

Investigation of the Effect of Using Cavity Disinfectant Before Cementation of CAD/CAM Blocks on Shear Bond Strength

CAD/CAM Blokların Simantasyonundan Önce Kavite Dezenfektanı Kullanımının Makaslama Bağlanma Dayanımı Üzerindeki Etkisinin İncelenmesi

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ABSTRACT

Objective: The aim of this study was to investigate the effect of cavity disinfectant application on the shear bond strength of current Computer Aided Design/Computer Aided Manufacturing (CAD/CAM) blocks to dentin.

Methods: Samples of three CAD/CAM blocks, Celtra Duo, Vita Enamic, and Tetric CAD (2x3x3 mm) were obtained from each material under water cooling. Chlorhexidine digluconate (CHX) was applied to half of the samples, while the other half remained untreated. Variolink DC and Variolink LC resin cements were used to bond the blocks to the teeth. All samples underwent testing to measure shear bond strength. Fracture failure patterns were examined using a stereomicroscope. Statistical analysis was performed using a two-way analysis of variance (ANOVA).

Results: Celtra Duo exhibited the highest bond strength, while composite block showed the lowest bond strength value ($P<.05$). The use of CHX resulted in a decrease in the SBS of the Tetric CAD in samples cemented with Variolink DC ($P<.05$), but there was no statistically significant difference observed in the bond strength of the Vita Enamic and Celtra Duo ($P<.05$). CHX application decreased the SBS in all blocks in the Variolink LC cemented samples ($P<.05$).

Conclusion: The results of the study showed that cavity disinfectants had a mostly negative effect on the bonding of CAD/CAM blocks to dentin.

Keywords: Adhesive dentistry, CAD/CAM, chlorhexidine, resin cement

ÖZ

Amaç: Bu çalışmanın amacı, kavite dezenfektanı uygulamasının mevcut Bilgisayar Destekli Tasarım/Bilgisayar Destekli Üretim (CAD/CAM) bloklarının dentine makaslama bağlanma dayanımı üzerindeki etkisini araştırmaktır.

Yöntemler: Celtra Duo, Vita Enamic ve Tetric CAD (2x3x3 mm) olmak üzere üç CAD/CAM bloğundan su soğutması altında örnekler elde edildi. Örneklerin yarısına klorheksidin diglukonat (CHX) uygulanırken, diğer yarısına işlem uygulanmadı. Blokların simantasyonunda Variolink DC ve Variolink LC rezin simanları kullanıldı. Tüm örnekler makaslama bağlanma dayanımını ölçmek için teste tabi tutuldu. Kırılma başarısızlık paternleri bir stereomikroskop kullanılarak incelendi. İstatistiksel analiz iki yönlü varyans analizi (ANOVA) kullanılarak yapıldı.

Bulgular: Celtra Duo en yüksek bağlanma dayanımı değerini sergilerken, Tetric CAD en düşük bağlanma dayanımı değerini göstermiştir ($P<.05$). CHX kullanımı Variolink DC ile simante edilen örneklerde Tetric CAD'in bağlanma dayanımında azalmaya neden olurken ($P<.05$), Vita Enamic ve Celtra Duo'nun bağlanma dayanımında istatistiksel olarak anlamlı bir fark gözlenmemiştir ($P<.05$). CHX uygulaması, Variolink LC ile simante edilen örneklerdeki tüm bloklarda bağlanma dayanımını azaltmıştır ($P<.05$).

Sonuç: Çalışmanın sonuçları kavite dezenfektanlarının CAD/CAM bloklarının dentine bağlanması üzerinde çoğunlukla olumsuz bir etkiye sahip olduğunu göstermiştir.

