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Evidence-based periodontal plastic surgery: an assessment of quality of systematic reviews in the treatment of recession-type defects

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Abstract

Objective: To assess methods, quality and outcomes of systematic reviews (SRs) conducted to evaluate the effectiveness of root coverage (RC) procedures in the treatment of recession-type defects (RTD).

Methods: MEDLINE and EMBASE were searched up to and including April 2010 to identify SRs investigating the effectiveness/efficacy of surgical interventions for the treatment of patients with RTD. Searching was conducted independently by two reviewers, and data extraction was based on the methodological criteria applied and on the effects of interventions reported by each SR. The checklist proposed by Glenny and colleagues, the Overview Quality Assessment Questionnaire and the ''Assessment of Multiple systematic Reviews'', instrument were used to assess the quality of SRs. Additionally, the methodological criteria applied by included reviews were compared with those proposed by the Cochrane Collaboration.

Results: Search strategy identified 716 potentially eligible articles, of which 12 papers regarding 10 SRs were included in the study. Results from different SRs showed that subepithelial connective tissue grafts associated or not to coronally advanced flaps can be used to reduce recession depth and improve the width of keratinized tissue. All quality assessment tools showed that most of the SRs were of good methodological quality, but they also highlighted key points that could be improved in future reviews. Only two SRs followed in full the guidelines proposed by the Cochrane Collaboration.

Conclusions: All SRs agree that RC may be anticipated by different surgical procedures. However, differences in the methodological quality between reviews were quite evident, and thus making a clear indication that there is a need of standardization of the methods that will be applied by future SRs. As a result, a standardized checklist for reporting SRs was proposed by the authors.

Treatment of recession-type defects (RTD) represents a major aesthetical and functional challenge for clinicians, given that teeth with gingival recession (GR) are at a higher risk of buccal tactile and thermal hypersensitivity, root abrasion and deterioration of smile aesthetics (Chambrone & Chambrone 2006, 2009).

In spite of the number of trials evaluating the effects of root coverage (RC) procedures in the last years, a huge

variation in outcome measures may be found between techniques due to methodological differences between studies (Roccuzzo et al. 2002, Chambrone et al. 2009c). Therefore, meta-analysis and systematic reviews (SR) have been growing in popularity, because they can provide a precise, consistent and quality combination of huge amount of data (Higgins & Green 2008).

Furthermore, because periodontal surgical procedures are financially costly, time consuming and technically demanding (Trombelli 2005), evidence-based information achieved by well-designed SR becomes an important tool in the current clinical decision-making process, as well as they have been stimulating much debate over the value of RC procedures and the ways clinical research should explore these techniques in the future. On the other hand, the methodology used by SR is not always consistent and many may report diverse methodological flaws (Glenny et al. 2003). Consequently, improvement of SR quality is a critical issue to ensure evidence-based decision making. At the moment, no studies assessing the methodological quality of SR on RC procedures have been performed.

Therefore, the aims of this study were to (1) identify all currently existing SRs on the treatment of RTD, (2) to evaluate their methodological quality and (3) to evaluate the evidence grade within the SR.

Methods
Criteria for considering reviews for this study

Inclusion criteria

Only SRs evaluating RTD that were surgically treated by RC procedures were included.

Exclusion criteria

Reviews not reporting a systematic approach for individual studies' inclusion or that did not explore the results of RC procedures in terms of recession reduction and attachment gain were not included.

Selection of systematic reviews (electronic and hand searching)

To address the study, focused questions ''How effective is the treatment of recession-type defects?'' and ''What is

the level and quality of the evidence-based information available?'' were asked A combined MEDLINE/EMBASE search up to and including April 2010 was conducted to identify SR published in English-language journals. The search strategy was based in the terms ''periodontal plastic surgery or root coverage procedures''. Also, reference lists of any potential review were examined (i.e. hand searching) in an attempt to identify any other papers.

