CODEN [USA]: IAJPBB ISSN: 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES

http://doi.org/10.5281/zenodo.3559048

Available online at: http://www.iajps.com Research Article

ANALYSIS OF EFFECT OF DIFFERENT CLEANSING AGENTS AND ADHESIVE RESINS ON BOND STRENGTH OF CONTAMINATED ZIRCONIA

Dr Muhammad Usman[1], Dr Sonera Noor[1], Dr Anum Mansoor[1]

[1]House Officer at Punjab Dental Hospital, Lahore

Abstract:

Introduction: *The performance and longevity of indirect restorations can be affected by several factors, such as preparation design/coarseness, provisional luting agent, cleansing protocol, fit of the definitive restoration, and type of the definitive luting agent.* ***Aims and objectives:*** *The basic aim of the study is to analyse the effect of different cleansing agents and adhesive resins on bond strength of contaminated zirconia.* ***Material and methods:*** *This descriptive study was conducted in Punjab Dental Hospital, Lahore during January 2019 to July 2019. The data was collected from both male and female patients. All specimens were then sintered in ceramic and zirconia sintering furnaces according to the manufacturers' firing instructions. A total of 100 cylindirical specimens with a diameter of 1mm and 3mm height were obtained from a composite resin. Subsequently, ceramic and composite resin specimens were ultrasonically cleaned in ethanol series and deionized water for 15 min, respectively. Surfaces of all specimens were wetpolished with 800-grit silicon carbide paper.* ***Results:*** *The data was collected from 100 patients. Mean SBS values for E ceramic group were observed as C:14,9±6, S1:12,1±6,9, S2:19,4±7,2 and S3:19,5±7,5 while for Z group, 7,3±10,7, 15,7±4,8, 17,3±5,5, and 17,1±7,3, respectively (P>.05). EX ceramic surface cleaning with S3 regimen resulted in significantly higher SBS values than C, S1 and S2.* ***Conclusion:*** *It is concluded that cleaning application on lithium disilicate saliva-contaminated ceramic surface had a significant influence on resin-ceramic bond strength increase.*

Corresponding author:

Muhammad Usman,

House Officer at Punjab Dental Hospital, Lahore

QR code

Please cite this article in press Muhammad Usman et al., ***Analysis Of Effect Of Different Cleansing Agents And Adhesive Resins On Bond Strength Of Contaminated Zirconia,*** *Indo Am. J. P. Sci, 2019; 06(11).*

INTRODUCTION:

The performance and longevity of indirect restorations can be affected by several factors, such as preparation design/coarseness, provisional luting agent, cleansing protocol, fit of the definitive restoration, and type of the definitive luting agent. The main objective of restorative procedures is to obtain an adaptation as close as possible between the restorative material and the tooth structure to avoid the presence of gaps and consequent microleakage [1]. Resin-based dental luting cements can infiltrate into the dentinal tubules and exposed collagen network to promote a micromechanical interlock.

Also, because of the tooth-colored appearance, minimal solubility, biocompatibility, and strengthening effects to the remaining dental structure provided by resin luting materials, their use has been increasing over the past decade [2]. Despite the positive aspects of resin luting cements, the main disadvantage of the adhesive cementation technique is the number of steps involved in the luting protocol. For longer than 20 years, conventional resin cements have been used in conjunction with dentin bonding agents; this has resulted in a multistep application technique that is considered time-consuming and technique-sensitive [3].

Also, the discrepancy between the depth of acid etching and resin infiltration can lead to postoperative sensitivity and hydrolytic degradation because of the large area of collagen fibrils exposed but not encapsulated by the bonding resin [4]. A resin cement that combines pre-treatment of dental tissues and resin infiltration in a single application would be advantageous because it may overcome some of the limitations associated with a multistep technique. The introduction of self-adhesive resin cements was a major advance in dental adhesive cementation early in the decade, because they do not require additional steps of etching, priming, or bonding; instead, their application is accomplished through a single clinical step, which allows the clinician to use a cementation protocol very similar to that used with conventional zinc-phosphate and polycarboxylate cements [5]. Self-adhesive cements are based on multifunctional phosphoric acid methacrylates, which demineralize and infiltrate the tooth structure, resulting in micromechanical retention [6].

Aims and objectives

The basic aim of the study is to analyse the effect of different cleansing agents and adhesive resins on bond strength of contaminated zirconia.

MATERIAL AND METHODS:

This descriptive study was conducted in Punjab Dental Hospital, Lahore during January 2019 to July 2019. The data was collected from both male and female patients. All specimens were then sintered in ceramic and zirconia sintering furnaces according to the manufacturers' firing instructions. A total of 100 cylindirical specimens with a diameter of 1mm and 3mm height were obtained from a composite resin. Subsequently, ceramic and composite resin specimens were ultrasonically cleaned in ethanol series and deionized water for 15 min, respectively. Surfaces of all specimens were wetpolished with 800-grit silicon carbide paper. Three surfaces of cubic ceramic specimens were contaminated with fresh human saliva obtained from a healthy female donor who had not consumed any food or drinks 1.5 hrs before sample collection and surface was used as control.

Statistical analysis

Hospital-based clinical data were presented in the form of number and percentage through tables and graphs. Statistical analysis was done by SPSS Version 20.0.

RESULTS:

The data was collected from 100 patients. Mean SBS values for E ceramic group were observed as C:14,9±6, S1:12,1±6,9, S2:19,4±7,2 and S3:19,5±7,5 while for Z group, 7,3±10,7, 15,7±4,8, 17,3±5,5, and 17,1±7,3, respectively (P>.05). EX ceramic surface cleaning with S3 regimen resulted in significantly higher SBS values than C, S1 and S2.