Anahtar Kelimeler: Adeziv diş hekimliği, CAD/CAM, klorheksidin, rezin siman

INTRODUCTION

In dentistry, Computer Aided Design/Computer Aided Manufacturing (CAD/CAM) technology simplifies the production process of indirect restorations and enables the creation of aesthetic and tooth-compatible restorations.¹ After the data of a tooth to be restored is transferred to the computer environment using



intraoral scanners, the digitally designed restorations are fabricated from various blocks using the system's integrated milling devices.¹ Feldspathic ceramics, lithium disilicate reinforced glass ceramics, leucite reinforced glass ceramics, nanoceramics, hybrid ceramics, and zirconia-reinforced lithium silicate ceramics are used in CAD/CAM systems.²

With the improvements in adhesive dentistry, resin cements are frequently used for the cementation process of indirect restorations. The strong adhesive bond of resin cement to dental tissues plays a critical role in providing material retention, reducing postoperative sensitivity, and improving the fracture strength of restored teeth.³ Therefore, a strong bond at the tooth/restoration interface is recommended for the long-term successful clinical performance of indirect restorations.⁴

Disinfection of the tooth surface with an antimicrobial agent is beneficial in the elimination of the harmful effects of bacterial microleakage.⁵ Chlorhexidine digluconate (CHX) acts on both gram-positive and gram-negative microorganisms.⁶ Because of its antimicrobial effect, CHX has been suggested to be applied to the cavity before restoration placement.⁷ CHX is a potent matrix metalloproteinase (MMP) inhibitor in addition to its antibacterial activity.⁸ MMPs in dentin have been shown to be involved in the degradation of unprotected collagen fibrils within the hybrid layer. Therefore, CHX may play a role in the longevity of resin bonding to dentin.⁹ The application of CHX has been found to significantly inhibit endogenous collagenolytic activity in dentin, which is responsible for the degradation of dentin collagen fibrils and resin-dentin bonds over time.¹⁰

The bonding of resin cements to CAD/CAM blocks has been examined in many previous studies.^{11–13} However, there is a dearth of research investigating the use of cavity disinfectants in the bonding of CAD/CAM blocks with adhesive resin cements. The present study's objective was to look into the impact of cavity disinfection on shear bond strength (SBS) prior to cementation of CAD/CAM blocks with adhesive resin cements. The null hypothesis of the present study is that the use of cavity disinfectant prior to cementation of CAD/CAM blocks with adhesive resin cements will not affect the SBS.

METHODS

Ethics committee approval was obtained from the Gülhane Scientific Research Ethics Committee of the University of Health Sciences (Date: 11.03.2021, Number: 46418926)

The sample size required for the study was calculated for the F test with the G*Power 3.1 program by taking $\beta=0.80$, $\alpha<0.05$ and the effect size=0.40 as a result of the literature research (thesis proposal, article, bibliography) and it was concluded that it should be at least 66 in total. The number of samples in the study was planned as 84 teeth in total ($n=7$ in each group).

Three different CAD/CAM blocks were used in the study: zirconia-reinforced glass ceramic block (Celtra Duo, Dentsply Sirona, USA), polymer infiltrated resin ceramic block (Vita Enamic, VITA Zahnfabrik, Germany), and composite block (Tetric CAD, Ivoclar Vivadent, Schaan, Liechtenstein). Dual-cure resin cement (Variolink DC, Ivoclar Vivadent, Schaan, Liechtenstein) and light-cure resin cement (Variolink LC, Ivoclar Vivadent, Schaan, Liechtenstein) were used for the cementation of the blocks. 2% chlorhexidine (Bisco Cavity Cleanser, Inc., Schaumburg, IL, USA) was used as a cavity disinfectant. Table 1 lists the materials used in the study.

