategies appear in Supplementary Table S1.

The PubMed strategy combined three blocks:

#1 "Gingival Recession"[Mesh] OR "gingival recession*"[tiab] OR "root coverage"[tiab] OR "recession defect*"[tiab] OR mucogingival[tiab]

#2 "Platelet-Rich Fibrin"[Mesh] OR "platelet-rich fibrin"[tiab] OR "platelet rich fibrin"[tiab] OR PRF[tiab] OR "L-PRF"[tiab] OR "A-PRF"[tiab] OR "i-PRF"[tiab] OR "T-PRF"[tiab]

#3 "Collagen"[Mesh] OR collagen*[tiab] OR Mucograft[tiab] OR "Fibro-Gide"[tiab] OR Mucoderm[tiab] OR "xenogeneic matri*"[tiab] OR "porcine matri*"[tiab]

#4 #1 AND #2 AND #3

2.4 Study Selection

Records were de-duplicated and screened in a spreadsheet rather than a dedicated screening tool such as Rayyan (Ouzzani et al., 2016). A generative AI tool (see Declarations) sorted the records by title and abstract, and one author read every record and every full text and made each decision. A second reviewer reviewed the screening decisions for all included studies and all full-text exclusions, and disagreements were settled by discussion. Screening was therefore not done independently in duplicate, and no agreement statistic was calculated. Reasons for every full-text exclusion are listed in Supplementary Table S2.

2.5 Data Collection

A piloted form captured design, country, sample size (patients and sites), defect type, PRF protocol (tubes, g-force or rpm, time), collagen product, flap technique, follow-up and funding. Data were extracted with the help of a generative AI tool (see Declarations). One reviewer checked each extracted value against the source report, and a second reviewer re-checked the extracted values of every included trial against its source report, with disagreements settled by discussion. When a trial appeared in more than one report, such as a journal article and a thesis, the reports were collated under one study and data were taken from the most complete one (Higgins et al., 2024). Trial authors were not contacted for missing data. Medians were converted to means with the Wan method (Wan et al., 2014). A missing standard deviation was imputed from the pooled SD of the other trial in the same analysis, and the effect of that choice was tested in sensitivity analyses (Higgins et al., 2024).

2.6 Outcomes

The primary outcome was mean root coverage (MRC, %) at 6 months. Secondary outcomes were complete root coverage (CRC), recession depth reduction, recession width, keratinized tissue width (KTW), gingival thickness (GT), clinical attachment level (CAL), probing depth (PD), the Root Coverage Esthetic Score (Cairo et al., 2009), patient-reported outcomes and adverse events. Where a trial reported several time points, the one closest to 6 months fed the main analysis and 12-month data were analyzed separately.

2.7 Risk of Bias

One reviewer applied the Cochrane RoB 2 tool (Sterne et al., 2019), and a second reviewer reviewed the judgements for every domain of every trial, with disagreements settled by discussion. The split-mouth variant was used for within-patient designs. Each trial received a judgement of low risk, some concerns or high risk across the five domains, with an overall rating driven by the worst domain. Some concerns in three or more domains were also rated high risk overall, as the RoB 2 guidance permits (Sterne et al., 2019).

2.8 Synthesis

Continuous outcomes were pooled as mean differences (MD) of 6-month values with 95% confidence intervals (CI); complete root coverage was to be analysed as a risk ratio, pooled on the log scale with the two arms of a split-mouth trial treated as independent. A random-effects model was chosen because PRF protocols and collagen products differ. Between-study variance (τ^2) was estimated by restricted maximum likelihood (REML), and the confidence interval by the Hartung–Knapp–Sidik–Jonkman (HKSJ) method (IntHout et al., 2014). Study characteristics are tabulated (Table 2), risk of bias is shown as a traffic-light plot (**Figure 2**), and the results of each trial and of each synthesis are shown in forest plots (**Figures 3 and 4**; Supplementary Figures S1 and S2).

Split-mouth trials compare two sides of the same mouth, so their arms are not independent. The variance of each within-patient MD was computed from the arm SDs with an imputed correlation of 0.5 (Elbourne et al., 2002; Higgins et al., 2024), and the correlation was varied from 0.2 to 0.8 in sensitivity analyses. When a trial reported site-level SDs but treated several sites per patient, the number of patients, not sites, was used as the sample size. This is conservative, because it discards part of the information that multiple sites carry.

Heterogeneity was described with τ^2, Cochran's Q and I^2 (Higgins et al., 2003). With only two to five trials, the HKSJ interval rests on one to four degrees of freedom and can be very wide (Röver et al., 2015). It can also be too narrow: when the observed heterogeneity is much smaller than the model expects, the HKSJ variance scale factor falls below 1 and the interval shrinks below the Wald interval. We therefore report the REML estimate with a Wald-type 95% CI and, for each outcome, the Röver–Knapp–Friede modification of HKSJ, which never lets the scale factor drop below 1 (Röver et al., 2015). The three intervals are read together. Where baseline values differed between arms, change-from-baseline MDs were analysed as a check, with change SDs imputed from a baseline–follow-up correlation of 0.5 (Higgins et al., 2024). Analyses were run in Python 3 with NumPy and SciPy; τ^2 was estimated by Fisher scoring and checked against direct maximization of the REML likelihood. The code is provided as Supplementary File S2. No outcome was pooled from fewer than two trials.

2.9 Subgroup and Sensitivity Analyses

The subgroups examined were PRF type (L-PRF, A-PRF, i-PRF), collagen type (matrix or membrane), flap design (CAF or tunnel/VISTA), defect type (single or multiple) and trial design (parallel or split-mouth). Subgroup analyses were run only where each subgroup held at least two trials. Sensitivity analyses varied the imputed correlation, treated sites as independent, used change scores where baselines differed, replaced imputed SDs with lower and higher values, and halved the sample sizes of trials that randomized sites rather than patients (a design effect of 2). Where at least four trials contributed, each was omitted in turn, and trials without 6-month data were dropped to leave a 6-month-only set. With 10 or more trials per outcome, small-study effects would have been checked with a funnel plot and Egger's test (Egger et al., 1997).

2.10 Certainty of Evidence

GRADE was applied to recession depth, MRC, CRC, KTW and GT, and for Comparison 1 also CAL (Guyatt et al., 2008). Evidence started at high certainty and was downgraded for risk of bias, inconsistency, indirectness, imprecision and publication bias. Summary of findings tables follow the GRADE format, with every downgrade explained. Imprecision of recession depth was judged against the information size needed to detect the pooled difference with 80% power at a two-sided α of 0.05, and for every outcome against the width of the confidence interval.

2.11 Changes Made During the Review

Five methodological decisions were made or changed once the review was under way. First, the PRF definition was made explicit: fibrin concentrates prepared without anticoagulant. PRFM, which needs anticoagulant and calcium chloride, was therefore excluded. Second, Wald-type intervals were added beside the HKSJ interval because no outcome had more than five trials. Third, change-score, SD-imputation and design-effect sensitivity analyses were added once baseline imbalances, missing SDs and site-level randomization were found. Fourth, analyses were run in Python instead of RevMan. Fifth, the Röver–Knapp–Friede modification of the HKSJ interval was added after the standard HKSJ interval for mean root coverage proved narrower than the Wald interval in a preliminary analysis of three almost identical trial estimates (Röver et al., 2015). With the fourth trial included the standard interval is wider than the Wald interval again, and all three intervals are still reported.

