Durability Of Zirconia And Lithium Disilicate Crowns In Bruxism Patients: a Systematic Review

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ABSTRACT

Background*: Bruxism causes fatigue stress from repetitive occlusal loading without adequate recovery, which weakens both tooth structure and restorative materials. Patients with bruxism require dental treatment that minimizes biological damage while preserving function and esthetics. However, achieving an optimal balance between strength and esthetic appeal in crown materials remains challenging. This review aims to evaluate the durability of dental crown materials in patients with bruxism to support clinical decision-making in material selection.*

Method*: This literature review adhered to the PRISMA guidelines using the PICOS framework, focusing on crown placement in bruxism patients to evaluate clinical performance based on material type. Comparisons were based on different crown materials, and outcomes focused on clinical performance. Eligible studies included randomized controlled trials, cohort studies, and case series. A search of PubMed, Google Scholar, Scopus, and ScienceDirect (2018–2024) yielded 1,416 articles, of which three met the inclusion criteria.*

Results*: Three studies were included, consisting of one randomized clinical trial, one prospective clinical study, and one observational case series. The findings demonstrated high survival rates and low complication rates for zirconia and lithium disilicate crowns in bruxism patients. The randomized clinical trial reported no significant difference between the two materials in terms of survival and complications. Observational findings suggested generally favorable outcomes, although complications were more frequently observed in bruxism patients.*

Conclusion*: Zirconia and lithium disilicate crowns show favorable short-term clinical performance in patients with bruxism. However, the limited number of high-quality studies highlights the need for further well-designed clinical research*

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INTRODUCTION

Dental crown restoration is widely used in daily clinical practice, especially when tooth structure loss is more than 50% due to caries, fracture, or teeth after endodontic treatment.[1] Dental crowns are a crown shell shaped like a tooth that functions to protect the remaining tooth structure due to severe damage so that it can restore the function, shape, and aesthetics of the tooth.[2] Metal crowns, metal-ceramic crowns, and ceramic crowns are materials used to make crowns with a good level of durability and mechanical and aesthetic clinical properties that come from the characteristics of the material. Decreased strength and weakening of the material can be caused by fatigue stress due to repeated occlusal loads causing restoration failure, such as in the case of bruxism.[3]

Bruxism is defined as diurnal (not sleeping) or nocturnal (sleeping) parafunctional activity characterized by teeth grinding and/or clenching or pushing of the lower jaw. During physiological chewing function, humans develop forces that can easily reach 200 N, depending on various factors.[4] The average bite force measured in studies of maximal bruxism was 777.7 ± 78.7 N to 1692 N.[5] Abnormal increase in the frequency and duration of interdental contact, which significantly contributes to tooth wear, broken restorations, muscle aches, and TMJ pain. While most patients are unaware of bruxism activity, the presence of visible wear edges on the teeth or diagnostic impressions alerts the dentist to the habit. It is estimated that approximately 5% of patients experience wear and tear severe enough to require restorative treatment.[6]

Some studies of the clinical durability of dental crowns do not include patients with habitual bruxism because a higher rate of mechanical complications such as tooth erosion and fracture can occur in this group of patients compared with patients without bruxism.[7] Fractures of the ceramic material and dislodgement of the crown are the most common failures. occurs in bruxism patients. Metal or metal-ceramic restorations appear to be the safest option in the case of high-load conditions. However, because of the risk of ceramic fracture in metal-ceramic restorations, many dentists prefer metal crowns for patients with severe bruxism. Today's zirconia materials, which have excellent strength, aesthetics, and mechanical properties almost identical to metal crowns, have been used in bruxism patients.[8]

Dental treatment performed on bruxism patients is carried out to prevent further tooth wear and restore aesthetics and function with minimal biological costs. This can be a challenge because the aesthetics and strength of the restorative materials have not been easily combined so far. The most aesthetically and biologically minimally invasive materials, such as feldspathic ceramics and composites, are also the weakest, while the strongest materials, such as metals, have inferior aesthetics. Rehabilitation of patients with bruxism requires restorative materials with adequate wear resistance and fracture strength properties.[9]The aim of this review article is to determine the durability of dental crown materials in bruxism patients so that this can be taken into consideration in selecting crown materials.

