

The Effect of Time on Root Coverage Outcomes: A Network Meta-Analysis

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Appendix

Search Strategy

The search strategy was performed respectively in MEDLINE/Pubmed, EMBASE and Cochrane Central Register of Controller Trials (CENTRAL):

- ("gingival recession/surgery"[Mesh Terms] OR "gingival recession/therapy"[Mesh Terms]) AND ("randomized controlled trial"[Publication Type] OR "randomized controlled trials as topic"[MeSH Terms] OR "randomized controlled trial"[All Fields] OR "randomised controlled trial"[All Fields])
- gingival AND recession AND randomized AND controlled AND trial
- “Gingival recession” [Search All Text] AND “root coverage” [Search All Text]

In addition, an electronic screening of Medicine Gray Literature Report was performed to identify ongoing or unpublished studies (<http://greyLit.org>).

Furthermore, a manual search through periodontics-related journals, including *Journal of Dental Research*, *Journal of Clinical Periodontology*, *Journal of Periodontology*, *Journal of Periodontal Research* and *International Journal of Periodontics & Restorative Dentistry*, from January 2016 to December 2017, was performed. The references of all the articles were reviewed in full text to identify all other available articles. Finally, previous systematic reviews investigating root coverage procedures were screened for article identification (Al-Hamdan et al. 2003; Atieh et al. 2016; Buti et al. 2013; Cairo et al. 2014; Cairo et al. 2016b; Chambrone et al. 2008; Chambrone et al. 2012; Chambrone et al. 2009; Chambrone and Tatakis 2015; Chambrone and Chambrone 2009; Cheng et al. 2015; Cheng et al. 2007; Clauser et al. 2003; Gapski et al. 2005; Graziani et al. 2014; Hwang and Wang 2006; Oates et al. 2003; Pagliaro et al. 2003; Rocuzzo et al. 2002; Tatakis et al. 2015)

Data extraction

Studies were excluded by screening the titles and abstracts and full-text reading by two separate investigators (L.T., S.B.) using a predetermined data extraction form to confirm the eligibility of each study based on the aforementioned criteria. The primary outcomes were mid-facial REC at different time points, and the secondary outcomes were KTW and CAL at different follow-up intervals. Data was independently extracted by the same two authors (L.T. and S.B.). Patient characteristics, the treatments and clinical

outcomes were registered. When clinical data was lacking, authors of the trials were contacted. At each stage, any debates between the reviewers were resolved through discussion and consensus. If a disagreement persisted, the judgment of a third reviewer (F.C.) was decisive.

Bias assessment scale and related parameters for the evaluation of risk of bias

The Cochrane Risk of Bias Tool for Randomized Controlled Trials was used to evaluate randomized controlled trials (RCTs) (Higgins et al. 2011), by addressing the following items:

1. Random sequence generation. Selection bias (biased allocation to interventions) due to inadequate generation of a randomized sequence).
2. Allocation concealment. Selection bias (biased allocation to interventions) due to inadequate concealment of allocations prior to assignment.
3. Blinding of participants and personnel. Performance bias due to knowledge of the allocated interventions by participants and personnel during the study.
4. Blinding of outcome assessment. Detection bias due to knowledge of the allocated interventions by outcome assessors.
5. Incomplete outcome data addresses. Attrition bias due to amount, nature or handling of incomplete outcome data.
6. Selective reporting. Reporting bias due to selective outcome reporting.
7. Other bias. Bias due to problems not covered elsewhere in the table.

The potential risk of bias was categorized as low if a study provided detailed information on the above parameters. Moderate risk was considered if a study failed to provide information on only one of the parameters, whereas if a study showed missing information pertaining to >2 parameters, it was categorized as exhibiting a high risk of bias.

Appendix Table 1. Characteristics and references of the excluded articles

| Rationale for exclusion (n) | Reference |
|--|--|
| Data extraction not possible (n=8) | (Alkan and Parlar 2013; Burkhardt and Lang 2005; Dandu and Murthy 2016; Godavarthi et al. 2016; Jahnke et al. 1993; Keceli et al. 2008; Lops et al. 2015; Salhi et al. 2014) |
| Follow-up < 6 months (n=15) | (Al-Zahrani et al. 2004; Baghele and Pol 2012; Barbosa et al. 2009; De Toledo Lourenço et al. 2009; Harris et al. 2005; Ibbott et al. 1985; Lafzi et al. 2011; Lafzi et al. 2007; Laney et al. 1992; Oles et al. 1985; Papageorgakopoulos et al. 2008; Pini et al. 2000; Pini-Prato et al. 1999; Shepherd et al. 2009; Toledo et al. 2009) |
| No RCTs (n=17) | (Bellver-Fernandez et al. 2016; Berlucchi et al. 2005; Cummings et al. 2005; Dembowska and Drozdziak 2007; Erley et al. 2006; Hirsch et al. 2005; McGuire and Scheyer 2006; Moses et al. 2006; Nemcovsky et al. 2004; Novaes and de Barros 2008; Nunn and Miyamoto 2013; Ozcan et al. 1997; Pini et al. 1996; Pini et al. 1992; Pini-Prato et al. 2010; Trombelli et al. 1995; Wennström and Zucchelli 1996) |
| Only cases with NCCL included (n=5) | (Santamaria et al. 2009a; Santamaria et al. 2013; Santamaria et al. 2009b; Santamaria et al. 2008; Santamaria et al. 2010) |
| Only outcomes at baseline and final follow-up provided (n=111) | (Ahmedbeyli et al. 2014; Aichelmann-Reidy et al. 2001; Alves et al. 2012; Andrade et al. 2008; Andrade et al. 2010; Aroca et al. 2013; Ayub et al. 2012; Banihashemrad et al. 2009; Bansal et al. 2016; Barros et al. 2004; Barros et al. 2005; Barros et al. 2015; Berlucchi et al. 2002; Bittencourt et al. 2012; Bittencourt et al. 2006; 2007; Borghetti et al. 1999; Borghetti and Louise 1994; Bouchard et al. 1994; Caffesse et al. 2000; Cardaropoli and Cardaropoli 2009; Cardaropoli et al. 2012; Cardaropoli et al. 2014; Cheung and Griffin 2004; Cordioli et al. 2001; Côrtes et al. 2004; da Silva et al. 2004; De Queiroz Côrtes et al. 2004; de Souza et al. 2008; Deshpande et al. 2014; Dilsiz et al. 2010; Dodge et al. 2000; Doğan et al. 2015; Duval et al. 2000; Eren and Atilla 2014; Felipe et al. 2007; Francetti et al. 2005; Gilbert et al. 2015; Gobbato et al. 2016; Gumus and Buduneli 2014; Han et al. 2008; Harris 1997; 1998; 2000; Huang et al. 2005; Huynh et al. 1995; Jankovic et al. 2012; Jankovic et al. 2010; Jepsen et al. 1998; Joly et al. 2007; Kassab et al. 2006; Kimble et al. 2004; Kuru and Yildirim 2013; Lins et al. 2003; Lucchesi et al. 2007; Mahajan et al. 2012; Mahajan et al. 2007; Matarasso et al. 1998; Mazzocco et al. 2011; McGuire et al. 2009; Milinkovic et al. 2015; Modica et al. 2000; Muller et al. 1999; Nazareth and Cury 2011; Nizam et al. 2015; Ozcelik et al. 2011; Ozcelik et al. 2016; Ozcelik et al. 2015; Ozenci et al. 2015; Ozturan et al. 2011; Paolantonio 2002; Paolantonio et al. 1997; Paolantonio et al. 2002; Piloni et al. 2006; Pourabbas et al. 2009; Rahmani and Lades 2006; Rasperini et al. 2011; Ricci et al. 1996; Rocuzzo et al. 1996; Rosetti et al. 2000; Santana et al. 2010a; Santana et al. 2010b; Santana et al. 2010c; Schlee and Esposito 2011; Silva et al. 2004; Singh et al. 2015; Spahr et al. 2005; Tal et al. 2002; Tatakis and Trombelli 2000; Thombre et al. 2013; Tonetti et al. 2018; Tözüm et al. 2005; Trabulsi et al. 2004; Trivedi et al. 2014; Trombelli et al. 1998; Trombelli et al. 1996; Ucak et al. 2017; Wang et al. 2001; Wang et al. 2014; Wang et al. 2015; Woodyard et al. 2004; Yilmaz et al. 2014; Zanwar et al. 2014; Zucchelli et al. 2003; Zucchelli et al. 1998; Zucchelli et al. 2012; Zucchelli et al. 2014a; Zucchelli et al. 2009a; Zucchelli et al. 2010; Zucchelli et al. 2014b; Zucchelli et al. 2009b) |
| Only smoking patients included (n=2) | (Costa et al. 2016; Reino et al. 2012) |