3. RESULTS AND DISCUSSION

3.1 Study Selection

The database searches returned 177 records (PubMed 48, Scopus 54, Cochrane CENTRAL 75). After 60 duplicates were removed, 117 titles and abstracts were screened, and 31 reports were assessed for eligibility (**Figure 1**). Two further records, Ibrahim et al. and ShehabEldin et al., were found outside the database searches; both were assessed in full and excluded.

Seven trials, reported in 12 records, met the criteria (Abdelhaleem et al., 2025; Durgapal and Shetty, 2023; Jain et al., 2021; Magrin et al., 2026; Patra et al., 2022; Raval et al., 2022; Shashikumar et al., 2020). Five compared PRF with collagen directly, and two compared PRF-enriched collagen with the same collagen alone. CENTRAL returned the registry records of four included trials (Mansoura, NCT06357351; Patra, CTRI/2020/06/026141; Magrin, RBR-3hqrvrr; Jain, CTRI/2020/1/022679) and a conference abstract of the Magrin trial. Each registry number is given in the trial's own paper, so these are additional reports, not additional trials (Supplementary Table S2). The Mansoura registration was matched to its 2025 publication (Abdelhaleem et al., 2025). All five direct comparisons were extracted from their full texts (Abdelhaleem et al., 2025; Durgapal and Shetty, 2023; Jain et al., 2021; Raval et al., 2022; Shashikumar et al., 2020). Sixteen trials (18 records) could not be classified (Supplementary Table S2). Fourteen are registry records, all found through CENTRAL, that contain no results. Two have a published report: Santamaria et al. (2026), whose full text could not be obtained, and Ali et al., a 2026 post hoc analysis of a randomized trial of a volume-stable collagen matrix with or without i-PRF (NCT05389059) that reports complete root coverage only. By design, 11 compare PRF with collagen, 3 add PRF to collagen, and 2 cannot be assigned from the registry entry. Whether the registered trials have since been published was not checked beyond the three database searches.

Three trials that looked eligible were excluded at the eligibility stage (Supplementary Table S2). Ibrahim et al. (2022) compared PRF plus collagen with PRF alone, so collagen alone was never the comparator. Al-Barakani et al. (2024) followed patients for 3 months only. A third trial evaluated a platelet-rich fibrin matrix (PRFM), a product normally prepared with anticoagulant and calcium chloride (ShehabEldin et al., 2020); in this trial it was made from platelet-rich plasma with calcium chloride using the Fibrinet system. The first two were counted as PRF-versus-collagen trials in an earlier review (Bhagwat et al., 2025), which partly explains why our study set differs from it.

3.2 Characteristics of Included Trials

Table 2. Characteristics of included trials

Trial	Design, country	Patients / sites	Flap	PRF arm	Collagen arm	Follow-up
Comparison 1: PRF vs collagen						
Shashikumar et al., 2020	Parallel RCT, India	38 randomized; 36 analysed (18 vs 18)	CAF	L-PRF membrane (3,000 rpm, 10 min)	Bioresorbable collagen membrane	1, 3 and 5 years (1-year data used)
Jain et al., 2021	Site-randomized trial (coin toss), India	8 patients / 20 sites (10 vs 10)	VISTA	A-PRF (1,500 rpm, 14 min)	Healiguide® collagen membrane	6 months
Raval et al., 2022	Parallel RCT, India	Not reported / 34 sites (17 vs 17); RT1–RT2	CAF	L-PRF (3,000 rpm, 10 min)	Xenogeneic collagen matrix	6 months

Trial	Design, country	Patients / sites	Flap	PRF arm	Collagen arm	Follow-up
Durgapal and Shetty, 2023	Split-mouth RCT, India	10 patients / 44 sites (22 vs 22); RT1–RT2	VISTA	A-PRF (1,500 rpm, 12 min)	Bioresorbable collagen membrane (bioguide)	6 months
Abdelhaleem et al., 2025	Parallel RCT, Egypt (NCT06357351)	24 patients / 46 teeth (12 vs 12); RT1	VISTA	A-PRF (1,500 rpm, 14 min)	Bovine collagen matrix (Tutopatch®)	6 months
Comparison 2: PRF + collagen vs collagen alone						
Patra et al., 2022	Split-mouth RCT, India	13 / 40 sites (20 vs 20)	VISTA	i-PRF (700 rpm, 60 g, 3 min) soaked into the membrane and injected around the site	Healiguide® membrane alone	6 months
Magrin et al., 2026; Michels, 2026	Split-mouth RCT, Brazil	24 analysed of 25 / 48 teeth	CAF	Liquid PRF (2,700 rpm, 400 g, 3 min) impregnated into the matrix	Fibro-Gide® alone	6 months

The five Comparison 1 trials differ in ways that matter. Two used a coronally advanced flap with L-PRF membranes (3,000 rpm for 10 minutes), and three used VISTA with A-PRF (1,500 rpm for 12 to 14 minutes), so PRF type and flap design cannot be separated. The comparator was a thin resorbable membrane in Shashikumar et al., Jain et al. and Durgapal and Shetty, and a collagen matrix in Raval et al. and Abdelhaleem et al. Jain et al. and Raval et al. randomized sites rather than patients (20 sites in 8 patients; 34 sites, patient number not reported) and analysed sites as independent units. Durgapal and Shetty split the mouth in 10 patients and analysed 22 site pairs, again as independent pairs. Shashikumar et al. had no 6-month visit, so its 1-year data were used. Baseline recession depth lay between 2.0 and 3.0 mm in all five.

The two Comparison 2 trials share a question and little else. They differ in flap design, in PRF form and spin, in scaffold (a thin membrane against a cross-linked, volume-stable matrix) and in baseline defect depth (about 2.8 against 3.5 mm). Patra et al. analysed all 40 sites with unpaired tests; Magrin et al. analysed the deepest recession on each side with paired tests.

3.3 Risk of Bias

Judgments for the seven trials with extractable data are shown in **Figure 2**. Some concerns in three or more domains were rated high risk overall (Section 2.7).

- **Abdelhaleem 2025 — some concerns.** The sequence was computer-generated and concealed in opaque, sealed envelopes that the surgeon opened immediately before surgery (D1, low). One surgeon operated, and no loss to follow-up is reported (D2 and D3, low). A single assessor, blinded to group and calibrated before measuring, recorded the outcomes (D4, low). The trial is registered (NCT06357351), but recruitment dates are not reported, so prospective registration cannot be confirmed. The unit of analysis (patients or teeth) is not stated, and several gingival thickness P values could not be reproduced from the reported means and SDs (D5, some concerns).

- **Jain 2021 — high.** Sites, not patients, were randomized by coin toss, with no description of concealment (D1, some concerns). The trial was prospectively registered (CTRI/2020/1/022679) and is called single-blinded, but the paper does not say who measured the outcomes (D4, some concerns). Twenty sites in eight patients were analysed as independent observations.

The report also contains inconsistencies: a control-arm probing depth of 0.50 ± 0.00 mm, a mean root coverage P value that cannot be reproduced, and standard deviations that differ between text and tables (D5, some concerns).

