EGYPTIAN
DENTAL JOURNAL
www.eda-egypt.org

VOL. 69, 2591:2598, OCTOBER, 2023

PRINT ISSN 0070-9484 • ONLINE ISSN 2090-2360

ORTHODONTICS, PEDIATRIC AND PREVENTIVE DENTISTRY

Submit Date : 16-07-2023 • Accept Date : 03-08-2023 • Available online: 1-10-2022 • DOI : 10.21608/EDJ.2023.220770.2624

EFFECT OF SILVER DIAMINE FLUORIDE ON THE MICROTENSILE BOND STRENGTH OF FLOWABLE RESIN COMPOSITE AND GLASS IONOMER CEMENT TO CARIOUS PRIMARY DENTIN (AN-IN VITRO STUDY)

Sarah Osama M. Saied*, Basma Gamal Awad** *and* Amira Saad Badran***

ABSTRACT

Purpose: This in vitro research examined how silver diamine fluoride (SDF) affects flowable resin composite (FRC) and glass ionomer cement (GIC) microtensile bond strength to carious primary dentin.

Materials & Methods: Twenty extracted carious primary molars were used in this study, and their sound proximal surfaces were reduced occluso-gingivally using a diamond bur in a high-speed hand piece, and then polished using 600-grit silicon carbide paper. Artificial decay were created by placing the teeth in a demineralizing solution for 96 hours, then rinsing with deionized water for 30 seconds. Each set of teeth was randomly assigned to one of four categories (group size = 5 teeth): The experimental group I (FRCa) included SDF38%+FRC, the control group II (FRCb) included FRC alone, the experimental group III (GICa) included SDF38%+GIC, and the control group IV (GICb) included GIC alone. With an Instron Universal Testing Machine and a stress rate of 1 mm/min until bond failure, the microtensile bond strength was calculated. The failure load, in newtons, was divided by the bonding area in cross section, also in newtons. Megapascal (MPa) readings were taken.

Results: In terms of microtensile bond strength test, there was no statistical significant difference between Group I (FRCa) & Group II (FRCb) and Group III (GICa) & Group IV (GICb), ($p>0.05$).

Conclusion: The microtensile bond strength of FRC and GIC to carious primary teeth wasn't impacted by SDF, according to this study.

KEYWORDS: Glass ionomer cement, Silver diamine fluoride, Flowable composite, Microtensile bond strength.

---

* Master's Student, Department of Pediatric Dentistry & Dental Public Health, Faculty of Dentistry, Ain Shams University, Cairo, Egypt.
** Lecturer, Department of Pediatric Dentistry & Dental Public Health, Faculty of Dentistry, Ain Shams University, Cairo, Egypt.
*** Professor, Department of Pediatric Dentistry & Dental Public Health, Faculty of Dentistry, Ain Shams University, Cairo, Egypt.

INTRODUCTION

As one of the most common oral diseases in children, dental decay is a dangerous issue for public health. Despite governmental efforts to prevent dental decay, the most common cause of tooth loss globally, the issue persists (1). Dental disease is usually caused by an ecological imbalance in the balance between dental plaque and oral microbial biofilms (2).

Paediatric dental decay affects a large percentage of children younger than six (3). Unfortunately, pediatric dental caries limits communication and eating, decreases children's self-esteem because of bad physical appearance, and negatively impacts the job and health of guardians (4).

Since the primary goal of pediatric dentistry is the prevention and control of caries, many preventive strategies are increasingly used as an alternative to ECC treatment (5-7).

Silver Diamine Fluoride (SDF) is one such idea. It is unique in that it hardens teeth while killing bacteria, thereby stopping and preventing tooth decay. In regards to preventing tooth decay, it looks to be almost twice as beneficial as fluoride varnishes (7). The alkaline environment of SDF could promote the formation of apatite from collagen by promoting the bonding of salivary phosphate ions with undamaged collagen (8).

The initial development of the Micro Tensile Bond Strength (μTBS) test was started in 1994. Since then, it has been used extensively in many testing labs, making it one of the most competitive and flexible power tools available today. Despite the fact that it is a static and dynamic strategy, it has been subjected to morphological and spectroscopic studies utilizing an advanced dentin adhesive system (9).