Despite the increasing use of ceramic crowns in restorative dentistry, clinical evidence specifically evaluating their performance in bruxism patients remains limited. Most available studies either exclude patients with parafunctional habits or focus on laboratory-based outcomes, resulting in a gap in clinically relevant evidence. Therefore, a systematic evaluation of available clinical data is necessary.

METHOD

The study selection process was performed using the Population, Intervention, Comparison, Outcomes, and Study design (PICOS) framework. The criteria were defined as follows: (P) patients with bruxism or parafunctional habits (e.g., heavy grinders); (I) tooth-supported dental crowns, particularly zirconia and lithium disilicate crowns; (C) comparison between different ceramic crown materials or single-arm evaluation when comparative data were not available; (O) clinical outcomes, including survival rate, complications, and overall clinical performance; and (S) randomized controlled trials (RCTs), cohort studies, prospective clinical studies, and observational case series. If multiple publications were identified from the same patient population, only the most recent study with the most complete data was included. Electronic searches were performed in the following databases: Google Scholar, PubMed, Scopus, and ScienceDirect. A combination of keywords and Boolean operators was used to optimize the search strategy.

The inclusion criteria were: (1) studies involving patients with bruxism or parafunctional habits; (2) studies evaluating tooth-supported crowns made of zirconia and/or lithium disilicate; (3) studies reporting clinical outcomes such as survival rate, complications, or clinical performance; (4) clinical study designs including RCTs, cohort studies, prospective studies, and case series; (5) studies published in English; and (6) studies published between 2018 and 2024. The exclusion criteria were: (1) studies not involving bruxism patients; (2) in vitro, in silico, or finite element studies; (3) studies evaluating implant-supported restorations, dentures, veneers, inlays, or onlays; (4) studies without relevant clinical outcomes; and (5) non-primary studies such as reviews, opinion articles, and letters.

RESULTS

The results found in the searched database have been shown by PRISMA flow charts. Initial electronic searches identified 1140 articles in Google Scholar, 2 in PubMed, 8 in Scopus, and 266 in Science Direct. The total number of articles obtained was 671 ignoring 745 duplicate articles. After reading the titles and abstracts, another 661 articles were eliminated, because they did not meet the inclusion criteria or because they presented different subjects for the study, resulting in only 3 articles that met the criteria (Table 1).