Validity assessment and data extraction

The selection of SR was performed by two independent reviewers (L. C. and L. A. C.). Disagreement between the review authors was resolved by discussion with the inclusion of other review author (C. M. P.). From each review included, data extraction was based on the following issues: (a) types of studies included/inclusion criteria; (b) types of participants/defects treated; (c) types of interventions (i.e. RC procedures); (d) types of outcome measures; (e) search methods for identification of studies (electronic and hand searching); (f) data collection and quality assessment; (g) effect of interventions; (h) conclusions of included SRs and (i) assessment of quality of included SRs. Data extraction was performed in duplicate (L. C. and C. M. F.). A third reviewer (C. M. P.) was responsible for checking the accuracy of all data extracted.

Assessment of SR quality was performed using three quality assessment tools: (1) the checklist proposed by Glenny et al. (2003); (2) the Overview Quality Assessment Questionnaire (OQAQ) (Oxman & Guyatt 1991) and (3) a measurement tool for the ''Assessment of Multiple systematic Reviews'' (AMSTAR) (Shea et al. 2007). The first tool, the Glenny et al. (2003) checklist is based on a combination of topics that have been demonstrated to influence the review's quality, as well as it covers all important issues that should be reported by high-standard SRs (i.e. from the identification of clinical knowledge gap/focused question to results' interpretation) (Needleman et al. 2005).

The second checklist was originally designed to appraise the scientific quality (i.e. adherence to scientific principles) of SR published in medical literature. It was chosen because it has been systematically qualified and clearly authenticated by a number of assorted studies (Oxman et al. 1991,

Oxman 1994, Jadad & McQuay 1996, Lundh et al. 2009, Salmos et al. 2010). The questionnaire is a 10-item tool that asks reviewers to answer the queries using a three-point scale (i.e. yes, no, can't tell or partially). Items 1–9 deal with five areas (i.e. search strategy, studies selection, assessment of validity, analysis of data and conclusion), and on the grounds of the appraisal of these items, an overall score between 1 and 7 ($\leqslant 3$ is considered as having extensive or major flaws and $\geqslant 5$ as having minor or minimal flaws) is assigned to the last item (Jadad & McQuay 1996, Lundh et al. 2009).

The third instrument, AMSTAR, is an 11-item assessment tool based on items from the OQAQ and Sacks et al. (1987) checklist. AMSTAR was selected as the best instrument for appraising SRs by The Canadian Agency for Drugs and Technologies in Health due to its good reliability and convergent validity (Shea et al. 2007). In addition, the methods used by SRs published in regular dental journals were compared with those proposed by the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins & Green 2008).

Data synthesis

Data were collated into evidence tables. Descriptive summary was performed to determine the quantity of data and included studies characteristics. Weighted mean differences (WMD), odds ratio (OR) and risk ratio (RR) with their associated 95% confidence intervals (CI) were extracted from included SRs reporting pooled data from RCT (i.e. meta-analyses from at least two trials). In cases in which a review did not describe the calculation of WMD, OR or RR, yet it had reported including OR and CI of each individual study used in the analyses, the generic inverse variance statistical method was conducted to estimate an effect measure of interest (i.e. random-effects meta-analysis). As well, the final methodological quality analysis was descriptive, and a projected mean and 95% CI of the overall OQUAQ scores were calculated.