Appendix Table 2. General overview of the included studies

| Study | Study design | Country | Patients and Recessions (N) | Age (mean in years) | Smoking patients included | Recession type | Setting and funding |
|-------------------------|---------------------|--------------------------|------------------------------------|----------------------------|----------------------------------|-----------------------|--|
| (Abolfazli et al. 2009) | Split-mouth | Iran | 12 and 24 | 34.5 | No | Single | University, NR |
| (Alkan and Parlar 2011) | Split-mouth | Turkey | 12 and 24 | NA | No | Single | University, support from University |
| (Amarante et al. 2000) | Split-mouth | Norway | 20 and 40 | 38.4 | Yes | Single | University, partially supported by a company |
| (Aroca et al. 2009) | Split-mouth | Hungary | 21 and 134 | 31.7 | Yes if ≤ 20 cig./day | Multiple | University, self-supported |
| (Aroca et al. 2010) | Split-mouth | Hungary | 20 and 139 | 31.7 | No | Multiple | University, self-supported |
| (Ayub et al. 2014) | Split-mouth | Brazil | 15 and 30 | 45 | No | Single | University, supported by a grant |
| (Azaripour et al. 2016) | Parallel | Germany | 40 and 71 | 38.6 | No | Single/ Multiple | University, self-supported |
| (Barker et al. 2010) | Split-mouth | United States of America | 14 and 52 | 42.6 | No | Multiple | University, partially supported by a company |
| (Bednarz et al. 2016) | Parallel | Poland | 30 and 137 | NA | No | Multiple | University, NR |
| (Bherwani et al. 2014) | Parallel | India | 20 and 75 | NA | No | Multiple | University, NR |

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|--------------------------------|-------------|--------------------------|------------|------|---------------------------|---------------------|--|
| (Bittencourt et al. 2009) | Split-mouth | Brazil | 17 and 34 | 33.5 | No | Single | University, supported by a research funding |
| (Byun et al. 2009) | Parallel | United States of America | 20 and 20 | 42.6 | No | Single | University, supported by a research funding |
| (Cairo et al. 2016a) | Parallel | Italy | 32 and 74 | 53.1 | Yes if ≤ 10 cig./day | Multiple | University, self-supported |
| (Cairo et al. 2012) | Parallel | Italy | 29 and 29 | 45.9 | Yes if ≤ 20 cig./day | Single | University, self-supported |
| (Cairo et al. 2015) | Parallel | Italy | 24 and 24 | 53.1 | Yes if ≤ 20 cig./day | Single | University, self-supported |
| (Carney et al. 2012) | Split-mouth | United States of America | 17 and 40 | 49.4 | No | Multiple | University, self-supported |
| (Castellanos et al. 2006) | Parallel | Mexico | 22 and 44 | 42.5 | No | Single | University, NR |
| (Cetiner et al. 2003) | Parallel | Turkey | 22 and 60 | NA | Yes if < 10 cig./day | Single | University, NR |
| (Cieslik-Wegemund et al. 2016) | Parallel | Poland | 28 and 106 | 35 | No | Multiple | University, NR |
| (Cordaro et al. 2012b) | Split-mouth | Italy | 10 and 58 | NA | Yes if ≤ 10 cig./day | Multiple | University, NR |
| (Cortellini et al. 2009) | Parallel | Italy | 85 and 85 | 37.8 | Yes if ≤ 20 cig./day | Single | University, self-supported |
| (Cueva et al. 2004) | Split-mouth | United States of America | 17 and 58 | 39 | Yes | Single/ Multiple | University, partially supported by a company |

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|---------------------------------|-------------|-------------------------------------|-----------|------|------------------------------|---------------------|---|
| (De Queiroz Côrtes et al. 2006) | Split-mouth | Brazil | 13 and 26 | 32.8 | No | Single | University, NR |
| (Del Pizzo et al. 2005) | Split-mouth | Italy | 15 and 30 | 39.5 | No | Single | University, NR |
| (Deliberador et al. 2015) | Split-mouth | Brazil | 12 and 24 | 41 | No | Single | University, NR |
| (Fernandes-Dias et al. 2015) | Parallel | Brazil | 40 and 40 | 40.2 | No | Single | University, supported by a grant |
| (Ghahroudi et al. 2013) | Parallel | Iran | 22 and 71 | 45.3 | NA | Single/ Multiple | University, self-supported |
| (Hägewald et al. 2002) | Split-mouth | Germany | 36 and 72 | 36 | Yes if < 10 cig./day | Single | University, supported by a company |
| (Haghighati et al. 2009) | Split-mouth | Iran | 16 and 32 | NA | No | Multiple | University, self-supported |
| (Henderson et al. 2001) | Split-mouth | United States of America | 10 and 20 | 42.2 | No | Multiple | Private Practice, supported by a company |
| (Henriques et al. 2010) | Split-mouth | Brazil | 12 and 24 | 42.7 | No | Single | University, NR |
| (Ito et al. 2000) | Parallel | Japan | 6 and 8 | 34 | NA | Multiple | University, NR |
| (Jain et al. 2017) | Parallel | India | 30 and 30 | 29.6 | No | Single | University, NR |
| (Jepsen et al. 2013) | Split-mouth | Germany, Italy, Sweden, Spain | 45 and 90 | 39.5 | Yes if \leq 10 cig./day | Single | University, supported by a company |

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|----------------------------|-------------|--------------------------|------------|------|---------------------------|---------------------|--|
| (Jepsen et al. 2017) | Split-mouth | Germany, Italy | 18 and 36 | 44 | Yes if ≤ 10 cig./day | Single | University, supported by a company |
| (Jhaveri et al. 2010) | Split-mouth | India | 10 and 20 | 36.5 | NA | Single | University, partially supported by a research organization |
| (Köseoğlu et al. 2013) | Split-mouth | Turkey | 11 and 22 | 31 | No | Single | University, supported by a research grant |
| (Kuis et al. 2013) | Split-mouth | Croatia | 37 and 114 | 31.1 | No | Single | University, supported by a research grant |
| (Leknes et al. 2005) | Split-mouth | Norway | 20 and 40 | 38.4 | Yes | Single/ Multiple | University, partially supported by a company |
| (McGuire and Nunn 2003) | Split-mouth | United States of America | 17 and 34 | 44.9 | No | Single | Private Practice, supported by a company |
| (McGuire and Scheyer 2010) | Split-mouth | United States of America | 23 and 46 | 43.7 | No | Single | Private Practice, supported by a company |
| (McGuire and Scheyer 2016) | Split-mouth | United States of America | 17 and 34 | 51.3 | No | Single | Private Practice, supported by a company |
| (McGuire et al. 2012) | Split-mouth | United States of America | 9 and 18 | 55.4 | No | Single | Private Practice, supported by a company |
| (McGuire et al. 2014) | Split-mouth | United States of America | 20 and 40 | 52.5 | No | Single | Private Practice, supported by a company |
| (Moka et al. 2014) | Parallel | India | 20 and 20 | NA | No | Single | University, NR |
| (Moreira et al. 2016) | Parallel | Brazil | 40 and 40 | 34.4 | No | Single | University, partially supported by a company |

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|---------------------------|-------------|--------------------------|-----------|------|---------------------------|---------------------|--|
| (Moslemi et al. 2011a) | Split-mouth | Iran | 15 and 30 | 39.4 | No | Single | University, supported by a research grant |
| (Nickles et al. 2010) | Parallel | Germany | 9 and 24 | 32.2 | Yes | Single/ Multiple | University, self-supported |
| (Novaes et al. 2001) | Split-mouth | Brazil | 9 and 30 | 42 | No | Single/ Multiple | University, partially-supported by a company |
| (Pini Prato et al. 2011a) | Split-mouth | Italy | 9 and 18 | NA | Yes | Single | University, self-supported |
| (Rasperini et al. 2018a) | Parallel | Italy | 25 and 25 | 49.7 | Yes if ≤ 20 cig./day | Single | University, self-supported |
| (Reino et al. 2015) | Split-mouth | Brazil | 20 and 40 | 42 | NA | Single | University, partially supported by a research grant and by a company |
| (Romagna-Genon 2001) | Split-mouth | France | 20 and 40 | 37 | No | Single | University, NR |
| (Roman et al. 2013) | Parallel | Romania | 42 and 42 | 31 | Yes if ≤ 10 cig./day | Single/ Multiple | University, supported by a research grant |
| (Rosetti et al. 2013) | Split-mouth | Brazil | 12 and 24 | 39 | No | Single | University, supported by a research grant |
| (Sangiorgio et al. 2017) | Parallel | Brazil | 68 and 68 | 37.5 | No | Single | University, supported by a research grant |
| (Santamaria et al. 2017) | Parallel | Brazil | 42 and 42 | 40.2 | No | Single | University, supported by a research grant |
| (Shin et al. 2007) | Split-mouth | United States of America | 14 and 82 | 45.4 | Yes | Multiple | University, partially supported by companies |