Table 1. Materials and characteristics used in the study

Material type	Materials (Code)	Lot number	Composition by weight	Manufacturer
Resin-based (hybrid ceramic)	Vita Enamic	9130	86% ceramic (SiO ₂ , Al ₂ O ₃ , Na ₂ O, K ₂ O, ZrO ₂ , 14%	Vita Zahnfabrik, Germany
Resin-based (composite)	Tetric CAD	45236	Bis-GMA, Bis-EMA, TEGDMA, UDMA, Bariumglass, Aluminiumglass, SiO ₂ glass	Ivoclar Vivadent, Switzerland
Zirconia-reinforced lithium silicate (ZLS)	Celtra DUO	6006448	SiO ₂ , Li ₂ O, ZrO ₂ (~10%), P ₂ O ₅ , Al ₂ O ₃ , K ₂ O, CeO ₂ , pigments	Dentsply Sirona, USA
Dual-cure resin cement	Variolink Esthetic DC	014B1	Monomers: Urethane dimethacrylate, methacrylate. Fillers: ytterbium trifluoride and pteroid mixed oxide initiators, stabilizers, and pigments.	Ivoclar Vivadent, Switzerland
Light-cure resin cement	Variolink Esthetic LC	019X1	Monomers: UDMA, Bis-GMA, HEMA, TEGDMA, GDMA. Fillers: ytterbium trifluoride and spheroid mixed oxide. Initiator and stabilizers: Ivocerin, and thiocarbamide hydroperoxide	Ivoclar Vivadent, Switzerland
Cavity disinfectant	Bisco Cavity Cleanser	1900000744	2% CHX Digluconate	Bisco, USA
Primer	Monobond Plus	0199J	Phosphoric acid methacrylate, silane methacrylate, sulfide methacrylate, alcohol	Ivoclar Vivadent, Switzerland
Adhesive resin	Adhese Universal	Z014J2	Methacrylates, ethanol, water, highly dispersed silicon dioxide, initiators, and stabilizers	Ivoclar Vivadent, Switzerland
Hydrofluoric acid	Ultradent Porcelain Etch	BNYZ6	5% Hydrofluoric acid	Ultradent Products Inc, USA

Bis-EMA, bisphenol A polyethylene glycol diether dimethacrylate; Bis-GMA, bisphenol A diglycidylmethacrylate; TEGDMA, triethylene glycol dimethacrylate; UDMA, urethane dimethacrylate; HEMA, Hydroxyethyl methacrylate; GDMA, glycerol-dimethacrylate

Storage of Teeth

In the study, 84 intact molar teeth extracted for different reasons in the last 3 months were used. The calculus and remaining tissues on the teeth were removed with hand tools. Until testing, they were kept in a saline solution at room temperature. The solution was changed regularly each week.

Preparation of the CAD/CAM Block Materials

Twenty-eight rectangular prismatic samples, each 2 mm thick and 3 x 3 mm in size, were cut from the blocks used in the study using a precision cutting device (Micracut 201, Metkon Instrument Inc., USA). The 28 samples were then split into four groups at random based on their bonding characteristics with two different resin cements as well as their disinfection with cavity disinfectant. A schematic view of the groups is shown in Figure 1.

Preparation of Teeth

With the occlusal surface parallel to the horizontal plane, the teeth were embedded in acrylic blocks. Flat dentin surfaces were obtained by grinding the cusps with a low-speed diamond saw (Isomet, Buehler LTD, Lake Bluff, IL, USA) under water cooling. The exposed dentin surfaces were then abraded with a 600-grit silicon carbide abrasive paper disks (3M ESPE, St. Paul, MN, USA) to form a standard smear layer. Half of the tooth samples were treated with 2% CHX with a microbrush for 20 s and air-dried for 10 s, while the other half were left untreated.