- **Raval 2022 — high.** Sites were allocated by coin flip and numbered, but concealment is not described, and the PRF arm began with narrower keratinized tissue (1.76 against 2.41 mm; P = 0.021) (D1, some concerns). No assessor blinding is described, and the investigator who recorded the clinical parameters also prepared the sites according to the allotment numbers (D4, some concerns; a strict reading would be high risk). The number of patients and mean root coverage are not reported, no registration is reported, and one table holds an implausible standard deviation (6.66 for recession width) (D5, some concerns).

- **Shashikumar 2020 — high.** The sequence came from a computer-generated table and a random-number calculator, but concealment is not described (D1, some concerns). Of 38 enrolled patients, 36 were analysed, and the reason for the two missing is not given (D3, low). The paper names a calibrated examiner blinded to treatment, who also analysed the data, yet credits the assessment sessions to other authors, so it is unclear who took the measurements (D4, some concerns). No registration is reported, keratinized tissue width is listed as an outcome but its table duplicates the recession rows, and the complete-coverage percentages cannot be reconciled with 18 patients per arm (D5, some concerns).

- **Durgapal 2023 — high.** Sites were "randomly categorized" with no description of sequence generation or concealment, and the gingival index differed between the two sides at baseline (0.56 against 0.69; P = 0.01) (D1, some concerns). All 10 patients completed follow-up (D3, low). The paper does not say who measured the outcomes or whether the examiner was calibrated or blinded (D4, some concerns). No registration is cited. The reported P value for 6-month recession depth (0.76) contradicts the printed means (0.68 against 0.36 mm), mean root coverage has the same SD in both arms, attachment level at 6 months is smaller than recession plus probing depth, and the 22 site pairs from 10 patients were analysed as independent pairs (D5, some concerns).

- **Patra 2022 — high.** Allocation was by coin toss with no description of concealment (D1, some concerns). The paper calls itself "double blinded" but does not say who measured the outcomes (D4, some concerns). The trial was registered in June 2020 (CTRI/2020/06/026141), after its stated March 2020 start, despite the claim of prospective registration, and mean root coverage was reported without SDs (D5, some concerns). Concerns in three domains substantially lower confidence in the result.

- **Magrin 2026 — some concerns.** The sequence was computer-generated and concealed in sealed, opaque envelopes opened during surgery (D1, low). One of 25 patients was lost (D3, low). Outcomes were measured by the principal investigator, and his blinding is not stated (D4, some concerns). The trial was registered prospectively (RBR-3hqrvrr), and all clinical outcomes were reported (D5, low).

Operators could not be blinded in any trial because PRF and collagen look and handle differently, so outcome-assessor blinding decided Domain 4.

3.4 Comparison 1: PRF versus Collagen

Five trials contributed data (158 patients or sites). Forest plots are in **Figure 3**, and attachment level and probing depth are in Supplementary Figure S2. Durgapal and Shetty (2023) is the only split-mouth trial in this comparison. It reported site-level SDs for 22 site pairs in 10 patients, so the analysis used 10 pairs (Section 2.8).

Recession depth. All five trials pointed towards PRF, with estimates from −0.70 mm (Shashikumar et al.) to −0.06 mm (Raval et al.). The pooled MD was −0.44 mm (95% CI −0.59 to −0.30; HKSJ −0.64 to −0.24; I^2 = 0%; **Figure 3A**). Abdelhaleem et al. carried 54% of the weight and Durgapal and Shetty 23%.

Mean root coverage. Four trials reported it (124 patients or sites); Raval et al. did not. PRF gave 14.7 percentage points more coverage (95% CI 8.9 to 20.5; I^2 = 0%; **Figure 3B**). The HKSJ interval was 8.0 to 21.4 and the Röver-modified interval 5.2 to 24.1 points. Estimates ranged from 9.1 points (Durgapal and Shetty) to 17.2 points (Abdelhaleem et al.) and differed no more than chance would allow (Q = 1.52 on 3 degrees of freedom). Jain et al. added little (weight 3%) because its standard deviation was 46.6 points. Durgapal and Shetty gave the same standard deviation (17.1 points) for both arms, which is unusual, and carried 30% of the weight.

Keratinized tissue width and gingival thickness. Neither differed. Keratinized tissue was 0.10 mm narrower with PRF, a difference compatible with chance (95% CI −0.50 to 0.31; four trials, 122 patients or sites; I^2 = 43%; **Figure 3C**). Raval et al. found it 0.59 mm narrower with PRF and Durgapal and Shetty 0.18 mm wider. Gingival thickness differed by 0.05 mm (95% CI −0.10 to 0.20; three trials, 94 patients or sites; I^2 = 37%; **Figure 3D**). Durgapal and Shetty measured thickness with a colour-coded biotype probe and reported only percentages (72.4% with the membrane, 76.6% with A-PRF), so no mean thickness could be extracted. In Raval et al. the PRF arm began with narrower keratinized tissue, and measured as change from baseline the pooled keratinized tissue estimate moved to +0.20 mm (95% CI −0.04 to 0.45).

Attachment level. The trials disagreed (MD −0.56 mm; 95% CI −1.29 to 0.17; τ^2 = 0.54; I^2 = 86%; P for heterogeneity < 0.001; Supplementary Figure S2A). Abdelhaleem et al. found 1.6 mm less attachment loss with PRF, whereas Raval et al. and Durgapal and Shetty found 0.18 and 0.09 mm more. Two trials report relative attachment level, taken from a stent or from recession plus probing depth, and three report clinical attachment level from the cementoenamel junction, so even the measure differs. The pooled value should not be interpreted.

Probing depth. Only Jain et al. and Durgapal and Shetty reported it (64 sites). PRF sites were 0.18 mm deeper (Wald 95% CI 0.03 to 0.32; HKSJ −0.39 to 0.75; I^2 = 0%; Supplementary Figure S2B). Jain et al. supplied 79% of the weight, and its control arm had a probing depth of 0.50 ± 0.00 mm, so this estimate should not be interpreted.

Complete root coverage. It could not be pooled. Abdelhaleem et al., Jain et al., Raval et al. and Durgapal and Shetty did not report it. Shashikumar et al. gave 80% with PRF against 70% with collagen at 1 year, percentages that cannot be reached with 18 patients per arm.

3.5 Comparison 2: PRF-enriched Collagen versus Collagen Alone

Two split-mouth trials with 37 patients contributed (Magrin et al., 2026; Patra et al., 2022). They disagreed on the main outcome, and pooling did not resolve the disagreement (**Figure 4**).

Recession depth at 6 months. Patra et al. found shallower residual recession with i-PRF (MD −0.40 mm; 95% CI −0.73 to −0.07), whereas Magrin et al. found the opposite trend (MD 0.35 mm; −0.16 to 0.86). The pooled MD was −0.05 mm (95% CI −0.78 to 0.68; HKSJ −4.80 to 4.70), with substantial heterogeneity (τ^2 = 0.23; I^2 = 83%; P = 0.015).

Mean root coverage. Patra et al. reported 67.0% against 53.95% without SDs; Magrin et al. reported 53.8% (SD 29.6) against 59.8% (SD 31.3). With Patra's SD imputed at 30.4%, the pooled MD was 2.6% (95% CI −16.0 to 21.3; I^2 = 70%). Imputing 20% or 40% did not change the result.

