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Review

Is non-cavitated proximal lesion sealing an effective method for caries control in primary and permanent teeth? A systematic review and meta-analysis



Michelle Mikhael Ammari^{a,b}, Vera Mendes Soviero^c, Tatiana Kelly da Silva Fidalgo^a, Michele Lenzi^a, Daniele Masterson T.P. Ferreira^d, Cláudia Trindade Mattos^e, Ivete Pomarico Ribeiro de Souza^a, Lucianne Cople Maia^{a,*}

^aDepartment of Pediatric Dentistry and Orthodontics, School of Dentistry, Universidade Federal do Rio de Janeiro, Rio de Janeiro, Brazil

^bDepartment of Specific Training, School of Dentistry, Universidade Federal Fluminense, Nova Friburgo, Brazil

^cDepartment of Preventive and Community Dentistry, School of Dentistry, Universidade do Estado do Rio de Janeiro, Brazil

^dCentral Library, Center of Health Science, Universidade Federal do Rio de Janeiro, Brazil

^eDepartment of Dental Clinics, School of Dentistry, Universidade Federal Fluminense, Niterói, Brazil

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ABSTRACT

Objectives: The aim of this study was to perform a systematic review and meta-analysis on the effectiveness of sealing non-cavitated proximal caries lesions in primary and permanent teeth.

Data: Only controlled clinical trials and randomized controlled clinical trials that evaluated the effectiveness of sealing on non-cavitated proximal caries with a minimum follow-up of 12 months were included in the study. The primary outcome should be arrestment/progression of proximal caries evaluated by bitewing radiographs. A risk of bias evaluation based on the Cochrane Collaboration common scheme for bias was carried out for each study. The meta-analysis was performed on the studies considered low risk of bias and with pair-wise visual reading results through RevMan software.

Sources: A comprehensive search was performed in the Systematic Electronic Databases: Pubmed, Cochrane Library, Scopus, IBI Web of Science, Lilacs, SIGLE, and on website Clinical trials.gov, through until June 2013.

Study selection: From 967 studies identified, 10 articles and 3 studies with partial results were assessed for eligibility. However three articles were excluded and our final sample included 10 studies. According to the risk of bias evaluation, six studies were considered “high” risk of bias, and four “low” risk of bias. The forest plot of the meta-analysis showed low heterogeneity ($I^2 = 29\%$) and a favourable outcome for the Infiltrant. The chance of caries progression when this technique was used was significantly lower ($p = 0.002$) compared with Placebo.

Conclusion: Our results suggest that the technique of sealing non-cavitated proximal caries seems to be effective in controlling proximal caries in the short and medium term. Further long-term randomized clinical trials are still necessary to increase this evidence.

Clinical significance: Contemporary dentistry is focused in minimally invasive approaches that prevent the destruction of sound dental tissues next to carious lesions. This paper searches for evidence of the efficacy of sealing/infiltrating non-cavitated proximal caries in arresting caries progression both in permanent and primary teeth.

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* Corresponding author at: Disciplina de Odontopediatria da FO-UFRJ, Caixa Postal: 68066 – Cidade Universitária – CCS, CEP: 21941-971 Rio de Janeiro, RJ, Brazil. Tel.: +55 21 39382098.

E-mail address: rorefa@terra.com.br (L.C. Maia).

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1. Introduction

Traditionally, the diagnosis of proximal caries lesions has been done by visual inspection associated with bitewing radiographs. The value of the radiographs for detecting proximal carious lesions is beyond question.¹⁻⁵ In the past, the presence of radiolucency at any depth in a proximal surface, even those restricted to the enamel, was an indicative for restorative treatment. Nowadays, this practice is considered inadequate. According to the literature restorations must be restricted to cavitated lesions.⁶⁻⁸

