87th General Session & Exhibition of the IADR

THE SCIENCE BEHIND OUR PRODUCTS

GC CORPORATION R&D RELATED ABSTRACTS

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IADR 87th GENERAL SESSION

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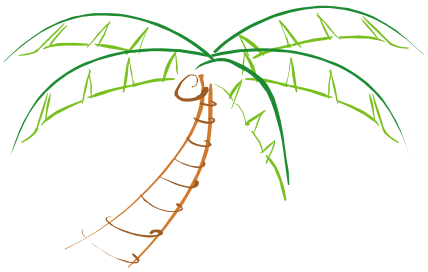

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Fuji Plus

976 Retention of quartz fiber posts using different luting cements

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Objectives: To determine the effect on the pull-out strength of threads cut into the surface of quartz fiber post cemented with three luting materials.

Methods: 42 human single-rooted, crownless teeth were treated endodontically and randomly assigned to six fiber posts groups: 1) to 3) were restored with Macro-Lock#3 posts (RTD); 4) to 6) with control posts made of the same material but lacking threads (RTD). The posts were cemented 12mm deep using Panavia(Kuraray), RelyX Unicem (3M ESPE), and Fuji Plus (GC) following the manufacturer instructions. The specimens were subjected to 5000 thermal cycles at 5 and 55°C and wet stored. Retentions were made on the emerging portion of the controls using a diamod bur, then a composite core was made using a mold. A pull-out stress was applied by clamping the core with an Instron machine (2mm/min speed). The pull-out strength was recorded for each group and compared (alpha=0.05). After the test, the specimens were observed under the stereomicroscope to determine failure patterns.

Results: The Macro-Lock demonstrated higher retention with all the luting materials employed, statistically significant when RelyX and Fuji were used (P<.05), suggesting that the threads on their surface are effective to improve the pull-out strength. The highest retention of Macro-Locks was obtained using the Fuji GIC and the self-adherent cement (RelyX). The resin cement coupled with an adhesive system (Panavia) showed lower retention forces, probably caused by the “C” factor dynamics.

Conclusion: The grooves on Macro-Lock surface are effective to improve the retention; these posts could be used safely with low cost, easy to use materials such as resin modified GIC. Control posts were less retentive, particularly when RelyX Unicem was used. This could be explained by the smooth surface and lack of any thread.

MEMO

Fuji CEM

536 Fracture Resistance of Zirconia Resin-bonded Fixed Partial Dentures

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Objectives: Zirconia resin-bonded fixed partial dentures have been suggested for treating single missing teeth mainly in juvenile patients or caries resistant dentitions. The use of Zirconia (ZrO_2) ceramic resin-bonded fixed partial dentures must fulfill several criteria (strength, fit, esthetics, and biocompatibility) to be clinically successful. The strength of the zirconia resin-bonded fixed partial denture is still a matter of debate. In the anterior quadrant biting forces may generate from 200 to 300 N. This study evaluated the fracture resistance of zirconia resin-bonded fixed partial dentures fabricated by CAD/CAM technology.

Material and Methods: Seventeen resin-bonded fixed partial denture zirconia frameworks were fabricated by CAD/CAM methods. Each specimen was developed from individual one-piece models of a typical central and cuspid preparation. The frameworks were cemented onto their respective metal models under finger pressure in a manner consistant with the clinical situation. All the frameworks were cemented to their model with Fuji CEM (GC America) luting cement. All samples were loaded using a universal testing machine with a force application at a cross-head speed of 0.5 mm/min at the center of the pontic area.

Results: The samples demonstrated a mean maximum load to fracture of 420.68 N, and a mean value of 221.99 with a SD of 97.09 N.

Conclusion: Based upon average biting forces zirconia resin-bonded fixed partial dentures to restore single anterior missing teeth may suitable as an alternative to either fixed partial dentures or implant supported single crowns.

Supported by NobelBiocare/ University of Michigan Center for Excellence

MEMO

G-CEM

525 Durability of Bonding Strength of Luting Cements to Zirconia Ceramic

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Objectives: The aim of this study was to investigate the bonding characteristics and durability of luting cements to zirconia treated with several surface modifications after suffering thermal cycling.

Methods: We used commercial two RMGI cements (RG: Resiglass, Shofu. GM: G-CEM, GC) and one RBL cement (RX: Rely-X ARC, 3M ESPE). Three groups of specimens with different surface modification were prepared. Group1: Non-modification (NM), Group2: Alumina sandblasting (AS), Group3: Tribochemical (TC) treatment (silane coupling agent + sandblasting alumina particle with modified silica: Rocatec® Soft, 3M ESPE). Surface treatment of zirconia was applied with phosphoric monomer (EP: Epricord, Kuraray). Plate specimens of zirconia (Noritake Dental Supply, Japan) were embedded in an acrylic tube. A titanium cylindrical specimen with a sandblasted surface was bonded to the zirconia surface with each cement. Shear bond tests of thermal cycled (10.000 cycles) specimens were performed using a universal testing machine at l mm/min. Shear bond strength (SBS) was analyzed statistically using one-way ANOVA and the Tukey's multiple comparison test.

Results: SBSs of zirconia with several surface modifications after thermal cycling was shown in Table.

	NM	AS	TC
RX	0.9±2.0	16.6a ±3.4	26.5ab±3.2
RX+EP	15.7a±4.8	41.0A±4.6	43.7A±3.2
RG	27.9bc±2.8	42.4A ±4.7	39.7A±5.0
GM	22.6ab±6.7	36.6Ac ±4.3	40.5A±10.2

Means with same superscript letters in the column are not statistically different (p>0.05), n=7

SBSs of RX+EP were significantly higher than those of RX in all surface modification. SBSs of RMGI cements were higher than those of RX and RX+EP in NM. SBSs of RMGI cements after thermal cycling increased on AS and TC surface were comparable with those of RX+EP.

Conclusions: We have already reported that RX+EP of TC was suitable for silica-based glass ceramics (Shimakura Y. et al, DMJ 26(5), 713-721, 2007). However, we also found the procedure was complicated. Therefore, results obtained in this study suggested that RMGI cements was useful for bonding to zirconia with simple alumina sandblasting procedure because of uniform structure of zirconia.

MEMO

G-CEM

1841 Shear Bond Strength of Four Cements on Four Substrates

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OBJECTIVE: To measure and compare cement shear bond strength to enamel, dentin, zirconia and feldspathic porcelain.

METHODS: Enamel & Dentin: Teeth were trimmed and wet ground (320-grit SiC paper) to obtain flat enamel (80) and dentin (80) surfaces and randomly divided into 4 groups for enamel and dentin (n=10). Cercon: 40 discs (d=10mm/thickness=4mm) were wet ground (320-grit SiC paper), air abraded (50µm Al2O3) and randomly assigned to 4 groups (n=10). ProCAD: 40 blocks were wet ground (320-grit and 600-grit SiC paper), polished (0.05µm Al2O3 slurry), etched (6% HF gel/90s), and primed (3-5min). Cements were manipulated following manufacturers' instructions, loaded into plastic tube (diameter=1.5mm), placed onto the prepared tooth surface, light or chemically cured under a constant weight of 110gr. Samples were stored (370C/24hrs), thermocycled (60-600C/1000cycles), debonded (Instron/1mm/min), and statistically analyzed (ANOVA, Tukey/Kramer post-hoc/p=0.05).

RESULTS: Mean(MPa) ±SD

	Experimental cement	Maxcem Elite	G-Cem	RelyX-Luting Plus
Enamel	12.8±4	12.2±4	12.5±4	8.8±2
Dentin	8.2±2	8.9±4	19±2	8.2±3
Zirconia	23.6±4	15.2±2	12.2±2	13.2±1
ProCAD	32.5±3	20.4±2	14.7±1	9.1±1

Substrates: **Enamel** No significant differences on bonding to enamel was seen. **Dentin** G-Cem Capsule showed highest strength ($p<0.05$). **Zirconia & ProCAD** Experimental material had highest bond to both substrates ($p<0.0001$). Bond strengths on ProCAD were significantly different for all materials (GC Exp>MaxCem Elite>GCem-Capsule>RelyX Luting Plus ($p<.05$). ***Materials*: Experimental material** produced significant differences with all bonding substrates (Procad>Zirconia>Enamel>Dentin). **MaxCem Elite** showed highest bond strength on ProCAD ($p<0.0001$). Bond to dentin produced the lowest bond strength. The differences were not significant between the substrates enamel and dentin and also for enamel and zirconia. **G-Cem Capsule**'s bond strength was significantly higher only to dentin. **Rely X Luting Cement** showed higher bond strength only to zirconia ($p<0.0001$).

CONCLUSION: In general most cements outperformed an RMGI and should provide good clinical service.

Supported in part by a grant from GC Corp.

MEMO

G-CEM

2353 Interfacial evaluation of self-adhesive cements bonded to conditioned dentin

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Objectives: The study evaluated the interfacial characteristics of contemporary self-adhesive resin cements after EDTA and Polyacrylic acid (PAA) dentin pre-treatments.

Methods: Three self-adhesive cements were used to lute fourty-eigth composite overlays to deep coronal dentin. Three groups were formed according to the dentin surface pre-treatment (n=9): 1) 0.1 M EDTA demineralization; 2) 10% PAA etching; 3) No treatment of dentin. Luting procedures were performed under a simulated pulpal pressure (PP) of 15 cm H2O. After 24-h, samples were sectioned into 1-mm thick slabs and grinded until getting a thickness of 5-6 µm. Cement-dentin interfaces were characterized using the Masson's trichrome staining technique and scanning electron microscopy (SEM).

