Self-conditioning adhesives in pediatric dentistry: an integrative literature review
Adesivos autocondicionantes em odontopediatria: uma revisão integrativa da literatura
Adhesivos autocondicionantes en odontopediatría: una revisión integradora de la literatura

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Abstract
As clinical time must be taken into account in pediatric dental care, the use of self-etching accessories is the best alternative for restorative procedures in this population. Cons suitable accessories, which require a conditioning time, self-etching accessories and time separators with the number of steps and the number of steps required. However, this theme is still not clear in the literature. Thus, the objective of this integrative literature review was to compare, in relation to their clinical performance and their adhesive properties, self-etching accessories compared to the performance of restorations compared to primary teeth. The search was performed on Pubmed, Google Scholar and EBSCOHost with the descriptors “dentin-bondin agents OR dentin-bonding system” AND “deciduous OR primary teeth” AND “self-etch adhesive OR self-etch system” Per studies from the last five years. Thirty-six articles were obtained and five were selected. In only one study, self-etching adhesives and performance differences between their self-etching characteristics and performance differences between the evaluated characteristics. Therefore, studies selected for the selected studies, randomly selected and with study time are considered better that are not more rigid and that are more rigid in randomized trials and that have been considered as time period.

Keywords: Adhesives; Self-etching; Pediatric dentistry.

Resumo
Como o tempo clínico deve ser levado em consideração no atendimento odontopediátrico, a utilização de adesivos autocondicionantes pode ser a melhor alternativa para os procedimentos restauradores nessa população. Contrastando com os adesivos convencionais, que requerem um tempo de condicionamento separado, os adesivos autocondicionadores reduzem o número de etapas e o tempo de aplicação necessário. Entretanto, esse tema ainda não está claro na literatura. Desta forma, o objetivo desta revisão de literatura integrativa foi comparar, em relação ao seu desempenho clínico e suas propriedades adesivas, os adesivos autocondicionadores aos convencionais no desempenho de restaurações em dentina de dentes deciduos. A busca foi realizada no Pubmed, Google Acadêmico e EBSCOHost...
Conceição,
dências para os últimos cinco anos. Foram obtidos 36 artigos e cinco até step and dentin
literature, as the use of two avoiding decrease;
edding crystals the
require adhesives may be the best alternative for restorative procedures in children. In contrast to conventional
etching adhesives reduce the number of steps and application time required (Soares, et al., 2018). Thus, in this integrative
literature review, the influence of the use of self-etching adhesives compared to conventional adhesives on the performance of
dentin restorations of primary teeth is evaluated.

1. Introduction

Restorations are the most frequently performed dental procedures in primary dentition, as their main objective is to
maintain primary teeth in anatomical-functional conditions in the arch until their physiological exfoliation (Chisini, et al.,
2018). For restorations to present a better clinical performance, adhesive systems are crucial, being classified, based on the
adhesive strategy, according to the way in which they interact with the smear layer, removing it totally or partially (Froehlich,
et al., 2021). Complete removal occurs when using some acidic substance, for example phosphoric acid, as a separate step and
subsequent surface washing, this technique being called "conventional". Techniques that partially remove or modify the smear
layer are called "self-etching" because the conditioning occurs simultaneously with the infiltration of the adhesive (Conceição,
et al., 2010; Silva, 2016).

As fast clinical time is important when managing behavior during pediatric dental care, the use of self-etching
adhesives may be the best alternative for restorative procedures in children. In contrast to conventional adhesives, which
require a separate etching time, self-etching adhesives reduce the number of steps and application time required (Soares, et al.,
2020). In addition, self-etching adhesives are composed of acidic monomers of lower acidity than phosphoric acid, used before the
conventional technique (dos Santos Rodrigues, 2021). In this way, it avoids excessive loss of dentin matrix and apatite
crystals around the collagen network, especially in primary teeth that have less mineralization and greater reactivity to acid
etching. As demineralization and resin monomer infiltration occur simultaneously, the collapse of demineralized dentin will
decrease; therefore, fewer potential discrepancies and gap formation, ie, gaps, can be observed. Thus, decreasing or even
avoiding microleakage, secondary caries and postoperative sensitivity (Ebrahimi, et al., 2018).