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|--------------------------|-------------|-------------------------------|------------|------|---------------------------|---------------------|---|
| (Stefanini et al. 2016) | Split-mouth | Germany, Italy, Sweden, Spain | 45 and 90 | 39.5 | Yes if ≤ 10 cig./day | Single | University, supported by a company |
| (Taiyeb Ali et al. 2015) | Parallel | Malaysia | 6 and 8 | 37.8 | No | Single/ Multiple | University, supported by a research grant |
| (Wilson Jr et al. 2005) | Split-mouth | United States of America | 13 and 26 | 47.7 | No | Single | Private practice, supported by a company |
| (Zucchelli et al. 2014c) | Parallel | Italy | 50 and 149 | 33.7 | Yes if ≤ 10 cig./day | Multiple | University, self-supported |
| (Zucchelli et al. 2016) | Parallel | Italy | 50 and 50 | NA | Yes if ≤ 10 cig./day | Single | University, NR |
| (Zuhr et al. 2014) | Parallel | Germany | 24 and 47 | 37.9 | No | Single/ Multiple | Private practice, self-supported |

NR: Not reported. Cig./day: cigarettes per day

Appendix Table 3. General characteristics of the intervention

| Study | Follow-up (months) | Treatment group 1, REC results \pm SD | Treatment group 2, REC results \pm SD | Treatment group 3, REC results \pm SD | Treatment group 4, REC results \pm SD | Tooth brushing instruction |
|-------------------------|--------------------|---|---|---|---|---|
| (Abolfazli et al. 2009) | 12, 24 | CAF + CTG $0.5 \pm 0.19, 0.33 \pm 0.14$ | CAF + EMD $0.83 \pm 0.26, 1 \pm 0.21$ | NP | NP | No brushing the area for 3 weeks Patient was given OHI at each visit |
| (Alkan and Parlar 2011) | 6, 12 | CAF + CTG $0.42 \pm 0.51, 0.42 \pm 0.51$ | CAF + EMD $0.33 \pm 0.49, 0.33 \pm 0.65$ | NP | NP | No brushing the area for 2 weeks Brushing instruction given |
| (Amarante et al. 2000) | 3, 6 | GTR $1.4 \pm 1.3, 1.8 \pm 1.4$ | CAF $1 \pm 1.2, 1.1 \pm 1.3$ | NP | NP | No brushing the area for 2 weeks Patients instructed to use a soft toothbrush |
| (Aroca et al. 2009) | 3, 6 | CAF $0.4 \pm 0.5, 0.6 \pm 0.6$ | CAF + PRF* | NP | NP | No brushing the area for 15 days Patients instructed to use a soft toothbrush and a roll technique |
| (Aroca et al. 2010) | 6, 12 | TUN + CTG $0.6 \pm 0.8, 0.6 \pm 0.9$ | TUN + CTG + EMD* | NP | NP | No brushing the area for 15 days Patients instructed to use a soft toothbrush and a roll technique |
| (Ayub et al. 2014) | 6, 12 | CAF + ADM $0.38 \pm 0.25, 0.26 \pm 0.22$ | CAF + ADM $1.14 \pm 0.3, 0.71 \pm 0.35$ | NP | NP | No brushing the area for 2 weeks Patients was given OHI. |
| (Azaripour et al. 2016) | 6, 12 | CAF + CTG $0.02 \pm 0.9, 0.02 \pm 0.9$ | TUN + CTG $0.04 \pm 0.1, 0.06 \pm 0.1$ | NP | NP | No brushing the area for 4 weeks Patients instructed to use a soft toothbrush given |

| | | | | | | |
|---------------------------|--------|---|---|----|----|---|
| (Barker et al. 2010) | 3, 6 | CAF + ADM $1.08 \pm 0.91, 0.67 \pm 0.76$ | CAF + ADM $1.04 \pm 0.85, 0.65 \pm 0.76$ | NP | NP | No brushing the area for 2 weeks Brushing instruction given |
| (Bednarz et al. 2016) | 3, 6 | TUN + CTG $0.25 \pm 0.44, 0.13 \pm 0.33$ | TUN + FL* | NP | NP | NR |
| (Bherwani et al. 2014) | 3, 6 | CAF $0.54 \pm 0.82, 0.1 \pm 0.31$ | TUN + CTG $0.89 \pm 0.71, 0.22 \pm 0.42$ | NP | NP | Patients instructed to use roll technique given |
| (Bittencourt et al. 2009) | 6, 30 | CTG $0.1 \pm 0.19, 0.07 \pm 0.2$ | SCPF* | NP | NP | Patients instructed to use a non-traumatic technique and a soft toothbrush |
| (Byun et al. 2009) | 3, 6 | CAF + CTG $0.25 \pm 0.59, 0.1 \pm 0.84$ | CAF + eCTG $0.2 \pm 0.72, 0.35 \pm 0.85$ | NP | NP | OHI instruction given at each visit |
| (Cairo et al. 2016a) | 6, 12 | CAF $0.6 \pm 0.6, 0.6 \pm 0.6$ | CAF + CTG $0.2 \pm 0.4, 0.2 \pm 0.4$ | NP | NP | No brushing the area for 2 weeks Patients instructed to use roll technique and a soft toothbrush (and after 3 months a medium-size bristle toothbrush) |
| (Cairo et al. 2012) | 3, 6 | CAF $0.4 \pm 0.6, 0.8 \pm 0.6$ | CAF + CTG $0.5 \pm 0.5, 0.4 \pm 0.5$ | NP | NP | No brushing the area for 2 weeks Patients instructed to use roll technique and a soft toothbrush |
| (Cairo et al. 2015) | 12, 36 | CAF $0.7 \pm 0.6, 0.9 \pm 0.8$ | CAF + CTG $0.3 \pm 0.5, 0.5 \pm 0.8$ | NP | NP | No brushing the area for 2 weeks Patients instructed to use roll technique and a soft toothbrush |

| | | | | | | |
|---------------------------------|-----------|--|--|---|----|--|
| (Carney et al. 2012) | 3, 6 | ADM $0.95 \pm 0.98, 0.76 \pm 0.84$ | ADM + rhPDGF* | NP | NP | No brushing the area for 2 weeks Patients instructed to use roll technique and a soft toothbrush (and after 1 a regular toothbrush) |
| (Castellanos et al. 2006) | 6, 12 | CAF $0.86 \pm 0.92, 0.9 \pm 0.95$ | CAF + EMD $0.27 \pm 0.52, 0.36 \pm 0.6$ | NP | NP | No brushing the area for 3 weeks Patient was given OHI. |
| (Cetiner et al. 2003) | 6, 12 | CAF + CTG $0.5 \pm 0.67, 0.6 \pm 0.65$ | GTR (PLGA membrane) $1.1 \pm 0.88, 0.9 \pm 0.6$ | GTR (SDDA membrane) $1.2 \pm 0.63, 1.2 \pm 0.66$ | NP | No brushing the area for 8 weeks Brushing technique given |
| (Cieslik-Wegemund et al. 2016) | 3, 6 | TUN + CTG $0.4 \pm 0.3, 0.4 \pm 0.4$ | TUN + CM $0.2 \pm 0.4, 0.2 \pm 0.4$ | NP | NP | No brushing the area for 8 weeks Patients instructed to use roll technique and a soft toothbrush |
| (Cordaro et al. 2012b) | 6, 24 | CAF $0.64 \pm 0.78, 0.9 \pm 0.81$ | CAF + EMD $0.62 \pm 0.58, 0.81 \pm 0.56$ | NP | NP | No brushing the area for 4 weeks Patients instructed to use roll technique and a soft toothbrush |
| (Cortellini et al. 2009) | 3, 6 | CAF $0.8 \pm 0.8, 0.8 \pm 0.8$ | CAF + CTG $0.4 \pm 0.7, 0.6 \pm 0.9$ | NP | NP | No brushing the area for 7-9 days. Patients instructed to use a soft toothbrush for 2 weeks and then a power-driven toothbrush |
| (Cueva et al. 2004) | 3, 6 | CAF $0.93 \pm 0.71, 0.77 \pm 0.69$ | CAF + EMD $0.33 \pm 0.52, 0.19 \pm 0.41$ | NP | NP | No brushing the area for 4 weeks. Patient was given OHI. |
| (De Queiroz Côrtes et al. 2006) | 6, 12, 24 | CAF $1.08 \pm 0.84, 1.19 \pm 0.8, 1.62 \pm 1$ | CAF + ADM $0.88 \pm 0.89, 1 \pm 0.84, 1.15 \pm 0.8$ | NP | NP | No brushing the area for 1 month. Patients instructed to use roll technique and a soft toothbrush |