Results: No hybrid layer, nor resin tag formation were detectable at the interfaces of the tested cements bonded to non treated dentin. A narrow light red zone of collagen partially reacting with cement was seen for G-Cem in EDTA and PAA groups. No cement-dentin interaction was observed for RXU in EDTA group, while a light purple line of partially reacting collagen was seen for the PAA group. No dentin interactions were observed for Bis-Cem for both EDTA and PAA groups.

Conclusions: Self-adhesive cements showed limited interaction with dentin, despite the partial removal of smear layer. Their bonding mechanism should be furtherly studied.

(Grants number - CAPES# O565-07-5- JA-P08-CTS3944, CICYT/FEDER: MAT08-02347/MAT) and JA-P08-CTS3944.

MEMO

G-CEM Automix

481 Influence of tooth surface preparation on self-adhesive resin cements

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Objectives: The smear layer is known to influence the self-etching ability of adhesive materials. The property of smear layer depends on how it is formed. This study evaluated the tensile bond strength (TBS) of some self-adhesive resin cements to the bovine tooth with various surface roughnesses.

Methods: TBS test was carried out according to ISO/TS11405. Bovine tooth was prepared with wet silicon carbide paper(grit: #120,#180 or #600). Bonding area was regulated(3mm in diameter) with a plastic tape. The cements were handled following manufacturers' instructions. A stainless steel rod was cemented(self-curing mode) to each substrate. The specimens were stored at 37-C-100%RH for 1hour and soaked in 37-C distilled water for 23hours. TBS was measured(SHIMADZU AG-I. test speed:1mm/min) after the storage.

Results: In the table, asterisk(*) indicates significant difference(one-way ANOVA, **: p<0.01, *: p<0.05) compared with GAM in the same column. GAM showed the highest value among the cements in any condition. TBS on different surface roughness is also compared in the same row. Tooth surface preparation, however, did not affect the TBS significantly for all cements.

		Enamel			Dentin		
Material	Manufacturer	#120	#180	#600	#120	#180	#600
G-CEM Automix (GAM)	GC	11.4(2.3)	11.8(3.3)	9.8(3.0)	10.3(8.8)	10.2(2.5)	9.9(2.0)
RelyX™ Unicem Clicker™	3M ESPE	8.3(3.0)**	6.6(2.4)**	7.6(2.0)*	4.3(2.1)**	5.2(2.6)**	5.5(1.3)**
MAXCEM™ Elite	KERR	6.9(1.3)**	6.4(2.6)**	5.8(1.4)**	3.5(1.4)**	3.8(1.2)**	3.0(1.8)**
CLEARFIL? SA luting	Kuraray	6.1(1.8)**	5.3(1.3)**	5.5(1.4)**	4.4(1.2)**	7.0(2.0)*	6.9(3.8)

Conclusion: There is no significant difference on TBS at different surface roughness for all cements. The curing period may allow the self-adhesive resin cements to penetrate the smear layer at various thicknesses. It is supposed high bonding ability of GAM is caused by both of the self-etching ability of the phosphate monomer and the permeability of methacrylate monomers.

MEMO

G-CEM Automix

1836 Retention of Self-Adhesive Luting Cements to Zirconia Copings

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Objective: To examine the retention strengths of self-adhesive luting cements between zirconia copings and dentin in vitro. The following groups were tested (N=12 per group):

Group 1: Maxcem Elite (Kerr)
Group 2: G-CEM Automix (GC America)
Group 3: Rely-X Unicem Clicker (3M ESPE)
Group 4: MonoCem Self-Adhesive Resin Cement (Shofu)

Methods: Forty-eight (48) extracted human molars were prepped for all-ceramic crowns. The copings were cemented according to manufacturer's directions for each of the four cement groups. Cemented teeth were stored in distilled water for 3 days at 37°C and thermocycled for 300 cycles between 5°C and 55°C with a dwell of 30 seconds. Each sample was subjected to a “pull-out test” using an Instron Universal Testing Machine model 4201 at a crosshead speed of 5.0 mm/min until failure.

Results: The data was compared using one-way analysis of variance (ANOVA). The p-value of 0.066 suggested that there was no statistically significant difference among the four groups. The mean retention strengths were Group 2=294.7N, Group 4=230.7N, Group 3 =204.3N, and Group 1=187.1N.

Conclusion: There was no statistically significant difference between the retention strengths in each group.

Research sponsored in part by GC America.

MEMO

G-CEM Automix and G-CEM capsule

520 Flexural Strength, Modulus and Crown Retention of Four Cements

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Objective: To compare flexural strength, elastic modulus in two curing modes and crown retention of four cements

Methods:
Flexural strength and elastic modulus: Seventy specimens (27mmx2.5mmx2.5mm) were prepared using a Teflon split-mold following manufacturers' instructions. Thirty specimens (n=10) were light-cured and 40 were chemically-cured. The cement specimens were stored in distilled water (37ºC,24h) and subjected to a three-point bend test (INSTRON-5565,1mm/min).

Crown retention: Extracted teeth embedded in acrylic resin were ground flat occlusally; lathe-cut to produce a standardized uniformly tapered crown preparation. Zirconia crowns were waxed, milled and a hole was drilled through them. Margins were checked for opening and fit, cemented following manufacturer's instructions under a constant weight of 2kg and cured. After water storage (37ºC, 24h), specimens were debonded with a metal rod passing through the hole in the crown and a wire attached to the hook of the testing machine (INSTRON-5565) by loading in tension at cross-head speed of 0.5mm/min until failure. Results were analyzed with ANOVA and Tukey/Kramer (p=0.05).

RESULTS: Results are displayed in the table below (Mean±SD)

Properties	Flexural Strength (MPa)		Modulus (GPa)		Crown Retention (N)
Cement	Light Cure	Chemical Cure	Light Cure	Chemical Cure	
G-CEM Automix	105.5±22	106.8±15	6.5±1	5.3±1	358.4±87
MAXCEM ELITE	57.6±13	63.8±9	4±1	3.1±1	185.8±79
G-CEM CAPSULES	24±5	30±5	5±1	5±1	427.7±89
RELY X LUTING PLUS CEMENT	N/A	22.3±4	N/A	2±1	114.9±20

Flexural strength: G-CEM Automix showed significantly higher flexural strength in both curing modes to the other materials ($p<0.0001$). Modulus: G-CEM Automix (light-cured) was significantly higher than all materials in both curing modes, except to its own chemically cured material ($p<0.0001$). Crown retention: G-CEM capsules and G-CEM Automix produced significantly higher retention than other materials tested. ($p<0.0001$).

Conclusion: Cement selection should be based on mechanical properties as well as the retention provided.

Supported in part by a grant from GC.

MEMO

Fuji Ortho LC

913 White Spot Lesions around the Brackets: An in-Vitro Study

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Enamel decalcification adjacent to brackets during orthodontic treatment may be a concern in patients with poor oral hygiene.

Objective: the aim of this in-vitro study was to evaluate the cariostatic potential of a resin modified glass ionomer cement (RMGIC) (Fuji Ortho LC, GC America Inc, Chicago, IL) and amorphous calcium-phosphate (ACP) containing composite resin (Aegis Ortho, The Bosworth Co, Skokie, IL) to that of a resin control (Transbond XT, 3M Unitek, Monrovia, CA).

Methods: Brackets were bonded to human molars with Fuji Ortho LC (n=15), Aegis Ortho (n=15) and Transbond XT (n=15). In addition, 15 teeth with no bonding agent were used as control. Prior to bonding, acid-resistant varnish was applied to the buccal surfaces of teeth leaving 2 mm exposed sound enamel around the brackets. Samples were immersed in 20 mL of demineralization solution at 37 ⊐C for 14 days. Decalcification of enamel surrounding orthodontic brackets was evaluated using visual examination under 2.5X magnification and Diagnodent. Data were analyzed with Fisher's test and statistical significance was set at P<.05.

Results: In both Aegis Ortho and Fuji Ortho LC groups 80% of teeth were noted as without decalcification as compared to 50% in the Transbond group. However, these results were not statistically significant (P>0.05). All three groups were statistically significantly different than the control group (P<0.05). The degree of decalcification in the experimental groups was found to be slight so that Diagnodent was not able to detect white spot lesions.

Conclusions: Even though the teeth bonded with ACP containing composite resin and RMGIC exhibited caries inhibiting trends, no statistically significant differences were shown due to possibly small sample size and/or length of the immersion in the demineralization solution which need further investigation.

MEMO

Fuji Ortho LC

1885 Effect of Fluoride Release Rates of Adhesives on Enamel Demineralization

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Objective: This study tested the hypothesis that altering mass ratio of fluoride salts within a resin would alter the fluoride release pattern, and investigated their effects on enamel microhardness after pH cycling.

Methods: Three experimental resins based on UDMA (54wt%) TEGDMA (23wt%), and fluoride salts (23wt% of CaF2 and ZnF2) were prepared. The mass ratios of CaF2:ZnF2 were 9:1, 8:2 and 7:3. Henry Schein Orthodontic Bracket Adhesive (BA) and Fuji Ortho LC (OL) were negative and positive controls. Eighty disk specimens (n=8 for each material group) were prepared for fluoride release in demineralization (pH=4.30) and remineralization (pH=7.4) solutions for 49d. Composite resin cuboids (n=24) were bonded to three groups of teeth (n=6 per group) with BA, and a fourth group (n=6) with OL. Experimental resins 9:1 and 7:3 were injected around the base of cuboids on two groups bonded with BA. Each tooth specimen was subjected to 10 pH-cycles between pH 4.3 and 7.4 in two weeks. Cross-sectional enamel microhardness starting at 25µm beneath the enamel exposed during pH-cycling was measured at 25µm intervals to 300µm deep.

