INPLASY

The Effect of Different Surface Treatments on the Bond Strength of Zirconium Crowns: A Systematic Review and Meta-analysis

INPLASY202440023
doi: 10.37766/inplasy2024.4.0023
Received: 04 April 2024
Published: 04 April 2024

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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: INPLASY202440023

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 04 April 2024 and was last updated on 04 April 2024.

INTRODUCTION

Review question / Objective This study aims to identify scholarly journal articles investigating the effect of different surface treatments on the bond strength of Zirconia crowns. In addition, this study will explore the effect of the surface treatments on the mean retentive forces.

Condition being studied Restorative dentistry significantly evolved, using crowns to restore damaged teeth [1]. Crowns are a dental restoration used to cap damaged or weakened teeth to restore shape, size, strength, and aesthetics [2]. They are commonly used to protect and reinforce decayed or fractured teeth. Crowns may be made using different materials, including porcelain ceramics, metal alloys and resins [3]. On the other hand, crowns are restored in various steps, including teeth evaluation, preparation, moulding impressions, temporary crown placement, crown placement and adjustment for a proper fit and alignment.The bonding process of crowns is critical to the restoration's longevity, stability, and performance [4]. It requires adequate preparation for optimal clinical outcomes. Tooth preparation, involving decayed or damaged teeth removal, is often done to create space for the crowns [5]. It may involve reshaping for proper fit and alignment and bonding the crown onto the surface. On the other hand, bonding may be done using different adhesives and bonding techniques which require a suitable surface, emphasizing the significance of surface treatments on Zirconium crowns.
Despite the success of Zirconium crowns in restorative dentistry, the bonding strength and the long-term stability of the bond are critical to the success of the crowns. Surface treatments enhance the bonding properties of zirconium crowns and tooth substrates. However, previous research reports inconclusive results on the effect of different surface treatments on the bonding strength of zirconium crowns.

METHODS

Search strategy Modified PICOS criteria were used to identify and select eligible studies.

Participant or population Zirconium crowns.

Intervention Different surface treatment approaches, including air abrasion, acid etching, silanization, laser treatment, plasma treatment.

Comparator Crowns subjected to surface treatments and non-treated crowns or different surface treatment approaches where applicable.

Study designs to be included Randomized controlled trials, clinical trials, experimental studies, in-vitro studies, and any other suitable study designs investigating the effect of different surface treatments on the bond strengths of Zirconium crowns.

Eligibility criteria This study included studies investigating the impact of different surface treatments on the bond strength of Zirconia crowns. In addition, only studies with access to full-text and published in English were included. However, reviews, meta-analyses, conference abstracts, opinion pieces, editorials, and letters were excluded.

Information sources A reviewer conducted a comprehensive database search via PubMed, ScienceDirect, Cochrane Library, Dimensions, and Google Scholar. The following keywords were used in different combinations for different databases to optimize the search results: surface treatment, Surface modification, air abrasion, acid etching, silanization, laser treatment, plasma treatment, surface roughness, surface morphology, bond strength, zirconium, and crown.

Main outcome(s) Bonding Strength.

Additional outcome(s) Surface treatment type significantly influences the bond strength of Zirconia crowns. The results demonstrate that sandblasting or air abrasion, with chemical primers or coupling agents, effectively optimizes bond strength and clinical performance of zirconium crown restorations.

Data management This study included studies investigating the impact of different surface treatments on the bond strength of Zirconia crowns. In addition, only studies with access to full-text and published in English were included. However, reviews, meta-analyses, conference abstracts, opinion pieces, editorials, and letters were excluded.

Quality assessment / Risk of bias analysis The risk of bias in the eligible studies was assessed using the Cochrane Collaboration risk of bias assessment tool (robvis 2.0). In addition, the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for non-randomized experimental studies was used to assess the methodological quality of the eligible and in-vitro studies.

Strategy of data synthesis Data were systematically extracted from the included studies and tabulated in a Microsoft Excel workbook using software version 2021. Extracted data from the included studies were thematically analyzed [20]. In addition, the quantitative data were analyzed using the Review Manager software version 5.4.1, which used a full-review analysis approach. In addition, an intervention approach was used, employing an inverse variance statistical method with a random effects analysis model and a standard mean difference effect measure. In addition, the statistical analyses used totals and sub-totals with a 95% confidence interval.

Subgroup analysis The data was compiled from a variety of articles: • Author(s), year of publication, country, study design. • Total number of patients/ datasets. • Training/validation datasets • Test datasets.

Sensitivity analysis Not Applicable.

Language restriction Only articles in English.

Country(ies) involved Saudi Arabia.

Keywords Surface treatment; Bond strength; Zirconium; Crowns.

Dissemination plans All the data will be shared after publishing of the article.

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