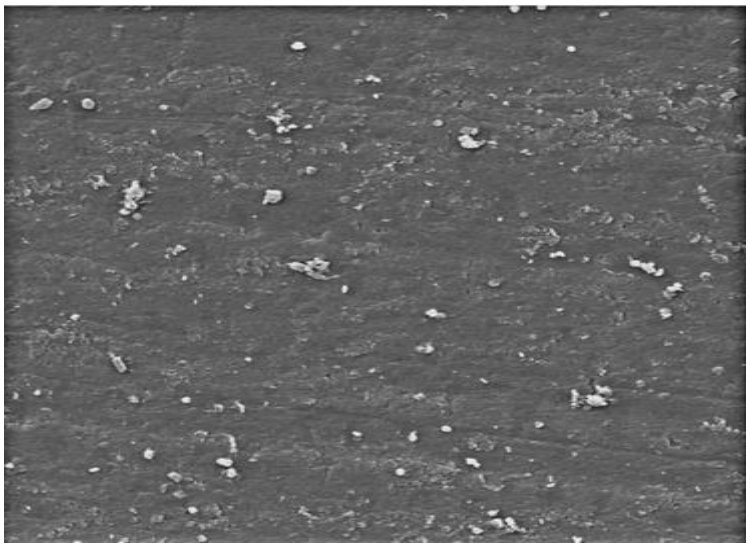

Figure 01: *SEM micrograph of dentin surface after cleansing treatment: G2—0.12% chlorhexidine digluconate*.

DISCUSSION:

The use of dentin-cleaning techniques to avoid any contaminants along the dentin-cement interface to improve the bond strength of self-adhesive luting systems to the dentin surface seems to be a desirable procedure. In the present study, chemical and mechanical cleansing protocols were tested using shear forces, because shear stress tends to provide a better representation of the forces capable of displacing crowns in the oral environment when compared with tensile stress [7]. Furthermore, the shear bond test is considered a reliable and convenient method of accessing the bond strength of luting materials.

It was hypothesized that different dentin-cleansing techniques would yield statistically significant differences in shear bond strength values of a self-adhesive resin cement to dentin [8]. Results of this study partially support the hypothesis, in that a significant difference in shear bond strength was observed between group 5 (aluminum oxide) and all other groups. The use of aluminum oxide particles significantly improved the bond strength of a self-adhesive cement to dentin (p<0.05) [9]. Particle abrasion using aluminum oxide particles is a dentin cleansing technique that has only recently regained attention in operative dentistry. It is a relatively old technique that is widely used by prosthodontists and dental technicians to increase surface roughness and enhance adhesion. Specimens abraded with aluminum oxide showed the highest shear bond strength values compared with any other cleansing technique. This result is consistent with a previous study showing significantly higher bond strength when aluminum oxide particles were used for dentin surface treatment before indirect restorations were cemented with a self-adhesive resin luting cement, compared with pumice and hand instruments [10].

In their study, tooth surfaces were treated with 50 and 27 µm aluminum oxide particles. Investigators observed that although the smaller particles promoted a more retentive pattern, particle size did not significantly influence bond strength. In the present study, 50 µm aluminum oxide particles were used and presented significantly higher bond strength compared with all other groups [11].

CONCLUSION:

It is concluded that cleaning application on lithium disilicate saliva-contaminated ceramic surface had a significant influence on resin-ceramic bond strength increase.

REFERENCES:

1. Blatz MB, Sadan A, Kern M. Resin-ceramic bonding: a review of the literature. J Prosthet Dent 2003;89:268–74.
2. Thompson J, Stoner B, Piascik J, and Smith R. Adhesion/cementation to zirconia and other non-silicate ceramics: Where are we now? Dent Mater, 2011; 27(1):71– 82
3. Denry I, Kelly JR. State of the art of zirconia for dental applications. Dent Mater 2008; 24:299-307.
4. Yang B, Wolfart S, Scharnberg M, Ludwig K, Adelung R, Kern M. Influence of contamination on zirconia ceramic bonding. J Dent Res 2007;86:749-53.
5. Özcan M, Dündar M, Çömlekoğlu ME. Adhesion concepts in dentistry: tooth and material aspects. J Adhes Scie and Technol 2012;0(online article first):1-21.

6. Amaral R, Özcan M, Valandro LF, Balducci I, and Bottino MA. Effect of conditioning methods on the microtensile bond strength of phosphate monomerbased cement on zirconia ceramic in dry and aged conditions. J Biomed Mater Res B Appl Biomater, 2008;85:1-9.
7. Zhang Y, Lawn BR, Malament KA, Van Thompson P, Rekow ED. Damage accumulation and fatigue life of particle-abraded ceramics. Int J Prosthodont 2006;19:442–8.
8. Cura C, Özcan M, Isik G, Saracoglu A. Comparison of alternative adhesive cementation concepts for zirconia ceramic: glaze layer vs zirconia primer. J Adhes Dent 2012;14:75-82.
9. Zhang S, Kocjan A, Lehmann F, Kosmacˇ T, Kern M. Influence of contamination on resin bond strength to nano-structured alumina-coated zirconia ceramic. Eur J Oral Sci 2010; 118: 396–403.
10. Piwowarczyk A, Lauer HC, Sorensen JA. In vitro shear bond strength of cementing agents to fixed prosthodontic restorative materials. J Prosthet Dent 2004;92: 265–73.
11. Eiriksson SO, Pereira PN, Swift EJ Jr, Heymann HO, Sigurdsson A. Effects of saliva contamination on resin-resin bond strength. Dent Mater 2004;20:37–44.