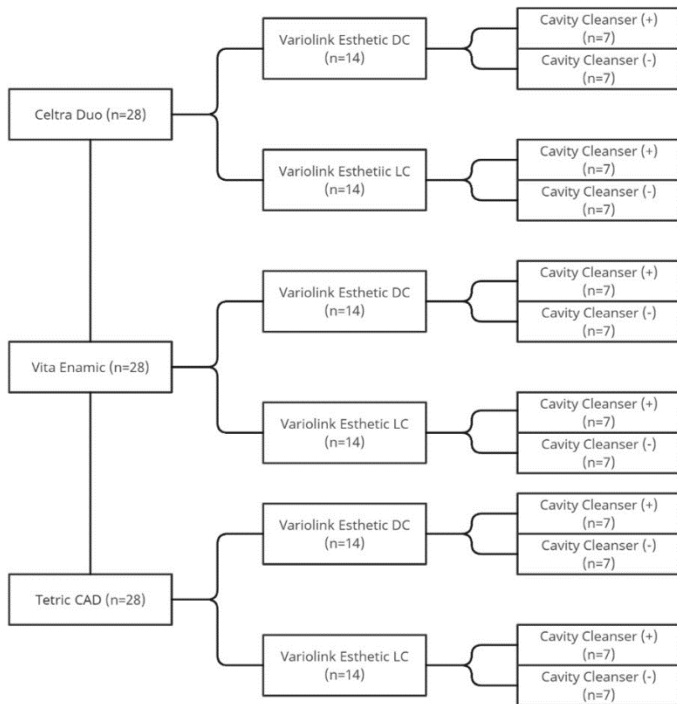


Figure 1. A schematic view of the groups

Cementation Procedures

5% hydrofluoric acid (Ultradent Porcelain Etch, Ultradent Products Inc, USA) was used to etch the blocks. The Vita Enamic (VE) blocks were etched for 60 seconds, while the Celtra Duo (CD) blocks were etched for 30 seconds. The bonding surfaces of Tetric CAD (TCAD) blocks were sandblasted with 25-50 μm aluminum oxide at 1.5 bar pressure (Aquacare, Velopex, London, UK). After sandblasting, they were cleaned with an ultrasonic cleaner (Easyclean, Renfert, IL, USA). The primer (Monobond Plus, Ivoclar Vivadent, Schaan, Liechtenstein) was applied to the pretreated surfaces of the blocks with a microbrush, left to act for 60 seconds, and then dispersed with an airflow.

Universal adhesive (Adhese Universal, Ivoclar Vivadent, Schaan, Liechtenstein) was applied to the dentin surfaces of all tooth samples for 20 seconds, dispersed with compressed air, it was light-cured (DTE O-light plus, Woodpecker, Guangxi, China) at 1000 mW/ cm^2 for 10 seconds. Variolink Esthetic DC was applied to half of the teeth and Variolink Esthetic LC was applied to the other half. CAD/CAM block samples were placed and fixed, and a brush was used to wipe the excess. It was polymerized with a 1000 mW/ cm^2 light sources.

Thermo-cycle Procedure

After cementation of the CAD/CAM blocks to the teeth, all samples were stored in distilled water at 37 $^{\circ}\text{C}$ for 24 h and then thermocycled (Thermocycler, SD Mechatronic, Westerham, Germany) 1000 times between 5 $^{\circ}\text{C}$ and 55 $^{\circ}\text{C}$ (20 seconds dwell time) prior to testing.

Shear Bond Strength Test

Samples were tested at a crosshead speed of 1.0 mm/min to failure using a universal testing machine (Lloyd Universal Testing Machine LRx; Lloyd Instruments) for the SBS. The values of SBS were calculated in megapascals (MPa) by dividing the maximum load at failure (N) by the bond area (mm^2).

Fracture Analysis

The fracture types of all samples were analysed using a stereomicroscope (Leica MZ12, Heerbrugg, Switzerland) at 25x magnification and were classified into three groups: cohesive failure, adhesive failure, and mixed failure.

Statistical Analysis

Statistical Package for the Social Sciences (IBM SPSS Corp., Version 22, Armonk, NY, USA) was used for statistical analysis. A two-way analysis of variance (ANOVA) was used to evaluate the results, and the Tukey test was used to compare the differences between groups in multiple comparisons. The statistical significance level was set at $P < .05$.

RESULTS

The results of the two-way ANOVA analysis on the effect of cavity disinfectant used on the SBS of CAD/CAM blocks are presented in Table 2 and Figure 2. The data in Table 3 showed a statistically significant difference ($P < .05$) in the SBS based on the material and method of bonding. Among the tested materials, CD bonded with Variolink Esthetic DC demonstrated the highest SBS to the dentin surface (CD: 12.61 ± 4.21 MPa), while TCAD bonded with Variolink Esthetic LC exhibited the lowest bond strength (TCAD: 2.02 ± 1.40 MPa). The SBS ranking of the samples bonded with Variolink Esthetic DC was $\text{CD} > \text{VE} = \text{TCAD}$. Similarly, the samples bonded with Variolink Esthetic LC had the following SBS ranking: $\text{CD} = \text{VE} > \text{TCAD}$.

The use of CHX resulted in a decrease in the SBS of TCAD in samples cemented with Variolink Esthetic DC ($P = .002$), but there was no statistically significant difference observed in the bond strength of the VE ($P = .335$) and CD ($P = .157$). CHX application decreased the SBS in all blocks in the Variolink Esthetic LC cemented samples ($P < .05$).