Results: ANOVA of fluoride release data showed both material and storage medium significantly ($p<0.0001$) affected the values of Fickian diffusion coefficient. The order of values (mean±SD; µg/d•mm2) from high to low were OL (310.2±15.1), 7:3 (272.7±42.3), 8:2 (238.7±18.4), 9:1 (112.9±39.8) and BA (2.4±0.8) in demineralization solution, and 7:3 (141.2±14.9), 8:2 (134.8±6.2), 9:1 (79.2±13.1), OL (52.9±5.3) and BA (1.8±0.7) in remineralization solution. Microhardness values were significantly influenced by the material at the depth of 25µm ($p<0.0001$), 50µm ($p<0.0001$), and 75µm ($p=0.0370$). The order of microhardness values were OL>7:3>9:1>BA.

Conclusion: The hypothesis is accepted and material with higher fluoride release in demineralization solution provided greater enamel protection during acid attacks.

This research was supported by a UFCD Student Summer Research Fellowship.

MEMO

Fuji Ortho LC & Fuji Ortho Band Paste pak

1946 Orthodontic Bracket Modification to Inhibit Enamel Demineralization

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Objectives: Demineralization adjacent to orthodontic brackets continues to be a significant clinical problem resulting in enamel white spot lesions. This project was designed to test the feasibility of modifying orthodontic brackets to provide a fluoride releasing reservoir to reduce demineralization during an acid challenge.

Methods: Forty orthodontic brackets (4 groups of 10) were modified to place 4 different resins on the exposed surface of the bracket base under the tie wings. Three resin-modified glass ionomers; Fuji Ortho LC (GC, Tokyo, Japan), Fuji Ortho Band Paste Pak (GC), and Vitrebond Plus (3M ESPE, St. Paul, MN) were chosen because of their potential for fluoride release while, Transbond Plus (3M Unitek, Monrovia, CA), was a traditional light-cured resin acting as a control. The modified brackets were bonded to bovine enamel surfaces and subjected to acid demineralization for 7 days. The degree of demineralization was measured using Quantitative Light Fluorescence (QLF) at baseline, 2 days and 7 days. ANOVA and post-hoc testing were used to analyze differences in demineralization between groups.

Results: No difference in enamel demineralization, measured as % fluorescence loss, between groups was seen at baseline. At day 2, differences began to appear with Ortho Band (-10.0% ± 1.2) and Ortho LC (-15.8% ± 3.7) having less demineralization than Vitrebond (-20.4% ± 7.3) and Transbond (-20.3% ± 9.8). By day 7, Ortho Band showed significantly less ($p<0.05$) demineralization (-11.6% ± 2.0) than the other resins with Vitrebond (-31.1% ± 13.8) and Ortho LC (-27.9% ± 10.2) no better than Transbond (-30.0% ± 14.4).

Conclusions: Fuji Ortho Band Paste Pak added to orthodontic brackets results in significantly less demineralization of adjacent enamel.

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MEMO

Fuji II

1896 In situ effects of materials on biofilm and enamel demineralisation

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Objectives: Since secondary caries is one of the main reasons for replacing restorations, this study assessed the effects of different restorative materials on the microbiological composition of dental biofilm and on enamel demineralisation around the restoration.

Methods: A randomized, double-blind, split-mouth in situ design was conducted in one phase of 14 days, during which, 20 volunteers wore palatal devices containing five human dental enamel slabs. Each slab was randomly restored with one of the following materials: Filtek-Z-250/Single Bond, control group (composite resin); Permite (amalgam); Fuji II (encapsulated resin-modified glass ionomer); Vitremer (resin-modified glass ionomer) and Ketac Molar (conventional glass ionomer). The volunteers used fluoride dentifrice, 3×/day and a 20% sucrose solution was dripped onto the slabs 8×/day. The biofilm formed on the slabs was analyzed to determine the counts of total streptococci, mutans streptococci and lactobacilli. Enamel demineralisation was determined by cross-sectional microhardness (CSMH) at 20 and 70 µm from the margin of the restoration. Kruskal-Wallis and Analysis of variance, followed by least mean squares (LMS) test, were used to evaluate microbiota and CSMH among the groups. The significance level used was 5%.

Results: No statistically significant differences were found in the cariogenic microbiota grown on the slabs. At a 20-µm distance, only Fuji II statistically differed from the other groups, showing the lowest demineralisation. At 70 µm, Fuji II significantly inhibited demineralisation when compared to Permite, Filtek-Z-250 and Ketac Molar.

Conclusions: In the context of fluoride dentifrice and under the cariogenic exposure conditions of this study, only the encapsulated resin-modified glass ionomer material provided additional protection against secondary caries.

MEMO

Fuji II LC

494 Microleakage of a New Self-Adhesive Flowable Cervical Restorative Composite Resin

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Objective: To determine the microleakage of a new self-adhesive flowable composite resin (EMBRACE WetBond, Class V Cervical Restorative Resin, Pulpdent) specifically marketed for Class V restorations, with or without an adhesive bonding agent (Optibond Solo Plus, Kerr), a microhybrid flowable composite resin (Revolution, Kerr) and a resin-modified glass-ionomer restorative (Fuji II LC, GC) bonded in Class V preparations.

Methods: Eight specimens were created per restorative group (n=8).Class V preparations were created on the facial and lingual surfaces of each tooth with a 45-beveled enamel margin and a 90-cervical margin.Restorative materials were placed in a single increment and light-cured (Bluephase 16i, Ivoclar) for 20-seconds, stored in 37oC water for 24-hours, thermocycled for 1000-cycles from 5-55C with a 30-second dwell time, coated with fingernail polish to 1-mm of margin, placed in a 0.5% basic-fuchsin dye for 24-hours, and embedded in epoxy.The teeth were sectioned three times with a low-speed saw (Isomet, Buehler).The sectioned surfaces (6 per preparation, 48 per group) were scanned and analyzed using Image J Software (NIH).The extent of dye penetration was expressed as a percentage of the cross-sectional length.A two-way ANOVA/Tukey was used to determine differences in the mean microleakage scores between each of the four groups at both coronal and cervical margins (alpha=0.05). See table.

Results: Significant differences were found between the four groups (p=0.001) but not between the margins (p=0.849) with no significant interaction (p=0.154).There was no significant difference between Groups 1, 2, or 3 and between Groups 1 and 4.

Conclusions: The marginal leakage of the self-adhesive restorative material (WetBond) was not significantly different from the adhesively-bonded flowable composite (Revolution).However, Fuji II LC or Wetbond with the use of an adhesive bonding agent (Optibond Solo Plus) significantly reduced microleakage compared with the self-adhesive WetBond.

Group	Mean Percent Microleakage (st dev)		Statistical Grouping (2-Way ANOVA)
	Coronal Margin	Cervical Margin	
1: Revolution Flowable (Kerr)	5.5 (8.0)	19.5 (25.8)	ab
2: Fuji II LC (GC America)	5.3 (4.6)	2.7 (2.6)	a
3: Wetbond Flowable (Pulpdent) with dentin bonding agent	9.9 (7.1)	6.4 (8.1)	a
4: Wetbond Flowable (Pulpdent)	25.5 (7.9)	20.2 (22.0)	b
Groups with the same letter are not significantly different (p>0.05)			

MEMO

Fuji II LC

3176 Glass Ionomer Bond Strength to Erbium:YAG Laser Â–Treated Teeth

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Objectives: To evaluate the in vitro effect of the Er:YAG laser (L) and high-speed rotary instrumentation (B) on the shear bond strength of a resin-modified glass ionomer (RMGI) to human enamel (E) and dentin (D), and determine which conditioner, either polyacrylic acid (CC) or a self-etch conditioner (SEC) resulted in higher bond strengths with either of the surface treatments.

Methods: Forty, third molars were used. Enamel and dentin specimens were sectioned and polished with 600-grit SiC paper and treated either with a carbide bur or an Er:YAG laser (2940 nm); energy settings were enamel (260 mJ/25 Hz) and dentin (160 mJ/ 10 Hz); and treated, either with 20% polyacrylic acid or a no-rinse self-etch conditioner. A shear testing jig was used to build the RMGI cylinder (2.4mm x 4 mm). After storage for 24 hours in water at 37 C°, specimens debonded in tension and bond strengths calculated in MPa. Means were compared using three-way analysis of variance and Fisher's PLSD post-hoc test ($P<0.05$) was used to determine differences among surface treatments, tooth substrate and conditioners.

Results: Both conditioners showed the highest adhesion strength on laser-treated teeth. The self-etch conditioner showed higher bond strength on dentin than enamel for both surface preparation treatments. Laser-treated enamel conditioned with polyacrylic acid had the highest bond strength (21.74 MPa.) and laser-treated dentin with the self-etch conditioner (20.27 MPa) while enamel - treated bur with the self-etch conditioner the lowest (6.49 MPa.)

Conclusion: bond strength of RMGI was higher or equal with Er:YAG laser preparation compared to bur. Both conditioners improved bond strength of RMGI in laser treated teeth. The Er:YAG laser seems to be a suitable surface treatment for bonding glass ionomers. Supported by GC America.

	LE	LD	BE	BD
CC	22 (12)*	17(10)^{ac}	16 (8)^{a}	18 (9) ^{ad}
SEC	16 (6) ^{b}	20 (7)^{c}	6 (3)	16(3) ^{bd}

Groups with the same superscript letters are statistically the same ($P<0.05$).
*Standard deviations in parenthesis

MEMO

Fuji II LC

3265 Light-activation Influence on the Thermal Analysis of a Resin-modified Glass-ionomer

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Resin-modified glass-ionomer (RMGI) acid-base and light polymerization reactions influence one another during early RMGI development. Previous research has shown the thermal degradation of a RMGI with differential scanning calorimetry (DSC) produces a material decomposition endotherm that may serve as a relative indicator of glass-ionomer/resin material character (Abey et al., IADR#33, 2007).