Using this kind of testing, the authors predicted that they might determine the adhesive performances of resins utilised for excavating carious or sclerotic dentin, as well as the regional bond strengths of various portions of the cavity while it was still in its early phases. Long-term durability of resin adhesion at different sites along the cavity walls on teeth recovered at different intervals after the placing of bonded restorations was also described (10,11).

Restorations' ability to bond to teeth is a crucial consideration in modern dental care. Any agent used prior to restorative treatment of teeth and enamel may interact with compounds that may cause changes in their mechanical properties (12).

Although many authors have investigated the effect of SDF on FRC and GIC, few studies have however investigated the effect of SDF on microtensile bond strength of FRC and GIC for primary teeth. Microtensile bond strength of GIC and FRC on carious primary dentin following exposure to SDF was the intended outcome of this study.

MATERIALS&METHODS

Ethical approval:

This study received approval from Ain Shams University Research Ethics Committee (FDASURecEM012006).

Sample size estimation:

According to the findings of a previous research that was conducted by Puwanawiroj, Aksrapak, et al. (13), we calculate an 80% power by setting an alpha (α)level of 0.05 (5%), and a beta (β)level of 0.20 (20%). Twenty (20) samples were assumed, with ten (10) in each group, based on the projected sample size (n). G*Power 3.1.9.4 (14) was used to determine the sample size.

Study sample:

In order to create artificial caries, the sound section of the proximal surface of twenty extracted carious primary molars was removed. This was done in order to simulate the development of caries. We did not consider teeth that had been restored or were substantially broken down.

There was a two-month maximum duration during which the teeth were kept in 0.9% sodium chloride solution at room temperature.

Preparation of specimens:

The teeth were randomly assigned into 4 groups (n=5 teeth/group)**: Group I (FRCa):** SDF38%+FRC, **Group II (FRCb):** FRC, **Group III (GICa):** SDF38%+GIC, **Group IV (GICb):** GIC.

Each specimen's sound proximal surface was reduced occluso-gingivally with a diamond bur in a high-speed hand piece and cleaned with 600-grit silicon carbide paper to make a flat dentin. Specimens were then inserted in demineralizing solution for 96hrs to create artificial caries followed by cleaning with deionized water for 30 seconds (15,16). For the purpose of intentionally inducing caries lesions in all of the samples, a demineralizing acetic acid solution with a pH of 4.4 was utilised (15,16). All of the specimens were submerged in a demineralizing solution for 96 hours (4 days) to create the required white spot caries-like lesions without cavitation (15,16) The International Caries Detection and Assessment System (ICDAS) scoring index requires that the produced white spot lesions (WSLs) meet scoreII (17,18). Score II indicates a clear visual alteration in enamel that is visible in both dry and wet conditions and suggests a demineralized carious enamel lesion (17,18). Specimens were then cleaned with deionized water by plastic syringe for 30 seconds (15,16) that was prepared by the Faculty of Science, Ain Shams University, Cairo, Egypt.

Group I: **Experimental group (flowable resin composite) FRCa:** A drop of 38% SDF following the manufacturer instructions was transferred directly to the exposed flat surface (artificial caries side) for three minutes, Specimens were then rinsed for 30 seconds using air/water spray then air-dried for 5 seconds (19,20). Ultra-etch 35% phosphoric acid was applied to the exposed flat surface (artificial caries side) for 15 seconds according to manufacturer's instructions. Specimens were then rinsed by air/water for 5 seconds (21). Bond fix was then applied to the exposed flat surface (artificial caries side) and allowed to act for 20 seconds then the adhesive layer was dried with an air jet for at least 5 seconds and light cured for 10 seconds using LED light curing system according to manufacturer's instructions(22). FRC was then applied and packed with a carver and ball burnisher. Any excess material was removed using a carver. After that, the FRC was light-cured for 40 seconds under the manufacturer's specifications (23). Polishing was done in constant and unidirectional motion using fine diamond bur in low-speed hand piece to remove excess material and to contour the desired shape (23). Finishing was done using medium fine grit disc in low-speed hand piece and light pressure (23). **Group II: Control group (flowable resin composite) FRCb:** Similar steps were conducted as group FRCa but without application of 38% SDF.