When samples without cavity disinfectant were looked at, the results of this study showed that the bond strength of Variolink Esthetic LC in TCAD material was statistically lower than that of Variolink Esthetic DC. However, there was no statistically significant difference between CD and VE materials. When the samples with cavity disinfectant were examined, the bond strength value of Variolink Esthetic LC was statistically lower than that of Variolink Esthetic DC in TCAD and CD materials. However, there was no discernible difference in VE material. According to the stereomicroscopic examination, a total of 14.3% adhesive fracture type failure, 16.7% cohesive fracture type failure, and 69% mixed fracture type failure were observed in this study.

Table 2. Two-way analysis of variance (ANOVA)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	672.736 ^a	11	61.158	9.496	.000	.592
Intercept	5187.750	1	5187.750	805.485	.000	.918
Material	372.562	2	186.281	28.923	.000	.445
Method	258.850	3	86.283	13.397	.000	.358
Material * Method	41.324	6	6.887	1.069	.389	.082
Error	463.718	72	6.441			
Total	6324.204	84				

a. R Squared = .592 (Adjusted R Squared = .530)

Table 3. Investigation of the shear bond values (MPa)

Material/Method	Tetric CAD (Mean \pm SD)	Vita Enamic (Mean \pm SD)	Celtra Duo (Mean \pm SD)
Dual-cure	9.18 \pm 2.56 ^{a,A}	9.03 \pm 2.23 ^{a,A}	12.61 \pm 4.21 ^{a,B}
Dual-cure +CHX	4.81 \pm 1.34 ^{b,A}	6.35 \pm 2.43 ^{ab,A}	10.55 \pm 3.55 ^{a,B}
Light-cure	5.87 \pm 2.59 ^{b,A}	8.87 \pm 1.87 ^{a,B}	10.66 \pm 3.25 ^{a,B}
Light-cure +CHX	2.02 \pm 1.40 ^{c,A}	5.81 \pm 1.84 ^{b,B}	8.56 \pm 1.23 ^{b,C}

**a-c indicates the statistical significance limit between rows, A-C indicates the statistical significance limit between columns*

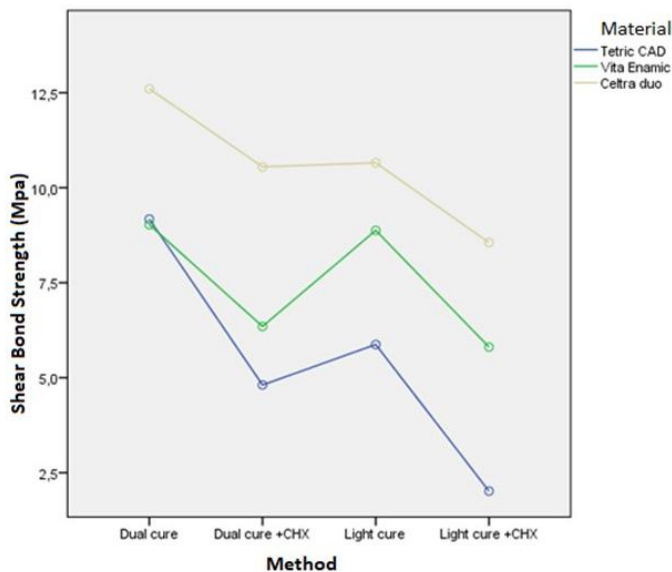


Figure 2. The result of the two-way ANOVA analysis on the effect of cavity disinfectant used on the SBS of CAD/CAM blocks

DISCUSSION

As a result of this study, it was determined that the use of CHX in bonding CAD/CAM blocks with resin cements has an effect on shear bond strength. Therefore, the null hypothesis of 'The use of cavity disinfectant before cementation of CAD/CAM blocks with adhesive resin cements will not affect SBS' was rejected.

In digital dentistry, CAD/CAM systems are commonly used to produce crown, bridge, and inlay-onlay restorations using various materials.^{14,15} The focus of this study was on three commonly used materials: polymer-infiltrated ceramic, zirconia-reinforced lithium disilicate ceramic, and composite blocks.