Objectives: To investigate the influence of light-activation on the thermal analysis of a resin-modified glass-ionomer at 30 minutes and 1 day after mixing.

Methods: Fuji II LC capsules (GC America, Alsip, IL) were mixed according to manufacturer instructions, dispensed into aluminum crucibles, and evaluated with DSC (Mettler Toledo, Inc., Columbus, Ohio) using a dynamic scan from 37 • 00oC at 10oC/min. Two groups were examined: specimens that were immediately light-activated (20 seconds) after mixing and another with no light-activation (dark cure). DSC evaluation was performed 30 minutes or 1 day after mixing and storage at 37oC. Thermograms were analyzed for material degradation endotherms with statistical analysis performed with two-way ANOVA (n=10/group/time).

Results: Two main endothermic degradation peaks were observed. The average and standard deviation values for the high and low temperature endothermic peaks for each group are listed. Capital and small letters denote significant differences ($p<0.05$) between DSC evaluation time after mixing (RMGI maturation time) and curing mode, respectively.

GROUP		Low Temperature Enthalpy (J/g)	Low Temperature Endotherm (oC)	High Temperature Enthalpy (J/g)	High Temperature Endotherm (oC)
30 min	Immediate Light Cure	20.67±6.90 Ab	191.08±11.18 Aa	17.27±7.87 Aa	405.91±3.09 Ab
	Dark Cure	24.21±8.49 Aa	165.7±11.28 Aa	9.45±14.88 Ab	416.39±13.24 Aa
1 Day	Immediate Light Cure	10.82±5.78 Bb	102.87±5.86 Ba	14.06±2.08 Aa	396.70±0.72 Ab
	Dark Cure	22.2±11.20 Ba	136.27±6.31 Ba	2.31±1.03 Ab	420.75±4.42 Aa

Conclusion: Variable light-activation and RMGI maturation time resulted in differences in RMGI character/structure that were detected with thermal analysis.

MEMO

Fuji II LC & Fuji IX & Caviton

44 Microleakage of Temporary Restorative Materials

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Objectives: Temporary restorative materials used between endodontic appointments are important in influencing the success of root canal treatment. The main objective of using the materials is to provide coronal seal to prevent the entry of microorganisms and debris into the root canal. The objectives of this study were to evaluate the degree of microleakage of four temporary restorative materials used in endodontic procedures and to identify the most effective temporary restorative material in term of preventing microleakage.

Methods: This was a laboratory experimental study using eighty human molar and premolar teeth (non-carious and non-restored crown). A standardized access cavity of 4mm x 4mm x 4mm was prepared on occlusal surface of each tooth. The teeth were then divided into four groups, of 20 teeth. Each cavity was then restored with one of the following materials: GC Fuji II LC, Caviton, GC Fuji IX and Kalzinol. This was followed by 2-hour incubation and 7-days immersion in 2% Methylene blue. Depth of penetration was measured using digital microscope after longitudinal sectioning of each tooth.

Results: There was statistically significant different in microleakage among the temporary restorative materials tested ($P<0.001$). GC Fuji II LC produced the highest sealing ability with minimum and maximum leakages of 0.479mm and 1.992mm respectively, followed by Caviton and GC Fuji IX. Kalzinol had the least sealing ability with minimum and maximum leakages of 3.259mm and 5.424mm, respectively.

Conclusion: Within the limitations of this study, GC Fuji II LC was found to be the most effective sealer compared to other tested materials.

MEMO

Fuji III

3201 Strengthening Mechanism of Apatite-Ionomer Cement

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The mechanical properties of glass-ionomer cement (GIC) may be improved with the addition of hydroxyapatite (HA). Previously, we have reported on HA-added GIC (apatite-ionomer cement) with improved mechanical and microstructural properties, with uncompromised bonding and fluoride properties (Dent Mat J 22(2):126-136, 2003; Biomat 24 (2003) 3787-3794; FDI 2008: PP19). However, the chemical interactions involved are still unknown.

Objectives: To evaluate the flexural strength and chemical characteristics of apatite-ionomer cement. Methods: A chemical-curing GIC sealant (GC Fuji III®) was used as the control and base material. Spherical HA (HA: Taihei Sangyo Inc.) was added from 4-32wt% into the GIC powder. Samples (six/group) were prepared (P/L 1.6) and subjected to flexural test. Statistics was done using Scheffe's F test. HA powder properties were analyzed. The representative fracture surfaces were analyzed using EPMA. .

Results:There was increased flexural strength (MPa) with the addition of HA as shown:

Control	+ 4% HA	+ 8% HA	+ 12% HA	+ 16% HA	+ 20% HA	+ 24% HA	+ 28% HA	+ 32% HA
4.93 ±1.7	7.12 ±1.8	8.16 ±3.6	11.28** ±3.3	11.88* ±6.1	14.99*** ±4.6	15.08*** ±2.9	13.90*** ±3.4	12.04* ±6.0

(***p<0.001;**p<0.01;*p<0.05 Significant difference compared to control.

HA particle analysis: Diffraction particle size 20.6±0.25µm mean; surface area 42.1±0.11 m2/g; microcompressive strength 0.63±0.06 MPa.

Microanalysis showed the presence of calcium (19.6%), silicon (17.4%),phosphorus (4.5%), aluminum (13.2%), fluorine (1.3%) and strontium (19.9%) in the matrix of the apatite-ionomer cement. This indicated the formation of new matrix with phosphorus and calcium ions. The more calcium ions available with more HA added, the higher is the strength of the cement.

Conclusion: The strengthening ability of HA is due to matrix modification specifically through ion interchange between GIC and HA.

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MEMO

Fuji Triage

1097 The Effect of Sealant Types on Demineralization of Surrounding Enamel

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Purpose: To determine the differences between types of dental sealants in protecting surrounding enamel from demineralization challenge.

Methods: Fifty extracted human mandibular molars were used in this in vitro study. The occlusal surfaces were sealed using 5 different sealants: UltraSeal XT® plus (control), Fuji Triage® (glass ionomer), Clinpro® (fluoride), Bosworth Aegis® (amorphous calcium phosphate), and experimental self-etched sealant (fluoride). The sealed molars were immersed individually in a lactic acid gel for 20 days to produce artificial caries lesion. Then a cross sectional microhardness test was performed at 0.5 mm away from the sealant margin. The hardness values were converted to mineral content (volume%), the total mineral loss was calculated and subjected to ANOVA and Student-Newman-Keuls test.

Results: Means(SD) total mineral loss were: 1801(512), 87(124), 1004(420), 1274(375), and 1334(725) volume%-microns for UltraSeal XT® plus, Fuji Triage®, Clinpro®, Bosworth Aegis®, and experimental self-etched sealant, respectively. Glass ionomer sealant (Fuji Triage®) was significantly more effective in protecting the surrounding enamel 0.5 mm from the sealant margin than other sealants ($p<0.05$). Resin-based sealants with added fluoride (Clinpro® and experimental self-etched) or amorphous calcium phosphate (Bosworth Aegis®) had some protective effect when compared to the non-fluoride control (UltraSeal XT® plus) ($p<0.05$).

Conclusions: Resin-based sealants containing fluoride or amorphous calcium phosphate showed some protective effect on surrounding enamel from demineralization challenge. Glass ionomer sealant is the most effective in protecting surrounding enamel from demineralization.

MEMO

Fuji IX

1000 Twenty-four months of CRT prospective clinical evaluation of ART restoration

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Objective: The objective of this study was to compare in a clinical randomized trial the performance of 2 glass ionomer cements used in Atraumatic Restorative Treatment (ART) technique.

Methods: Seventy-nine schoolchildren aged from 6 to 9 year-old, with at least two active caries in primary molar teeth (n=141, Class I and II restorations) from opposite hemi arches had been selected to participate in the experiment (split-mouth designed). Children were randomly divided into 2 groups: Group 1 - Ketac-Molar (K) and Group 2 - Fuji IX (F). Primary molars presenting open decayed cavities (≥ 3 mm) were handling excavated and filled according to ART approach. Restorative materials were randomly allocated in the primary teeth. Restorations were evaluated in baseline, 3, 6, 12 and 24 months. The data were submitted to the Wilcoxon, Mann-Whitney and t-test ($p<0.05$).

Results: For Fuji IX Class I, there was no significant difference between the recalls, but for Ketac-Molar a significant reduction of the success occurred at 6 months and another decrease at 12 months. For Class II both materials showed similar performance, with significant success rate reduction at 3 months (K-29%; F-37%); Ketac-Molar showed another success rate decrease at 24 months, and Fuji after 6 months. No significant difference was found between both materials, in the same period of time for Class I and II, except at 24 months for Class I, when Ketac-Molar presented higher failure rate (75%).

Conclusion: The 24-month survival rates for treating tooth decay in school children with the ART approach was shown to be appropriate and effective particularly in small Class II lesions for both materials. However, the Fuji IX glass ionomer cement presented better performance when used in Class I cavities.

MEMO

Fuji IX

1881 24-month Evaluation of Glass-ionomer Sealants in a Clinical Randomized Trial

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Objective: The aim of this study was to compare the clinical performance of Ketac Molar (K) and Fuji IX (F) glass ionomer cements as sealant in a clinical randomized trial.

Methods: A prospective study (CRT) was carried out with a sample of 79 schoolchildren aged from 6 to 9 year-old. Each subject was randomized to receive one sealant material on one side and the other sealant material on the contra lateral side. All pits and fissures were cleaned with a probe and wet cotton pellets in order to remove dental biofilm and debris. The same dentist (PAS) using the “press-finger” technique placed all sealants using relative isolation. The total of 98 permanent first molars was sealed with Fuji IX and 99 with Ketac Molar in a split mouth design randomly assigned in the same child. The follow-up was made at baseline, 3, 6, 12 and 24 month. For the sealants successful, caries lesion absence was considered. Wilcoxon, Mann-Whitney and Log-Rank Tests ($p<0.05$) were used for statistical analysis.

