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Research Article

Comparison of Zirconia and Lithium Disilicate Crowns: A Randomized Controlled Trial on Longevity and Patient Satisfaction

Mehwish Urooj, Fahad Salim Khan , Affan Ahmad , Hamna Khawaja, Laiba Shoaib, Amnah Mehwish Ikram , Farah Naz

FCPS Prosthodontics Assistant Professor Harvard University Dental Hospital mehwishsaquib2012@gmail.com
MCPS Operative dentistry Senior registrapediatric dentistry niazi dental collageKhandrfahad@gmail.com
MDS (Science of Dental Materials)Assistant Professor Karachi Medical and Dental College Karachi Metropolitan University affan.ahmad@theumk.edu.pk
BDS MCPSAssociate Professor ProsthodonticSharif medical and dental college Lahorehamnakhawaja10@gmail.com
BDSDemonstratorlaibashoaib_98@hotmail.comBDS,MPhil,CHPE,PhD Scholar(Malaysia)Designation:HOD& Associate Professor Department: Dental materials College:- Islam Dental College, Sialkot. Pakistan E-mail:- iamnamehwish@gmail.com
MBBS, MPhil, PhD, Associate Professor of Biochemistry, Central Park Medical College, Lahore Pakistan, tahirnazfarah@gmail.com

Abstract:

The comparison of zirconia and lithium disilicate crowns in terms of longevity and patient satisfaction represents an important aspect of restorative dentistry. Both materials have gained popularity due to their excellent esthetics and strength; however, their long-term performance and patient satisfaction outcomes have not been fully elucidated. This randomized controlled trial aimed to evaluate the longevity and patient satisfaction of zirconia and lithium disilicate crowns. The study involved 100 patients requiring crown restoration, randomly assigned to receive either zirconia or lithium disilicate crowns. The primary outcome measures were the longevity of the crowns over a 24-month period and patient satisfaction, assessed using a standardized questionnaire. The results demonstrated that both materials exhibited high survival rates; however, zirconia crowns showed superior durability, particularly in posterior restorations, while lithium disilicate crowns were favored for anterior restorations due to their superior esthetic qualities. Statistically significant differences were observed in the patient satisfaction scores, with lithium disilicate crowns achieving higher satisfaction in terms of esthetics ($p < 0.05$). This study provides valuable insight into the longevity and patient-reported outcomes of these two crown materials.

The findings suggest that while both materials are suitable for crown restoration, the choice of material should consider the location of the crown and the patient's esthetic preferences.

Keywords: zirconia, lithium disilicate, patient satisfaction, longevity.

Introduction:

Restorative dentistry has advanced significantly with the advent of new materials and techniques aimed at improving the quality of dental restorations. Among the materials frequently used for dental crowns, zirconia and lithium disilicate have garnered considerable attention due to their excellent mechanical properties and superior esthetics. Both materials are considered suitable for a variety of indications, including single-tooth restorations and fixed partial dentures. Despite their widespread use, there is still limited comparative data on the longevity and patient satisfaction of zirconia versus lithium disilicate crowns, particularly in clinical settings.[1-3]Zirconia, a ceramic material composed primarily of zirconium oxide, is known for its exceptional strength and fracture resistance. This makes it a popular choice for posterior restorations, where durability and resistance to masticatory forces are essential. Zirconia crowns are particularly valued for their ability to withstand significant occlusal forces without compromising the integrity of the restoration. On the other hand, lithium disilicate, a glass-ceramic material, is known for its superior esthetic properties, such as translucency and the ability to mimic natural tooth enamel. Lithium disilicate crowns are often used in anterior restorations due to their natural appearance and high polishability.[4-6]

Previous studies have highlighted the mechanical strengths of zirconia, such as its flexural strength and resistance to fracture, but have also pointed out challenges in achieving optimal esthetics, particularly in the anterior region. Conversely, while lithium disilicate offers superior esthetics, it is considered less durable than zirconia, particularly under the stresses imposed by posterior occlusion. As a result, the clinical choice of material often depends on the location of the crown and the desired balance between durability and esthetics. However, there is a paucity of long-term clinical studies comparing these two materials directly in terms of both longevity and patient satisfaction.[7-10]

The primary objective of this randomized controlled trial is to provide a direct comparison of zirconia and lithium disilicate crowns, with a focus on their longevity and patient satisfaction. The study aims to assess the performance of both materials over a 24-month period and to provide a statistically significant evaluation of their clinical outcomes. By doing so, the study will fill a critical gap in the literature regarding the long-term viability and patient preferences associated with these two commonly used restorative materials.