Complete root coverage. Patra et al. found 5 of 20 sites completely covered with i-PRF against 1 of 20 with collagen alone (RR 5.0; 95% CI 0.64 to 39.1; counts derived from the 25% and 5% reported in the full text), whereas Magrin et al. found 3 of 24 teeth with PRF against 7 of 24 without (RR 0.43; 0.13 to 1.46). The trials disagree, and the pooled risk ratio carries no information (RR 1.27; 95% CI 0.12 to 13.8; I^2 = 75%). Both counts treat the two arms as independent.

Keratinized tissue width. Both trials favoured PRF (pooled MD 0.60 mm; 95% CI 0.35 to 0.85; I^2 = 0%), but the HKSJ interval crossed zero (−0.36 to 1.56). Both trials also started with wider keratinized tissue on the PRF side. Measured as change from baseline, the difference fell to 0.33 mm (95% CI 0.09 to 0.58; HKSJ −1.21 to 1.88).

Gingival thickness. The trials pointed in opposite directions. Patra et al. reported thicker tissue with i-PRF (MD 0.55 mm; 0.43 to 0.67), and Magrin et al. slightly thinner tissue (MD −0.10 mm; −0.26 to 0.06). The pooled value (0.23 mm; 95% CI −0.41 to 0.86; I^2 = 98%) should not be interpreted.

Attachment level and probing depth. Neither differed (CAL MD 0.01 mm, 95% CI −0.34 to 0.35; PD MD −0.08 mm, −0.35 to 0.20; Supplementary Figure S1).

3.6 Sensitivity Analyses

For Comparison 1, recession depth and mean root coverage kept their direction in every analysis (Table 3). The recession depth difference held when change scores were analysed (−0.37 mm; 95% CI −0.56 to −0.19), when the sample sizes of the two site-randomized trials were halved (−0.45 mm; −0.61 to −0.30), when Shashikumar et al.'s 12-month data were dropped (−0.42 mm; −0.57 to −0.26), when the within-patient correlation for Durgapal and Shetty was set to 0.2 or 0.8 (−0.45 and −0.41 mm)

and when its 22 sites were treated as independent pairs (−0.41 mm; −0.55 to −0.28). Omitting any single trial left the Wald, HKSJ and Röver-modified intervals below zero. Without Abdelhaleem et al., the largest trial, the pooled MD was −0.37 mm (Wald −0.59 to −0.16; HKSJ −0.72 to −0.03), and without Durgapal and Shetty it returned to −0.48 mm (−0.64 to −0.31). The root coverage difference was less secure. It was unchanged by the design effect (14.7 points; 8.8 to 20.5) and by treating Durgapal's sites as independent pairs (13.5 points; 7.4 to 19.6), and the Wald interval excluded zero whenever one trial was omitted (estimates 11.8 to 17.1 points). With three trials left, however, the Röver-modified interval included zero when Abdelhaleem et al. (−6.9 to 30.6) or Shashikumar et al. (−1.2 to 29.5) was omitted. Keratinized tissue width stayed compatible with no difference in every analysis, but its estimate moved between −0.32 and +0.20 mm, so even its direction is not stable. Attachment level stayed heterogeneous (I^2 57% to 89%), and no analysis excluded zero.

Subgroup analyses were exploratory. Recession depth did not differ between the three VISTA/A-PRF trials and the two flap/L-PRF trials (−0.45 against −0.39 mm; P for difference = 0.86) or between membrane and matrix comparators (−0.43 against −0.36 mm; P = 0.78). Attachment level did not differ by flap (−0.73 against −0.34 mm; P = 0.62) or by comparator (−0.39 against −0.72 mm; P = 0.74), and the three VISTA trials were themselves heterogeneous (I^2 = 91%). PRF type and flap design are completely confounded, because every L-PRF trial used a coronally advanced flap and every A-PRF trial used VISTA. A subgroup by trial design was not possible, since only one trial was split-mouth.

Table 3. Sensitivity analyses for Comparison 1 (pooled MD, Wald 95% CI unless stated)

Analysis	Recession depth (mm)	Mean root coverage (%)	Keratinized tissue width (mm)	Gingival thickness (mm)	Attachment level (mm)
Primary (5, 4, 4, 3 and 5 trials)	−0.44 (−0.59, −0.30)	14.7 (8.9, 20.5)	−0.10 (−0.50, 0.31)	0.05 (−0.10, 0.20)	−0.56 (−1.29, 0.17)
HKSJ interval	(−0.64, −0.24)	(8.0, 21.4)	(−0.67, 0.47)	(−0.29, 0.38)	(−1.53, 0.41)
HKSJ, Röver modification	(−0.65, −0.23)	(5.2, 24.1)	(−0.76, 0.56)	(−0.29, 0.38)	(−1.60, 0.48)
Change from baseline	−0.37 (−0.56, −0.19)	—	0.20 (−0.04, 0.45)	0.12 (−0.04, 0.28)	−0.47 (−1.08, 0.13)
6-month trials only (Shashikumar omitted)	−0.42 (−0.57, −0.26)	14.2 (7.2, 21.1)	−0.10 (−0.50, 0.31)	0.10 (−0.17, 0.36)	−0.48 (−1.40, 0.44)
Site-randomized trials, n halved	−0.45 (−0.61, −0.30)	14.7 (8.8, 20.5)	0.00 (−0.35, 0.36)	0.06 (−0.11, 0.22)	−0.58 (−1.34, 0.19)
Durgapal, within-patient r = 0.2	−0.45 (−0.60, −0.30)	15.4 (9.2, 21.6)	−0.11 (−0.52, 0.30)	—	−0.57 (−1.30, 0.17)
Durgapal, within-patient r = 0.8	−0.41 (−0.55, −0.27)	13.4 (7.3, 19.5)	−0.08 (−0.49, 0.32)	—	−0.55 (−1.28, 0.18)
Durgapal, 22 site pairs as independent	−0.41 (−0.55, −0.28)	13.5 (7.4, 19.6)	−0.08 (−0.49, 0.32)	—	−0.55 (−1.28, 0.18)
Without Abdelhaleem	−0.37 (−0.59, −0.16)	11.8 (3.3, 20.4)	−0.14 (−0.70, 0.41)	—	−0.21 (−0.77, 0.35)
Without Jain	−0.44 (−0.59, −0.29)	14.7 (8.7, 20.6)	−0.10 (−0.57, 0.37)	—	−0.54 (−1.38, 0.29)

Analysis	Recession depth (mm)	Mean root coverage (%)	Keratinized tissue width (mm)	Gingival thickness (mm)	Attachment level (mm)
Without Raval	−0.47 (−0.62, −0.32)	—	0.13 (−0.14, 0.40)	—	−0.76 (−1.58, 0.05)
Without Durgapal	−0.48 (−0.64, −0.31)	17.1 (10.1, 24.1)	−0.32 (−0.75, 0.12)	—	−0.77 (−1.61, 0.07)

Trial-by-trial omission was run for the four outcomes with four or more trials (recession depth, mean root coverage, keratinized tissue width and attachment level). Omitting Shashikumar equals the 6-month row. Keratinized tissue width is unchanged in the 6-month row because that trial reported none, and the Raval row shows a dash for root coverage because that trial reported none. The correlation and unit-of-analysis rows apply to Durgapal and Shetty, the only split-mouth trial; gingival thickness is unaffected because it reported none. Mean root coverage in the 6-month row rests on three trials.