Results: For the Ketac Molar sealants, there was no significant difference on success rate until the 12 months. For Fuji IX sealants, at 3 months evaluation the success rate decreased significantly, having a new significant reduction only at 24 months. No significant difference was found between both the materials, in the same period of time.

Conclusion: This study supports the evidence that both materials showed high and similar success rates after 24 months. Additionally, Ketac Molar and Fuji IX glass ionomer cements can be used for occlusal sealing treatment using “press-finger” technique.

MEMO

Fuji IX Fast

2387 Long Term In Vitro Bioactivity of Two Glass Ionomers

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Aim: The aim was to characterize reaction products of two glass ionomers exposed for 2 yrs to a physiological saline solution. In our previous study [2007 IADR Abst #2022], the two materials, Ketac Radiopaque (K), 3M-Espe, and Fuji IX Fast (F), GC, did not show any evidence of reactivity when stored in the same solution for 2 m.
Methods: K is based mainly on a Ca(La)-fluoroalumino silicate. In F, Sr replaces Ca in the glass. Discs (n=3), 10 x 2 mm, of each material made in accordance with manufacturer's recommendation, were stored in 5 ml of a phosphate buffered saline, PBS, solution (pH=7.2, 37oC) contained in polyethylene vials for 2 years. During storage, precipitation occurred in respective solutions. After washing with distilled water and drying, all treated specimens and precipitates were examined by SEM and EDXA.

Results: F yielded more precipitates in PBS than K. For F, the precipitates showed the presence of mainly Sr, Al, P, and O, and are tentatively identified as strontium alumino phosphate. Precipitates from K, were identified as calcium alumino phosphate as they contained Ca, Al, P, and O. All discs exposed to PBS were covered with adherent deposits. They were more extensive in F. The composition of the deposits was similar to those of respective precipitates formed in PBS.

Conclusion: Both Fuji IX and Ketac Molar have been found to be bioactive. F is more reactive than C. The formation of precipitates and surface deposits is attributed to a complex apatitic reaction(s) between various cations (Sr, Ca, Al) leached from respective glasses and the phosphate ions in PBS. The reported in vivo hardening of tooth structures surrounding glass ionomer restorations is attributed to this mineralization reaction.

MEMO

Fuji IX GP

3249 5-Year Clinical and Laboratory Evaluation of Open Sandwich Technique

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Objectives: To assess and compare clinically and laboratory amalgam/glass-ionomer cement(GIC) with composite/GIC open sandwich restorations in class II slot preparations.

Methods: 53 combined amalgam/GIC and 61 composite/GIC restorations (highly viscous Fuji IX GP,GC,Japan) made with the open sandwich technique were placed in 114 Class II proximal slot cavities in 44 patients, and were periodically assessed clinically for five years. Moreover, an in vitro study was carried out as well using extracted human molars, to assess the relative adaptation of amalgam and resin composite to glass ionomer cement and respective tooth structures.
Confocal Tandem Scanning Microscopy(TSM) was employed to examine the interfacial areas. The interfacial gap distance existing between substrate tooth surface and respective restorations was recorded with image analysis computer software as indicative of relative adaptation.

Results: The clinical data presented as frequencies and percentages revealed higher success rates for composite/GIC restorations than amalgam/GIC restorations. Amalgam/GIC restorations exhibited a high success rate of 96% during the first two years. However, the success rate decreased to 90% during the 3rd year, followed by a sharp decrease to 81% during the 4th year, and eventually reached only 60% in the 5th year.

Composite/GIC restorations showed a high success rate of 96% throughout the first 3 years, that decreased to 89% and 87% during the 4th and 5th years respectively, without exhibiting sharp decline as that for amalgam/GIC restorations

The laboratory data of interfacial gap distance(Student's t test,$p<0.05$) and TSM revealed optimum adaptation of glass-ionomer to tooth structures and indicated that composite/GIC exhibited better adaptation to each other and to tooth structure than amalgam/GIC .

Conclusions:
1- Composite/GIC open sandwich could be the restoration of choice for class II slot preparations.
2- The adaptation of the composite/GIC is better than that for amalgam/GIC to each other and to tooth structure.

MEMO

ART

1903 Preliminary Evidence of Mechanical Recovery of ART Treated Carious Dentin

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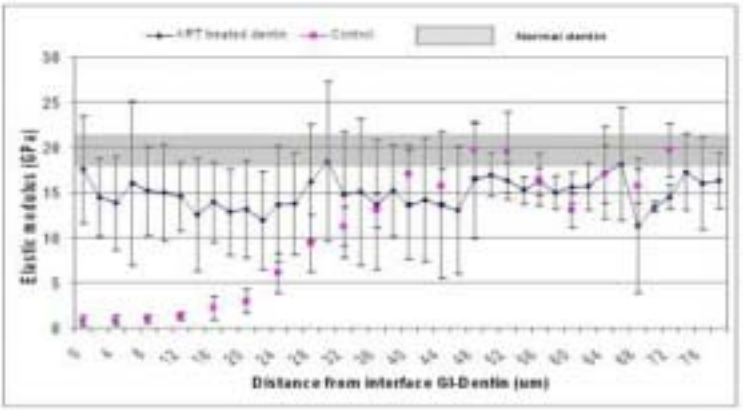
Atraumatic restorative treatment technique consists of hand excavation of carious dentin and preservation of sound tissues that might be suitable for remineralization after restoration with glass ionomer (GI) cement. ART restorations allow fluoride release over their lifetime thus favoring remineralization, but little information exists about the mechanical recovery of treated tissues and the depth of remineralization under ART restorations.

Objective: This pilot study sought to provide preliminary data on the clinical effectiveness of ART in remineralizing and recovering the mechanical properties of carious dentin. Methods: Twelve teeth prepared by the same practitioner were obtained, gamma-irradiated, embedded and subsequently cross-sectioned to expose the inner surface of the teeth and the interface between the glass ionomer and the treated dentin. Simulated caries lesions in dentin substrates (12mm2) were used as a control. Representative specimens (n=5) of the ART teeth and the control had their elastic-modulus determined by AFM-based nanoindentation in water. 2 lines containing 30-40 indents with an interval of 2 um between each was performed across the dentin-GI interface extending into dentin. Data was analyzed using ANOVA (P <.05). Additionally, specimens (n=7) were embedded, cross-sectioned and metalographycally prepared to obtain 100 µm thick samples for subsequent imaging with a polarized light microscope (PLM).

Results: Elastic-modulus of ART treated dentin was not significantly different from normal dentin through the extension of the indented area; yet, ART yielded properties significantly higher than the control group until a depth of about 20 um. It was also noted that full mechanical recovery was not homogeneously distributed along the areas measured. PLM images suggested similarities between the inner-most affected zone of the simulated caries with the dentin right under the G



Conclusion: This study suggested that the clinical application of ART might facilitate remineralization and provide the mechanical recovery of treated carious dentin.

Supported: NIH DE16849

MEMO

G-Coat

46 Effect of Surface Sealants on Microleakage of Composite Resin Restorations

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Objectives: To evaluate the effects of application of surface sealants or self-etch adhesive on microleakage of resin composite restorations.

Methods: Standard Class V cavities (3x2x1,5mm) were prepared at the cemento-enamel junction on the buccal and lingual surfaces of 35 human premolars. The cavities were treated with an etch-and-rinse adhesive system (Single Bond 2, 3M ESPE) and restored with a nanocomposite resin (Filtek Supreme XT, 3M ESPE). Restorations were finished and polished using a disc system (Sof-Lex, 3M ESPE) after 24 hours and divided into seven groups (n=10) according to the sealing materials: Group 1- Negative control (without use of any sealant); Group 2– Positive control, Clearfil SE Bond (Kuraray Medical); Group 3– Top Coat (Kuraray Medical); Group 4– Fortify Plus (Bisco); Group 5- Clinpro white varnish (3M ESPE); Group 6- G Coat (GC); Group 7– Opti Guard (Kerr). Teeth were stored in distilled water for 24 hours at 37°C and thermocycled 1000 times. They were then, immersed in 0.5% aqueous basic fuchsin dye solution for 24 hours and sectioned longitudinally in bucco-lingual direction. The slices were observed under a stereomicroscope (x20 magnification) by two examiners and dye penetration scores were recorded separately for enamel and dentin. Data were analyzed using Chi-square test (p=0.05).

Results: There were no significant difference between enamel and dentin margins in all groups (p>0.05). For enamel, G Coat showed no microleakage, while Clearfil SE Bond exhibited the highest scores (p>0.05). For dentin, Top Coat resulted in the lowest microleakage, whereas Fortify Plus showed the highest microleakage (p>0.05). However, the results of experimental groups were not statistically different from the control groups for both enamel and dentin margins (p>0.05).

Conclusion: The microleakage of resin composite restorations did not differ with the application of surface sealants.

MEMO

G-Coat & Unifast II

2393 Resin coating material influences to gingival fibroblasts and Porphyromonas gingivalis

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Objectives: Recently, resin coating materials are used to burnish composite resin or temporally crown in order to prevent plaque accumulation. However, it is not clear whether it influences on gingival condition and periodontal bacteria. Therefore, we investigated the effect of resin coating materials on human gingival fibroblasts (HGF) and Porphyromonas gingivalis (Pg).