Results

The search retrieved 716 references (i.e. 714 by electronic search/two by hand searching) (Fig. 1). After screening titles, abstracts and full text of potential
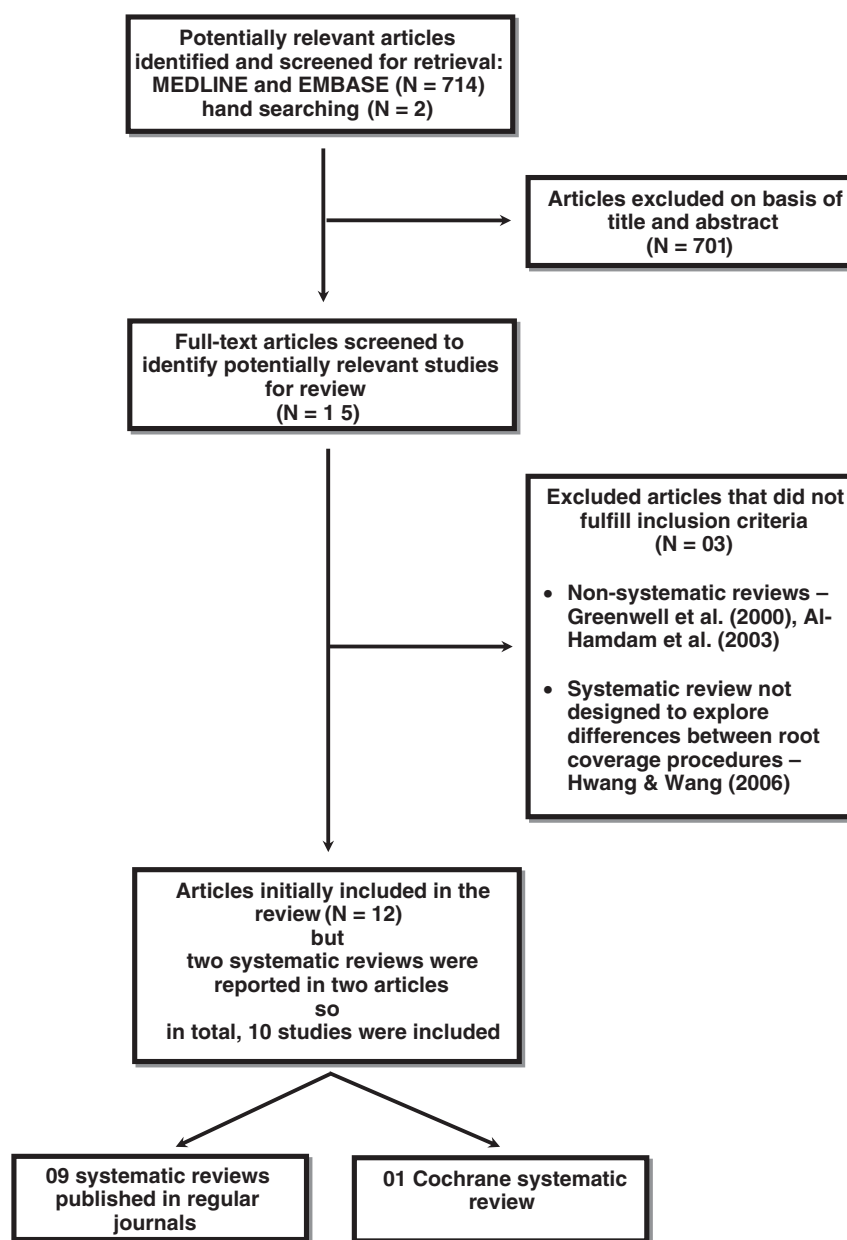
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┌─────────────────────────────┐
│ Potentially relevant articles│
│ identified and screened for  │
│ retrieval:                   │
│ MEDLINE and EMBASE (N = 714) │
│ hand searching (N = 2)       │
└─────────────────────────────┘
              │
              │      ┌────────────────────────────┐
              ├─────▶│ Articles excluded on basis of│
              │      │ title and abstract          │
              │      │ (N = 701)                   │
              │      └────────────────────────────┘
              ▼
┌─────────────────────────────┐
│ Full-text articles screened to│
│ identify potentially relevant │
│ studies for review           │
│ (N = 1 5)                    │
└─────────────────────────────┘
              │
              │      ┌────────────────────────────┐
              │      │ Excluded articles that did not│
              │      │ fulfill inclusion criteria   │
              │      │ (N = 03)                    │
              ├─────▶│                             │
              │      │ • Non-systematic reviews –   │
              │      │   Greenwell et al. (2000), Al-│
              │      │   Hamdam et al. (2003)      │
              │      │                             │
              │      │ • Systematic review not      │
              │      │   designed to explore        │
              │      │   differences between root   │
              │      │   coverage procedures –      │
              │      │   Hwang & Wang (2006)       │
              │      └────────────────────────────┘
              ▼
┌─────────────────────────────┐
│ Articles initially included in│
│ the review (N = 12)          │
│ but                          │
│ two systematic reviews were  │
│ reported in two articles     │
│ so                           │
│ in total, 10 studies were    │
│ included                     │
└─────────────────────────────┘
          ╱         ╲
         ╱           ╲
┌──────────────┐  ┌──────────────┐
│ 09 systematic│  │ 01 Cochrane  │
│ reviews      │  │ systematic   │
│ published in │  │ review       │
│ regular      │  │              │
│ journals     │  │              │
└──────────────┘  └──────────────┘
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Fig. 1. Flow chart of articles screened through the review process.

