Journal of Dentistry 62 (2017) 36–53

Contents lists available at ScienceDirect

Journal of Dentistry

journal homepage: www.elsevier.com/locate/jdent

Influence of adhesive strategy on clinical parameters in cervical restorations: A systematic review and meta-analysis

Marcos Schroeder[a], Ivo Carlos Correa[a], Jose Bauer[b], Alessandro D. Loguercio[c,*], Alessandra Reis[c]

[a] Department of Dental Materials, School of Dentistry, Federal University of Rio de Janeiro (UFRJ), Cidade Universitária, Zip Code 21941-971, Rio de Janeiro, Brazil
[b] Discipline of Dental Materials, School of Dentistry, Federal University of Maranhão (UFMA), Av. dos Portugueses, 1966, Zip Code 65085680, São Luis, Maranhão, Brazil
[c] Department of Restorative Dentistry, School of Dentistry, State University of Ponta Grossa (UEPG), Rua Carlos Cavalcanti, 4748, Zip Code 84030-900, Campus Uvaranas, Ponta Grossa, Paraná, Brazil

ARTICLE INFO

Keywords:
Adhesive system
Non-carious cervical lesions
Randomized clinical trials
Systematic review
Postoperative sensitivity

ABSTRACT

Objectives: We aimed to answer the following PICO question: "Is the risk of postoperative sensitivity (POS), retention rates and marginal discoloration of composite restorations [CR] bonded with self-etch (SE) in non-carious cervical lesions (NCCLs) of adults equals to etch-and-rinse (ER) adhesives?".
Methods: A comprehensive search was performed in May 2016 in the MEDLINE, Scopus, Web of Science, LILACS, BBO and Cochrane Library and SIGLE, abstracts of IADR, unpublished and ongoing trials registries, dissertations and theses without restrictions. Only randomized clinical trials that compared composite resin restorations placed with self-etch and etch-and-rinse in NCCLs were included. After removal of duplicates and non-eligible articles, 50 articles from 42 studies (follow-ups of the same study were merged) remained for synthesis of the risk of bias (Cochrane Risk of bias tool).
Results: Thirteen studies were at "high" risk of bias, yielding 29 studies for meta-analysis. No difference on the POS after restoration placement (risk ratio [RR] 1.04; 95% CI 0.81 to 1.34) as well as in the retention rates for all follow-up periods was observed. The etch-and-rinse approach produced less marginal discoloration at 18 months to 2 years (RR 1.51; 95% CI 1.21 to 1.90) and at 4 to 5 years (RR 1.81; 95% CI 1.28 to 2.55) ($p < 0.0007$).
Conclusions: The adhesive strategy did not influence the POS and the retention rates of composite resin in NCCLs in any of the follow-up periods; but less marginal discoloration was found in etch-and-rinse adhesives.
Clinical significance: Composite resin restorations placed with self-etch and etch-and-rinse adhesives produce restoration with the similar clinical service and POS, however using etch-and-rinse adhesives one can reduce marginal discoloration. PROSPERO registration number: CRD42015019533.

1. Introduction

For the good performance of etch-and-rinse systems, a preliminary etching of the dental substrate with phosphoric acid is needed prior to the application of the bonding solution. The aim of this procedure is to remove the smear layer, which, in turn, increases the dentin permeability and hydraulic conductance of dentin [1].

An incomplete monomer penetration due to over-etching [2] or inadequate adhesive application may leave voids in the hybridized area as well as denuded collagen fibrils allowing dentin fluid movement [3] mainly under occlusal stress. The modification in the hydrodynamics of the dentinal fluids sensitizes the nerve endings and may cause postoperative sensitivity (POS). The fact that self-etch systems do not remove but incorporate the smear layer in the hybridized complex [4], has led to a widespread belief that self-etch systems produce composite restorations with less risk of POS [5]. On the other hand, a recent meta-analysis about the effect of adhesive strategy in posterior composite restorations has pointed out that POS is a very infrequent finding [6], and not affected by the type of adhesive approach employed.

However, these conclusions cannot be extrapolated to other types of dental restorations. Differently from posterior restorations, cervical lesions are usually hypermineralized dentin lesions, characterized by the presence of dentin sclerotic casts within the dentin tubules [7]. The etching of the cavity with the phosphoric acid from the etch-and-rinse adhesives remove partially the obliteration that occurs in exposed

* Corresponding author at: Department of Restorative Dentistry, School of Dentistry, State University of Ponta Grossa (UEPG), Rua Carlos Cavalcanti, 4748, Zip Code 84030-900, Campus Uvaranas, Ponta Grossa, Paraná, Brazil.
E-mail addresses: bauer@ufma.br (J. Bauer), aloguercio@hotmail.com (A.D. Loguercio).

http://dx.doi.org/10.1016/j.jdent.2017.05.006
Received 3 March 2017; Received in revised form 3 May 2017; Accepted 5 May 2017

dentin of cervical lesion, which from a theoretical point of view, may lead to increased postoperative sensitivity [7].

Although there are previous systematic reviews of the literature published about the performance of adhesive systems on composite restorations in cervical lesions, most of them did not evaluate POS [8–14]. Additionally, the risk of bias were not accessed in some studies [9–11,13,14] or not taken this analysis into consideration when running the meta-analysis [12]. Performing meta-analyses of studies that are at risk of bias may lead to deviation from the truth. If bias is present in each (or some) of the individual studies, meta-analysis will simply compound the errors, and produce a 'wrong' result that may be interpreted as having more credibility.