Despite the advantages of using self-etching adhesives in primary dentin, it is still a controversial topic in the
literature, as the use of two-step self-etching adhesives for primary dentin has similar results to those with two-step adhesive
and rinse, in addition to self-etching adhesives of a step are not suitable (Ebrahimi, et al., 2018). Thus, in this integrative
literature review, the influence of the use of self-etching adhesives compared to conventional adhesives on the performance of
dentin restorations of primary teeth is evaluated.
2. Methodology

The study is an integrative review, research that consists of a search for relevant subjects on a given subject, which allow research, as they can identify gaps in the literature with the realization of others. (Mowbray, 2015). Thus, the report was developed according to the structuring of the Integrative Systematic Review Manual (Cunha, 2014).

The guiding question established for this integrative literature review was: "Does the use of self-etching adhesives compared to conventional adhesives influence the performance of dentin restorations of primary teeth?".

Portals for accessing PubMed, Google Scholar and EBSCOHost electronic databases were consulted between September and October 2021, using the following keywords: Deciduous Teeth, Primary Teeth, Self-etching Adhesive, Self-etching System and Dentin; according to the search strategy (Deciduous Teeth) OR (Primary Teeth) AND (Self-etch Adhesive) OR (Self-etch System) OR (Total-Etch) AND (Dentin), with the filters language in English and Portuguese and publication period between January 2007 and October 2021. Duplicate evidence was located with the help of Mendeley and excluded. The search was also performed in the gray literature and manually in the references of the selected articles.

The articles identified by the initial strategy were independently evaluated by the reviewers through the analysis of titles and abstracts, according to the following eligibility criteria: Population - dentin of primary teeth, Intervention - use of self-etching adhesives, Intervention Comparison - conventional adhesives, Outcome - clinical performance of self-etching adhesives and Study Design - clinical studies.

Studies that met the eligibility criteria were summarized according to year of publication, authors, title, objective, study design, sample size, eligibility criteria, interventions, outcomes, randomization, blinding, and main conclusions.

3. Results

Figure 1 comprises the summary of the search and selection of studies. 1150 articles were identified, 7 selected, therefore 2 excluded and 5 elected in this integrative literature review.
Figure 1: Flowchart of search and selection of studies.

Table 1 shows the summary of articles included according to year of publication, authors, title, objective, study design, sample size, eligibility criteria, interventions, outcomes, randomization, blinding and main conclusions.
Table 1: Summary of articles included according to year of publication, authors, title, objective, study design, sample size, eligibility criteria, interventions, outcomes, randomization, blinding and main conclusions.