For Comparison 2, no sensitivity analysis changed the direction or significance of a result (Table 4). Using the control-arm recession depth printed in Patra's abstract (1.5 mm) rather than its table (1.3 mm) moved the pooled MD to −0.15 mm (95% CI −1.08 to 0.78). Subgroup analyses were not possible with two trials.

Table 4. Sensitivity analyses for Comparison 2 (pooled MD, Wald 95% CI)

Analysis	Recession depth (mm)	Mean root coverage (%)	Keratinized tissue width (mm)	Gingival thickness (mm)
Primary (r = 0.5; n = patients)	−0.05 (−0.78, 0.68)	2.6 (−16.0, 21.3)	0.60 (0.35, 0.85)	0.23 (−0.41, 0.86)
Within-patient r = 0.2	−0.07 (−0.80, 0.66)	2.1 (−16.4, 20.7)	0.60 (0.29, 0.92)	0.23 (−0.41, 0.87)
Within-patient r = 0.8	−0.04 (−0.77, 0.70)	3.1 (−15.6, 21.9)	0.60 (0.44, 0.77)	0.23 (−0.41, 0.86)
Sites treated as independent	−0.09 (−0.81, 0.64)	3.1 (−15.6, 21.8)	0.62 (0.32, 0.91)	0.23 (−0.41, 0.87)
Change from baseline	0.04 (−0.46, 0.54)	—	0.33 (0.09, 0.58)	—
Patra SD imputed at 20% / 40%	—	3.7 (−15.1, 22.4) / 1.3 (−17.0, 19.5)	—	—

3.7 Certainty of Evidence

In Comparison 1, certainty was moderate for recession depth, low for mean root coverage, keratinized tissue width and gingival thickness, and very low for attachment level (Table 5). In Comparison 2 it was very low for four of five outcomes and low for keratinized tissue width (Table 6).

Table 5. Summary of findings for Comparison 1 (five RCTs, 158 patients or sites)

Outcome (participants; trials)	Effect (95% CI)	Certainty (GRADE)	Reasons for downgrading
Recession depth (158; 5)	MD −0.44 mm (−0.59 to −0.30)	⊕⊕⊕◯ Moderate	Risk of bias, four of five trials high and the largest with some concerns (−1). Imprecision not downgraded: 158 participants exceed the roughly 80 needed to detect 0.44 mm at an SD of 0.7 mm, and every sensitivity interval excluded zero
Mean root coverage (124; 4)	MD 14.7% (8.9 to 20.5); modified HKSJ 5.2 to 24.1	⊕⊕◯◯ Low	Risk of bias (−1); imprecision, wide modified interval that included zero when Abdelhaleem or Shashikumar was omitted (−1)
Keratinized tissue width (122; 4)	MD −0.10 mm (−0.50 to 0.31)	⊕⊕◯◯ Low	Risk of bias, including baseline imbalance (−1); imprecision, interval spans benefit and harm (−1)
Gingival thickness (94; 3)	MD 0.05 mm (−0.10 to 0.20)	⊕⊕◯◯ Low	Risk of bias (−1); imprecision (−1)
Attachment level (158; 5)	MD −0.56 mm (−1.29 to 0.17)	⊕◯◯◯ Very low	Risk of bias (−1); inconsistency, I^2 86% (−2); imprecision (−1)
Complete root coverage	Not estimable	Not graded	No trial gave usable data; the one report with percentages cannot be reconciled with its sample size

Indirectness was not downgraded. PRF type, flap and comparator differed between trials, and that variation is handled through the inconsistency rating and the subgroup analyses. With fewer than 10 trials, publication bias could not be assessed.

Table 6. Summary of findings for Comparison 2 (two split-mouth RCTs, 37 patients)

Outcome at 6 months	Effect (95% CI)	Certainty (GRADE)	Reasons for downgrading
Recession depth	MD −0.05 mm (−0.78 to 0.68)	⊕◯◯◯ Very low	Risk of bias (−1); inconsistency, I^2 83% (−1); imprecision (−2)
Mean root coverage	MD 2.6% (−16.0 to 21.3)	⊕◯◯◯ Very low	Risk of bias (−1); inconsistency (−1); imprecision and imputed SD (−2)
Keratinized tissue width	MD 0.60 mm (0.35 to 0.85)	⊕⊕◯◯ Low	Risk of bias, including baseline imbalance (−1); imprecision, HKSJ interval crosses zero (−1)
Gingival thickness	MD 0.23 mm (−0.41 to 0.86)	⊕◯◯◯ Very low	Risk of bias (−1); inconsistency, I^2 98% (−2); imprecision (−1)

Outcome at 6 months	Effect (95% CI)	Certainty (GRADE)	Reasons for downgrading
Complete root coverage	RR 1.27 (0.12 to 13.8); 5/20 vs 1/20 sites and 3/24 vs 7/24 teeth	⨁◯◯◯ Very low	Risk of bias (−1); inconsistency, I^2 75% (−1); imprecision (−2)

3.8 Principal Findings

PRF used in place of a collagen membrane or matrix gave more root coverage, by about 15 percentage points, but the evidence is thin. It rests on four small trials, most at high risk of bias, and its certainty is low. Recession depth pointed the same way (0.44 mm less with PRF) and held up in every sensitivity analysis, which is why its certainty is moderate, while keratinized tissue width and gingival thickness did not differ. In absolute terms the trials reported 50 to 77% root coverage with collagen and 67 to 86% with PRF. Whether that gap matters to patients cannot be judged from these data, because complete root coverage, the outcome patients notice, could not be compared.

For the second question the answer is clearer, if less encouraging. Enriching a collagen scaffold with PRF did not improve root coverage in the two trials available. One trial favoured PRF and the other did not, and their pooled estimate sits on zero with a wide interval. Keratinized tissue width was the only outcome to move consistently, by roughly 0.3 to 0.6 mm, and even that rests on low-certainty evidence from 37 patients.

3.9 Why the Trials Disagree

The two trials of PRF-enriched collagen share a question but little else. Patra et al. (2022) placed a thin, fast-resorbing membrane through a VISTA tunnel, soaked it in i-PRF spun at about 60 g and injected more around the site. Magrin et al. (2026) used a cross-linked, volume-stable matrix under a coronally advanced flap with liquid PRF spun at 400 g. Their defects also differed: recessions in the Magrin trial were deeper at baseline, about 3.5 against 2.8 mm.

Biology offers one reading. PRF delivers growth factors early but cannot hold space; a collagen scaffold holds space but brings no signal of its own. A thin membrane may gain from what PRF adds, while a dense, cross-linked matrix may already provide enough structure, leaving PRF little to contribute. Laboratory work shows that liquid PRF penetrates collagen biomaterials to different depths depending on their structure (Al-Maawi et al., 2019). Surgical design adds a second layer. Tunnel and VISTA approaches keep the papillae intact and protect the blood supply beneath the flap (Zadeh, 2011), which could favour a biologically active graft.