This may explain why controversial results have been published regarding the clinical performance of adhesive systems in non-carious cervical lesions. For instance, Krithikadatta [10] and Chee et al. [8] concluded that self-etch adhesive has the same clinical performance than etch-and-rinse adhesive despite the number of bonding steps. However, this does not agree with other systematic reviews that reported significant differences between self-etch adhesive and etch-and-rinse adhesive [9–11,13,14].

Therefore, the aim of this systematic review of the literature was to answer the following PICO question (P – participant; I – intervention; C – comparator; O – outcome) through a systematic review of the literature and meta-analysis of randomized clinical trials: "Is the risk of postoperative sensitivity (POS), retention rates and marginal discoloration of composite restorations [CR] bonded with self-etch (SE) in non-carious cervical lesions (NCCLs) of adults equals to etch-and-rinse (ER) adhesives?"

2. Materials and methods

2.1. Protocol and registration

We registered this study protocol at the PROSPERO database under the registration number CRD42015019533, and we followed the recommendations of the PRISMA statement for the report of this systematic review [15].

2.1.1. Information sources and search strategy

The controlled vocabulary (mesh terms) and free keyword in the search strategy were defined based on the following elements of the PICOS question:

- Population (P): adult patients with the need of non-carious cervical lesions restorations.
- Intervention (I): placement of composite restorations with self-etch adhesives.
- Comparison (C): the intervention should be compared with composite restorations placed with an etch-and-rinse adhesive.
- The outcomes (O): risk and intensity of postoperative sensitivity, retention rates and marginal discoloration marginal.
- Study design (S): randomized clinical trials.

To identify trials to be included for this review, we searched on the electronic databases MEDLINE via PubMeb, Scopus, Web of Science, Latin American and Caribbean Health Sciences Literature database (LILACS), Brazilian Library in Dentistry (BBO) and Cochrane Library (Table 1). We hand-searched the reference lists of all primary studies for additional relevant publications. No restrictions were placed on the publication date or languages. In case earlier systematic reviews of the literature were identified, their reference lists were used as source information to identify eligible studies.

The abstracts of the annual conference of the International Association for Dental Research (IADR) and their regional divisions (1990–2015) were also searched. Authors were contacted and asked whether they have published a full text article or research report where more details about the methodology and results could be found. The grey literature was explored using the database System for Information on Grey literature in Europe (SIGLE). Dissertations and theses were searched using the ProQuest Dissertations and Theses Full text database as well as the Periódicos Capes Theses database.

To locate unpublished and ongoing trials related to the review question, the following trials registry were also searched: Current Controlled Trials (www.controlled-trials.com), International Clinical trials registry platform (http://apps.who.int/trialsearch/), the ClinicalTrials.gov (www.clinicaltrials.gov), Rebec (www.rebec.gov.br) and EU Clinical Trials Register (https://www.clinicaltrialsregister.eu).

The search strategy along with the date of search for all databases was included in Table 1. This search strategy was appropriately modified for each database to identify eligible studies. Full text versions of the papers that appeared to meet the inclusion criteria were retrieved for further assessment and data extraction.

2.1.2. Eligibility criteria

We included only randomized clinical trials (RCTs) with parallel or split-mouth design (Table 1) that compared both adhesive strategies. No minimum follow-up period was established since one of the outcomes of interest was the POS after restoration placement. Additionally, RCT studies were excluded if 1) other cavity types were treated other than NCCLs; 2) bases or liners were always used before adhesive application; 3) silorane-based adhesives were employed; 4) chemically-cured adhesives were used; 5) restorations were placed in primary teeth; 6) etch-an-rinse adhesives with phosphoric acid concentrations lower than 20% were employed; 7) composite resins were not employed as restorative materials.

2.1.3. Study selection and data collection process

Initially, the articles were selected by title and abstracts according to the previously described search strategy. Articles appearing in more than one database were considered only once. Full reports were also obtained when there was insufficient information in the title and abstract to make a clear decision. Subsequently, full-text articles were acquired and two reviewers classified those, which met the inclusion criteria. Two reviewers extracted relevant information about the study design; participants, interventions and outcomes were extracted using customized extraction forms (Table 2).

2.1.4. Data items

When there were multiple reports of the same study (*i.e.* reports with different follow-ups), data from all reports were extracted directly into a single data collection form to avoid overlapping data. The collection form was pilot tested using a sample of study reports to ensure that the criteria were consistent to the research question. When the risk and intensity POS was reported in different time periods, we collected the data from the shortest period.

Regarding the retention rates and marginal discoloration we collected data from the studies and grouped them according to the following follow-ups: 1 year; 18 months to 2 years; 3 years and 4 to 5 years. When more than one adhesive of each type was included in the study, their values were combined to make a single entry.

2.1.5. Risk of bias in individual studies

Quality assessments of the included trials were evaluated by two independent reviewers, using the Cochrane Collaboration's tool for assessing risk of bias in randomized trials [16]. The assessment criteria contained six items: sequence generation, allocation concealment, blinding of the outcome assessors, incomplete outcome data, selective outcome reporting, and other possible sources of bias. During data extraction and quality assessment, any disagreements between the reviewers were resolved through discussion, and if needed, by consulting a third reviewer.

For each aspect of the quality assessment, the risk of bias was scored