The use of resin cements in the adhesive cementation process has a major impact on the clinical success of indirect restorations. Therefore, careful selection of resin cements is critical to long-term success.¹⁴

Another factor that determines the success of a restoration is the bond between the tooth structure and the restorative material.¹⁵ Failure to achieve proper adhesion results in microleakage between the tooth and restoration, which is defined as the passage of bacteria, fluids, chemicals, molecules, and ions. This compromises the clinical performance and longevity of the restoration, causing discoloration, recurrent caries, and postoperative sensitivity.¹⁶

Numerous investigations have been conducted to examine the influence of cavity disinfectants on the bonding efficacy of resin composites. These studies have revealed that the bond strength of these materials is influenced by various factors, such as the active ingredients present in the cavity disinfectant and the particular brand of adhesive system utilized.^{17–19} As a result of this study, the effect of using cavity disinfectant on SBS in cementation of blocks currently used in the CAD/CAM systems with different resin cements was investigated.

In previous study examining the SBS of three different CAD/CAM materials bonded with different resin cements, Naiboğlu et al.²⁰ found that Lava Ultimate showed lower bond strength in each group compared to VE and Vita Suprinity. However, in a study by Bellan et al.²¹ using the same materials, Lava Ultimate showed higher bond strength than Vita Suprinity and VE. In Bellan's study, all three materials were sandblasted with 50 µm Al₂O₃. In Naiboğlu's study, Lava Ultimate was sandblasted, VE and Vita Suprinity were roughened with hydrofluoric acid. The

authors claimed that the difference in bond strength between the two studies was due to differences in surface preparation. In this study, TCAD was sandblasted; CD and VE were etched with hydrofluoric acid. The lower bond strength of TCAD in this study may also be attributed to the surface preparation method used, similar to the above-mentioned study.

In a study by Cekic-Nagas et al.²², the higher bond strength of VE compared to Lava Ultimate and Cerasmart was attributed to its higher filler content. Similarly, in this study, VE (86% mass) showed higher bond strength than TCAD (71% mass), possibly due to its higher filler content. In the same study²², they suggested that the low bond strength of CAD/CAM resin blocks was due to the infiltration of water into the resin matrix of these blocks after 1 day of water storage or thermal cycling. In addition, without any intermediate connections, inorganic filler particles are incorporated into polymer matrixes in composite materials.²³ However, VE has a cross-linked network structure, which may result in less water absorption compared to resin nanoceramics. In this study, the higher bond strength of VE than TCAD may be due to the fact that it absorbed less water.

Okutan et al.²⁴ found higher bond strength of Vita Suprinity compared to VE in their study investigating the bond strength of different thicknesses of Empress CAD, VE, and Vita Suprinity materials with light-cured resin cement. Şen and Us²⁵ found in their study that 1.2 mm zirconia-reinforced glass-ceramic was more translucent than polymer-infiltrated ceramic. The authors attributed this to the different chemical compositions of the materials. In another study, zirconia-reinforced glass ceramics of various thicknesses were found to be more translucent than polymer-infiltrated ceramics.²⁶ Okutan et al.²⁴ in their above-mentioned study attributed the higher bond strength of Vita Suprinity than VE to its higher translucency. According to this study, the higher bond strength of CD compared to VE may be attributed to its higher translucency.

Bacteria is a significant factor in the success of restorative dentistry treatments. The aim of such procedures is to remove infected dentin and create an appropriate cavity for restorative materials. To ensure success, cariogenic microorganisms need to be removed before restorations are placed. If not eliminated, these bacteria can cause pulp sensitivity, inflammation, and secondary caries.²⁷ To reduce the risk of pulpal inflammation caused by bacterial activity, the use of antibacterial agents is recommended during restorative procedures.²⁸ One of the problems associated with the use of cavity disinfectants with dentin bonding agents is the possibility of compromising the bond strength of the restorative material to the dentin.¹⁷

When examining the literature, it is evident that there are varying results regarding the effects of CHX on dentin bonding. Some researchers^{29–33} argue that CHX has a negative or no effect on dentin bonding, as in this study. Hipólito et al.²⁹ studied the effect of 0.2% and 2% CHX application on the micro-tensile bond strength of resin composites cemented with two different resins and found that CHX reduced bond strength. Soares et al.³⁰ examined the bond strength of indirect composite cemented with dual-cure resin cement to dentin treated with 0.12% and 2% CHX and found that CHX did not affect the bonding. In their study examining the effects of various cavity disinfectants and lasers on the SBS of adhesives, Alici et al.³¹ found that CHX reduced bond strength. Turkun et al.³² found that CHX did not statistically affect the bond strength of ceramics to dentin. Bulut et al.³³ found that 0.2% and 2% CHX had an insignificant effect on SBS to dentin in their study of all-ceramic restorations cemented with three dual-cure resin cements.