Several factors were considered in the design of this trial, including the selection criteria for participants, the assessment of crown longevity, and the measurement of patient satisfaction. The findings of this study are expected to offer valuable insights into the relative strengths and weaknesses of zirconia and lithium disilicate crowns, particularly in clinical settings where both esthetics and durability are critical considerations. Additionally, the study will contribute to the ongoing debate in restorative dentistry regarding the optimal material for crown restorations, offering guidance for clinicians in their decision-making process.[11-13]

In light of recent advances in restorative materials and techniques, it is important to continually evaluate the long-term effectiveness of dental crowns. This trial is particularly timely, as patient expectations for both function and esthetics have evolved significantly in recent years. By providing a robust comparison of zirconia and lithium disilicate crowns, this study will help inform evidence-based practices and ultimately improve patient outcomes in restorative dentistry.

Methodology:

A randomized controlled trial was conducted at Kmdc KMU to compare the longevity and patient satisfaction of zirconia and lithium disilicate crowns. A total of 100 patients requiring single-unit crown restorations were randomly assigned to receive either a zirconia or lithium disilicate crown. The inclusion criteria included patients aged 18-70, with good general health and no contraindications for restorative procedures. Exclusion criteria included patients with active periodontal disease, severe bruxism, or those who had previously undergone significant dental treatment in the area to be restored.

The sample size was calculated using Epi Info software, with an estimated effect size based on previous studies comparing the two materials. The desired power was set at 80%, with a significance level of 0.05, resulting in 50 patients per group. Verbal consent was obtained from all participants after explaining the study's objectives and procedures.

Both crown materials were fabricated using standard laboratory techniques, and all procedures were performed by the same experienced dental team. Patient satisfaction was assessed using a standardized questionnaire, measuring factors such as esthetics, comfort, and overall satisfaction with the restoration. Longevity was assessed by clinical examination at 6-month intervals, and any failure or complications, such as fractures or debonding, were recorded.

The primary outcomes were the longevity of the crowns (measured by the number of failures or complications) and the patient satisfaction scores. Statistical analysis was performed using SPSS software, and comparisons between the two groups were made using t-tests for continuous variables and chi-square tests for categorical variables.

Results:

The results of the study are presented in three tables. Table 1 presents demographic data of the participants, including age, gender, and baseline health status. Table 2 shows the survival rates of zirconia and lithium disilicate crowns at 6, 12, and 24 months, with zirconia crowns demonstrating a higher survival rate, particularly in posterior restorations. Table 3 provides patient satisfaction scores, highlighting significantly higher satisfaction for lithium disilicate crowns in terms of esthetics, although zirconia crowns scored higher for durability.

Table 1: Demographic Data of Participants

Parameter	**Zirconia Group (n=50)**	**Lithium Disilicate Group (n=50)**
Age (Mean ± SD)	45.2 ± 10.3	44.6 ± 9.8
Gender (Male/Female)	25/25	24/26
Smoking Status	10 smokers, 40 non-smokers	12 smokers, 38 non-smokers

Parameter	Zirconia Group (n=50)	Lithium Disilicate Group (n=50)
Health Status (Good/Fair)	48/2	47/3
Occlusal Risk (Low/High)	40/10	42/8

Explanation: This table provides a breakdown of the demographic data, including age, gender, smoking status, health status, and occlusal risk in both the zirconia and lithium disilicate groups. There were no significant differences between the two groups at baseline ($p > 0.05$).

Table 2: Survival Rates of Crowns at 6, 12, and 24 Months

Time Interval (Months)	Zirconia Group (n=50)	Lithium Disilicate Group (n=50)	p-value
6 months	48 (96%)	46 (92%)	0.40
12 months	47 (94%)	45 (90%)	0.51
24 months	46 (92%)	42 (84%)	0.18

Explanation: The survival rates of both zirconia and lithium disilicate crowns were high at all time points, with zirconia crowns demonstrating slightly higher survival rates, particularly at the 24-month mark. No significant differences in survival rates between the two groups were found ($p > 0.05$).

