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BONDING TO EROSIVELY CHALLENGED ENAMEL AND DENTIN: SCOPING REVIEW OF *IN VITRO* STUDIES

INTRODUCTION: Dental erosion represents a growing challenge in oral rehabilitation, affecting more than 30% of the world population.^{1,2} Given contemporary rehabilitation methods, it is of great importance to determine the best adhesive strategy and current evidence regarding an eroded substrate.³ While current adhesive techniques are very relevant, there is also a clear necessity to assess biomimetic approaches capable of remineralization.⁴ Provided that the eroded substrate is an increasing complex challenge, it is very relevant to identify the best restorative options and evidence-based protocols.

OBJECTIVES:

1. To review and summarize *in vitro* studies which tested bond strength to eroded enamel and/or dentin
2. To identify evidence gaps and guide future research regarding this topic

METHODS: The review was conducted following PRISMA-ScR guidelines. PubMed/Medline, Scopus and EMBASE (Ovid) databases were searched to identify peer-reviewed articles published in the last 10 years, without language restrictions. Three reviewers independently performed data charting and quality assessment of papers, adapting the method described by Montagner et al. (2014).

P Permanent human or bovine teeth

I *In vitro* testing of different adhesives, inhibitors or remineralizing strategies in restoration of eroded enamel or dentin

C *In vitro* restoration of eroded OR sound enamel or dentin following the traditional technique

O Bond strength test using any type of setup (tensile, shear, push-out)

KEYWORDS

- Tooth Erosion
- Dental Erosion
- Bond
- Adhesive
- Adhesion
- Interface
- Adhesive Interface
- Resin-Dentin
- Bond strength
- Bond interface

INCLUSION CRITERIA

- In vitro studies
- Permanent human or bovine molars
- Direct restorations
- Erosive cycle applied previous to restoration
- Studies in which bond strength was tested
- Peer-reviewed articles from 2010-2020

EXCLUSION CRITERIA

- Animal or clinical studies
- Primary teeth
- Indirect restorations
- Erosive cycle applied after restoration
- Studies that did not test bond strength
- Evidence previous to 2010

RESULTS:

- 29 studies were selected for final review
- Evidence shows that eroded dentin presents lower bond strength results when compared to sound dentin
- Adhesion to eroded dentin is influenced by the type of adhesive strategy and its composition
- 10-MDP-containing adhesives showed better bond strength results
- There is a higher activity of MMP on eroded substrate and the use of enzymatic inhibitors may be beneficial

The studies were grouped in 4 categories:

1. Comparison of materials and their application mode
2. Enzymatic inhibitors
3. Surface pre-treatments
4. Remineralising techniques

EROSIVE PROTOCOL TYPE OF TEST TYPE OF SUBSTRATE

- 76%** STUDIES IN DENTIN
- 17%** STUDIES IN ENAMEL
- 7%** STUDIES IN BOTH SUBSTRATES
- 62%** MICROTENSILE BOND STRENGTH
- 21%** MICROSHEAR BOND STRENGTH
- 14%** SHEAR BOND STRENGTH
- 3%** TENSILE BOND STRENGTH
- 48%** CITRIC ACID
- 31%** REGULAR, LIGHT OR ZERO COCA-COLA
- 7%** SPRITE
- 7%** ORANGE JUICE
- 3%** HYDROCHLORIC ACID + PEPSIN

- +** 12 STUDIES WITH LOW RISK OF BIAS
- 7 STUDIES WITH MODERATE RISK OF BIAS
- x** 10 STUDIES WITH HIGH RISK OF BIAS

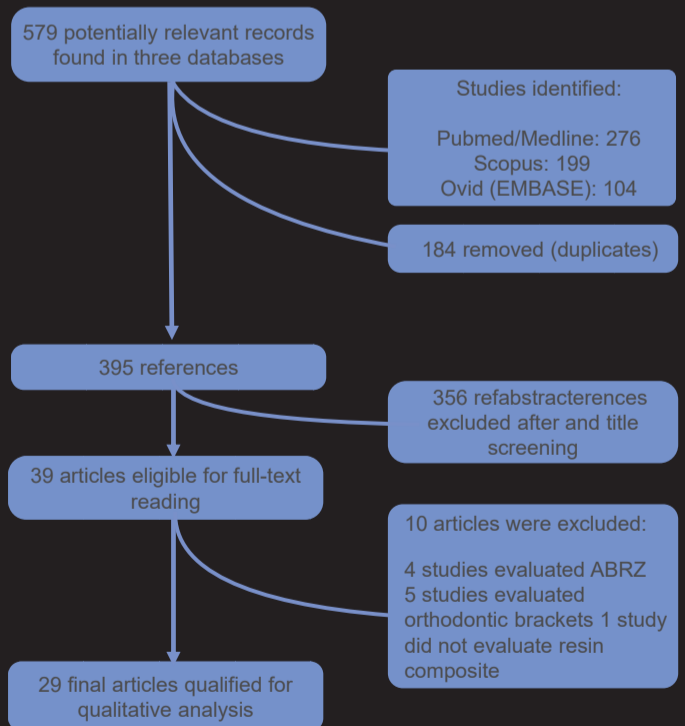


Figure 1. PRISMA flowchart followed for scoping review and qualitative analysis

CONCLUSION: It is well established that eroded enamel seems to be beneficial as a substrate for adhesion, while the contrary happens in dentin. Adhesive type and composition seem significant in bonding to the latter. 10-MDP-containing adhesives demonstrated better bond strength results. Remineralising agents also represent a promising method to increase bond in dentin and should be further studied.

CLINICAL IMPLICATIONS: Establishing clear protocols based on current *in vitro* evidence is key to impact clinical outcomes regarding adhesion to an eroded substrate. Adhesive choice in dentin and remineralising formulations should be considered.

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