eligible reviews, 12 papers were included in this review (Roccuzzo et al. 2002, Clauser et al. 2003, Oates et al. 2003, Pagliaro et al. 2003, Gapski et al. 2005, Cheng et al. 2007, Cairo et al. 2008, Chambrone et al. 2008, 2009a, b, c, 2010). One SR had their data reported in two papers (Pagliaro et al. 2003 [Part 1] and Clauser et al. 2003 [Part 2]). Therefore, the article labelled as ''Part II'' was included under one review name (i.e. Pagliaro et al. 2003). Similarly, a Cochrane review published in the *Cochrane Database of Systematic Reviews* (Chambrone et al. 2009c) was re-published in another scientific journal (Chambrone et al. 2010), and thus both

were included under the original study name (Chambrone et al. 2009c). In total, 10 SRs were considered eligible for inclusion. One further SR was not included because it was originally designed to explore the association between flap thickness and RC outcomes and not differences between procedures (Hwang & Wang 2006). The Kappa score for agreement between the reviewers for screening of SRs was 0.92 (95% CI: 0.82–1).

Characteristics of included reviews

The main characteristics of each included review are depicted in Appen-

dix S1. Data from the meta-analyses by Cheng et al. (2007) were not included in Appendix S1 because these authors have combined data from randomized controlled trials (RCT) and non-randomized controlled trials. Similarly, Cairo et al. (2008) reported data from meta-analysis evaluating only one RCT. Overall, all reviews unanimously concluded that the treatment of RTD by means of RC [i.e. coronally advanced flap (CAF) alone or associated with grafts or biomaterials, guided tissue regeneration and subepithelial connective tissue grafts (SCTG)] may lead to statistically significant improvements in GR, clinical attachment level (CAL) and keratinized tissue (KT) width. Moreover, they found limited data on patient-based outcomes (i.e. aesthetics and root sensitivity).

Assessment of quality of included SRs

Data collection and quality assessment performed by included reviews

All the SRs reported that data selection and extraction were performed by two or more independent reviewers, and MEDLINE was the database most commonly explored for data retrieval (Appendix S1). Moreover, 80% of the included SRs searched in at least two databases, 70% restricted their search to English-language journals, 50% reported k scores for inter-reviewer agreement and 20% searched for unpublished data (i.e. grey literature).

With respect to the quality assessment performed by the included SR, only four SRs (Roccuzzo et al. 2002, Cairo et al. 2008, Chambrone et al. 2008, 2009c) followed the *Cochrane Handbook of Systematic Reviews* (Higgins & Green 2008). The remaining publications failed to provide sufficient information regarding the criteria and methods applied for the evaluation of randomization, allocation and blinding procedures, as well as information regarding withdraws and drop outs within each individual study included in their reviews. Besides, the reviews by Chambrone et al. (2008), Cairo et al. (2008) and Chambrone et al. (2009a, c) reported/categorized the risk of bias from the included trials.

Assessment of quality of included SRs is reported in Tables 1–3. Of the 10 SR, two (20%) fulfilled each criterion proposed by Glenny et al. (2003) (Cairo et al. 2008, Chambrone et al. 2009c). Although some review's protocols (i.e.

Table 1. Quality assessment checklist for systematic reviews on root coverage procedures (Glenny et al. 2003)