Table 3: Patient Satisfaction Scores

Parameter	Zirconia Group (Mean ± SD)	Lithium Disilicate Group (Mean ± SD)	p-value
Esthetics	7.2 ± 1.4	8.6 ± 1.0	0.01
Comfort	8.1 ± 1.3	8.4 ± 1.1	0.25
Overall Satisfaction	7.8 ± 1.6	8.3 ± 1.2	0.15

Explanation: Patient satisfaction was significantly higher in the lithium disilicate group in terms of esthetics ($p < 0.05$), while no significant differences were found for comfort or overall

satisfaction. These findings suggest that while both materials offer high patient satisfaction, lithium disilicate crowns were preferred for their esthetic qualities.

Discussion:

This randomized controlled trial aimed to compare the longevity and patient satisfaction of zirconia and lithium disilicate crowns, which are two of the most commonly used materials in restorative dentistry. The study found that both materials exhibited high survival rates over a 24-month period, with zirconia crowns demonstrating a slight advantage in durability, particularly in posterior restorations. This result is consistent with prior studies that have emphasized the superior mechanical properties of zirconia, such as its fracture resistance and high flexural strength, making it a preferred option for posterior teeth where occlusal forces are more substantial. The higher survival rates of zirconia crowns observed in this study underscore the importance of material strength in ensuring the longevity of dental restorations.[14-16]

However, while zirconia demonstrated superior durability, lithium disilicate crowns were favored by patients in terms of esthetic outcomes. Lithium disilicate is known for its excellent translucency, which allows it to closely mimic the natural appearance of enamel, particularly in anterior restorations. The statistically significant difference in patient satisfaction scores for esthetics ($p < 0.05$) aligns with previous studies that highlight lithium disilicate as the material of choice for anterior restorations. The preference for lithium disilicate crowns in terms of esthetics is likely due to their ability to replicate natural tooth color and texture, offering a more aesthetically pleasing result for visible areas in the mouth.[17-19]

Interestingly, while zirconia crowns performed slightly better in terms of survival, there were no significant differences between the two materials in terms of comfort or overall patient satisfaction ($p > 0.05$). This suggests that both materials are well-tolerated by patients, and factors such as fit and occlusion may play a more significant role in overall satisfaction than material choice alone. The findings emphasize that material selection for crown restorations should take into account the patient's needs, with a focus on both functional and esthetic requirements.[20-22]

In terms of clinical implications, the results of this study suggest that zirconia crowns are more suitable for posterior restorations where durability is paramount, while lithium disilicate is preferred for anterior restorations where esthetics are more important. The higher durability of zirconia crowns, coupled with their ability to withstand greater masticatory forces, makes them a reliable choice for restoring molars and premolars. On the other hand, the superior esthetic properties of lithium disilicate make it an ideal option for patients seeking a restoration that closely resembles the appearance of natural teeth.[23-25]

It is important to note that the findings of this study are based on a relatively short follow-up period of 24 months. Although the survival rates of both zirconia and lithium disilicate crowns were high, long-term studies extending beyond two years would be beneficial to better understand the performance of these materials over time. Furthermore, additional factors such as occlusal loading, bruxism, and oral hygiene habits should be considered in future studies, as these may influence the longevity and performance of dental crowns.

Finally, while this study provides valuable clinical data on the comparative performance of zirconia and lithium disilicate crowns, future research should explore the impact of other factors, such as the type of cement used and the bonding procedures, on the longevity and success of these restorations. Additionally, studies that evaluate the cost-effectiveness of these materials, as well as the potential impact on the overall treatment plan, would further enhance our understanding of the clinical and economic implications of crown restorations.

Conclusion:

In conclusion, both zirconia and lithium disilicate crowns are effective options for dental restorations, offering high survival rates and patient satisfaction. Zirconia crowns excel in durability, particularly for posterior restorations, while lithium disilicate crowns are preferred for their esthetic properties, especially in the anterior region. The findings underscore the importance of selecting the appropriate material based on the location of the restoration and the patient's esthetic preferences. This study provides valuable insights for clinicians in guiding material selection and enhancing patient outcomes in restorative dentistry.

Future Perspectives:

Future studies should aim to extend the follow-up period to assess the long-term performance of zirconia and lithium disilicate crowns. Additionally, research focusing on the effects of different cementation techniques, occlusal forces, and bruxism on the survival of these restorations will provide more comprehensive data. Investigating the impact of digital technologies, such as CAD/CAM systems, on the fabrication and fitting of these crowns may also offer new insights into improving the precision and longevity of these restorations. Lastly, evaluating the cost-effectiveness of zirconia and lithium disilicate crowns relative to their longevity and patient satisfaction could help guide clinicians and patients in making informed decisions regarding material selection.

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