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Influence of Rinsing Processes on the Quality of 3D-Printed Prostheses

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ADMINISTRATIVE INFORMATION

Support - Without financial support.

Review Stage at time of this submission - The review has not yet started.

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 10 November 2025 and was last updated on 10 November 2025.

INTRODUCTION

Review question / Objective Evaluate the effect of rinsing procedures (type of products, rinsing duration) on the quality of 3D-printed prostheses (accuracy, mechanical resistance, and surface roughness).

Condition being studied The condition being studied is the impact of different rinsing procedures (solvent type, rinsing duration, and agitation method) on the quality of 3D-printed dental prostheses fabricated from photopolymer-based resin.

METHODS

Search strategy The search will use a combination of controlled vocabulary (e.g., MeSH terms) and free-text keywords related to:
3D printing technologies: “3D printing”, “additive manufacturing”, “vat photopolymerization”
Materials: “resin-based materials”, “photopolymer”, “dental resin”
Post-processing procedures: “rinsing”, “cleaning”, “post-curing”, “ultrasonic cleaning”, “isopropyl alcohol”, “ethanol”
Evaluated properties: “mechanical properties”, “flexural strength”, “dimensional accuracy”, “surface roughness”

Electronic Database Search
A comprehensive search will be conducted across the following databases:
PubMed/MEDLINE
Scopus
Web of Science
Cochrane Library
Google Scholar

Filters:
Publication period: 2015–2025
Field: Dentistry

no restrictions of language.

Participant or population The population includes 3D-printed dental devices fabricated using photopolymerizable resins. These include surgical guides, dental models, provisional restorations, and splints.

Intervention Post-print rinsing procedures applied to 3D-printed photopolymer resin devices. These include variations in solvent type (e.g., isopropyl alcohol, ethanol, TPM), solvent concentration, rinsing duration, and agitation method (manual, ultrasonic, etc.).

Comparator Comparison will be made between different post-print rinsing protocols, including variations in solvent type, rinsing duration, and agitation method (manual vs ultrasonic). Studies without rinsing procedures will also be considered as control or reference groups.

Study designs to be included In vitro experimental studies, literature reviews and systematic reviews.

Eligibility criteria
Inclusion criteria;
• In vitro or experimental studies, literature reviews, and systematic reviews.
• Studies evaluating the properties of 3D-printed photopolymer-based resin materials, including dimensional accuracy/adaptation, mechanical strength, surface quality/roughness, and biocompatibility.
• Studies assessing the influence of rinsing procedures—specifically the type of solvent, rinsing duration, and agitation method—on at least one of these properties.
• Articles published between 2010 and 2025.
• Studies focusing on dental or biocompatible photopolymer resins, or on a general approach applicable to such materials.

Exclusion criteria;
• Clinical studies that do not directly measure the properties of 3D-printed parts.
• Letters to the editor, conference abstracts without usable data, and case reports.
• Studies conducted on other technologies that do not include a rinsing step during the post-processing phase.
• Studies using non-photopolymerizable or non-dental materials.

Information sources Electronic databases: PubMed/MEDLINE, Scopus, Web of Science, Cochrane Library, Google Scholar.

Main outcome(s)
Final Properties of the 3D-Printed Parts:
Dimensional accuracy / adaptation
Mechanical strength
Surface quality (roughness, smoothness).

Quality assessment / Risk of bias analysis
The methodological quality of the selected studies will be evaluated using an appraisal checklist appropriate for each study type.
• In vitro or experimental studies:
– Faggion, 2012 (adapted from the CONSORT statement for in vitro studies in dentistry) – https://pubmed.ncbi.nlm.nih.gov/23177493/
– CRIS Guidelines (Checklist for Reporting In-vitro Studies) – https://pmc.ncbi.nlm.nih.gov/articles/PMC4127685/

• Systematic reviews:
– AMSTAR 2 (A Measurement Tool to Assess Systematic Reviews) – https://amstar.ca/Amstar_Checklist.php

Strategy of data synthesis Data Extraction and Presentation
The extracted data will include: author, year, material, printing technology, rinsing parameters (solvent type, duration, method), as well as the evaluated properties (dimensional accuracy, mechanical strength, surface roughness, biocompatibility).

Presentation of Results:
The results will be summarized in comparative tables accompanied by a descriptive analysis.

Subgroup analysis
Solvent type: isopropyl alcohol (IPA), ethanol, tripropylene glycol monomethyl ether (TPM)
Rinsing duration
Agitation method: manual vs. ultrasonic.

Sensitivity analysis A sensitivity analysis will be conducted to assess the robustness of the review findings. This will involve excluding studies with a high risk of bias, examining the impact of different rinsing protocols (e.g., solvent type, rinsing duration, and agitation method), and evaluating whether the overall conclusions remain consistent when inclusion criteria or analytical approaches are varied. Where appropriate, subgroup-specific sensitivity tests will also be performed to explore the influence of methodological heterogeneity.

Language restriction No restrictions.

Country(ies) involved Morocco.

Keywords 3D printing; additive manufacturing; vat photopolymerization; resinbased materials; photopolymer resin; post-processing; post-curing; rinsing; cleaning; rinsing solvent; cleaning solvent; isopropyl3D.

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