	Roccuzzo et al. (2002)	Plagliaro et al. (2003)	Oates et al. (2003)	Gapski et al. (2005)	Cheng et al. (2007)	Chambrone et al. (2008)	Cairo et al. (2008)	Chambrone et al. (2009a)	Chambrone et al. (2009c)	Chambrone et al. (2009b)
(A) Did the review address a focused question? (yes, no, can't tell)	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
(B) Did authors look for appropriate papers? (yes, no, can't tell)	No*	No*	Yes	Yes	No*	Yes	Yes	No*	Yes	No*
(C) Do you think authors attempted to identify all relevant studies? (yes, no, can't tell)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	yes
(D) Search for published and unpublished literature? (yes, no, can't tell)	No†	No†	No†	No†	No†	No†	Yes	No†	Yes	no†
(E) Were all languages considered? (yes, no, can't tell)	No (English only)	No (English only)	No (English only)	No (English only)	No (English only)	No (English only)	Yes	No (English only)	Yes	Yes
(F) Was any hand searching carried out? (yes, no, can't tell)	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
(G) Was it stated that the inclusion criteria were examined by at least two reviewers? (yes, no, can't tell)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(H) Did reviewers attempt to assess the quality of the included studies? (yes, no)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(I) If so, did they include this in the analysis? (yes, no, can't tell, not applicable)	No	Not applicable	No	No	No	Yes	Yes	No	Yes	Yes
(J) Was it stated that the quality assessment was carried out by at least two reviewers? (yes, no, not applicable)	Yes	Not applicable	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(K) Are the results given in a narrative or pooled statistical analysis? (narrative, pooled, not applicable)	Pooled	Narrative and pooled	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled	Pooled	Narrative
(L) If the results have been combined was it reasonable to do so? (yes, no, can't tell, not applicable)	Yes	Yes	Can't tell	Yes	Yes	Yes	Yes	Yes	Yes	Not applicable
(M) Are the results clearly displayed? (yes, no, not applicable)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(N) Was an assessment of heterogeneity made and reasons for variation discussed? (yes, no, not applicable)	Yes	Yes	No‡	Yes	Yes	Yes	Yes	Yes	Yes	Not applicable
(O) Were the results of the review interpreted appropriately? (yes, no, can't tell, not applicable)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

*Not only randomized clinical trials were included (inclusion of controlled clinical trials and/or case series).
†Unpublished data were not searched.
‡Reasons for variation were not discussed.

Table 2. OQUAQ applied to systematic reviews on root coverage procedures (Oxman & Guyatt 1991)

	Roccuzzo et al. (2002)	Plagliaro et al. (2003)	Oates et al. (2003)	Gapski et al. (2005)	Cheng et al. (2007)	Chambrone et al. (2008)	Cairo et al. (2008)	Chambrone et al. (2009a)	Chambrone et al. (2009c)	Chambrone et al. (2009b)
(1) Were the search methods reported?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(2) Was the search comprehensive?	Yes	No	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
(3) Were the inclusion criteria reported?	Yes	Yes	Yes	Yes	Yes	Yes	Partially	Yes	Yes	Yes
(4) Was selection bias avoided?	Yes	NO	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
(5) Were the validity criteria reported?	Yes	Partially	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(6) Was validity assessed appropriately?	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(7) Were the methods used to combine studies reported?	Yes	Yes (no meta-analysis)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes (no meta-analysis)
(8) Were the findings combined appropriately?	Yes	Can't tell	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(9) Were the conclusions supported by the reported data?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(10) What was the overall scientific quality of the overview? (1–7)	7	2	5	7	3	7	6	7	7	7

Yes, no, can't tell (queries 2, 4, 6 and 8) or partially (queries 1, 3, 5, 7 and 9).

methods) seemed to be more rigorously developed than others, some methodological flaws were identified. OQUAQ showed a median agreed overall score for the meta-analyses of 7, ranging from 2 to 7 (mean: 5.8, 95% CI: 4.45–7.14), indicating minor or minimal flaws. Each criterion was fulfilled by 80–00% of SR. Items 4, 5 and 6 were fulfilled by 80% of reviews, and only one did not fulfil items 2, 4, 6 and 8 (see Table 2). For AMSTAR, each criterion was fulfilled by 20–100% (Table 3). The results achieved by OQUAQ and AMSTAR instruments showed that the search method was considered adequately reported for both tools, at least 70% performed a comprehensive search, and 90% reported in full the inclusion criteria. All the reviews were clear in what types of participants, intervention and outcome measures were included in the review. Conversely, 20% of SR used the status of publication (i.e. grey literature) as an inclusion criterion.