Group III: Experimental (Glass Ionomer Cement) GICa: Similar steps of application of 38% SDF were conducted as in group FRCa. Cavity conditioner was applied for 10 seconds then washed off using water spray for 10 to 20 seconds. Specimens were then allowed to be air dried using air spray (24). Glass ionomer cement was applied into exposed flat surface (artificial caries side) using carver and ball burnisher after the capsule was mixed for 10 seconds in the amalgamator at high speed (+/-4,000 RPM). Any extra material was removed with a carver before being light-cured for 20 seconds with an LED light curing system under the manufacturer's specifications (25). Finishing was done using superfine diamond bur under water spray in low-speed hand piece and polishing strips (25). Equia coat was then applied to the restoration and light cured for 10 seconds (25). An approximately

4mm high GIC block was built up on the exposed flat surface (Artificial caries side) (26) (Figure 1). **Group IV: Control group (Glass Ionomer Cement) GICb:** Similar steps were conducted as group GICa but without application of 38% of SDF**.**

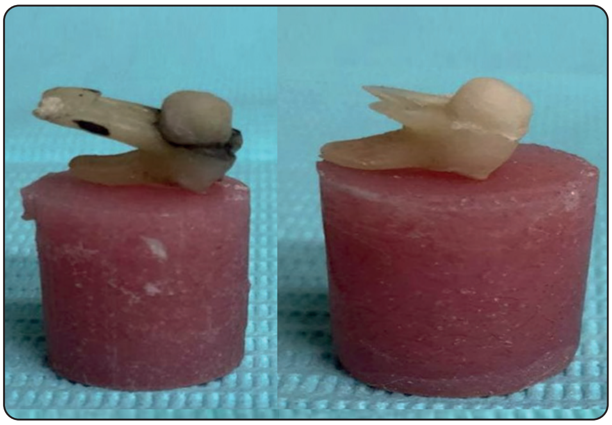

Fig. (1) Test Group and Control Group Specimen, an approximately 4mm high GIC block was built up on the exposed flat surface (Artificial caries side).

To generate slices of around 0.7 mm thickness, a slow-speed water-cooled diamond saw (Isomet 1000, USA) was used to segment specimens.. A digitised calliper was used to double-check the measurements (27). After that, specimens were affixed to resin blocks that were 12 mm in diameter and 18 mm in depth. Utilising arborimpregnated diamond cutting blades with a wear-resistant Ti-C coating, specimens were trimmed and processed into sticks with a cross-sectional area of one millimetre square using a tapered diamond disc with a 4" diameter, 0.3 mm thickness, and 0.5" arborimpregnated diamond cutting blades. (Figure 2a and 2b) (27). Throughout the whole process of moulding and testing, specimens were maintained at a constant level of wetness (27). Tensile testing was performed on each specimen using a Universal Testing Machine ((Model 2519-104; Instron®, US) at a rate of one millimetre per minute until bond failure (27). as seen in (Figure 2d). Microtensile testing demonstrated that beam strength was used in determining tooth-specific result (Fig. 2c). This was done by taking one beam from each tooth specimen and using it to represent that specimen in the testing. The force in Newtons (N) needed to displace the restoration was recorded. The micro tensile bond strength (TBS) was determined by dividing the load at failure (N) by the cross-sectional bonding area (1 mm2). Readings were recorded in megapascal (MPa).

Statistical analysis

The Shapiro-Wilk test was used to check whether the numerical data were normally distributed, and the findings were shown in the form of means and standard deviations. The data on binding strength was examined using one-way analysis of variance and Tukey's post hoc test since the data followed a normal distribution. The limit of detection for significance in all analyses was set at a p value of 0.05. The studies were performed using R, a statistical programming language, version 4.1.2 on Windows (28).