Methods: The polymerized resin plates (UNIFAST II, GC, Tokyo, Japan) were coated with Surface-coat (KURARAY, Tokyo, Japan) (S-coat) or G-coat (GC, Tokyo, Japan). HGF were cultured in aMEM containing 10% FBS on coated and non-coated (control) plates. To evaluate the viability and shape of the HGF, MTS assay and actin staining with rhodamine phalloidin (invitrogen) were performed respectively. To estimate the antibacterial effect, each plate was immersed in Brain Heart Infusion medium containing Pg (1x106 CFU/ml) at 37°C in anaerobic condition (80%N2, 10%H2, 10%CO2). The quantity of bacterium attached on each plate was evaluated by crystal violet quantification (570 nm). Statistical significance was determined using a two-way repeated ANOVA and Fisher's PLSD with two predictors; coating difference (S-coat/G-coat/control) and incubated time.

Results: S-coat and G-coat tended to decrease HGF viability. S-coat suppressed actin filament formation, while G-coat and control did not. Interestingly, the number of adherent Pg was significantly decreased by S-coat after 12, 24 and 36 hours ($p=0.004$, <0.001, 0.003, respectively) and by G-coat after 24 and 36 hours ($p<0.001$, $p=0.002$, respectively) in comparison with control.

Conclusions: While S-coat and G-coat tended to decrease HGF viability, they clearly prevented Pg accumulation on the polymerized resin plates sunk in the anaerobic BHI medium.

MEMO

G-BOND

157 Composite Bond Strength to Intact Enamel with Current Simplified Adhesives

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Objectives: The objective of this in vitro study was to compare microtensile bond strength (MTBS) of six simplified adhesive systems and one total-etch, one-bottle adhesive system to intact enamel.

Methods: The roots of twenty one human sound incisor teeth were removed, the enamel surfaces were cleaned with pumice, randomly assigned into 7 groups and treated one of the adhesives: Hybrid Bond (Sun Medical); AdheSE One (Ivoclar/Vivadent); One Coat 7.0 (Coltene/Whaledent); Danville Experimental (Danville Materials); Clearfil TriS Bond (Kuraray); G Bond (GC); and Prelude total-etch (Danville Materials) as control. Composite resin (Clearfil AP-X, Kuraray) build-ups were created and after 24 h, the teeth were sectioned into beams of 1.0 mm2 cross-sectional area. Each beam was tested in a microtensile tester (Bisco) at 1mm/minute. Data was calculated as MPa and statistically analyzed (one-way ANOVA, Tukey-test).

Results: MTBS values of adhesives to intact enamel were as follows (n=14) (Mean±SD): Hybrid Bond:15.62±3.90 a; AdheSE One:17.29±3.88 ab; One Coat 7.0:19.59±3.95 abc; Danville Experimental:18.65±5.33 abc; Clearfil TriS Bond:20.89±2.96 bcd; G Bond: 23,49±4.21 cd; Prelude total-etch:25.79±5.24 d. different letters indicate statistically different groups, p=0.000):

Conclusion: Clearfil TriS Bond and G Bond showed similar bond strength with Prelude total-etch system (p=0.064). The other simplified adhesives showed similar performance (p=0.239) however MTBS values to intact enamel of these systems were lower than the data obtained by Prelude total-etch system (p<0.05).

MEMO

G-BOND

545 Three-year Clinical Evaluation of G-Bond in Non-carious Cervical Lesions

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Introduction: The aim of this study was to evaluate the clinical performance of G-Bond (GC Corporation, Japan) dentine bonding agent, over 3 y in unprepared non-carious cervical lesions (NCCL).

Materials and Methods: Ethics Committee approval was obtained, and 47 restorations were placed (30 anteriors, 13 premolars, 4 molars) in 10 patients aged 45-75 y (mean 62 y), using Gradia resin composite (GC) and G-Bond dentine bonding agent, according to the manufacturer's instructions. Patients were recalled at 6 mo, 1 y, 2 y and 3 y, and photographs taken for assessment of colour match and marginal discoloration.

Results: Eight patients were available for recall at 3 y, providing 40 restorations for evaluation, all of which were present. One restored tooth had been extracted for unassociated reasons. One restoration had minor marginal discoloration at 1 y; at 2 y, four restorations had slight and clinically insignificant marginal discoloration; at 3 y, the marginal staining was unchanged.

Discussion: G-Bond is a HEMA-free, ‘mild-etch' all-in-one bonding agent, i.e., etching, priming and bonding are achieved simultaneously. The functional ionomer 4-MET and a phosphate ester achieve bonding by hybridization. The absence of HEMA precludes possible hypersensitivity. Pre-etching the uncut enamel with phosphoric acid overcomes the sub-optimal etching which occurs with ‘mild-etch' dentine bonding agents, which is confirmed by the absence of enamel marginal staining. The mild staining at the dentine margin could indicate bond degradation, but may also be a consequence of the difficulty of isolation of the area during restoration. A key requirement when using G-Bond is to dry the adhesive aggressively in order to evaporate the acetone solvent and thus prevent phase separation.

Conclusion: G-Bond shows good clinical performance in NCCL after 3 y.

Supported by GC Corp, Japan.

MEMO

G-BOND and Gradia Direct

546 Clinical Evaluation of a Self-Etching Adhesive System

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Simplified adhesive systems are growing in clinical use.

Objectives: The purpose of this longitudinal clinical trial was to evaluate a self-etching adhesive in Class V cavities.

Methods: 54 non-carious erosion/abfraction lesions in 26 patients were restored. Gradia Direct composite resin was placed using a self-etching adhesive, G-Bond following ADA guidelines mandating no cavity preparation. After cleaning the tooth surface with pumice, the adhesive system was placed. The G-Light was used for polymerization of the adhesive and the composite resin. The following parameters were evaluated at 6 months (n=54) and 18 months (n=50) using modified Ryge criteria: Color Change (CC), Recurrent Decay (RD), Marginal Discoloration (MD) Marginal Integrity (MI). Tooth sensitivity (S) and retention (R) were also documented. Data was analyzed with Chi Square.

Results: (A=alfa, B=bravo, C=charlie, D=delta)

	Six-months	**18 Months**
CC	100% A	100% A
RD	100 % A	100% A
MD	94.4 % A, 5.6% B	98.0 % A, 2.0 % B
MI	90.7 % A, 9.3 % B	90 % A, 10% B
S	100% A	100 % A
R	100% A	98 % A 2% D

38.2 % of patients reported preoperative sensitivity to tactile or air stimulation. No patient exhibited sensitivity at either the six-month or 18 month recall. There were significant differences in marginal integrity and marginal discoloration after 18 months ($p>0.05$). Minimal marginal changes were observed and 1 restoration was lost to retention failure.

Conclusions: The adhesive system and composite resin performed well after 18 months of clinical service in Class V cavities. Some minimal changes in marginal stain and integrity were observed.

Supported by GC America.

MEMO

G-BOND, Gradia Direct

3244 3-year clinical evaluation of Gradia Direct restorations

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Objectives: Recently, the demand of the patient for aesthetic restoration has been increased, but nowadays almost all cases of the direct resin composite restorations use only one shade. Gradia Direct (GC) is a brand-new resin composite with multiple color shade variations to match to surround tooth color. G-Bond is a one-bottle one-step bonding system containing phosphoric ester monomer with high bonding efficacy. The purpose of this study was to evaluate the 3-year clinical performance with G-Bond and Gradia Direct system.

Methods: A total of 37 non-carious cervical lesions were restored in 37 patients using this system. The baseline records were made immediately after placement according to the modified Ryge/USPHS criteria for retention, marginal discoloration, marginal adaptation, surface texture, abrasion, marginal fracture, and body fracture. Restored teeth were assessed for secondary caries and pain. Soft tissue around restored teeth was also assessed for gingival irritation and soft tissue irritation. The patients were followed up routinely up to 36 months and the restorations were evaluated for clinical acceptability.

Results: At 36 months, data available for all assessment periods were 100 per cent, and all the restorations were classified as clinically satisfactory and assigned with an Alpha rating. No restorations were recorded with Bravo or Charlie. The Kaplan-Meier probability of survival rate for these restorations was 1.00. Especially, all the patients were very satisfied with the color match to the surround tooth structure.

Conclusion: As a result, the G-Bond & Gradia Direct restorative system was very aesthetic and noted to be a promising for next generation restoratives.

MEMO

G-BOND

981 Orthodontic bracket bonding by applying one-step self-etch adhesive system

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Objectives: In order to minimize the intervention to the intact enamel and prevent the enamel fracture, we designed the novel bonding system of the orthodontic bracket by applying a one-step self-etch adhesive system. The purpose of this study is to control the fracture portion at the debonding of the bracket from the enamel.

Methods: Resin cements (Superbond C&B [SB, Sun Medical], Transbond XT [TB, 3M Unitek]), one-step self-etch adhesives (G-Bond [GB, GC], Tri-S bond [TS, Kuraray Medical]) and extracted human premolars were used. After one-step self-etch adhesive was applied to the enamel surface and polymerlized, the brackets were bonded to the adhesive layer with resin cements. The brackets were bonded to the enamel surface, etched by phosphoric, with resin cements as a control. Measurement of shear bond strength and observation of fracture surface were performed.

Results: Mean shear bond strengths obtained from the experimental groups were lower than that obtained from the control groups. However, mean bond strengths of the experimental groups were more than 11.3MPa, and the interfacial failure was observed at the adhesive layer and resin cement interface. Contrast, the enamel fracture was observed in the control group.

Conclusion: The application of a one-step self-etch adhesive system to the bonding of the bracket to the enamel for orthodontic treatment exhibited noticeable high bond strength and controlled the fracture portion. This bonding technique is very powerful to prevent the enamel fracture at the debonding of the bracket from the enamel surface.