In summary, the results of the three tools identified key items that were not reported. Some reviews experienced from the lack of transparency, such as incomprehensive literature search (i.e. search for studies published only in English and absence of inclusion of unpublished trials), unclear inclusion criteria, non-evaluation of publication bias (if applicable) and ineffective quality appraisal of the included studies (Tables 1–3). Additional supporting information regarding the criteria applied by OQUAQ and AMSTAR may be found in Appendixes S2 and S3.

Discussion

Evidence-based periodontal plastic surgery (PPS) and a summary of the main results

Evidence-based PPS could be defined as the systematic assessment of clinically relevant scientific evidence designed to explore the aesthetic and functional effects of treatment of defects of the gingiva, alveolar mucosa and bone, based on clinician's knowledge and patient's centred outcomes, such as perception of aesthetic conditions, functional limitations, discomfort, root sensitivity, level of sociability after surgery and preferences. The treatment of GR with RC procedures (as part of PPS) has become an important issue of current Periodontology. The 10 SRs published since 2002 represent what should

Table 3. AMSTAR instrument applied to systematic reviews on root coverage procedures (Shea et al. 2007)

	Roccuzzo et al. (2002)	Plagliaro et al. (2003)	Oates et al. (2003)	Gapski et al. (2005)	Cheng et al. (2007)	Chambrone et al. (2008)	Cairo et al. (2008)	Chambrone et al. (2009a)	Chambrone et al. (2009c)	Chambrone et al. (2009b)
(1) Was an ''a priori'' design provided?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(2) Was there duplicate study selection and data extraction?	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(3) Was a comprehensive literature search performed?	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes
(4) Was the status of publication (i.e. grey literature) used as an inclusion criterion?	No	No	No	No	No	No	Yes	No	Yes	No
(5) Was a list of studies (included and excluded) provided?	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
(6) Were the characteristics of the included studies provided?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(7) Was the scientific quality of the included studies assessed and documented?	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
(8) Was the scientific quality of the included studies used appropriately in formulating conclusions?	Yes	Not applicable	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
(9) Were the methods used to combine the findings of studies appropriate?	Yes	Not applicable	No	Yes	No	Yes	Yes	Yes	Yes	Not applicable
(10) Was the likelihood of publication bias assessed?	Not applicable	No	No	No	No	No	No	No	Not applicable	No
(11) Was the conflict of interest stated?	No	No	No	No	No	No	Yes	Yes	Yes	Yes

be the highest level of evidence available, and thus the basis for clinical decision making.

A critical evaluation of the current literature showed that each individual review adopted similar focused questions, i.e. appraisal of the effects of treatment of one or more RC procedures in the treatment of RTD (Appendix S1), as well as all of them reported significant improvements in recession depth and in CAL, with or without KT gain, irrespective of surgical technique. Moreover, results from meta-analyses demonstrated that SCTG and CAF (alone or associated with SCTG or some biomaterials) should be used as procedures of first choice. With respect to patient-centred outcomes, it could be seen that there are insufficient data regarding patient's evaluation about the appearance of treated teeth, patient's preference to a specific procedure or root sensitivity. In addition, it should be clear that the data reported in the various SR are somewhat different, based on different inclusion criteria and the simple fact, that, for instance, in 2002 there was a more limited database of RCTs available compared with the more recent SRs conducted in 2009.

Quality of the evidence and potential biases in the review process

Two of the aims of this study were to appraise the methodological quality, and to evaluate the evidence grade within the SRs. For such purposes, three instruments were used to assess transparency and quality of included review. The results of such a broad exercise can be useful to reduce the likelihood of bias. It could be seen that only 20% of the 10 SR assessed satisfied all the criteria included in the Glenny et al. (2003) checklist, but as shown by the OQUAQ and AMSTAR instruments the majority of trials described an overall scientific quality with minor flaws (Tables 1–3). On the other hand, the quality assessment of the included SRs highlighted key areas where improvements could be made, such as search strategies.