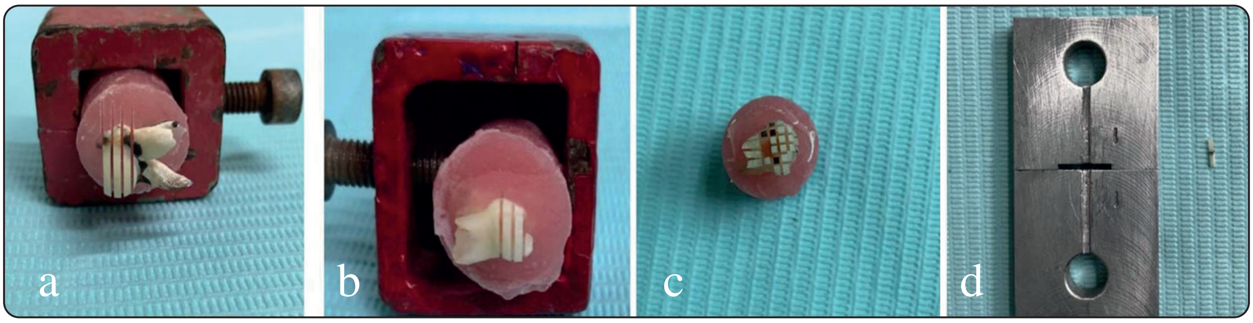

Fig (2a-2d) These specimens were then sliced into 0.7 mm thick slices using a water-cooled diamond saw, and then a tapered diamond bur was used to trim and prepare the slices into sticks with a cross-sectional area of 1 mm2

RESULTS

Micro tensile Bond Strength Test (MPa):

1. Descriptive Statistics:

Descriptive statistics for the groups were presented in **Table (1), (2)** and **Figure (3)**.

TABLE (1) Mean ± standard deviation (SD) of micro-tensile bond strength (MPa) for groups FRCa & FRCb.

Micro-tensile bond strength (MPa) (mean±SD)		**p-value**
FRCa	**FRCb**	
8.18±1.62	9.46±1.84	**0.277ns**

; significant ($p \leq 0.05$), ns; non-significant ($p>0.05$)

TABLE (2) Mean ± standard deviation (SD) of micro-tensile bond strength (MPa) for groups GICa & GICb.

Micro-tensile bond strength (MPa) (mean±SD)		**p-value**
GICa	**GICb**	
10.46±1.80	11.64±1.58	**0.303ns**

; significant ($p \leq 0.05$), ns; non-significant ($p>0.05$)

Means with different superscript letters are statistically ns; non-significant different($p>0.05$).

2.Intergroup Comparison:

Tukey's post hoc test showed that the experimental specimens (FRCa & GICa) (8.18±1.62) & (10.46±1.80) had a non-significant lower microtensile bond strength than the control specimens (FRCb &GICb) (9.46±1.84 & 11.64±1.58). Mean and standard deviation (SD) values of microtensile bond strength (MPa) for different groups were presented in table (1,2) and figure (3).

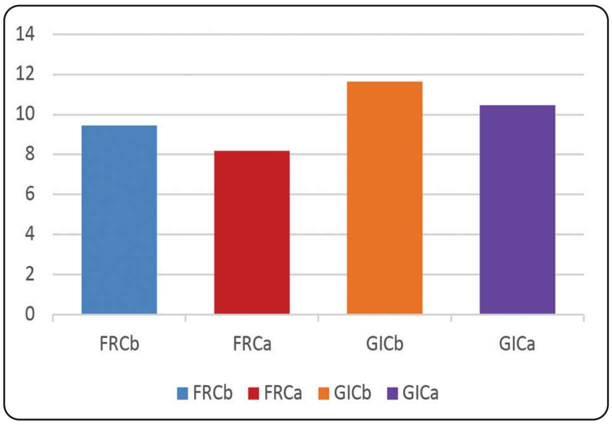

Fig. (3) Micro tensile bond strengths (in MPa) are shown in a bar chart for several groups.

DISCUSSION

Decay, or cavities, in children's teeth are more common and more severe in developing nations. High treatment costs and lack of knowledge about oral health care are problems that hinder caries control initiatives in these countries. Fortunately, there are safe and effective preventative methods for preventing tooth decay in children, such as fluoride varnishes. SDF is a different way of preventing cavities, especially in preschool children. SDF has the potential to revolutionise paediatric and public health dentistry because of its low risk, high effectiveness, low cost, and high feasibility (29).

One of the most crucial factors that influence modern restorative dental treatments is the level of adhesion between the restorative material and the underlying tooth structure. Any material that is put on the surfaces of dentine and enamel before restoration treatments could stop them from bonding, which would cause their mechanical properties to change (30).

When it comes to avoiding new caries development after the restoration has been done, the most critical variables are a firm attachment to the tooth structure and a tight closure surrounding the cavity (31). For this reason, it is absolutely necessary to assess the restorations' capacity for sealing and their binding strength in order to evaluate their effectiveness.