The trials were also analysed differently. Patra et al. treated 40 sites in 13 patients as independent observations, and Magrin et al. analysed one tooth per side with paired tests. Our analysis corrected for the split-mouth design, and the pooled results held when the correlation or the unit of analysis was changed (Table 4).

Then there is PRF itself. “PRF” in these trials spans protocols from 700 rpm for 3 minutes to classic L-PRF spun at 2,700 rpm for 12 minutes. These are not the same product, and few trials reported relative centrifugal force, tube type or rotor geometry. In Comparison 1 the protocols were L-PRF at 3,000 rpm for 10 minutes in two trials and A-PRF at 1,500 rpm for 14 minutes in two and for 12 minutes in one, and none reported relative centrifugal force.

In Comparison 1 the trials agreed on recession depth and root coverage and disagreed on attachment level. The three VISTA trials with A-PRF ranged from −1.60 mm (Abdelhaleem et al.) to +0.09 mm (Durgapal and Shetty), and as a group they did not differ from the two flap trials with L-PRF (−0.73 against −0.34 mm; P = 0.62). Durgapal and Shetty and Abdelhaleem et al. both measured attachment from the cementoenamel junction, yet one found no difference and the other 1.6 mm. The comparator may play a part (a membrane in Durgapal and Shetty, a matrix in Abdelhaleem et al.), but Jain et al. also used a membrane and found an intermediate effect. In Abdelhaleem et al., moreover, the control-arm attachment level (3.70 mm) is deeper than its recession depth would suggest (Supplementary File S3, section A5), and without that trial the pooled difference was −0.21 mm (95% CI −0.77 to 0.35). The data cannot say which of these explanations, if any, is right.

3.10 Comparison with Earlier Reviews

Miron et al. (2020) found that PRF improved root coverage over CAF alone but did not match CTG. Saleh et al. (2024) pooled the two VISTA trials of A-PRF against a collagen membrane and found 0.37 mm more recession reduction with A-PRF (95% CI 0.21 to 0.52; I^2 = 51%), with no difference in keratinized gingiva. Bhagwat et al. (2025) reviewed six trials narratively and concluded that PRF, alone or with collagen, outperformed collagen alone. Their set, however, included a trial whose comparator was PRF alone (Ibrahim et al., 2022) and a trial with 3 months of follow-up (Al-Barakani et al., 2024). They also described significant soft-tissue gains in the latter that its own tables do not show (P = 0.86 for keratinized tissue width and P = 0.53 for gingival thickness) (Al-Barakani et al., 2024).

This review keeps the two clinical questions apart and requires at least 6 months of follow-up. For PRF-enriched collagen, it does not support the optimistic conclusion. For PRF used instead of collagen, our direction agrees with both reviews. Saleh et al. (2024) pooled two VISTA trials and found 0.37 mm more recession reduction with A-PRF; we found 0.44 mm across five trials and 0.45 mm in the three VISTA trials, although the trial sets differ. Bhagwat et al. (2025) also favoured PRF, but they could not pool, and our pooled estimates rest on small trials with low certainty.

3.11 Strengths and Limitations

All seven included trials were retrieved by the PubMed or Scopus searches. Split-mouth trials were analysed as paired data, with every assumption stated and tested. PRF used *instead of* collagen was never mixed with PRF used *with* collagen. The extracted values were checked a second time against the source documents.

The limits are plain. The review was not registered and had no written protocol, so the choice of outcomes and analyses cannot be checked against a dated plan, and decisions made after seeing the data cannot be ruled out. Only PubMed, Scopus and Cochrane CENTRAL were searched. Web of Science, ClinicalTrials.gov, the WHO ICTRP and regional repositories were not, so trials found only there, and unpublished trials, may have been missed. CENTRAL brought in registry records, but the registers were not searched directly, so the list of registered trials is probably incomplete. Comparison 1 holds five trials and Comparison 2 only two, and with two trials neither heterogeneity nor the HKSJ interval can be estimated with any precision. All trials were small and single-centre, and most stopped at 6 months, although root coverage can drift over time (Tavelli et al., 2019). Operators could not be blinded, and assessor blinding was rarely reported. One standard deviation had to be imputed. Sixteen trials could not be classified (Section 3.1). Eleven of them compare PRF with collagen by design, so the first comparison could change when they report. One, a three-arm randomized trial of i-PRF added to a collagen matrix with 6 months of follow-up (Santamaria et al., 2026), may qualify for the second comparison once its full text is read. Another, a post hoc analysis of a randomized trial of the same comparison (NCT05389059), reports complete root coverage only, and the recession depth results of that trial are unpublished. Screening, data extraction and risk-of-bias rating were each done by one reviewer and reviewed by a second, not carried out independently in duplicate, so a missed study or an extraction error is more likely than with duplicate independent work. Data for the Magrin trial were first taken from the authors' doctoral thesis and then checked against the published article, and the two agreed. Finally, the collagen products ranged from thin guided tissue regeneration membranes to volume-stable matrices designed for soft-tissue augmentation.

Comparison 1 carries further problems. Two of its five trials randomized sites rather than patients and analysed them as independent units, a third (Durgapal and Shetty) analysed 22 split-mouth site pairs from 10 patients as independent pairs, and a fourth does not state its unit of analysis. Halving the sample sizes of the site-randomized trials and varying the assumptions for the split-mouth trial changed nothing material, but the reported precision remains uncertain. Several reports contain internal inconsistencies: a standard deviation of zero, identical standard deviations in both arms, P values that cannot be reproduced or that contradict the printed means, duplicated table rows and complete-coverage percentages that do not fit the group sizes. One trial supplied only 12-month data. PRF type, flap design and comparator are confounded across the five trials, so no subgroup contrast is interpretable. Finally, the Mansoura trial carries 54% of the weight for recession depth and was reported by the same group as the Saleh meta-analysis cited above (Saleh et al., 2024); the analysis without it (Table 3) is therefore worth reading, and it points the same way (−0.37 mm).

3.12 Implications

For practice. On current evidence, adding PRF to a collagen matrix adds cost and a blood draw without a demonstrated gain in root coverage. Replacing the collagen membrane or matrix with PRF may improve recession depth (moderate certainty) and root coverage (low certainty), but keratinized tissue and gingival thickness did not differ. PRF is a reasonable option for clinicians who wish to avoid a collagen product; it is not yet a proven improvement.

For research. Future trials should:

1. Report PRF protocols in full, including relative centrifugal force, tube type and spin time.
2. Follow patients for at least 12 months.
3. Blind the outcome assessor, and report patient-level as well as site-level data.
4. Use the Root Coverage Esthetic Score and validated patient-reported outcomes alongside clinical measures.
5. Test PRF against volume-stable matrices directly, not only against thin membranes.

4. CONCLUSION

Within the limits of the available trials:

1. PRF used in place of a collagen membrane or matrix gave more mean root coverage (about 15 percentage points, low certainty) and less residual recession (about 0.4 mm, moderate certainty) in RT1–RT2 recession. Keratinized tissue width and gingival thickness did not differ.
2. Enriching a collagen scaffold with PRF did not improve recession depth or mean root coverage at 6 months (very low certainty).
3. PRF enrichment may increase keratinized tissue width slightly, by about 0.3 to 0.6 mm (low certainty).
4. Both substitutes spare the palate, but neither has been shown to replace a connective tissue graft where maximum coverage is the goal.