<table>
<thead>
<tr>
<th>Author; Date</th>
<th>Objective</th>
<th>Study Design</th>
<th>Sample size</th>
<th>Eligibility Criteria</th>
<th>Interventions</th>
<th>Outcome</th>
<th>Randomization</th>
<th>Blinding</th>
<th>Main conclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zulfikaroglu et al., 2008</td>
<td>Test different types of adhesives on Class II restorations.</td>
<td>Prospective randomized clinical trial</td>
<td>51 children/75 restorations.</td>
<td>Presence of at least 1 primary molar with indication for pulpectomy; Restorable tooth tissue remaining with 2 occlusal surfaces (OM or OD) after complete caries removal that does not require a metal crown for final restoration (i.e. extensive tissue loss or MOD cavity preparation).</td>
<td>4 restoration protocols: 1 – Amalgam fillings (negative control); 2 – Hybrid resin and universal adhesive; 3 – Polyacid modified resin and universal adhesive; 4 – Restoration with Dyract and universal adhesive</td>
<td>Clinical examination: amount of restoration (discoloration and marginal adaptation, enamel loss and caries); Radiographic examination: interradicular and periapical radiolucency, internal and external root resorption and Pathological root resorption.</td>
<td>In block.</td>
<td>Prize draw.</td>
<td>During the 12-month evaluations, pulpectomized deciduous molars restored with composite resin + conventional adhesive (group 2) and F 2000 Adhesive + self-etching adhesive (group 5) had the highest clinical and radiographic success rates.</td>
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<tr>
<td>Donmez et al., 2016</td>
<td>To evaluate the clinical performance of restorations</td>
<td>Split-mouth randomized</td>
<td>32 children/128 restorations.</td>
<td>Patients with four primary first and/or second molars with interproximal caries that extends into the</td>
<td>4 adhesive restoration protocols: 1 – 3-step universal adhesive restorations;</td>
<td>FDI criteria Aesthetic properties: surface gloss and roughness, surface and marginal color, color matching and</td>
<td>Prize draw.</td>
<td>Restoration reviewer.</td>
<td>Better adaptation was found in restorations made with universal systems than with</td>
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<tr>
<td>Study</td>
<td>Design</td>
<td>Participants</td>
<td>Interventions</td>
<td>Outcomes</td>
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<td>Pitchika; Metz; Rothmaier, 2016.</td>
<td>Retrospective clinical study</td>
<td>601 children/2146 restorations</td>
<td>Patients who received at least 1 filling under local anesthesia at the Department of Restorative Dentistry and Periodontics at Ludwig Maximilian University between January 2004 and December 2012.</td>
<td>6 adhesive restoration protocols: 1- Self-etching adhesive and traditional resin; 2 - Self-etching adhesive and fluid resin;</td>
<td>There wasn't.</td>
<td>Restorations performed with self-etching adhesives and traditional resins had less failure. The protocol with the greatest failure was the one that used acid etching.</td>
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<td>various clinical trials</td>
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<td>Study</td>
<td>Objective</td>
<td>Participants</td>
<td>Procedures</td>
<td>Adhesives Used</td>
<td>Findings</td>
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<td>Lenzi et al., 2017</td>
<td>To evaluate, in 18 months, the performance of universal adhesives, applied in self-etching and in two-stages after selective removal of carious tissue in deciduous molars.</td>
<td>Prospective randomized clinical trial.</td>
<td>44 children/90 restaurants.</td>
<td>2 adhesive protocols: 1 - Self-etching adhesives fixing restorations in deciduous molars; 2 - Conventional adhesives fixing restorations in deciduous molars.</td>
<td>Restore failure – 18-month survival time.</td>
<td>Both self-etching and double-step adhesives do not influence the clinical performance of universal adhesives used in primary molars. There is a trend towards better clinical results with the self-conditioning technique.</td>
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Soares et al., 2020. To evaluate clinical efficacy, at six months and at one year, of three adhesive systems in primary dentition. Prospective randomized clinical trial. 34 children/101 restaurants. Patients assisted at the Pediatric Dentistry Clinic of the FMUC, between September 2016 and January 2017, with deciduous molars with carious lesions on the interproximal surface with dental involvement, without pulp pathology, caries lesion, margins entirely in enamel and that have occlusal contact with the antagonist.

3 protocols for adhesive restorations:
1 – One-step self-etching adhesive system;
2 – Two-step self-etching adhesive system;
3 – Conventional two-step adhesive system.

FDI criteria
Aesthetic properties: surface gloss and roughness, surface and marginal coloring, color matching and translucency, anatomical shape.

Functional properties: fracture of the restorative material, marginal adaptation, interproximal contact, radiographic examination.

Biological properties: postoperative sensitivity and tooth vitality, secondary caries, tooth fractures and cracks, local reactions of dental tissue in contact with the restoration, local and systemic symptoms.

In block. Double blind.

In the intergroup comparison, there were no significant differences between the adhesive systems in the different evaluation periods. A worsening of the “restoration retention” parameter was observed in the conventional technique at 12 months.

Source: Authors.
4. Discussion

The effective adhesion of restorative resins to the mineralized tissues of the tooth has been the subject of research for approximately 40 years. According to Buonocore, in 1955, the bond strength between the restorative resin and the dental enamel increased significantly after acid conditioning of the enamel surface with 85% orthophosphoric acid. Generally speaking, the most common basic mechanism of bonding to enamel and dentin essentially involves a process of controlled demineralization of the tissues and the infiltration of resin monomers that, after polymerization, promote a micromechanical bond (Leitão, 2008). This ability to "adhere" restorative materials to dental tissues revolutionized dentistry, allowing the adoption of more conservative and less invasive restorative procedures (Baratieri, 2003; Sofan, et al., 2017). Regarding composite resin restorations performed on deciduous teeth, it is observed that the greatest technical problems that affect longevity are related to failures during acid attack of enamel/dentin, a fact that may be a consequence of the difficulty in controlling the child behavior allied to the lack or difficulties in performing an adequate isolation of the operative field (Costa; Czernay; Vieira, 2003).