Flowable composite SDI was used as it contains polishability, wear resistance, strength and all are amplified by carefully treated nano-fillers. Furthermore, the resin possesses a fluoride release property that facilitates the uptake of fluoride ions into the tooth structure. Fluoride ions are carried in and out of the resin and tooth by the oral fluid, which causes ionic mobility (23).

Results in this study showed that, there was no statistical significance difference between 38% SDF test group and the control group without SDF application.

Results came in accordance with the researcher Wu DI et al. (30), who mentioned that SDF and potassium iodide had no influence on the binding strength of self-healing GIC with caries-free permanent dentin. In addition, Quock et al. (2012) (27) found that the SDF did not impact the bond between composites and intact dentin.

Previous studies have demonstrated that GIC creates a stronger attachment to undamaged dentin(32). This is because primary dentin that has been damaged by decay has less GIC binding compared to healthy dentin. In addition to the following researchers, Selvaraj et al. (2016)(33), Siqueira (2020) (34), and Firouzmandi (2020)(35) who reported that bond strength didn't change in SDF-treated dentin.

Results of previous research conducted by Selvaraj et al. (2016), Quoc et al. (2012), Wu et al. (2016) and Firouzmandi (2020), this can be attributed to the method used, in which the lesion is treated with a 38% SDF solution for a set time (three minutes) and then rinsed. 30 seconds with distilled water SDF. It seems that material that aids adhesion in peritubular and intertubular dentin is removed by washing with water. This illustrates that washing the SDF after application time may mitigate the SDF's negative effect on the adhesive's binding strength.

The findings of this study disagree with Küçükyılmaz et al. (36) who stated that Dentin's microtension bond strength is decreased when SDF is given to it without first washing away the active components.Therefore, the tubules of the dentin were clogged with silver precipitants, which prevent the deep penetration of the resin materials.

Also, Markham (2020)(37), Aye KO KO(2020)(38), LUTGEN (2018)(39), Koizumi (2016)(40) and SOENO (2001)(41) who mentioned that SDF's inappropriate and demineralized too much dentin, weakens the dentin and the resin composite is damaged. Researchers have previously noted that SDF in dentin may interfere with the chemical interaction between the adhesives and calcium ions in dentin, hence preventing the formation of excellent adhesive connections at the contact.

Furthermore, Madhu M, Caitlin C, and Rosivack RG (2020)(42) reported that micro tensile bond strength to a glass ionomer was increased in carious dentin that had been pretreated with silver diamine fluoride and potassium iodide. It has been theorised that the silver iodide precipitate in the dentinal tubules could react with the carboxylic acid in glass ionomer cements. Increased bond strength with SDF/KI may be due to the carboxylic acid in glass ionomer cements adhering to the silver iodide precipitate generated in the dentinal tubules. This was proved by the fact that the use of SDF/KI resulted in a higher bond strength.

It is possible that the fluoride content and concentration in demineralized dentin may be increased by putting SDF/KI to the dentin before applying a glass ionomer cement. SDF/KI treatment has been shown to enhance binding strength, and this is likely because to the deep penetrating fluoride. And the data that this study was collected did not support this assertion in any way.

Limitations of this Study

The present study shows some flaws. Due to its in vitro structure, it does not fully adhere to the oral region. Therefore, when considering the clinical use of SDF, clinical studies should be conducted to determine the bond's efficacy, evaluate its therapeutic effects, biological effects on the pulp, and interactions with other restorative materials. As a result, one must use care when directly extrapolating from in vitro investigations to clinical occurrences.

CONCLUSION

Several inferences may be drawn from the results of this in vitro investigation.

The binding strength of FRC or GIC does not change through the use of decayed primary dentin that has been pretreated with 38% (SDF).