The principle of minimum intervention is to prevent or to postpone the restorative treatment as much as possible since the placement of a restoration causes, inevitably, the destruction of sound dental tissues next to the carious lesion. Moreover, during the preparation of a proximal surface, damage to the adjacent tooth surface will occur almost always, even when the dentist is very careful.⁹ In fact, a filling can represent the beginning of a restorative cycle in which restorations will be replaced several times if a strategy to control the carious process is not implemented.¹⁰

Non-cavitated caries lesions can be arrested or reverted by non-invasive strategies.⁶⁻⁸ In proximal tooth surfaces, the presence of cavitations significantly reduces the chance of arresting the lesions.¹ The use of fissure sealants has been considered a successful procedure not only to prevent occlusal caries,^{11,12} but also to control the progression of active initial caries or even radiographically evident caries with moderate depth in the occlusal surface.^{13,14} Promising results have also been observed after sealing enamel lesions on smooth surfaces. *In vitro* studies have shown that artificial caries lesions can be penetrated by adhesives or fissure sealants.¹⁵⁻¹⁹ In addition, initial lesions on smooth surfaces infiltrated with low viscosity resins became more resistant to further demineralization.^{18,20}

The present work reports the findings of a systematic review and meta-analysis focused on the following question: Is non-cavitated proximal lesion sealing an effective method for caries control in primary and permanent teeth?

2. Materials and methods

2.1. Search strategy

The search process was performed independently by two of the authors (MMA and ML) under the guidance of a librarian (DMF). The search strategy included appropriate changes in the key words and followed the syntax rules of each database. The descriptors were selected from a combination of a previous search in MeSH (Medical Subject Headings) terms and the most cited terms in relevant previous publications. The terms were searched on the field *Title/Abstract*, as possible. No filters or limits were applied in the searches, and also no limits regarding language or year of publication. The electronic searches up to June 2013 were conducted using the following electronic bibliography databases: PubMed, Scopus, ISI Web of Science, Cochrane Library, Lilacs, SIGLE (System of Information on Grey Literature in Europe) and registered clinical trials

site (clinicaltrials.gov). Researchers were contacted to identify unpublished and ongoing studies. Furthermore, efforts were made to obtain conference proceedings and abstracts when possible. A complementary hand search was performed by screening the references of the selected articles to find any that did not appear in the database search. The electronic database and search strategy are summarized in [Table 1](#).

2.2. Inclusion criteria outlines according to the population, interventions, comparisons, and outcomes (PICOS)

Study design (S): randomized-controlled trials (RCTs), and controlled clinical trials (CCTs) with at least 12 months of follow-up.

Population (P): children and adults with non-cavitated proximal caries, either in primary or permanent teeth.

Interventions (I): sealing and/or infiltration of proximal caries.

Comparison (C): the intervention under investigation should be compared to control groups with different material/technique or placebo.

Outcome (O): caries arrestment/progression detected by bitewing radiographs.

2.3. Exclusion criteria

Non controlled clinical trials, editorial letters, pilot studies, historical reviews, *in vitro* studies, cohort, observational and descriptive studies, such as case reports and case series were excluded. In addition, animal studies were also excluded. When duplicate samples were identified, the authors were contacted in order to point out the most completed study for inclusion in this systematic review.

2.4. Selection of studies

Initially, two of the authors (MMA and TF) selected the studies by titles and abstracts based on the search strategy described previously. Then, the full texts of the potentially eligible studies were read and selected based on the inclusion criteria (PICOS criteria). Disagreement between the two authors was solved by consensus with a third senior reviewer (LCM). Papers appearing in more than one database search were considered only once. If the same study had multiples reports just the last one with the longest follow-up period was considered.

2.5. Methodological risk of bias assessment and data extraction

Each selected study was evaluated for inner methodological risk of bias according to the Cochrane Collaboration common scheme for bias: selection, performance, attrition, detection, and reporting bias.²¹

The selection bias that comprises systematic differences on baseline characteristics of the studied groups was assessed by the sequence generation and allocation concealment domains. Sequence generation describes the method used to generate the allocation sequence in order to produce comparable groups. While allocation concealment refers to the method used to conceal allocation sequence to determine

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