Table. Shear bond strength (MPa) **(n=12)**

	Mean	S.D.		Mean	S.D.
Control group					
SB	16.3	3.8	TB	14.0	2.2
Experimental group		*			
GB-SB	14.3	3.3	GB-TB	15.7	3.5
TS-SB	11.3	2.9	TS-TB	12.7	3.0

Scheffe's F test : Significantly difference between means at $p < 0.05$:*

GB－SB : Combination of G-Bond and Superbond C&B
GB－TB : Combination of G-Bond and Transbond XT
TS－SB : Combination of Tri-S bond and Superbond C&B
SB－TB : Combination of Tri-S bond and Transbond XT

MEMO

G-BOND

1852 Effect of Phosphoric-acid-etching on Class-V Dentin Margin Integrity Using All-in-one-Adhesives

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Objective: To evaluate the continuity of dentinal margins of Class-V restorations using four all-in-one adhesives, after phosphoric-acid-etching of the dentin for up to 15 s, and stressed by thermocycling.

Methods: 200 extracted human central incisors were prepared for standardized Class-V-restorations (4 mm in incisal-apical direction (50% in enamel), 3 mm in mesio-distal direction, and 1.5 mm deep). The adhesive systems OptiBond FL (OPT) as a control, Adper Prompt L-Pop (PLP) with mixing and three one-bottle all-in-one adhesives AdheSe One (AHO), G-Bond (GB), and iBond Self Etch (IB) were used (each with n=8 samples). Following preparation, six different cavity pretreatment approaches were used prior to applying the all-in-one adhesives: manufacturer instructions (P1), selective phosphoric-acid enamel etching (30 s) ensuring no dentin acid contamination during rinsing (P2), allowing acid contact with dentin during rinsing (P3), and following dentin acid etching for 5, 10 and 15 seconds (P4, P5, P6 respectively). All teeth were restored using Filtek Z 250, which was placed in two increments starting at the cervical margins. The margins were evaluated following 21 days of water storage and after thermocycling (2000 cycles: 5 to 55 °C). Replicas were produced and quantitative SEM margin analysis (200x) was performed using standardized criteria by a single evaluator.

Results: Median values (% ”continuous margin”) for the different respective adhesive systems (P1/P2/P3/P4/P5/P6) after thermocycling were OPT: 100.0, PLP: 86.7/85.6/86.8/86.2/86.4/87.0, GB: 95.7/96.9/96.9/96.9/96.2/94.1, IB: 95.7/95.2/93.1/95.5/95.1/93.1, AHO: 89.7/89.1/88.2/91.1/90.4/91.0. The statistical evaluation (Kruskal-Wallis-Test with Bonferroni adjustment, $p<0.05$) showed no adverse effect on dentin marginal adaptation due to the additional phosphoric-acid-etching.

Conclusion: Phosphoric-acid-etching applied to improve adhesion to enamel of all-in-one adhesives has no adverse effect on the quality of dentin margins even if etching was accidentally applied to dentin for up to 15 s.

MEMO

G-BOND

2315 Effect of Adhesive System Application Modes on Dentin Permeability

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Objectives: To evaluate the dentin hydraulic conductance (HC) with adhesive system applied following different conditions.

Methods: One hundred twenty bovine incisors teeth were subjected to laminate cavity preparations. After removing the roots and the coronal pulp, the buccal dentin was treated with EDTA solution (0.5 M) for 5 minutes, rinsed, ultrasonicated for 12 minutes and connected to a permeability device. HC of the specimens was measured at 10 psi. Permeability was measured before and after the bonding procedures using the adhesives: G-Bond / GB (GC Corp.), Clearfil Tri-S-Bond / CTS (Kuraray Med.), Hybrid Coat / HY (Sun Medical), Bond Force / BF (Tokuyama), Adper Easy Bond / AEB (3M ESPE), Silorane / SI (3M ESPE), Clearfil SE Bond / CSE (Kuraray Med.) and Scotchbond Multi-Purpose / SMP (3M ESPE). All adhesive systems were applied as follows: 1) according to manufacturers' instructions; 2) two coats of all-in-one self-etching adhesives (GB, CTS, HY, BF, AEB) or priming step plus two coats of bond resin for the other systems (SI, CSE and SMP); and 3) one coat of all-in-one self-etching adhesives plus a thin layer of a flowable composite (Filtek-Flow, 3M ESPE) or priming step (SI, CSE and SMP) plus a thin layer of the same flowable composite.

Results: No significant difference was observed among the application modes concerning their ability to reduce dentin permeability ($p<0.05$). None of the adhesives showed a complete sealing of the bovine tooth dentin. SI showed lower permeability compared to SMP, but it was not different from other systems. These systems were also similar to SMP.

Conclusion: Results suggested that all systems tested were able to promote reduction in the HC. However, the wet bonding technique seemed more sensitive for dentin sealing.

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MEMO

G-BOND

2322 Influence of Acidic Adhesives on Cut Enamel Contact Angle

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Objective: This study was carried out to examine the influence on water contact angle of several acidic adhesive systems.

Methods: The systems used were: Bond Force (BF, Tokuyama Dental), Clearfil tri-S Bond (CT, Kuraray Medical), G-Bond (GB, GC), and 35% phosphoric acid (Etchant, 3M ESPE) as a control. Bovine mandibular incisors were mounted in self-curing resin and labial enamel was wet ground with #180, #600, and #2,000grit SiC paper. The adhesives were applied according to each manufacturer's instruction, and washed with acetone and with tap water. Water contact angle measurement was conducted using a sessile drop and θ/2 (a half angle) method by means of DropMaster (DM500, Kyowa Interface Science). ANOVA and Tukey HSD tests at a level of 0.05 were done. SEM observations of the treated enamel surface were also conducted.

Results: The contact angles of water droplets to the treated enamel surfaces were 8.7~9.4 for BF, 62.0~79.7 for GB, 49.5~69.7 for TS, and 8.2~9.1 for Etchant. Significant differences in contact angle were found for GB and TS. BF and Etchant treated enamel surfaces revealed significantly lower contact angles compared to GB and TS, and there were no changes in contact angle with different types of roughnesses created on enamel surfaces. From the SEM observations, different types of smear layer were observed.

Conclusion: The data suggest that enamel surfaces treated by single-step self-etch adhesives have different wetting characteristics and this tendency was dependent on the type of adhesive.

MEMO

G-BOND

2328 Relation between Degree of Conversion/pH and Bond-Strength of All-in-one Adhesives

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Objectives: To Evaluate the relation between Degree of Conversion (DC)/pH-value and Micro-Tensile Bond Strength (μ-TBS) of six all-in-one adhesives to dentin.

Methods: Flat occlusal dentin was exposed in 128 extracted human molars. Teeth were equally divided into 16 groups (8 teeth each). Two groups were randomly assigned for each all-in-one adhesive and controls: Clearfil S3 (S3-kuraray); G-Bond (GB-GC Dental); iBond (IB-Heraeus Kulzer); Xeno V (XB-Dentsply); Optibond All-in-one (OB-Kerr) and Adper Easy Bond (AEB-3M). Adper ScotchBond SE (ASE-3M) was used as two-bottle one-step control and Adper Single Bond Plus (SB-3M) as etch-and-rinse two-step control. Specimens were restored with Filtek Z250 Composite (3M). One group for each material was thermocycled (TC). μ-TBS to dentin was measured in a universal testing machine. Type of failure of debonded beams and bonded interface analysis of demineralized/deproteinized samples was done using SEM. DC was measured using Mid-FTIR and pH-value was measured using digital pH-meter. All data were analyzed by ANOVA and multiple comparisons using Tukey test ($p<0.05$). Regression analysis was applied to calculate the relation between DC/pH and bond strength.

Results: The following table shows μ-TBS in MPa, DC % and pH. Standard deviations are given in parentheses. High correlation was found between reduction in μ-TBS after thermocycling and DC ($R^2 = 0.803$), and low correlation with pH ($R^2 = 0.091$).

Material	μ-TBS (MPa)		DC %	pH
	Pre-TC	Post-TC		
SB	58.17(10.1)a	43.56(8.4)b	61.00(3.1)c	-
GB	53.40(9.6)a	45.30(6.9)b	85.99(1.5)a	3.02 (0.03)ab
OB	48.40(8.0)b	33.32(7.2)c	62.52(6.0)c	3.02 (0.02)ab
AEB	43.55(6.2)bc	36.64(6.6)c	83.43(2.4)a	3.12 (0.03)a
S3	39.62(7.1)c	33.79(3.8)c	84.07(3.8)a	3.09 (0.02)a
ASE	38.72(9.6)c	32.41(7.4)c	81.47(4.3)a	2.62 (0.02)bc
IB	26.75(4.2)d	21.12(4.5)d	83.25(3.6)a	2.21 (0.02)d
XB	25.88(5.5)d	20.17(3.8)d	73.50(4.4)b	2.29 (0.02)cd

Within a Column, values with the same letters are not statistically different

Conclusions: The degree of conversion of all-in-one adhesives has more influence than pH on their bond strength.

MEMO

G-BOND PLUS

1802 Adhesive Properties of New All-in-one Adhesive, GC G-BOND PLUS

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Objectives: To compare G-BOND PLUS with other adhesive products on the shear bond strength (SBS) and adhesive interface using TEM.

Methods: G-BOND PLUS was compared with BOND FORCE (Tokuyama), SE BOND (Kuraray) and OptiBond FL (Kerr). Bovine tooth was embedded in acrylic resin and the exposed surface was polished with 320-grid SiC paper. G-BOND PLUS was applied to the surface, dried by strong air-blowing after 10s, and then light cured for 5s using G-Light (GC). Other adhesives were applied according to manufacturers' instructions. The cylindrical mold (Ultradent, D=2.38) was placed on the surface. Clearfil AP-X (Kuraray) was filled into the mold and light cured for 20s. The specimens (n=5) were stored in 37°C water for 24h and loaded in a testing machine (Shimadzu) with a cross-head speed of 1mm/min. TEM specimen was demineralized with EDTA and embedded in epoxy-resin. Then ultrathinned section of 80-90nm-thick was carbon-spattered and observed using TEM. The statistical analysis on SBS for the examined materials was conducted using t-test ($P<0.01$).