REFRENCES

1. Selwitz RH, Ismail AI, Pitts NB. Dental-Caries-Seminar.pdf. Lancet. 2007;369(4):51–9.
2. Featherstone JDB. The continuum of dental caries - Evidence for a dynamic disease process. In: Journal of Dental Research. 2004.
3. Ismail AI, Sohn W. A systematic review of clinical diagnostic criteria of early childhood caries. Vol. 59, Journal of Public Health Dentistry. Blackwell Publishing Inc.; 1999. p. 171–91.
4. BaniHani A, Deery C, Toumba J, Munyombwe T, Duggal M. The impact of dental caries and its treatment by conventional or biological approaches on the oral health-related quality of life of children and carers. Int J Paediatr Dent. 2018 Mar 1;28(2):266–76.
5. Çolak H, Dülgergil Ç, Dalli M, Hamidi M. Early childhood caries update: A review of causes, diagnoses, and treatments. Vol. 4, Journal of Natural Science, Biology and Medicine. 2013. p. 29–38.
6. Niederman, R., Feres, M., Ogunbodede, E. Dentistry.. In: Debas, HT.Donkor, P.Gawande, A.Jamison, DT.Kruk, ME., Mock, CN., editors. Essential Surgery: Disease Control Priorities. The 2015 International Bank for Reconstruction and Development / The World Bank; Washington (DC): 2015. p. 173-95.
7. Rosenblatt A, Stamford TC, Niederman R. Silver diamine fluoride: a caries "silver-fluoride bullet". J Dent Res. 2009; 88(2):116–25. (PubMed: 19278981).
8. Gao SS, Zhao IS, Hiraishi N, et al. Clinical Trials of Silver Diamine Fluoride in Arresting Caries among Children: A Systematic Review. JDR Clinical & Translational Research. 2016.
9. Mei ML, Ito L, Cao Y, Lo ECM, Li QL, Chu CH. An ex vivo study of arrested primary teeth caries with silver diamine fluoride therapy. J Dent. 2014;42:395-402.
10. Fusayama T, Nakamura M, Kurosaki N, Iwaku M. Non-pressure adhesion of anew adhesive restorative resin. J Dent Res 1979;58:1364–70.
11. Sano H, Shono T, Sonoda H, Takatsu T, Ciucchi B, Carvalho R, et al. Relationshipbetween surface area for adhesion and tensile bond strength–evaluation of amicro-tensile bond test. Dent Mater 1994;10(July (4)):236–40
12. Knight GM, McIntyre JM, Mulyani. The effect of silver fluoride and potassium iodide on the bond strength of auto cure glass ionomer cement to dentine. Aust Dent J 2006;51(1):42-5.
13. Puwanawiroj, Aksrapak, et al. "Microtensile bond strength between glass ionomer cement and silver diamine fluoride-treated carious primary dentin." Pediatric dentistry 40.4 (2018): 291-295.
14. Faul, Franz, et al. "G* Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences." Behavior research methods 39.2 (2007): 175-191.
15. Ten Cate JM, Duijesters PPE. Alternating demineralization and remineralization of artificial enamel lesions. Caries Res. 1982; 16: 201-10.
16. Kumar VLN, Itthagarun A, King NM. The effect of casein phosphopeptide-amorphous calcium phosphate on remineralization of artificial caries-like lesions: an in vitro study. Aust Dent J. 2008; 53: 34-40.
17. Abrams SH, Sivagurunathan KS, Silvertown JD, et al. Correlation with Caries Lesion Depth of The Canary System, DIAGNOdent and ICDAS II. The open dentistry journal 2017; 11: 679-689.
18. Gugnani N, Pandit IK, Srivastava N, Gupta M, Sharma M. International Caries Detection and Assessment System (ICDAS): A New Concept. Int J Clin Pediatr Dent. 2011;4(2):93-100.
19. Horst JA, Ellenikiotis H, Milgrom PM. UCSF Protocol for Caries Arrest Using Silver Diamine Fluoride: Rationale,

Indications and Consent. Pennsylvania dental journal. 2017;84(1):14, 16-26.