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|------------------------------|-----------|--|---|----|----|---|
| (Del Pizzo et al. 2005) | 6, 12, 24 | CAF $0.33 \pm 0.62, 0.53 \pm 0.83, 0.6 \pm 0.83$ | CAF + EMD $0.27 \pm 0.46, 0.27 \pm 0.59, 0.4 \pm 0.74$ | NP | NP | No brushing the area for 1 month. Patients instructed to use roll technique |
| (Deliberador et al. 2015) | 3, 6 | CAF + CTG $0.92 \pm 1.38, 1.08 \pm 1.38$ | CAF + BFPG * | NP | NP | No brushing the area for 2 weeks. Patients instructed to use roll technique and a soft toothbrush |
| (Fernandes-Dias et al. 2015) | 3, 6 | CAF + CTG $0.15 \pm 0.5, 0.21 \pm 0.53$ | CAF + CTG + LLLT* | NP | NP | No brushing the area for 2 weeks. Patients instructed to use a non-traumatic brushing technique and a soft toothbrush |
| (Ghahroudi et al. 2013) | 3, 6 | CAF + CTG $1.54 \pm 1.22, 1.88 \pm 1.47$ | CAF + SAAG* | NP | NP | No brushing the area for 1 week. Patient was given OHI. |
| (Hägewald et al. 2002) | 3, 6, 12 | CAF $0.8 \pm 1.1, 1 \pm 1.1, 1 \pm 1.2$ | CAF + EMD $0.3 \pm 0.8, 0.8 \pm 0.9, 0.8 \pm 1$ | NP | NP | No brushing the area for 3 weeks. Patients instructed to use a soft toothbrush |
| (Haghighati et al. 2009) | 3, 6 | CAF + CTG $1.19 \pm 0.83, 1.06 \pm 0.93$ | CAF + ADM $0.44 \pm 0.65, 0.41 \pm 0.66$ | NP | NP | No brushing the area for 6 weeks. Patients instructed to use roll technique and a soft toothbrush |
| (Henderson et al. 2001) | 3, 6, 12 | CAF + ADM $0.4 \pm 0.7, 0.15 \pm 0.34, 0.15 \pm 0.34$ | CAF + ADM $0.3 \pm 0.48, 0.25 \pm 0.42, 0.25 \pm 0.42$ | NP | NP | Patient was given OHI |
| (Henriques et al. 2010) | 6, 12 | CAF + CTG $1.5 \pm 1.31, 1.42 \pm 1.16$ | CAF + CTG + EMD* | NP | NP | No brushing the area for 4 weeks Patient was given OHI |
| (Ito et al. 2000) | 6, 12 | GTR $0.63 \pm 0.74, 0.88 \pm 0.64$ | FGG* | NP | NP | No brushing the area for 14 days. Patients instructed in toothbrushing with a soft brush |

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|----------------------------|---------------|--|---|----|----|--|
| (Jain et al. 2017) | 3, 6 | CAF + PRF* | CAF + AM* | NP | NP | NR |
| (Jepsen et al. 2013) | 3, 6 | CAF $0.89 \pm 1.11, 1.02 \pm 1.08$ | CAF + CM $0.84 \pm 0.95, 0.87 \pm 0.94$ | NP | NP | No brushing the area for 4 weeks Patients instructed to control traumatic brushing technique |
| (Jepsen et al. 2017) | 6, 12, 36 | CAF $1.02 \pm 1.08, 0.5 \pm 0.57, 0.58 \pm 0.6$ | CAF + CM $0.87 \pm 0.94, 0.31 \pm 0.49, 0.28 \pm 0.39$ | NP | NP | No brushing the area for 4 weeks Patients instructed to control traumatic brushing technique |
| (Jhaveri et al. 2010) | 3, 6 | CAF + CTG $0.4 \pm 0.6, 0.5 \pm 0.81$ | CAF + ADM + GF* | NP | NP | No brushing the area for 4 weeks Patients instructed to use roll technique |
| (Köseoğlu et al. 2013) | 3, 6, 12 | CAF + CM $0.72 \pm 0.6, 0.73 \pm 0.55, 0.28 \pm 0.49$ | CAF + CM + GF* | NP | NP | No brushing the area for 4 weeks Patients instructed to gentle toothbrushing using a soft toothbrush |
| (Kuis et al. 2013) | 6, 12, 24, 60 | CAF $0.25 \pm 0.51, 0.28 \pm 0.49, 0.35 \pm 0.52, 0.46 \pm 0.6$ | CAF + CTG $0.09 \pm 0.34, 0.09 \pm 0.34, 0.12 \pm 0.38, 0.19 \pm 0.44$ | NP | NP | No brushing the area for 2 weeks Patients instructed to use a soft toothbrush |
| (Leknes et al. 2005) | 6, 12, 72 | CAF $1.3 \pm 1.3, 1.4 \pm 1.3, 2.5 \pm 1.4$ | GTR $2 \pm 1.3, 2 \pm 1.5, 2.6 \pm 1.5$ | NP | NP | No brushing the area for 2 weeks. Patients instructed to use a non-traumatizing brushing technique and a soft toothbrush |
| (McGuire and Nunn 2003) | 3, 6, 12 | CAF + CTG $0.29 \pm 0.55, 0.29 \pm 0.5, 0.24 \pm 0.59$ | CAF + EMD $0.12 \pm 0.57, 0.06 \pm 0.5, 0.18 \pm 0.59$ | NP | NP | No brushing the area for 3 weeks. Patients instructed to use a non-traumatic brushing technique and, after 4 weeks, a regular tooth brushing technique |
| (McGuire and Scheyer 2010) | 6, 12 | CAF + CTG $0.1 \pm 0.36, 0.02 \pm 0.1$ | CAF + CM $0.52 \pm 0.74, 0.37 \pm 0.71$ | NP | NP | No brushing the area for 3 weeks. Patients instructed to |

| | | | | | | |
|----------------------------|----------|---|--|----|----|--|
| | | | | | | use bass brushing technique and a ultrasoft toothbrush |
| (McGuire and Scheyer 2016) | 6, 60 | CAF + CTG $0.1 \pm 0.36, 0.15 \pm 0.88$ | CAF + CM $0.52 \pm 0.74, 0.7 \pm 1.11$ | NP | NP | No brushing the area for 3 weeks. Patients instructed to use bass brushing technique and a ultrasoft toothbrush |
| (McGuire et al. 2012) | 12, 120* | CAF + CTG* | CAF + EMD* | NP | NP | No brushing the area for 3 weeks. Patients instructed to use a non-traumatic brushing technique and, after 4 weeks, a regular tooth brushing technique |
| (McGuire et al. 2014) | 6, 60 | CAF + CTG 0.07 ± 0.13 | CAF + rhPDGF + β TCP* | NP | NP | Patients were given OHI |
| (Moka et al. 2014) | 3, 6 | CAF $0.1 \pm 0.21, 0.1 \pm 0.21$ | SCPF* | NP | NP | No brushing the area for 3 weeks. Patients instructed to use a soft bristled toothbrush |
| (Moreira et al. 2016) | 3, 6 | CAF $1.15 \pm 0.37, 1.2 \pm 0.41$ | CAF + CM $1.4 \pm 0.5, 1.1 \pm 0.31$ | NP | NP | No brushing the area for 2 weeks. Patients instructed to use an atraumatic brushing technique and a soft-bristle toothbrush |
| (Moslemi et al. 2011a) | 6, 60 | CAF + CTG $1.13 \pm 0.91, 1.13 \pm 0.91$ | CAF + ADM $0.3 \pm 0.52, 1.27 \pm 1.01$ | NP | NP | No brushing the area for 6 weeks. Patients instructed to use roll technique and a soft-bristle toothbrush |
| (Nickles et al. 2010) | 6, 120* | CTG* | GTR* | NP | NP | No brushing the area for 6 weeks. Patients were given OHI |
| (Novaes et al. 2001) | 3, 6 | CAF + CTG $1.07 \pm 1.1, 1.13 \pm 1.08$ | CAF + ADM $1.2 \pm 1.08, 1.13 \pm 1.08$ | NP | NP | No brushing the area for 15 days. Patients instructed to use roll technique and a soft toothbrush |