SRs must use a transparent and inclusive search in order to reduce the chance of different types of bias (i.e. selection, publication and comparison) during their review process. They should try to identify all published and unpublished data, irrespective of language (Higgins & Green 2008). Although well-conducted RCT are more likely to

Title

✓ Identification of the study as a systematic review or meta-analysis

Abstract

✓ Background, objectives, data sources, study eligibility criteria, participants, interventions, study evaluation, synthesis methods, results, limitations, conclusions and implications of key findings (for practice and research)

Introduction

✓ Background of the condition to be appraised, the rationale for the review, a focused question and objectives

Methods

✓ Inclusion and exclusion criteria for considering studies (type of studies, participants, interventions and primary and secondary outcome measures of interest)

✓ Electronic searching using at least two databases, handsearching and search for unpublished literature (i.e. gray literature) with no language restriction, period of searching and search strategy applied.

✓ Data selection, extraction and management done by at least two independent reviewers. Extraction of data using pre-prepared data extraction forms.

✓ Quality assessment/assessment of risk of bias in included studies performed by at least two independent reviewers

✓ Data compilation into evidence tables grouped according to the study type (if more than a study design was included), with reference to methods, participants, interventions, outcomes, and notes regarding studies` specific details (location, contact with original author, source of support)

✓ Inclusion of synthesis methods (e.g. weighted mean difference, odds ratio, risk ratio), heterogeneity tests and evaluation of publication bias (if applicable to the review) for reviews employing meta-analysis

Results

✓ Results of search with flowchart of articles screened through the review process, included studies and studies` individual characteristics (methods, participants, interventions, outcomes) and excluded studies and reasons for exclusion at each stage

✓ Treatment modalities (if applicable), effects of interventions/outcome measures (results of meta-analysis with confidence intervals and heterogeneity if applicable), patients` preferences for a specific treatment modality (if applicable), occurrence of adverse effects and/or complications, withdraws, and drop out of patients

✓ Risk of bias in included studies (quality assessment measured by validated instruments), publication bias (if applicable), and any supplementary analysis (e.g. meta-regression, subgroups comparisons) if applicable

Discussion

✓ Summary of main results/evidence (primary and secondary outcomes if applicable)

✓ Quality of the evidence, potential biases and limitations in the review process

✓ Discussion of the results in the context of other evidence (agreement and disagreement with previous publications)

Review authors` conclusions

✓ Overall conclusions, implications for practice and for future research

Fig. 2. Standardized checklist for reporting systematic reviews in dentistry (Check Review).

be published in English-language journals, it may be assumed that a significant portion of the literature was not taken into consideration because the majority of the selected SRs included studies in English only. Consequently, SRs excluding unpublished and non-English-language papers may be at a higher risk of publication biases.

With respect to data pooling, combination of results was not considered adequate in one case (Oates et al. 2003). For pooling to be classified as appropriate, reviews needed to consider heterogeneity between studies and give a clear presentation of the characteristics of the primary studies included in the review. Oates et al. (2003) reported

an analysis where different procedures were mixed in a single analysis (i.e. acellular dermal matrix grafts/GTR *versus* SCTG). Therefore, it should be pointed out that pooling of results of individual studies in meta-analyses may be unwarranted or even (whether performed) be run using a different statistical method (i.e. random-effects model) if the outcomes are too heterogeneous due to differences in the sample of patients treated or type of procedures performed (Higgins & Green 2008, Lundh et al. 2009). Thus, reviewers should pay attention to the inclusion criteria applied (it will assist in confirming the similarity of studies and the suitability of further synthesis methods, including possible meta-analyses), to the extensiveness of the search strategy (i.e. language restriction and search for published and unpublished data) and to the use and description of criteria for assessing the validity (i.e. assessment of quality and risk of bias) of the included studies.

The three measurement tools applied to assess the methodological quality of SRs are generic and validated questionnaires designed to assess both the quality of reporting and the methodological quality of some aspects of recommendations. They provide a clear view of the main topics to be explored by high-quality SRs of interventions. Considering these results, one could argue that, perhaps, these instruments are too strict. However, it could be seen that first instrument (Glenny et al. 2003) was developed according to strict guidelines proposed by The Cochrane Collaboration, where specific strategies (from the formulation of the research question to data interpretation) were developed to allow a comprehensive evaluation of the existing literature. These guidelines aimed to reduce heterogeneity among trials and to obtain the best evidence available. Both OQUAQ and AMSTAR were designed to be quality assessment tools to estimate the quality of a SR, but they may as well be utilized to assist the preparation of SRs or meta-analyses. Several instruments exist to assess the methodological quality of SRs (Shea et al. 2007). These instruments have achieved general acceptance, although they have not all been developed systematically or empirically validated. Moreover, many of them are lengthy and contain complex information for their use (Shea et al. 2007).

