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The Comparative Effect of CPP-ACP and TCP for Enamel Microhardness: A Systematic Review

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ADMINISTRATIVE INFORMATION

Support - Universitas Airlangga.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 29 February 2024 and was last updated on 29 February 2024.

INTRODUCTION

Review question / Objective The precise question was formulated using the PICO (Participants, Intervention, Control, and Outcomes) concept, and the search for literature was determined by PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta Analyses 2020). The specific query was: 'What is the comparative effect of CPP-ACP and TCP in terms of its effect on enamel microhardness?'

Rationale The use of dental remineralization agents aims to minimize the occurrence of tooth damage such as carious lesions. Ingredients containing fluoride and non-fluoride help the process of remineralization of caries lesions. Tricalcium Phosphate [Clinpro, 3M ESPE] and Casein Phosphopeptide-Amorphous Calcium Phosphate (CPP-ACP) [GC Tooth Mousse] are two non-fluoride agents that are frequently used in dentistry.

Condition being studied This systematic review aims to compare the effects of TCP and CPP-APP as remineralization agents on enamel microhardness. The teeth used as research samples were healthy teeth free from caries lesions. The entire research procedure began with demineralizing the teeth using a specific solution and then remineralizing them with materials that stimulate remineralization. This process was carried out as a reflection of the demineralization and remineralization cycle that occurs in teeth within the oral cavity. Most of the tooth samples used were human teeth, but two studies included in this research used bovine teeth. The use of bovine teeth as a substitute for human teeth in studies involving bond strength observations is due to the easier availability of bovine teeth compared to human teeth. From 15 articles used in this study, one researcher utilized dentin as a sample. The use of dentin compared to enamel in this research may be based on the fact that the demineralization and remineralization cycles in dentin are somewhat different due to its

smaller crystal morphology, being more reactive to stimuli, and having a higher content of organic matter, water, and phosphoproteins.

METHODS

Search strategy A proposal for a systematic review was developed, adhering to PRISMA 2020 principles. The report adhered to the PRISMA 2020 checklist. Additionally, the registration number for the systematic review was registered on the global database for meta-analysis and systematic reviews protocols.

The search was conducted in these databases: Web of Science (<https://www.webof134.science.com/>), Scopus (<https://www.scopus.com/>), Embase (<https://www.embase.com/>), Dentistry & oral science (<https://www.ebsco.com/>), Pubmed (<https://pubmed.ncbi.nlm.nih.gov>). The search approaches in the chosen databases are displayed in Table 1.

Participant or population Human teeth (premolars that were extracted for orthodontic purposes, deciduous and permanent anterior teeth, maxillary central and lateral incisors, primary teeth, third molars, molars permanent) and bovine teeth.

Intervention CPP-APP and TCP Application.

Comparator Artificial saliva, acidic solution, distilled water; other F varnishes, CPP varnish.

Study designs to be included In vitro.

Eligibility criteria The initial publications that focused on the approach of comparing the effects of TCP and ACP-CCP on tooth microhardness in humans or animal models were included in this review. The following are the study's inclusion criteria: full-text publications that were openly accessible (via the Faculty of Dentistry, Airlangga University's IP address) and related to TCP and its effects on tooth microhardness as well as CPP-ACP. Evaluations, brief correspondence, editorial remarks, procedures, and suggestions were disregarded and left out. Included were all kinds of English-language experimental and observational studies. However, no redundant research was incorporated into the examination. All adults and children, regardless of gender or age, are suitable subjects for research, as are any other in vivo research objects. The research included artificial saliva, an acidic solution, and any additional therapies as investigation variables or exposures. Microhardness of enamel was one of the study's results. Letters to the editor, reviews, commentary,

and articles written in languages other than the English were not accepted. The year of publication was not restricted, but the only papers that were able to review for free were complete ones. In October 2023, the most recent search was carried out.

Information sources The following electronic databases were used as search engine: Web of Science (<https://www.webof134.science.com/>), Scopus (<https://www.scopus.com/>), Embase (<https://www.embase.com/>), Dentistry & oral science (<https://www.ebsco.com/>), Pubmed (<https://pubmed.ncbi.nlm.nih.gov>).

Main outcome(s) Enamel Microhardness. Further information was taken out of each study that was pertinent to the length of research, the sample size, the method employed, and the analyses that were conducted.

Additional outcome(s) To answer the focused question of: 'What is the comparative effect of CPP-ACP and TCP in terms of its effect on enamel microhardness?'

Data management Independently, both of the reviewers (R.A.K. and N.R.) carried out the internet-based literature approaches and chose studies. Differences were resolved through conversation with the second reviewer. Using Mendeley Reference Manager, the reviewers (R.A.K., N.R.) worked to extract, summarize, and duplicate screen data. The data extraction process was taken from articles with titles and abstracts that matched the topic and its keywords, primarily using PICO protocol (Participants: humans, teeth; Intervention: CPP-APP and TCP Application; Controls: artificial saliva, acidic solution, distilled water; Outcomes: Enamel Microhardness. Any disagreements were resolved by discussion with second reviewers (N.H, A.P.N). The reviewers (D.A.M, K.B) worked to duplicate screening, extract, and recapitulate data using Mendeley Reference Manager. Further information was taken out of each study that was pertinent to the length of research, the sample size, the method employed, and the analyses that were conducted.

Quality assessment / Risk of bias analysis The technique utilized to determine the bias risk was modified from earlier systematic reviews. A number of quality assessment criteria were evaluated in this assessment, including a clear test method specification, randomized samples or subjects, standardized sample or subject preparation, blinded testing, clearly defined enamel remineralization, and thorough reporting of results.

If the information was reported by the authors, 'Y' was marked on the article for that parameter; otherwise, 'N' was labeled if it was not noticeable. Based on the amount of "Y" components in the articles (1-2, 3-4, or 5-6), the risk of bias in the articles was categorized as high, moderate, or low.

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Strategy of data synthesis In all, 377 articles published were found using the keywords; these included 90 papers from Pubmed, 87 from Scopus, 67 from Embase, 56 from Dentistry and Oral Science, and 77 from Web of Science. After removing duplicate papers, there are remaining 142 papers. Initial screening by reading the abstract remaining 38 papers left for eligibility assessment. After reading all of the papers, the reviewers (R.A.K., N.R.) selected 15 that fulfilled the requirements for inclusion and used JBI critical evaluation tools to conduct independent critical assessments. Figure 1 displays the sequence schematic for procedure of the study selection. Table 2 displays articles' descriptive features that were part of this investigation.

Subgroup analysis Nil.

Sensitivity analysis Descriptive statistics were used in this study using Microsoft Excel (2021, Microsoft, Chicago, IL, the USA) that had been approved before being used.

Language restriction English.

Country(ies) involved Indonesia, Malaysia, Denmark, Australia.

Keywords CPPACP, TCP, Clinpro, Varnish, Microhardness, Enamel, Remineralization.

Contributions of each author

Author 1 - Nadya Rafika Amalia - Conceptualization, methodology, resources, writing-original draft preparation. Author 1 write the manuscript.

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