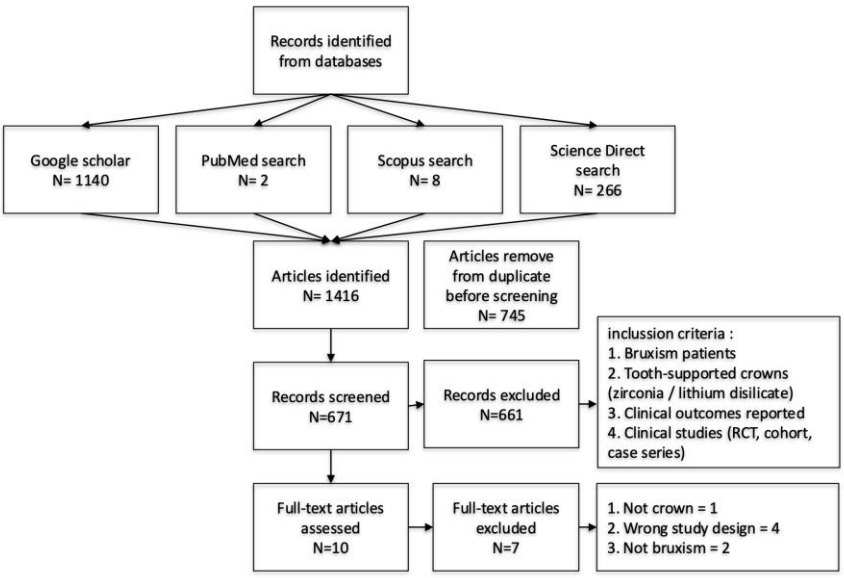

Figure 1. PRISMA flow chart for filtering article

Table 1. The article resulted from screening

Author (Year)	Study Design	Population	Sample Size	Intervention	Comparison	Follow-up	Outcomes Measured	Key Results	Main Findings
Hansen et al. (2018)	Observational case series	Heavy grinders with severe tooth wear (aesthetic zone)	13 patients, 84 crowns	Monolithic zirconia crowns	None	1–3 years (mean ~20 months)	Technical complications (chipping, fracture), biological findings, patient satisfaction	- 94% crowns without complications- 1 total fracture- Minor chipping in few cases- High patient satisfaction	Zirconia crowns showed low complication rates and high patient satisfaction in heavy grinders
[RCT] Ceramic Crowns & Sleep Bruxism (2023)	Randomized Clinical Trial	Patients with sleep bruxism (and control group)	~30 patients (divided into groups)	Zirconia crowns	Lithium disilicate crowns	1 year	Survival rate, success rate, technical complications	- Survival ~100%- No significant difference in complications- Low complication rate in all groups	No significant difference between zirconia and lithium disilicate in bruxism patients (short-term)
Zirconia clinical behavior (2019)	Prospective clinical study	Mixed population (including ~61.7% bruxism)	24 patients, 47 crowns	Monolithic zirconia crowns	None	Up to 2 years	Survival rate, success rate, complications	- High survival rate- Majority complications occurred in bruxism patients- Overall good clinical performance	Zirconia crowns perform well clinically, but complications more frequent in bruxism subgroup

DISCUSSION

Ceramic crowns have been widely used in restorative dentistry due to their favorable esthetic and biocompatible properties. However, their performance under parafunctional loading conditions such as bruxism remains a clinical concern. Bruxism is associated with significantly increased occlusal forces, which may exceed normal masticatory loads and contribute to restoration failure.[10–12] In addition, psychosocial and behavioral factors have also been implicated in the etiology of bruxism, further complicating its clinical management.

The findings of this review indicate that both zirconia and lithium disilicate crowns demonstrate acceptable short-term clinical performance in patients with bruxism. The included randomized clinical trial reported no significant difference between zirconia and lithium disilicate crowns in terms of survival rate and technical complications.[12] This suggests that both materials may be clinically reliable under increased occlusal load, at least in the short term.

Zirconia is known for its superior mechanical properties, including high fracture toughness and resistance to crack propagation, which contribute to its durability in high-stress environments.[13–16]These characteristics are supported by previous systematic reviews demonstrating high survival rates of all-ceramic restorations under functional loading conditions.[17,18] In addition, zirconia materials have undergone significant development in terms of translucency and classification, enabling their use in both anterior and posterior regions without compromising strength.[11]

In contrast, lithium disilicate offers excellent aesthetic properties and reliable adhesive bonding, with sufficient flexural strength to withstand functional loads. [14,19,20] Clinical studies have reported high survival rates and low complication rates for lithium disilicate crowns, making them a widely accepted restorative option. [14] Furthermore, advances in ceramic systems and bonding protocols have contributed to improved long-term performance of lithium disilicate restorations. [19,20]

Observational evidence included in this review also supports the clinical performance of zirconia crowns in bruxism patients. Hansen et al.[7] reported high patient satisfaction and low complication rates in heavy grinders, which is consistent with previous clinical findings.[7,21,22] However, this study was limited by a small sample size and lack of standardized diagnostic criteria for bruxism, which may affect the generalizability of the results.[2] Similarly, prospect clinical studies have demonstrated favourable outcomes for zirconia restorations, although a higher proportion of complications may occur in patients with bruxism due to increased occlusal load.[18] These findings are consistent with previous reports indicating that bruxism is a potential risk factor for mechanical complications in ceramic restorations.[5]

Despite these favourable findings, the overall level of evidence remains limited. Fracture behaviour and mechanical performance of ceramic materials have also been evaluated in laboratory and simulation studies. [23] Only one randomized clinical trial was identified, and the remaining studies were observational in nature. Furthermore, the follow-up periods were relatively short, ranging from 1 to 3 years, which limits the ability to draw conclusions regarding long-term durability. This is consistent with broader systematic reviews reporting variability in long-term outcomes of ceramic restorations.[24]