20. Chairside guide: Silver diamine fluoride in the management of dental caries lesions. Pediatric Dentistry., 2018:492-493.
21. Ultra-dent products Instruction for Use. Ultra-dent products USA.https://www.ultradent.com/products/categories/bond-etch/etchants/ultra-etch .
22. Voco dental products Instructions for use. Voco, Germany. https://www.voco.dental/in/portaldata/1/resources/products/instructions-for-use/e1/bondfix_ifu_e1.pdf .
23. wave-SDI products instructions for use. SDI, North America. https://www.sdi.com.au/au/en-eu/product/wave/.
24. 3m-ketac-conditioner-cee.pdf&fn=4400018034706-IFU.pdf https://multimedia.3m.com/mws/media/2122507O/3m-ketac-conditioner-cee.pdf
25. GC CORPORATION Fuji II LC CAPSULE Instructions For Use. GC CORPORATION Tokyo, Japanhttps://www.manualslib.com/manual/1497627/Gc-Corporation-Fuji-Ii-Lc-Capsule.html#manual (April 13, 2020).
26. 26. Zhao IS, Chu S, Yu OY, Mei ML, Chu CH, Lo ECM. Effect of silver diamine fluoride and potassium iodide on shear bond strength of glass ionomer cements to caries-affected dentine. Int Dent J. 2019;69:341-7.
27. 27. Quock RL, Barros JA, Yang SW, et al. Effect of silver diamine fluoride on microtensile bond strength to dentin. Oper Dent.2012;37:610–6.
28. R Core Team (2022). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R- project.org/.
29. Townsend JA, Wells MH. Behavior Guidance of the Pediatric Dental Patient. In: Pediatric Dentistry. Vol 40. Elsevier; 2019:352-370.e2. doi:10.1016/B978-0-323-60826-8.00024-9.
30. Wu DI, Velamakanni S, Denisson J, Yaman P, Boynton JR, Papagerakis P. Effect of silver diamine fluoride (sdf) application on microtensile bonding strength of dentin in primary teeth. Pediatr Dent. 2016;38:148-53.
31. Zhang N, Melo MAS, Chen C, Liu J, Weir MD, Bai Y, et al. Development of a multifunctionaladhesive system for prevention of root caries and secondary caries. Den Mater. 2015;31:1119-31.
32. Burrow MF, Nopnakeepong U, Phrukkanon S. A comparison of microtensile bond strengths of several dentin bonding systems to primary and permanent dentin. Dent Mater 2002; 18(3):239-45.
33. Selvaraj K, Sampath V, Sujatha V, Mahalaxmi S. Evaluation of microshear bond strength and nanoleakage of etch-and-rinse and self-etch adhesives to dentin pretreated with silver diamine fluoride/potassium iodide: An in vitro study. Indian J Dent Res. 2016;27(4):421.
34. Siqueira FSF, Morales LAR, Granja MCP, et al. Effect of Silver Diamine Fluoride on the Bonding Properties to Caries-affected Dentin. J Adhes Dent. 2020;22(2):161-172. doi:10.3290/j.jad.a44281
35. Firouzmandi M, Mohaghegh M, Jafarpisheh M. Effect of silver diamine fluoride on the bond durability of normal and carious dentin. J Clin Exp Dent. 2020;22(2):e468–73.
36. Kucukyilmaz E, Savas S, Akcay M, Bolukbasi B. Effect of silver diamine fluoride and ammonium hexafluorosilicate applications with and without Er:YAG laser irradiation on the microtensile bond strength in sound and caries-affected dentin. Lasers Surg Med. 2016;48(1):62-69. doi:10.1002/lsm.22439.
37. Markham MD, Tsujimoto A, Barkmeier WW, Jurado CA, Fischer NG, Watanabe H, et al.Influence of 38% silver diamine fluoride application on bond stability to enamel and dentin using universal adhesives in self-etch mode. Eur J Oral Sci. 2020;(12).
38. KO AK, MATSUI N, NAKAMOTO A, IKEDA M, NIKAIDO T, BURROW MF, et al. Effect of silver diammine fluoride application on dentin bonding performance. Dent Mater J. 2020;39(3):407–14.
39. Lutgen P, Chan D, Sadr A. Effects of silver diammine fluoride on bond strength of adhesives to sound dentin. Dent Mater J. 2018;37(6):1003–9.
40. Koizumi H, Hamama HH, Burrow MF. Effect of a silver diamine fluoride and potassium iodide-based desensitizing and cavity cleaning agent on bond strength to dentine. Int J Adhes Adhes. 2016;68(February):54–61. Available from: http://dx.doi.org/10.1016/j.ijadhadh. 2016.02.008.
41. Soeno K, Taira Y, Matsumura H, Atsuta M. Effect of desensitizers on bond strength of adhesive luting agents to dentin. J Oral Rehabil. 2001;28(12):1122–8.
42. Madhu M, Caitlin C, Rosivack RG. Comparison of Microtensile Bond Strength of Glass Ionomer to Carious Primary Dentin After Treatment with SDF and SDF/KI. J Dent Mater Tech 2020; 9(4): 203-210.