Periodontal plastic surgery for treatment of localized gingival recessions: a systematic review
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Authors' objectives
To assess the efficacy of periodontal plastic surgery (PPS) for treating localised gingival recession.

Searching
MEDLINE (via PubMed) and the Cochrane Oral Health Group's Trials Register were searched to April 2001 for reports published in the English language; the search terms were stated. The Journal of Periodontology, Journal of Clinical Periodontology and the Journal of Periodontal Research were manually searched up to April 2001. The reference lists from American Academy of Periodontology (AAP) position papers, and reviews from the EAP European Workshop (1994) and the AAP World Workshops (1989 and 1996) were also checked.

Study selection
Study designs of evaluations included in the review
Randomised controlled trials (RCTs), controlled clinical trials (CCTs), and case series of at least 6 months' duration were eligible for inclusion. Some of the included RCTs were of a split mouth design. The duration of the included studies ranged from 6 to 60 months.

Specific interventions included in the review
Studies of periodontal plastic surgery were eligible for inclusion. The review assessed the following types of surgery: coronally advanced flap (CAF), lateral positioned flaps, free gingival graft, connective tissue graft (CTG), and guided tissue regeneration (GTR) with resorbable or non-resorbable membranes.

Participants included in the review
Studies of patients with a clinical diagnosis of gingival recession (2 mm or more, Miller's class I or II) were eligible for inclusion.

Outcomes assessed in the review
Studies that assessed clinical outcomes were eligible for inclusion. The review assessed changes in gingival recession, clinical attachment level gain and root coverage, and long-term outcomes (stability of root coverage after more than 12 months and the patients' satisfaction with aesthetics).

How were decisions on the relevance of primary studies made?
Two reviewers independently screened titles and abstracts according to defined criteria (human trials, root coverage, longitudinal study and clinical outcomes). Any disagreements were resolved by discussion. Three reviewers assessed full publications and resolved any disagreements by discussion. Inter-reviewer agreement for both parts of the selection process was assessed using the kappa statistic.

Assessment of study quality
The validity of the RCTs was assessed on the basis of the adequacy of the method of randomisation, allocation concealment and blinding of the examiners. In addition, the validity of RCTs and studies of other designs was assessed using completeness of follow-up: the number of patients at baseline and follow-up reported by the treatment group; all entered patients accounted for at study completion; and the analysis accounted for drop-outs and excluded patients. Two reviewers independently assessed validity using a specifically designed form. Any disagreements were resolved by discussion with a third reviewer. Inter-reviewer agreement was assessed using the kappa statistic.
Data extraction
Two reviewers independently extracted the data onto a specifically designed form. The variance was estimated for some split mouth studies that did not report appropriate standard deviations of the difference. Where required, the authors recalculated site-based data using a patient-based analysis.

Methods of synthesis
How were the studies combined?
The studies were grouped and analysed according to the study design: differences between treatments using comparative studies; change from baseline for single arms from comparative studies; and change from baseline for case series. Similar studies were pooled in a meta-analysis using a fixed-effect or random-effects model. The weighted mean difference (WMD) and crude 95% confidence intervals (CIs) were estimated for the change in CAL for each treatment separately.

Where possible, ranges of percentage root coverage were reported for each type of surgery. The largest percentage of sites with complete root coverage were also reported for each type of surgery for any design of study.

How were differences between studies investigated?
Statistical heterogeneity was assessed using the chi-squared statistic. Where significant heterogeneity was detected it was explored using Galbraith plots. The influence of initial defect depth and type of barrier membrane on the results was explored using meta-regression.

Results of the review
Seventeen RCTs (378 patients), 3 CCTs (140 patients) and 10 case series (112 patients) were included in the review. Ten of the RCTs and CCTs were not included in the meta-analyses (the reasons were given).

There was good agreement between reviewers for the study selection process: kappa was 0.85 for screening abstracts and 0.79 for screening full publications.

In terms of the quality of the RCTs, the examiners were blinded in seven, an adequate method of randomisation was reported in six, allocation concealment was not reported in any RCT, and in 9 trials it was unclear whether or not drop-outs were accounted for.

Comparative studies: studies showed that CTG slightly, but significantly, reduced recession compared with GTR; the WMD (6 studies) was 0.43 mm (95% CI: 0.62, 0.23); no significant heterogeneity was detected (P=0.17). There was no significant difference in recession between GTR and CAF; the WMD (2 studies) was 0.18 mm (95% CI: -0.45, 0.82); no significant heterogeneity was detected (P=0.29). Nor was there a significant difference in recession between resorbable and non-resorbable membranes with GTR barriers; the WMD (2 studies) was 0.27 mm (95% CI: -0.07, 0.60); no significant heterogeneity was detected (P=0.21).

Comparative studies: the gain in clinical attachment level was similar for CTG compared with GTR, GTR compared with CAF, and for resorbable and non-resorbable membranes with GTR barriers.

In terms of long-term follow-up, one study (50 patients) found that clinical improvements were maintained after 18 months and 4 years' follow-up.

No studies assessed aesthetics.

Authors' conclusions
Periodontal plastic surgery reduces gingival recessions and improves clinical attachment levels. No one treatment was found to be more effective than all the others, but CTG significantly reduced recession compared with GTR.

CRD commentary
The review question was clear in terms of the study design, intervention, participants and outcomes. Several relevant sources were searched and the search terms were stated. Limiting the included studies to those in English may have resulted in the omission of relevant studies. Two reviewers independently selected the studies, assessed validity and extracted the data, thus reducing the potential for bias and errors. The validity of the RCTs was assessed using established criteria, whereas for non-randomised controlled studies, the validity assessment appears to have been limited to completeness of follow-up. The baseline comparability of the treatment groups was not one of the criteria assessed. Some relevant information on the included studies was tabulated but, since there were few details on the participants, it is unclear how generalisable these results may be. Most of the studies were conducted in university settings and the generalisability of the results to other settings is unknown.

The studies were grouped according to the interventions compared and pooled in meta-analyses. RCTs and non-randomised controlled trials were combined in meta-analyses, but the influence of study design on the results was not reported. Statistical heterogeneity was assessed and, where significant heterogeneity was detected, attempts were made to identify outlying studies; the influence on the results of two potential reasons for differences between the studies was explored. Heterogeneity could be due to several reasons, e.g. poor quality trials with small sample sizes. The unexplained heterogeneity suggests that the results from the review should be interpreted with caution.

**Implications of the review for practice and research**

Practice: The authors stated that CTG, CAF and GTR can be used where root coverage is indicated. CTG significantly reduced recession more than GTR. There were limited data on free gingival flaps and laterally positioned flaps.

Research: The authors stated that research is required to identify those factors (patient, aetiology, site, surgical method and operator variability) associated with a successful treatment outcome. They stated that future studies should evaluate meaningful outcomes ('success'), predictability of treatment and cost-benefit, and should include the treatment of multiple recession-type defects.

The authors also stated that authors of future research should adhere to the CONSORT guidelines (www.consort-statement.org).

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