Another important consideration is that most included studies focused primarily on restoration survival and technical complications, while limited data are available regarding biological outcomes, antagonist wear, or temporomandibular effects. [24] These aspects are particularly relevant in bruxism patients, where excessive loading may affect not only the restoration but also the surrounding structures.

qIn addition, restorative success may also be influenced by clinical factors such as margin design and periodontal management. Proper handling of subgingival margins and adherence to biologically oriented preparation principles are essential to ensure long-term stability of ceramic restorations.[25,26]

Overall, the available evidence suggests that zirconia and lithium disilicate crowns are viable treatment options for bruxism patients; however, careful case selection, occlusal management, and long-term monitoring remain essential. Further well-designed clinical trials with larger sample sizes and longer follow-up periods are required to establish definitive clinical guidelines, as long-term clinical evidence remains inconsistent and limited.[27]

CONCLUSION

Within the limitations of this systematic review, zirconia and lithium disilicate crowns demonstrate acceptable short-term clinical performance in patients with bruxism. No significant differences between the two materials were observed in the available randomized clinical trial. However, the current evidence is limited by the small number of studies, predominance of observational designs, and short follow-up periods. Therefore, the results should be interpreted with caution. Further high-quality, long-term randomized clinical trials are needed to establish evidence-based recommendations for material selection in bruxism patients.

REFERENCE

1 Jamal S, Ghafoor R, Khan FR, Zafar K. Five year evaluation of the complications observed in porcelain fused to metal (PFM) crowns placed at a university hospital. J Pak Med Assoc 2020;70. https://doi.org/10.5455/JPMA.16442.

2 Vagropoulou GI, Klifopoulou GL, Vlahou SG, Hirayama H, Michalakis K. Complications and survival rates of inlays and onlays vs complete coverage restorations: A systematic review and analysis of studies. J Oral Rehabil 2018;45. https://doi.org/10.1111/joor.12695.

3 Aldhuwayhi S, Alauddin MS, Martin N. The Structural Integrity and Fracture Behaviour of Teeth Restored with PEEK and Lithium-Disilicate Glass Ceramic Crowns. Polymers (Basel) 2022;14. https://doi.org/10.3390/polym14051001.

4 Baldi A, Carossa M, Comba A, Alovisi M, Femiano F, Pasqualini D, et al. Wear Behaviour of Polymer-Infiltrated Network Ceramics, Lithium Disilicate and Cubic Zirconia against Enamel in a Bruxism-Simulated Scenario. Biomedicines 2022;10. https://doi.org/10.3390/biomedicines10071682.

5 Lan TH, Chen PH, Fok ASL, Chen YF. Contact fracture test of monolithic hybrid ceramics on different substrates for bruxism. Dental Materials 2022;38. https://doi.org/10.1016/j.dental.2021.10.010.

6 Mengatto CM, Coelhode-Souza FH, De Souza OB. Sleep bruxism: Challenges and restorative solutions. Clin Cosmet Investig Dent 2016;8. https://doi.org/10.2147/CCIDE.S70715.

7 Hansen TL, Schriwer C, Øilo M, Gjengedal H. Monolithic zirconia crowns in the aesthetic zone in heavy grinders with severe tooth wear – An observational case-series. J Dent 2018;72. https://doi.org/10.1016/j.jdent.2018.01.013.

8 Mohapatra A, Choudhury GK, Panda S, Dhar U. Current concept of bruxism and its treatment options. Indian Journal of Forensic Medicine and Toxicology 2020;14. https://doi.org/10.37506/ijfmt.v14i4.12960.

9 Thayer MLT, Ali R. The dental demolition derby: bruxism and its impact - part 3: repair and reconstruction. Br Dent J 2022;232. https://doi.org/10.1038/s41415-022-4293-8.

10 Kelly JR, Benetti P. Ceramic materials in dentistry: Historical evolution and current practice. Aust Dent J 2011;56. https://doi.org/10.1111/j.1834-7819.2010.01299.x.

11 Gibbs CH, Mahan PE, Lundeen HC, Brehnan K, Walsh EK, Holbrook WB. Occlusal forces during chewing and swallowing as measured by sound transmission. J Prosthet Dent 1981;46. https://doi.org/10.1016/0022-3913(81)90455-8.

