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Effect of artificial aging on optical properties and mechanical strength of high-translucency zirconia: A systematic review and meta-analysis

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ADMINISTRATIVE INFORMATION

Support - King Khalid University.
Review Stage at time of this submission - Completed but not published.
Conflicts of interest - None declared.
INPLASY registration number: INPLASY202540112
Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 30 April 2025 and was last updated on 30 April 2025.

INTRODUCTION

Review question / Objective To determine how artificial ageing protocols affect the optical and mechanical performance of high-translucency zirconia.

Rationale Aging protocols are critical to predict zirconia’s durability, yet no consensus exists on testing methods.

Condition being studied Hydrothermal aging, thermocycling, UV light exposure, and xenon lamp weathering applied to HT zirconia.

METHODS

Search strategy Databases: PubMed, ScienceDirect, Scopus, Cochrane Library, Google Scholar.

Participant or population In vitro studies using zirconia samples.

Intervention Simulated aging processes like high-pressure steam or light exposure.

Comparator Compared aged zirconia to untreated samples or alternative materials.

Study designs to be included RCTs, prospective, cross-sectional, and in vivo studies with control groups.

Eligibility criteria Inclusion: English studies with defined aging protocols and outcomes. Exclusion: Animal studies, reviews, non-English articles.

Information sources Electronic Medical databases – PubMed, ScienceDirect, Scopus, Cochrane Library, Google Scholar.

Main outcome(s) Translucency parameters (TP), contrast ratio (CR), color stability, and flexural strength (FS).

Additional outcome(s) Secondary effects: texture changes and structural degradation.

Data management Data extracted into Excel sheets; meta-analysis done via RevMan 5.4 software.

Quality assessment / Risk of bias analysis Used a checklist by applying QUIN tool to evaluate study reliability; most had moderate bias risk.

Strategy of data synthesis Random-effects meta-analysis for pooled outcomes; narrative synthesis for qualitative data.

Subgroup analysis Analysed variations across aging techniques.

Sensitivity analysis Assessment of study heterogeneity with I^2 statistics.

Language restriction Only studies published in English included.

Country(ies) involved Saudi Arabia, India.

Other relevant information Differences in methods and materials affected result consistency due to high Heterogeneity.

Keywords High translucent zirconia, HT zirconia, artificial aging, hydrothermal artificial aging, flexural strength, translucency.

Dissemination plans To submit findings to peer-reviewed dental materials journals.

Contributions of each author

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