| | | | | | | |
|---------------------------|--------------|---|--|---|-----------------|--|
| (Pini Prato et al. 2011a) | 12, 60, 168* | CAF (root planning) $0.5 \pm 0.6, 0.7 \pm 0.8$ | CAF (polishing) $0.6 \pm 0.7, 0.9 \pm 1.1$ | NP | NP | No brushing the area for 3 weeks. Patients instructed to use roll technique and a soft toothbrush |
| (Rasperini et al. 2018a) | 12, 108 | CAF $0.9 \pm 0.4, 1 \pm 0.8$ | CAF + CTG $0.6 \pm 0.5, 0.5 \pm 0.5$ | NP | NP | No brushing the area for 7-9 days. Patients instructed to use a soft toothbrush for 2 weeks and then a power-driven toothbrush |
| (Reino et al. 2015) | 3, 6 | CAF + CM $1.34 \pm 0.6, 1.28 \pm 0.54$ | EFT + CM $0.64 \pm 0.6, 0.63 \pm 0.44$ | NP | NP | No brushing the area for 30 days. Patients were given OHI |
| (Romagna-Genon 2001) | 3, 6 | CAF + CTG $0.42 \pm 0.98, 0.57 \pm 1.17$ | GTR $0.82 \pm 1.03, 0.92 \pm 1.16$ | NP | NP | No brushing the area for 15 days. Patients instructed to use a soft toothbrush |
| (Roman et al. 2013) | 3, 6, 12 | CAF + CTG $0.44 \pm 0.7, 0.41 \pm 0.7, 0.41 \pm 0.7$ | CAF + CTG + EMD* | NP | NP | No brushing the area for 3 weeks. Patients were given OHI |
| (Rosetti et al. 2013) | 6, 18, 30 | CAF + CTG $0.4 \pm 0.6, 0.2 \pm 0.3, 0.3 \pm 0.65$ | GTR $1.42 \pm 0.97, 1.1 \pm 0.9, 0.5 \pm 0.6$ | NP | NP | Patients were given OHI |
| (Sangiorgio et al. 2017) | 3, 6 | CAF $0.88 \pm 0.77, 1.06 \pm 0.86$ | CAF + CM $0.38 \pm 0.51, 0.41 \pm 0.49$ | CAF + EMD $0.31 \pm 0.57, 0.37 \pm 0.66$ | CAF + CM + EMD* | No brushing the area for 15 days. Patients instructed to use a soft toothbrush and to modify traumatic toothbrushing |
| (Santamaria et al. 2017) | 3, 6 | CAF + CTG $0.4 \pm 0.7, 0.4 \pm 0.7$ | TUN + CTG $0.8 \pm 0.5, 0.6 \pm 0.6$ | NP | NP | No brushing the area for 2 weeks. Patients instructed to use a non-traumatic brushing technique and a soft toothbrush |
| (Shin et al. 2007) | 3, 6 | CAF + ADM $0.93 \pm 0.78, 0.94 \pm 0.78$ | CAF + ADM + EMD* | NP | NP | No brushing the area for 2 weeks. Patients instructed to |

| | | | | | | |
|--------------------------|-----------|---|--|----|----|--|
| | | | | | | use roll technique and a soft toothbrush |
| (Stefanini et al. 2016) | 6, 12 | CAF 1.02 ± 1.08, 0.93 ± 1.1 | CAF + CM 0.87 ± 0.94, 0.83 ± 0.99 | NP | NP | No brushing the area for 4 weeks. Patients instructed to control traumatic brushing technique |
| (Taiyeb Ali et al. 2015) | 3, 6 | CAF + CTG 1.25 ± 0.65, 1.38 ± 1.03 | CAF + ADM 1.25 ± 0.96, 1.25 ± 0.96 | NP | NP | NR |
| (Wilson Jr et al. 2005) | 3, 6 | CAF + CTG 1.4 ± 0.97, 1.4 ± 1.3 | CAF + HF-DDS* | NP | NP | No brushing the area for 3 weeks. Patients instructed to use an atraumatic brushing technique |
| (Zucchelli et al. 2014c) | 6, 12, 60 | CAF 0.06 ± 0.22, 0.1 ± 0.26, 0.3 ± 0.57 | CAF + CTG 0.1 ± 0.31, 0.13 ± 0.36, 0.09 ± 0.31 | NP | NP | No brushing the area for 4 weeks. Patients instructed to use an atraumatic brushing technique |
| (Zucchelli et al. 2016) | 3, 6, 12 | CAF (trapezoidal design) 0.03 ± 0.18, 0.13 ± 0.35, 0.16 ± 0.38 | CAF (triangular design) 0.2 ± 0.41, 0.2 ± 0.4, 0.3 ± 0.53 | NP | NP | No brushing the area for 4 weeks. Patients instructed in mechanical tooth cleaning |
| (Zuhr et al. 2014) | 6, 12 | CAF + EMD 0.53 ± 0.47, 0.55 ± 0.49 | TUN + CTG 0.02 ± 0.05, 0.04 ± 0.07 | NP | NP | No brushing the area for 2 weeks. Patients instructed to use an atraumatic brushing technique with a soft toothbrush |

NP: Not performed. NR: Not reported. CAF: Coronally Advanced Flap; CTG: Connective Tissue Graft; EMD: Enamel Matrix Derivative; GTR: Guided Tissue Regeneration; PRF: Platelet-Rich Plasma; TUN: Tunnel technique; ADM: Acellular Dermal Matrix; FL: Fascia Lata Allograft; SCPF: Semilunar Coronally Positioned Flap; eCTG: Connective Tissue Graft with an epithelial collar; rhPDGF: Recombinant Human Platelet-Derived Growth Factor; PLGA: Polylactide/polyglycolide Acid Membrane; SDDA: Solvent Dehydrated Duramater Allograft membrane; CM: Collagen Matrix; BFPG: Buccal Fat Pad Graft; LLLT: Low-Level Laser Therapy; SAAG: Subepithelial Amnion Allograft; AM: Amniotic Membrane; GF: Autogenous gingival Fibroblasts; βTCP: β-tricalcium phosphate; EFT: Extended Flap Technique; HF-DDS: Human Fibroblast-derived dermal substitute. OHI: Oral Hygiene Instructions.

*: treatment not considered in the in the network meta-analysis

Appendix Table 4. Direct and indirect pairwise comparisons of different treatment techniques for REC changes overtime with respect to different references.

| Treatment group | Reference | | | | | |
|-----------------|-----------------------------|--|--|--|--|---|
| | ADM | CM | CTG | EMD | Flap | GTR |
| 1 ADM | / | 0.0047† (-0.008, 0.018) | 0.0051 (-0.005, 0.015) | -0.0120† (-0.03, 0.005) | 0.0003 (-0.01, 0.011) | 0.0083† (-0.005, 0.22) |
| 2 CM | -0.0047† (-0.018, 0.008) | / | 0.0003 (-0.008, 0.009) | -0.0169 (-0.033, -0.059) | -0.0043 (-0.013, 0.004) | 0.0036† (-0.009, 0.016) |
| 3 CTG | -0.0051 (-0.015, 0.005) | -0.0003 (-0.009, 0.008) | / | -0.0171 (-0.032, -0.002) | -0.0047 (-0.008, -0.0007) | 0.0032 (-0.006, 0.013) |
| 4 EMD | 0.0120† (-0.005, 0.03) | 0.016727 (-0.0001, 0.033) | 0.0171 (0.002, 0.032) | / | 0.0123 (-0.002, 0.027) | 0.020367† (0.002, 0.037) |
| 5 Flap | -0.0003 (-0.011, 0.106) | 0.0043 (-0.004, 0.013) | 0.004 (0.0007, 0.008) | -0.0123 (-0.027, 0.002) | / | 0.0079 (-0.001, 0.017) |
| 6 GTR | -0.0083† (-0.022, 0.005) | -0.0036† (-0.016, 0.009) | -0.0032 (-0.013, 0.006) | -0.0203† (-0.037, -0.002) | -0.0079 (-0.017, 0.001) | / |

Each of the techniques in the rows 1 through 6, is compared to their respective references (head column), therefore, any value in the table reflects the coefficient (with the p values in parentheses) when any treatment technique in a row is compared in a pairwise comparison to the reference head column.