12 Schmitter M, Bömicke W, Behnisch R, Lorenzo Bermejo J, Waldecker M, Rammelsberg P, et al. Ceramic Crowns and Sleep Bruxism: First Results from a Randomized Trial. J Clin Med 2023;12. https://doi.org/10.3390/jcm12010273.

13 Denry I, Kelly JR. State of the art of zirconia for dental applications. Dental Materials 2008;24. https://doi.org/10.1016/j.dental.2007.05.007.

14 Parra LEB, Fierro NC, Palencia PG. Lithium disilicate and zirconia as prosthetic restorative materials. International Journal of Applied Dental Sciences 2023;9. https://doi.org/10.22271/oral.2023.v9.i4c.1860.

15 Kongkiatkamon S, Rokaya D, Kengtanyakich S, Peampring C. Current classification of zirconia in dentistry: an updated review. PeerJ 2023;11. https://doi.org/10.7717/peerj.15669.

16 Sailer I, Makarov NA, Thoma DS, Zwahlen M, Pjetursson BE. All-ceramic or metal-ceramic tooth-supported fixed dental prostheses (FDPs)? A systematic review of the survival and complication rates. Part I: Single crowns (SCs). Dental Materials, vol. 31, 2015. https://doi.org/10.1016/j.dental.2015.02.011.

17 Gracis S, Thompson V, Ferencz J, Silva N, Bonfante E. A New Classification System for All-Ceramic and Ceramic-like Restorative Materials. Int J Prosthodont 2016;28. https://doi.org/10.11607/ijp.4244.

18 Pieger S, Salman A, Bidra AS. Clinical outcomes of lithium disilicate single crowns and partial fixed dental prostheses: A systematic review. Journal of Prosthetic Dentistry 2014;112. https://doi.org/10.1016/j.prosdent.2014.01.005.

19 Guess PC, Schultheis S, Bonfante EA, Coelho PG, Ferencz JL, Silva NRFA. All-ceramic systems: Laboratory and clinical performance. Dent Clin North Am 2011;55. https://doi.org/10.1016/j.cden.2011.01.005.

20 Stawarczyk B, Liebermann A, Rosentritt M, Povel H, Eichberger M, Lümkemann N. Flexural strength and fracture toughness of two different lithium disilicate ceramics. Dent Mater J 2020;39. https://doi.org/10.4012/dmj.2019-045.

21 Rinke S, Gersdorff N, Lange K, Roediger M. Prospective Evaluation of Zirconia Posterior Fixed Partial Dentures: 7-Year Clinical Results. Int J Prosthodont 2013;26. https://doi.org/10.11607/ijp.3229.

22 Lobbezoo F, Ahlberg J, Glaros AG, Kato T, Koyano K, Lavigne GJ, et al. Bruxism defined and graded: An international consensus. J Oral Rehabil 2013;40. https://doi.org/10.1111/joor.12011.

23 Manfredini D, Lobbezoo F. Role of psychosocial factors in the etiology of bruxism. J Orofac Pain 2009;23.

24 Zarone F, Di Mauro MI, Ausiello P, Ruggiero G, Sorrentino R. Current status on lithium disilicate and zirconia: A narrative review. BMC Oral Health 2019;19. https://doi.org/10.1186/s12903-019-0838-x.

25 Hudyono R, Fathurrahman H, Elok N, Anggarani W, Putranto R. Knife-Edge Modified Subgingival Crown Preparation: Dental Preparation According to Biological Principles. Odonto : Dental Journal 2024;11. https://doi.org/10.30659/odj.11.2.305-316.

26 Putra HB, Asrianti D. Optimization of Post-Endodontic Restoration: Strategies for Handling Deep Subgingival Margin through DME and Crown Lengthening. Odonto : Dental Journal 2025;12. https://doi.org/10.30659/odj.12.231-246.
27 Sailer I, Pjetursson BE, Zwahlen M, Hämmerle CHF. A systematic review of the survival and complication rates of all-ceramic and metal-ceramic reconstructions after an observation period of at least 3 years. Part II: Fixed dental prostheses. Clin Oral Implants Res 2007;18. https://doi.org/10.1111/j.1600-0501.2007.01468.x.