On the other hand, because it is impossible to estimate the exact amount

of bias in any study, quality criteria may eventually be defined by some degree of subjectivity (Lundh et al. 2009). Nevertheless, at this point in time, the problem has not been resolved so far, and numerous papers (including those of Glenny et al. 2003) strongly encourage the authors to improve the methodology of SRs. Consequently, the aim of the quality studies (like the present one) is not just to mention the SRs (or arbitrary attribute points to them) but to identify the key items that are poorly reported in the papers. In the present study, differences between included SRs may be due to the fact that such reports may not always show how the SR was truly performed but only what has been published. Therefore, the complexity in interpreting results strengthens the argument that an SR must present a transparent process, with the reader of the review being capable to recognize what has been accomplished (Lundh et al. 2009).

The results of the present study also showed that only two SRs (Cairo et al. 2008, Chambrone et al. 2009c) fulfilled all requirements proposed by this checklist, and as advocated by The Cochrane Collaboration. In order to minimize inconsistencies between future reviews and to reduce the amount of bias, we propose the use of an evidence-based minimum set of standardized items. This 16-item standardized checklist (Fig. 2) was developed by combining key items proposed by the *Cochrane Handbook of Systematic Reviews*, with key items appraised by methodological quality measurement tools (i.e. OQUAQ and AMSTAR), and topics from the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (Moher et al. 2009). Moreover, PRISMA should be used as the basis by regular dental journals to improve the quality of intervention reviews published by them, and it can be found online at http://www.prisma-statement.org/.

With respect to the review process applied in the present study, it could be argued that two examiners (L. C. and L. A. C.) were not independent because they have evaluated their own works [i.e. they are authors of 4/10 papers (25% of the sample)]. Therefore, to reduce biases that could weaken this study, two independent reviewers were involved in the evaluation of the results achieved. Studies like the present one are designed to give a comprehensive, unbiased summary of current research

evidence. Additionally, it should be clear that although most of the reviews had some methodological flaws, these deficiencies could not be considered sufficient to limit the validity of their conclusions.

Concluding remarks

Of the available SRs on RC procedures, there is a clear evidence that mainly CAF alone or associated with SCTG led to statistically significant gains in GR and attachment level gain, with or without improvements in the width of KT.

Although all reviews have reported a good methodological quality, only two followed all the recommended steps proposed by the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins & Green 2008). Therefore, the main message of this paper is to remind or make clinicians aware of the fact that not all SRs have the same methodological quality (only because they are SRs). In light of the high number of SRs being produced in Periodontology (not all following the Cochrane guidelines), this is an important issue that should be appraised, and thus accurate and standardized methods for preparing and reporting SR are essential. In addition, it should be clear that even if a paper has used some systematic methods to appraise the available source of evidence or to conduct a meta-analysis, an evidence-based approach does not make a study an SR.

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Supporting information

Additional Supporting Information may be found in the online version of this article:

Appendix S1. Characteristics of included reviews.
Appendix S2. OQUAQ instrument (Oxman & Guyatt 1991).
Appendix S3. AMSTAR instrument (Shea et al. 2007).

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Clinical Relevance

Scientific rationale for the study: Considerable interest has been focused on the evidence-based treatment of RTD. However, well designed and conducted SRs must follow strict guidelines to allow precision data retrieval and interpretation. To date, an assessment of the quality reported by such SRs has not been done yet.

Principal findings: The results of this review have shown that the majority of RC procedures led to statistically significant gains in GR depth, CAL and in KT width. However, only 02/10 SRs were conducted according the methodology proposed by the Cochrane Collaboration. The three instruments used revealed some inconsistencies within reviews' quality.

Practical implications: SRs are necessary to ensure evidence-based decision making in RC, but while most of the reviews published in regular dental journals were of good methodological quality, some of them also had methodological problems. Therefore, the methodology of each individual SR should be scrutinized before accepting its results.