Adequately powered, assessor-blinded trials with 12-month follow-up and fully reported PRF protocols are needed before firm recommendations can be made.

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AUTHOR CONTRIBUTIONS

Shorooq Atif Abdulaal: Conceptualization, Methodology, Investigation, Formal analysis, Writing – original draft.

Talal Abdullah Mohamed Alajmi: Investigation, Validation, Writing – review and editing.

CONFLICT OF INTEREST

The authors declare no competing interests.

ETHICS STATEMENT

Not applicable. This review used published data only, and no human participants or animals were studied.

DATA AVAILABILITY STATEMENT

The data extraction sheet (Supplementary File S3) and the analysis code (Supplementary File S2) are provided with this article.

USE OF GENERATIVE AI

The authors used Claude (Anthropic) to help identify literature, sort records during screening, extract data and draft the statistical code and text. The authors checked every screening decision, extracted value, analysis and sentence and take full responsibility for the content.

SUPPLEMENTARY MATERIAL

- **Table S1.** Full search strategies with run dates and hit counts.
- **Table S2.** Records excluded at the eligibility stage, records awaiting classification, and additional reports of included trials.
- **Figure S1.** Comparison 2: attachment level and probing depth at 6 months.
- **Figure S2.** Comparison 1: attachment level and probing depth at the follow-up closest to 6 months.
- **File S2.** Analysis code (Python).
- **File S3.** Data extraction sheet.

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FIGURE LEGENDS

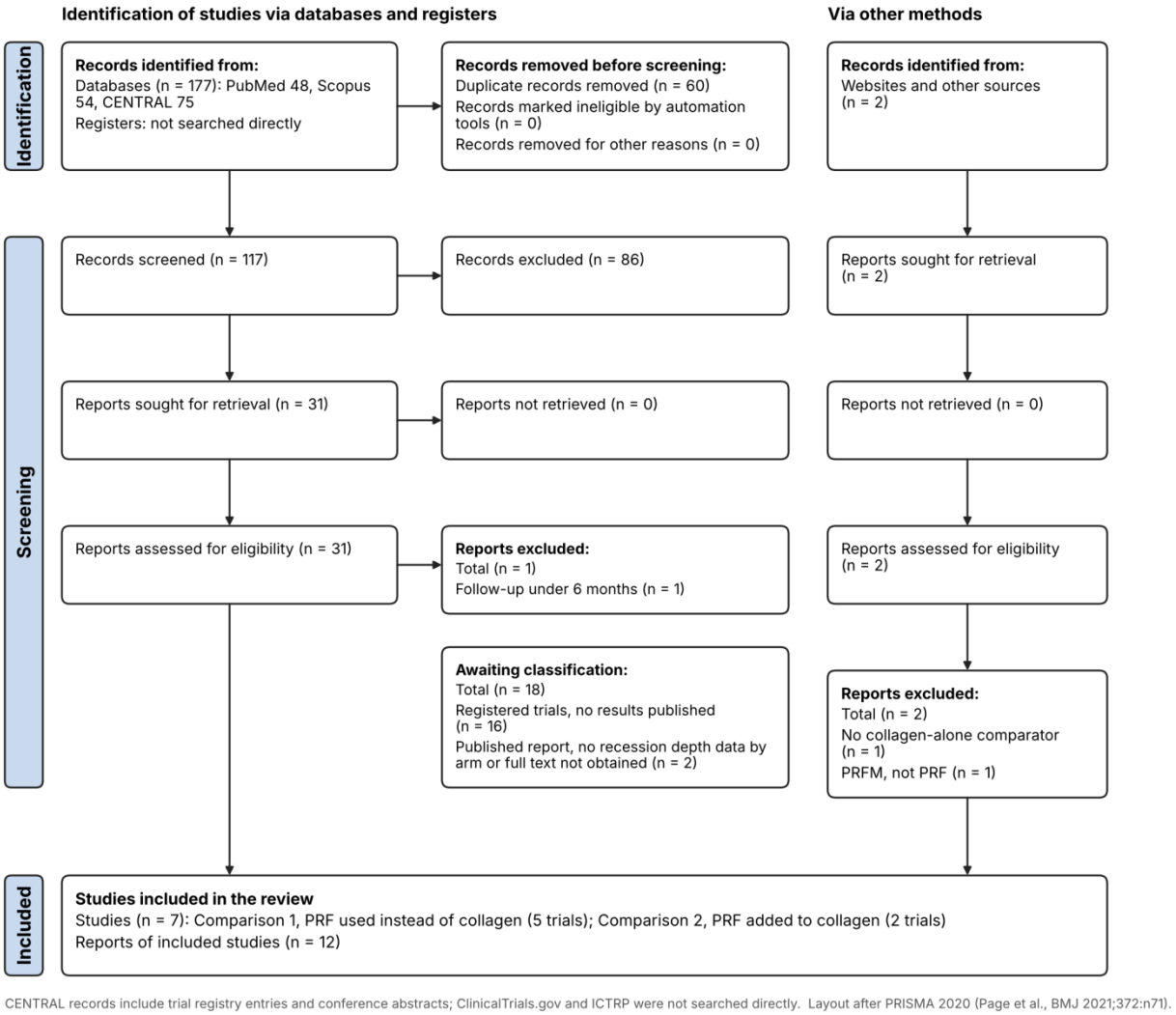
Figure 1. PRISMA 2020 flow diagram of study selection. Registers were not searched directly; registry records entered only through Cochrane CENTRAL. The two records in the right-hand column were found outside the database searches.

Figure 2. Risk of bias (RoB 2) of the seven trials with extractable data (Comparison 1: Abdelhaleem, Jain, Raval, Shashikumar, Durgapal; Comparison 2: Patra, Magrin). D1, randomization process; D2, deviations from intended interventions; D3, missing outcome data; D4, outcome measurement; D5, selection of the reported result.

Figure 3. PRF versus collagen: recession depth (A), mean root coverage (B), keratinized tissue width (C) and gingival thickness (D) at the follow-up closest to 6 months. Diamonds show the REML random-effects estimate with its Wald 95% CI; dashed lines show the HKSJ interval and its Röver modification. § site-level analysis; ‡ 12-month data; ¶ split-mouth trial analysed with n = 10 patients.

Figure 4. PRF-enriched collagen versus collagen alone: recession depth (A), mean root coverage (B), keratinized tissue width (C) and gingival thickness (D) at 6 months.

Figure 1



CENTRAL records include trial registry entries and conference abstracts; ClinicalTrials.gov and ICTRP were not searched directly. Layout after PRISMA 2020 (Page et al., BMJ 2021;372:n71).