Some researchers^{34–36} found that CHX pretreatment had a positive effect on bond strength, contrary to the results of this study. Gunaydin et al.³⁴ found in their study using four different adhesive systems that 2% CHX initially reduced bond strength when thermal cycling was not applied but increased it after application. Similarly, Zheng et al.³⁵ investigated the effect of different MMP inhibitors on microshear bond strength with two different adhesive systems and found that 2% CHX did not affect bonding in self-etch adhesive systems but increased bonding in the etch-and-rinse system. Muhammed Hassan et al.³⁶ used two different adhesives and two different composites and concluded that 2% CHX increased the SBS.

Dual-cure and light-cure cements have several advantages and disadvantages.³⁷ In this study, the bond strength of CAD/CAM blocks cemented with light-cure and dual-cure cements was evaluated. Previous study comparing the bond strength of three different resin cements reported that dual-cure resin cements bonded better to enamel than light-cure cements.³⁸ In contrast, a study investigating the bond strength of lithium disilicate-based ceramics with varying thickness and cement polymerization type found no significant difference between light-cure and dual-cure cements.³⁹ In another study, dual-cure cements were reported to be advantageous due to their chemical curing components that support the transformation even in the presence of limited radiant energy.³⁷ In this study, light-cure cements showed lower bond strengths in TCAD and CD materials with the use of CHX, while light-cure cements showed lower bond strengths in TCAD without the use of CHX. In other groups, the light-cure cement showed lower bond strength values, but these results were not statistically significant. While this can be attributed to the results of the aforementioned studies, the chance of completion of the polymerization is higher in dual-cure cements as the polymerization will be activated with low energy and the chemical will continue. Light-cure cements, on the other hand, must be fully exposed to light from all sides.⁴⁰ In this case, because the cement in this study may not have received light from all sides, the bond strength values may be lower.

In this study, a stereomicroscope was used to determine fracture percentages. A mixed fracture was the most common type of fracture after stereomicroscopic examination. In the study by Naiboğlu et al.²⁰ in which they investigated the SBS of three different CAD/CAM materials, the most mixed type of failure was observed, similar to this study. Adhesive type failure is predominant in the group with the lowest bond strength. These results are in agreement with this study. Manfro et al.⁴¹ found that the dominant failure type in samples tested after CHX application was adhesive/mixed failure. In the Okutan et al.²⁴ study, the groups with the highest bond strength showed mix failure, and the groups with the lowest bond strength mostly showed adhesive failure. The group exhibiting the highest shear bond strength demonstrated the greatest percentage of cohesive failure, whereas the group with the lowest bond strength exhibited the highest percentage of adhesive failure.

Limitations of this in vitro study include the storage of samples in distilled water, which is not fully representative of the dynamic environment of the oral cavity due to the absence of saliva, oral temperature, and occlusal load. The effectiveness of cavity disinfectants in improving the bond strength of CAD/CAM blocks should be evaluated in future studies.

CONCLUSION

According to the results of this study;

1- In general, lower SBS values were observed in teeth treated with 2% CHX. This difference was found to be statistically insignificant in the groups in which VE and CD were bonded with dual-cure cement.

2- Samples cemented with dual-cure resin cement generally showed higher shear bond strengths compared to those cemented with light-cure cement. However, this difference was not statistically significant in groups where VE and CD were not treated with CHX, as well as in VE groups that were treated with CHX.

When the bond strength of CAD/CAM blocks is examined, the highest bond strength was observed in CD. The difference between CD and VE in the light-cure cement group was statistically insignificant. The lowest bond strength value was observed in TCAD. The difference between TCAD and VE was statistically insignificant in both groups using dual-cure cement.

Ethics Committee Approval: Ethics committee approval was obtained from the Gülhane Scientific Research Ethics Committee of the University of Health Sciences (Date: 11.03.2021, Number: 46418926).

Informed Consent: Since there was no study conducted on the patient, an informed consent form is not required.

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