The color green indicates that in that particular comparison, the technique in the reference row provides statistically significant superior stability of the outcomes compared to the reference (column) overtime.

Red indicates that in that particular comparison, the technique in the reference row provides statistically significant inferior stability of the outcomes compared to the reference (column) overtime.

† indicates a purely indirect comparison never before tested in a clinical trial.

Bold signifies statistical significance

The values in the parenthesis display the lower and upper bounds of the 95% confidence intervals

Appendix Table 5. Random effect variances of the network model meta-analysis for the outcome of REC changes.

| Name | Variance | Std. Dev. |
|------------------------|----------|-----------|
| Study/arm (intercept) | 0.03046 | 0.174528 |
| Study/arm (time slope) | 0.000 | 0.000000 |
| Study (intercept) | 0.09708 | 0.311573 |
| Study (time slope) | 0.000057 | 0.007588 |
| Residual | 0.5666 | 0.752750 |

Study arm has a unique value for every arm × study combination

Study has a unique value for every study

(Number of: observations: 234, Study/arm: 91, Studies: 58)

KTW change

The results from the model failed to reveal a significant difference between either of the treatment groups for the changes in KTW over time. Nevertheless, CTG treatment showed a significant improvement in KTW after the recession treatment (0.87 (85% CI [0.57, 1.16]), $p < 0.001$), and the amount of KTW at baseline was also observed to greatly impact the overall treatment effect of all groups. In particular, for the CM group only, a significant correlation was noted with the amount of KTW at baseline and the treatment stability overtime (-0.09 (95% CI [-0.17, -0.02]), $p = 0.006$), indicating that when flap alone was the reference, recession defects with higher KTW at baseline responded better to CM treatment over time when compared to flap alone. When the population characteristics were analyzed, and Europe served as the reference, patients treated in Asia showed a significant estimate (0.77 (95% CI [0.25, 1.29]), $p = 0.002$), indicating a relapse of the KTW overtime.

Appendix Table 6. Direct and indirect pairwise comparisons of different treatment techniques for KTW changes over time with respect to different references.

| | Treatment group | Reference | | | | | |
|---|-----------------|-----------------------------|------------------------------|----------------------------|------------------------------|----------------------------|-----------------------------|
| | | ADM | CM | CTG | EMD | Flap | GTR |
| 1 | ADM | / | 0.017596† (-0.026, 0.062) | 0.0193 (-0.023, 0.062) | 0.0235† (-0.026, 0.073) | 0.0213 (-0.021, 0.063) | 0.0162† (-0.028, 0.061) |
| 2 | CM | -0.0176† (-0.062, 0.026) | / | 0.0017 (-0.012, 0.016) | 0.0059 (-0.024, 0.036) | 0.0037 (-0.011, 0.018) | -0.0013† (-0.022, 0.02) |
| 3 | CTG | -0.0193 (-0.062, 0.023) | -0.001 (-0.016, 0.012) | / | 0.0042 (-0.023, 0.031) | 0.0019 (-0.004, 0.008) | -0.0031 (-0.02, 0.013) |
| 4 | EMD | -0.0235† (-0.073, 0.026) | -0.0059 (-0.036, 0.024) | -0.0042 (-0.031, 0.023) | / | -0.0022 (-0.025, 0.029) | -0.0073† (-0.038, 0.024) |
| 5 | Flap | -0.0213 (-0.063, 0.021) | -0.0037 (-0.018, 0.011) | -0.0019 (-0.008, 0.004) | 0.0022 (-0.025, 0.029) | / | -0.0051 (-0.021, 0.011) |
| 6 | GTR | -0.0162† (-0.061, 0.028) | 0.0013† (-0.02, 0.022) | 0.0031 (-0.013, 0.02) | 0.007365† (-0.024, 0.038) | 0.0051 (-0.011, 0.021) | / |

Each of the techniques in the rows 1 through 6, is compared to their respective references (head column), therefore, any value in the table reflects the coefficient (with the p values in parentheses) when any treatment technique in a row is compared in a pairwise comparison to the reference head column.

Note that no statistically significant differences were observed among any of the pair-wise comparisons.

† indicates a purely indirect comparison never before tested in a clinical trial.

Bold signifies statistical significance

The values in the parenthesis display the lower and upper bounds of the 95% confidence intervals

Appendix Table 7. Random effect variances of the network model meta-analysis for the outcome of KTW changes.

| Name | Variance | Std. Dev. |
|------------------------|-----------|-----------|
| Study/arm (intercept) | 0.1211868 | 0.34812 |
| Study/arm (time slope) | 0.000 | 0.000000 |
| Study (intercept) | 0.2983870 | 0.54625 |
| Study (time slope) | 0.0001878 | 0.01371 |
| Residual | 1.5156627 | 1.23112 |

Study arm has a unique value for every arm × study combination
 Study has a unique value for every study
 (Number of: observations: 234, Study/arm: 91, Studies: 58)

CAL change

The model demonstrated a statistically significant estimate for treatment with ADM (-0.02 (95% CI [-0.051, -0.0001]), p=0.046), compared to flap alone, indicating that treatment with ADM results in a greater stability and improvement of the post-operative clinical attachment level over time. Baseline recession depth was also found to be a significant predictor to the overall treatment (0.26 (95% CI [0.032, 0.48]), p=0.02), particularly for treatment with ADM (-0.22 (95% CI[-0.33, -0.11], p<0.0001), displaying that when compared to flap alone, a greater recession at baseline responds better to treatment with ADM. And patients treated in South America (0.57 (95% CI [0.16, 0.97]), p=0.006) showed a significant pattern of worsening of CAL when compared to the population treated in Europe.

Appendix Table 8. Direct and indirect pairwise comparisons of different treatment techniques for CAL changes over time with respect to different references.

| Treatment group | Reference | | | | | |
|-----------------|---|-----------------------------|--|-----------------------------|---|-----------------------------|
| | ADM | CM | CTG | EMD | Flap | GTR |
| 1 ADM | / | -0.0171† (-0.049, 0.015) | -0.0259 (-0.051, -0.0001) | -0.0327† (-0.082, 0.017) | -0.0282 (-0.05, -0.0006) | -0.02612† (-0.06, 0.008) |
| 2 CM | 0.0171† (-0.015, 0.049) | / | -0.0087 (-0.031, 0.013) | -0.0156 (-0.063, 0.032) | -0.011 (-0.03, 0.011) | 0.0089† (-0.022, 0.04) |
| 3 CTG | 0.0259* (0.001, 0.054) | 0.0087 (-0.013, 0.031) | / | -0.0068 (-0.051, 0.037) | -0.0022 (-0.01, 0.014) | -0.0002 (-0.025, 0.025) |
| 4 EMD | 0.0327† (-0.017, 0.082) | 0.0156 (-0.032, 0.063) | 0.0068 (-0.037, 0.051) | / | 0.0045 (-0.039, 0.048) | 0.0066† (-0.042, 0.055) |
| 5 Flap | 0.0282* (0.001, 0.054) | 0.0111 (-0.011, 0.034) | 0.0022 (-0.01, 0.014) | -0.0045 (-0.048, 0.039) | / | 0.002 (-0.022, 0.027) |
| 6 GTR | 0.0261† (-0.028, 0.08) | 0.0089† (-0.022, 0.04) | 0.0002 (-0.025, 0.025) | -0.0066† (-0.055, 0.042) | -0.002 (-0.027, 0.022) | / |

Each of the techniques in the rows 1 through 6, is compared to their respective references (head column), therefore, any value in the table reflects the coefficient (with the p values in parentheses) when any treatment technique in a row is compared in a pairwise comparison to the reference head column.