Figure 2

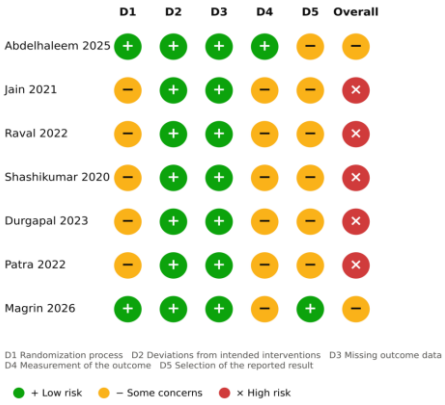


Figure 3

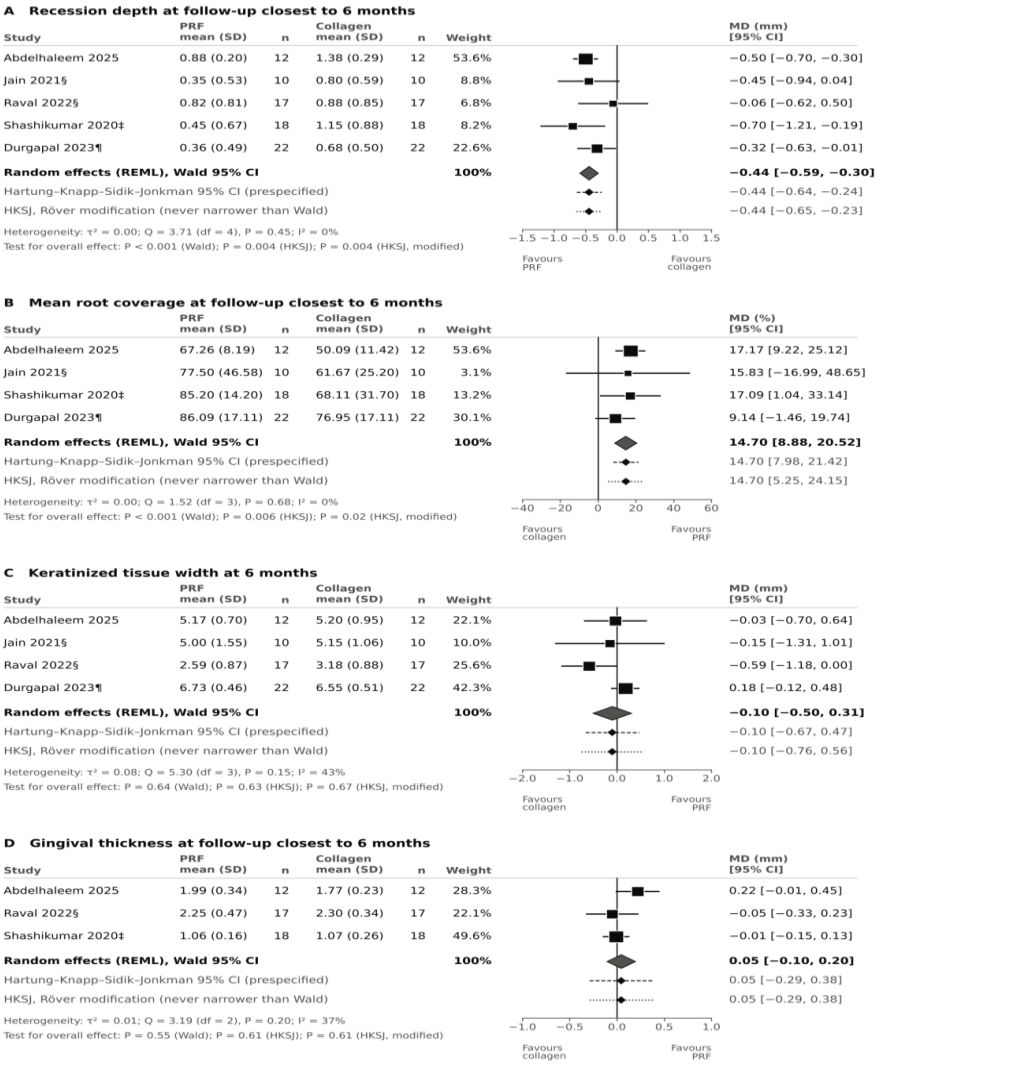
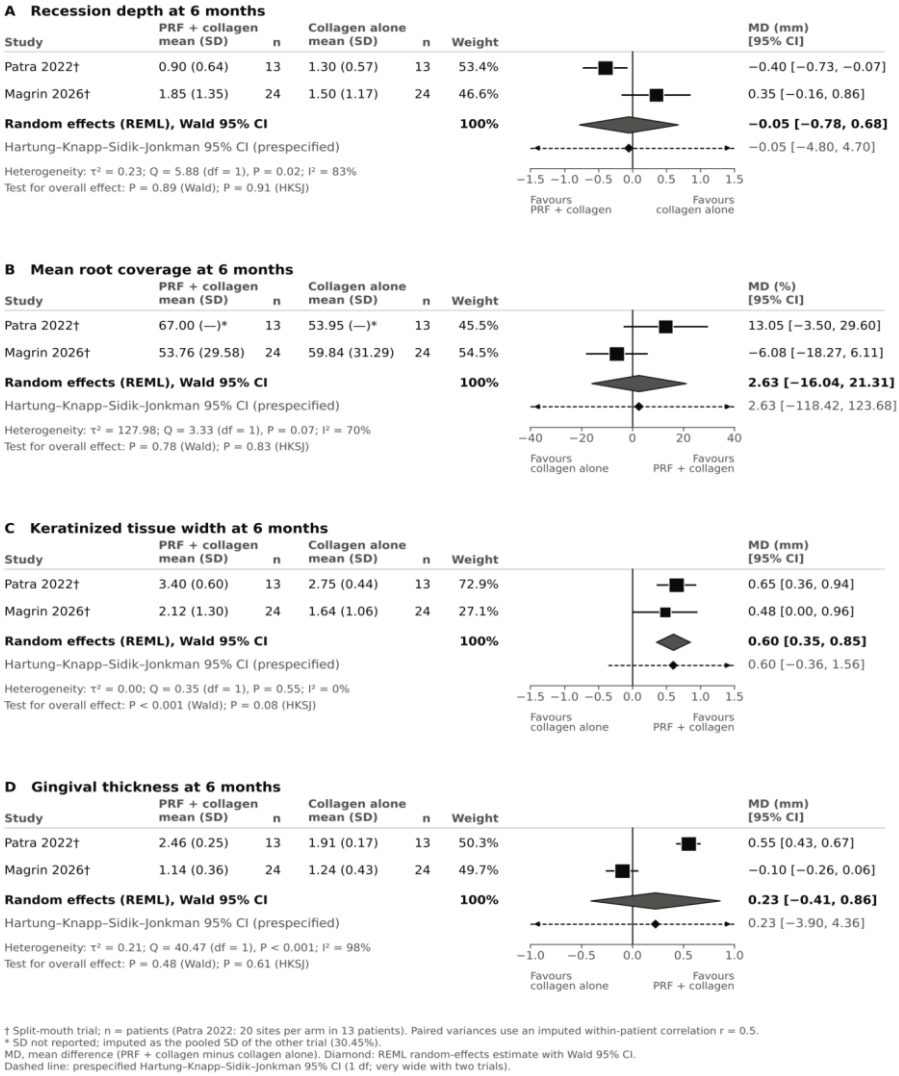


Figure 4



† Split-mouth trial; n = patients (Patra 2022: 20 sites per arm in 13 patients). Paired variances use an imputed within-patient correlation r = 0.5.
* SD not reported; imputed as the pooled SD of the other trial (30.45%).
MD, mean difference (PRF + collagen minus collagen alone). Diamond: REML random-effects estimate with Wald 95% CI.
Dashed line: prespecified Hartung–Knapp–Sidik–Jonkman 95% CI (1 df; very wide with two trials).