One option for these cases is the use of self-etching adhesives, which do not require the use of previous acid etching, reducing the clinical time required to perform the procedure, especially in the dentin of deciduous teeth. Despite being widely used today, the literature on clinical studies of self-etching adhesive systems in primary teeth is very limited (Ebrahimi, et al., 2018). This study aimed to evaluate the use of conventional adhesives in relation to self-etching adhesives in dentin of primary teeth with respect to their clinical performance of restorations.

Among the selected works, only the study by Pitchika, Metz and Rothmaier (2016) showed superior clinical success of self-etching adhesives in relation to other adhesive systems. In the studies included in this work, this one actually had the longest clinical evaluation time, being also the only one in an observational and retrospective nature. This factor may be decisive for the greater clinical success of self-etching adhesives, since Zulfikaroglu et al (2008) and Lenzi et al (2017) discuss the need for a longer clinical time to evaluate restorations to obtain a more satisfactory result, since in their studies there were no significant differences between self-etching adhesives and the others.

In studies conducted by Zulfikaroglu et al (2008) and Donmez et al (2016), marginal discoloration, better marginal adaptation and lower staining, respectively, were the only clinical evaluation items that showed a statistically significant difference between the adhesives, highlighting the lower performance of the self-etching adhesives. Similar to these results, Perdigao et al (2012) reported more marginal enamel deficiencies for self-etching adhesive systems and similar retention rates. However, this occurrence may be related to the presence of physiological spaces in the primary dentition, as mentioned by Donmez et al (2016). The microstructural differences between enamel and dentin require different mechanisms of action. The pH of self-etching adhesives must be low enough to condition the enamel and dissolve the smear layer, but not too low to avoid excessive demineralization of the dentin substrate. It has been suggested that self-etching adhesive systems are more suitable for primary teeth as primary dentin is less mineralized, based on the premise that these solutions cause less aggressive demineralization (Bucher, et al., 2015; Donmez, et al., 2016; Ebrahimi, et al., 2018).

Lenzi et al (2017) disagree with the other articles, as they did not find a statistically significant difference in any of the parameters evaluated. Such divergence may have occurred to the detriment of the various evaluation criteria adopted by each of the authors, generating more reliability or not of the adhesive systems studied. However, Zulfikaroglu et al (2008), Donmez et al (2016) and Soares et al (2020) were the only ones to present more rigorous evaluation criteria, using the FDI World Dental Federation Criteria and US Public Health Service, respectively, to verify the quality of restorations, while Lenzi et al (2017) and Pitchika, Metz and Rothmaier (2016) only verified failure and survival time of restorations.
Of the five selected studies, four are randomized clinical trials (Zulfikaroglu, et al., 2008; Dommez, et al., 2016; Lenzi, et al., 2017; Soares, et al., 2020), which allowed a standard for assessing the impact of interventions of a particular clinical condition, allowing to test its effectiveness (Vinagre, et al., 2015; Reis, et al., 2018). In addition, they chose to carry out restorations in molars, which is justified by the literature because they are teeth that have a longer useful life in the primary dentition, but also have a high prevalence of caries, especially on the interproximal surfaces (Myaki, et al., 2007; Chisini, et al., 2018).

In a more recent study, the article by Soares et al (2020) it was found that in the intergroup comparison of adhesive systems, no significant differences were detected between the evaluated systems, in the different evaluation periods. In relation to intra-group longitudinal comparisons, there was a significant worsening of the scores regarding the parameter “marginal adaptation” for all groups over time. Regarding the parameters of functional, biological and aesthetic properties, there were no significant differences over the evaluation periods, results that corroborate those of Lenzi et al (2017), which showed that no significant differences were also evidenced between the study groups, both adhesive strategies gave similar results. Although there was a trend towards a better result of the self-conditioning strategy in their study. Therefore, in the study by Soares et al (2020) the same trend was observed, considering the worsening of the scores of the parameter “restoration retention” in the two-step conventional adhesive system group at 12 months of follow-up. Although not statistically significant, the loss of restorations in the conventional technique group may be related to the greater sensitivity of the adhesive technique, predisposing to an error in the operative procedure (Lenzi, et al., 2017; Chisini, et al., 2018; Ebrahimi, et al., 2018).

5. Conclusion

There was no statistical and qualitative difference between conventional and self-etching adhesives in an overview of the articles studied, with the exception of one survey. Thus, prospective studies with a long period of time and based on randomized clinical trials with stricter, more reliable and eligible criteria are needed.

References