The color green indicates that in that particular comparison, the technique in the reference row provides statistically significant superior stability of the outcomes compared to the reference (column) overtime.

Red indicates that in that particular comparison, the technique in the reference row provides statistically significant inferior stability of the outcomes compared to the reference (column) overtime.

† indicates a purely indirect comparison never before tested in a clinical trial.

Bold signifies statistical significance

The values in the parenthesis display the lower and upper bounds of the 95% confidence intervals

Appendix Table 9. Random effect variances of the network model meta-analysis for the outcome of CAL changes.

| Name | Variance | Std. Dev. |
|------------------------|----------|-----------|
| Study/arm (intercept) | 0.04574 | 0.2139 |
| Study/arm (time slope) | 0.000 | 0.000000 |
| Study (intercept) | 0.78747 | 0.8874 |
| Study (time slope) | 0.01770 | 0.1330 |
| Residual | 1.30745 | 1.1434 |

Study arm has a unique value for every arm × study combination

Study has a unique value for every study

(Number of: observations: 234, Study/arm: 91, Studies: 58)

| | | | | | | | | |
|---------------------------|-----|---------|---------|---------|-----|-----|---------|----------|
| (Moka et al. 2014) | low | unclear | unclear | unclear | low | low | low | high |
| (Moreira et al. 2016) | low | low | low | low | low | low | low | low |
| (Moslemi et al. 2011a) | low | low | unclear | unclear | low | low | high | high |
| (Nickles et al. 2010) | low | unclear | low | low | low | low | low | moderate |
| (Novaes et al. 2001) | low | unclear | unclear | unclear | low | low | low | high |
| (Pini Prato et al. 2011a) | low | low | low | high | low | low | low | high |
| (Rasperini et al. 2018a) | low | low | low | low | low | low | low | low |
| (Reino et al. 2015) | low | low | low | low | low | low | low | low |
| (Romagna-Genon 2001) | low | low | unclear | low | low | low | low | moderate |
| (Roman et al. 2013) | low | low | low | low | low | low | low | low |
| (Rosetti et al. 2013) | low | low | unclear | unclear | low | low | low | high |
| (Sangiorgio et al. 2017) | low | low | low | low | low | low | low | low |
| (Santamaria et al. 2017) | low | low | low | low | low | low | low | low |
| (Shin et al. 2007) | low | unclear | low | high | low | low | low | high |
| (Stefanini et al. 2016) | low | low | low | low | low | low | low | low |
| (Taiyeb Ali et al. 2015) | low | low | unclear | unclear | low | low | low | high |
| (Wilson Jr et al. 2005) | low | low | low | low | low | low | low | low |
| (Zucchelli et al. 2014c) | low | low | low | low | low | low | low | low |
| (Zucchelli et al. 2016) | low | low | low | low | low | low | low | low |
| (Zuhr et al. 2014) | low | low | low | low | low | low | unclear | moderate |

Agreements and Disagreements with Previous Studies

In the literature, systematic reviews and meta-analyses were presented for evaluating the efficacy of periodontal plastic surgery in the treatment of localized or multiple GR defects (Buti et al. 2013; Cairo et al. 2014; Chambrone et al. 2012; Graziani et al. 2014; Oates et al. 2003; Rocuzzo et al. 2002). However, no review has previously focused on the stability of the root coverage outcomes. Buti and coworkers investigated the outcomes of periodontal plastic surgery through a network meta-analysis (Buti et al. 2013). Based on data derived from RCTs, they formed 9 direct and 12 indirect comparisons and ranked them according to their efficacy. In line with our results, the authors found that in the short term (6-12 months), CTG and EMD were the best options for recession reduction and complete root coverage, respectively (Buti et al. 2013). Similar results supporting CTG as the best treatment option in the localized and multiple GRs were also obtained by Cairo et al. and Graziani et al. (Cairo et al. 2014; Graziani et al. 2014). Our results are based on a NMA model constructed specifically for focusing on the effect on time on the stability of the outcomes, while considering possible influential parameters and data derived solely from RCTs with a minimum follow-up of 3 months, and those that evaluated clinical data in at least 2 time points.

From our results it seems that several factors, including baseline recession depth, KTW at the earliest recall, population and post-operative maintenance, are able to affect the stability of the gingival margin over time. However, when adjusted for all these variables, the NMA model showed that, except for CTG and GTR, all the surgical techniques tend to have a relapse of the gingival margin throughout time. A moderate incidence of GRs recurrence following flap alone (Pini Prato et al. 2011b; Pini Prato et al. 2018; Rasperini et al. 2018b), ADM (Harris 2004; Moslemi et al. 2011b) and EMD (Cordaro et al. 2012a) has been shown in several clinical trials, as well as the role of CTG as a biologic filler that improves soft tissue thickness and its stability in the long-term (Rasperini et al. 2018b; Zucchelli et al. 2018; Zucchelli et al. 2014d). The present NMA further corroborated these findings and showed, for the first time, the role of population and KTW at the earliest recall in the stability of the gingival margin.

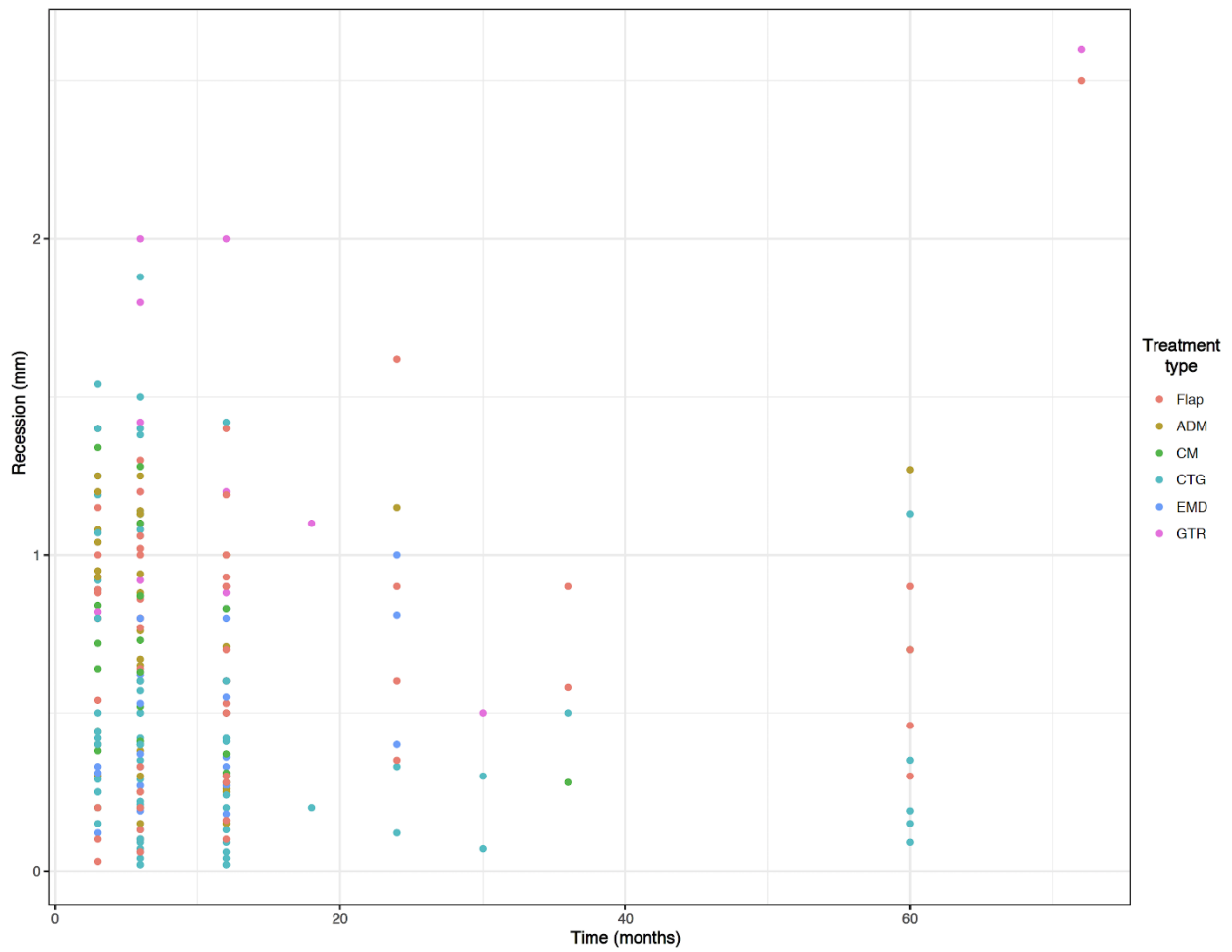
Implications for clinicians

Clinicians should be aware that root coverage procedures are significantly effective. However, time has a significant impact on the recurrence of gingival recessions. CTG-based techniques seem to be the best treatment option both in the treatment of GRs and in the stability of the gingival margin over time. Several predictors of stability, including baseline recession depth, KTW at the earliest recall and population were identified, and therefore should be taken into consideration when choosing the surgical approach. In particular, given its predictive value, increasing KTW, should be considered an outcome of the surgery.

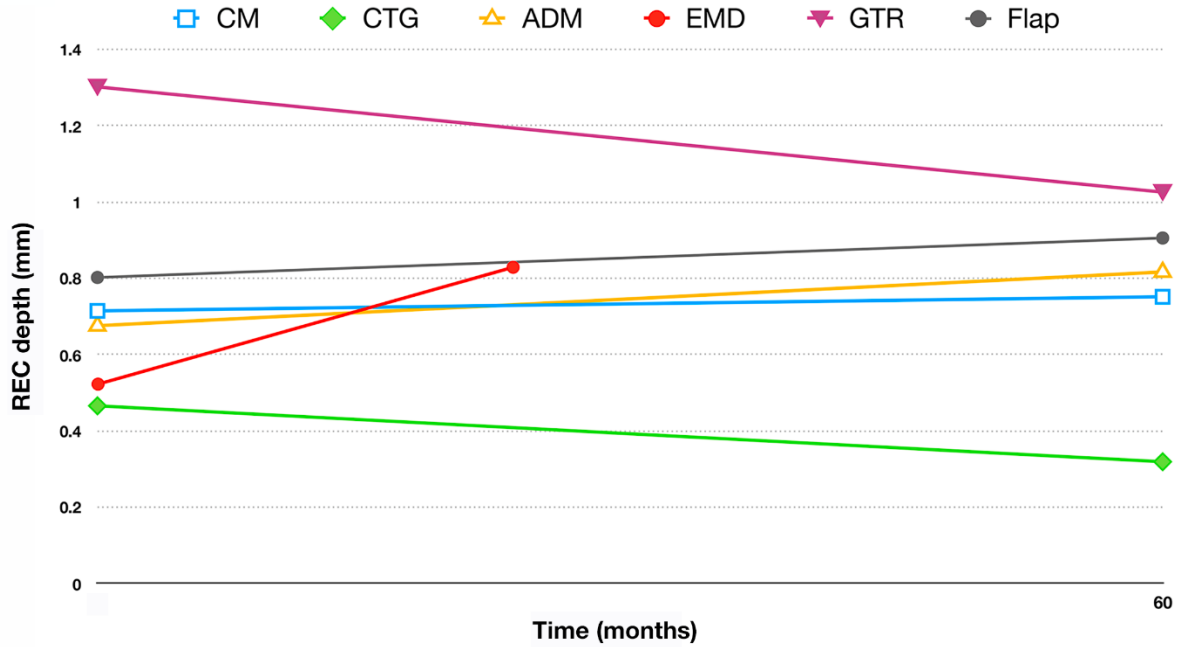
Recommendations for Future Research

Increasing the number of RCTs evaluating the efficacy of root coverage procedures with longer follow-up recalls and the evaluation of clinical outcomes at every examination is strongly encouraged. In addition, assessment and reporting of patients' biotype, gingival thickness and individual patient data including tooth location is highly recommended in research articles.

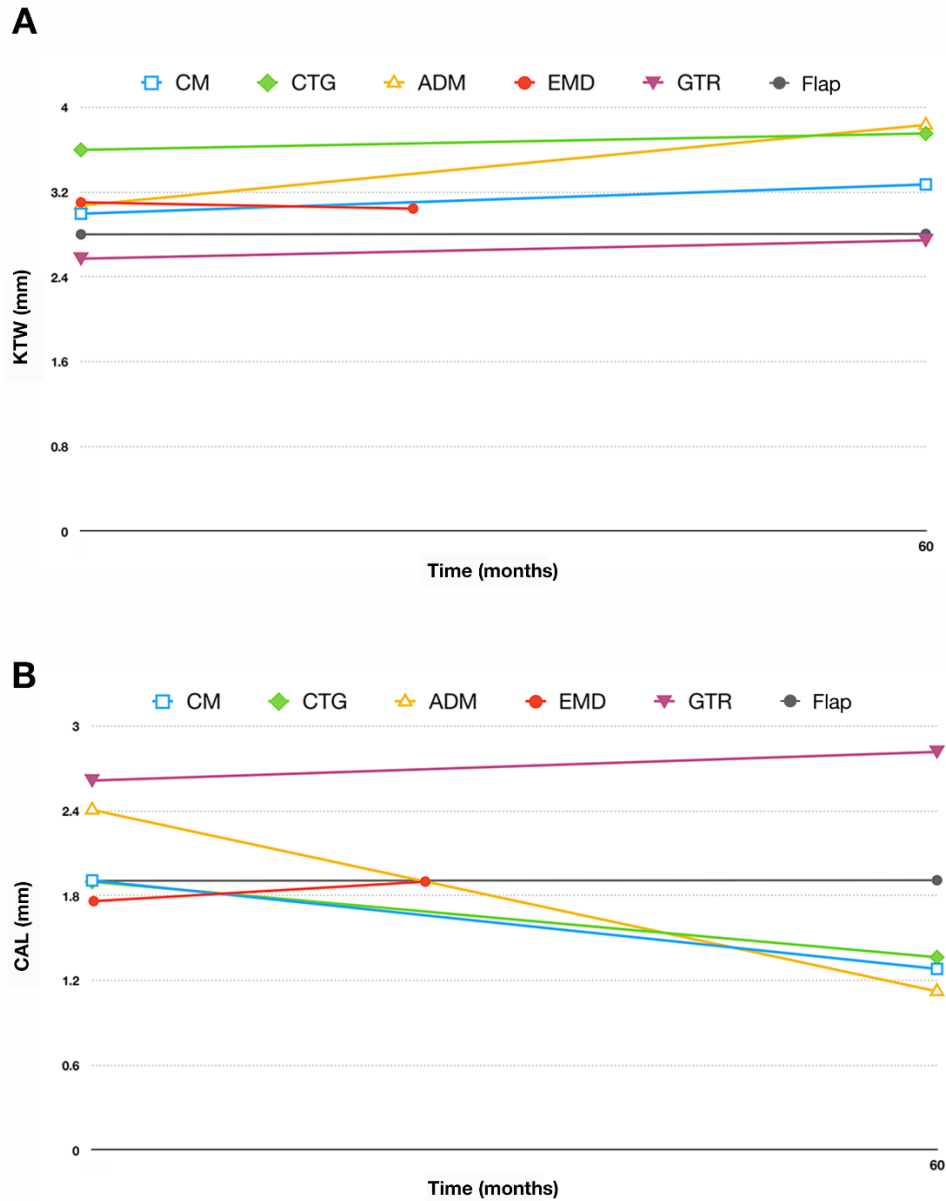
Appendix Figure 1. Scatter plot including the study summaries of the included randomized clinical trials for the outcome of REC. Note that studies beyond 80 months are not shown as they were not included in the network model. Additionally, this plot is not adjusted for repeated measures, baseline covariates and weights (as requested by reviewer).



Appendix Figure 2. The slope for recession changes among different approaches in first post-treatment 5 years. The plots models, based on the NMA model which accounts for baseline characteristics, visualize the behavior of the treatments up to a 60-month timepoint post-operatively. Note that time 0 is the treatment outcome at the earliest post-operative recall. Additionally, only for this visual representation, the EMD-treatment does not surpass 24 months due to lack of direct information from clinical trials beyond 24 months of recall.



Appendix Figure 3. The plotted slopes for A) KTW and 2) CAL among different approaches to 5 years post-treatment. Based on the NMA model, accounting for baseline characteristics, the produced plots visualize the behavior of the treatments up to a 60-month timepoint post-operatively. Note that time 0 is the treatment outcome at the earliest recall. Additionally, only for this visual representation, the EMD-treatment does not surpass 24 months due to lack of direct information from clinical trials beyond 24 months of recall.



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