Results: The SBS of BOND FORCE was significantly lower than other adhesives for both of enamel and dentin.

	SBS/MPa(SD)	
	Enamel	Dentin
G-BOND PLUS	31.5(4.7)[a]	27.9(4.4)[a]
BOND FORCE	18.9(6.7)[b]	17.4(6.4)[b]
SE BOND	29.4(5.9)[a]	29.0(7.7)[a]
OptiBond FL	32.7(4.7)[a]	26.1(5.8)[a]

In the demineralized TEM section of G-BOND PLUS, nano-interaction zone (NIZ) with high density of 500nm wide was observed and many non-demineralized HAp crystals were seen within the NIZ, which suggests that phosphoric ester monomer contained in G-BOND PLUS chemically bonds to HAp. SE BOND had NIZ of 1μ wide, but HAp crystals were less quantity than G-BOND PLUS. On the other hand, there was no NIZ observed in BOND FORCE and OptiBond FL.

Conclusions: From the results of SBS and TEM observation, G-BOND PLUS is considered to have a high bonding effectiveness and durability to the tooth structure.

MEMO

GDLS-200(Kalore), Gradia direct Posterior

2441 Polymerization shrinkage ratio of various resin composites

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Objectives: we have developed a low shrinkage resin composite. In the mean time, we have devised an original method for measuring polymerization shrinkage. The aim of this study was to examine and compare the polymerization shrinkage ratio of various resin composites in this method and the ISO draft method, which is considered to be the most accurate way to determine volumetric shrinkage rate.

Methods: six dental composite resins for filling [Experimental composite (GDLS-200, GC), Gradia direct P (GDP, GC), Premise (PR, Kerr corporation), Supreme DL (SU, 3M ESPE), Venus (VE, Heraeus Kulzer) and Estelite sigma quick (ES, Tokuyama Dental) were examined.

In our method, the linear shrinkage rate was determined in difference of sample thickness using CCD Laser Displacement sensor (Keyence corp.) before and after-curing.
The volumetric polymerization shrinkage ratio of resin composite was determined in difference of density between before and after-curing through density determinations in accordance with the buoyancy method (Archimedes' principle). Statistical analyses of linear shrinkage ratio were conducted using one-way ANOVA, and regression analysis was calculated for the results of two methods.

Results: Mean values of polymerization shrinkage ratio including standard deviations were shown as follows; (tests per material; n=5).

	Linear Shrinkage ratio (%)	Volumetric Shrinkage ratio (%)
GDLS-200	1.25 (0.05)	1.72
GDP	1.62 (0.02)	2.57
PR	1.35 (0.04)	2.03
SU	1.74 (0.03)	2.41
VE	2.19 (0.03)	2.81
ES	1.59 (0.04)	1.95

Linear polymerization shrinkage ratio of GDLS-200 was significantly lower than those for other samples ($p<0.01$). Strong correlativity between Linear and volumetric polymerization shrinkage ratio was shown ($p<0.05$)

Conclusion: Polymerization shrinkage ratios were different between various resin composites. GDLS-200 has significantly lower linear shrinkage ratio compared to other resin composites.

The result of the method for measuring polymerization linear shrinkage is reliable.

MEMO

G-BOND PLUS(GBA400), GDLS-200(Kalore)

2443 Vertical and Horizontal Setting Shrinkages in Composite Restorations

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Objectives: One of the major concerns with composite restorations is the setting shrinkage in the restorative cavity. The purpose of this study was to evaluate the setting shrinkage in vertical and horizontal dimensions in composite restoration with self-etching adhesives and composites [(Filtek supreme DL + Easy Bond, 3M ESPE (3M ESPE); Premise + OptiBond All-in-One , Kerr (Kerr); BEAUTIFIL II + FL-Bond II, Shofu (Shofu), Estelite Sigma Quick + Bond Force, Tokuyama (Tokuyama), Majesty P + SE Bond, Kuraray (Kuraray), GDLS-200 + GBA400, GC (GC)].

Methods: Cylindrical Class I cavities were placed in premolars, having diameter: 3.5 mm and depth: 1.5 mm. A restorative procedure was performed according to manufacturers' instructions. The shrinkage in the vertical dimension (VD) was determined microscopically (x 400) expressed as the change-in-depth of the center of restorative area in the tooth cavity, before and immediately after light-activation, divided by the total restoration depth. The shrinkage in the horizontal dimension (HD) was measured as the marginal gap in tooth cavity immediately after light-activation. Specifically, a restored tooth was polished, the maximum marginal gap width was measured and then divided by the tooth-cavity diameter. The obtained data was expressed as a percentage and summed of percentages for all ten specimens. Statistical analyses (VD vs. HD) were conducted by Mann-Whitney U-test (p=0.01, N=10).

Results: Sum (%, N=10)

	3M ESPE	Kerr	Shofu	Tokuyama	Kuraray	GC
VD	17.2 (0.4)	20.5 (0.6)	13.6 (0.4)	18.6 (0.4)	13.7 (0.5)	11.5 (0.4)
	S	S	S	S	S	S
HD	0.83 [3]	2.22 [0]	0.68 [3]	0.46 [5]	0.46 [5]	0.49 [6]

( ): S.D., [ ]: Number of specimens having no gaps, S: Significant difference.

Conclusions: There was a significant difference between VD and HD in the composite restorations.

MEMO

G-BOND PLUS, Gradia Direct LoFlo, Gradia Direct Anterior

2966 Influence of composite resin on bond strength of all-in-one adhesives

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Objectives: to assess the influence of the resin composite shrinkage and elastic behavior on microtensile bond strength to dentin of all-in-one adhesives.

Methods: Two all-in-one adhesives (Bond Force, Tokuayama, BF; GBA400 Experimental Adhesive, GC, GBA400) were tested in combination with the following resin composites, exhibiting different curing shrinkage behavior: the flowable Gradia Direct LoFlo (GC, volumetric shrinkage 3%, GDLF), the microfilled Gradia Direct Anterior (GC, volumetric shrinkage 2,5%, GDA), the sub-micron filled Estelite Sigma (Tokuyama, volumetric shrinkage 1,65%, E). A sample of 18 molars was randomly divided into 6 groups (n=3): BF/E, GBA400/E, BF/GDA, GBA400/GDA, BF/GLF, GBA400/GLF. A clinically relevant smear layer was created in dentin and the adhesive was applied following manufacturers' instructions. With the use of a cylindrical plastic matrix a resin composite build-up was incrementally built-up. Each added 2-mm thick layer of resin composite was cured for 40s (Astralis 7, Ivoclar-Vivadent). Microtensile beams obtained from the built-up teeth were loaded to failure. Failure modes were evaluated under a light microscope. Cohesive failures within the substrates were excluded from statistics, along with pre-test failures. Flexural strength and Young's modulus of the composite resins were measured with the three-point-bending test (ISO 4049/2000). Data from microtensile bond strength, flexural strength, elastic modulus measurements were statistically analyzed ($p<0.05$).

Results: The following microtensile bond strengths were measured (MPa, mean±sd): BF/E 44.7±17.6; GBA400/E 38.6±13.8; BF/GDA 31.1±13.9; GBA400/GDA 30.9±11.7; BF/GLF 32.6±14.4; GBA400/GLF 30.8±12.9. While the adhesive did not significantly influence microtensile bond strength, the composite was a significant factor. Regardless of the adhesive, E yielded significantly higher bond strengths than GDA and GLF, that were comparable. GLF had significantly lower flexural strength and elastic modulus than E and GDA, that were similar for these properties.

Conclusions: The adhesion to dentin of all-in-one adhesives is significantly affected by the shrinkage of the restorative resin composite.

MEMO

Solare, Gradia Direct

499 Marginal integrity of current commercial resin composites in dentin cavity

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Objectives: The purpose of the present study was to investigate the dentin cavity adaptation of the current resin composites by measuring the contraction gap width.

Materials and Methods: Ten commercial resin composites (Clearfil AP-X and Majesty, Kuraray Medical, Japan), (Solare and Gradia Direct, GC, Japan), (Palfique Estelite, Estelite sigma, Estelite sigma Quick, Estelite Pro and Estelite P-Quick, Tokuyama Dental, Japan), (Beautiful II, Shofu, Japan) were used. The proximal enamel of extracted human teeth was flatly eliminated and a cylindrical cavity, 3mm in diameter and 1.5mm in depth, was prepared in the exposed dentin. The dentin cavity wall was conditioned with 0.5mol/L EDTA for 60 sec followed by rinse and dry. Then the cavity was primed with 35vol% glyceryl mono-methacrylate solution for one sec followed by air blast. The resin composite was filled in the cavity mediated with a commercial dentin bonding agent (Clearfil Photo Bond, Kuraray medical, Japan). Ten minutes after the polymerization of composite, the marginal adaptation was inspected under a light microscope. The width of the possible contraction gap was measured by a micrometer mounted on an ocular lens of the microscope and the gap value was presented by the gap width in percentage to the cavity diameter. Ten specimens for each material were prepared. The inorganic filler content of the composite was measured according to the ISO 4049.

Results: Eight composites out of ten showed complete marginal adaptation. The Estelite P-Quick and Beautiful II exhibited poor marginal adaptation statistically by the Kruskal-Wallis one-way analysis of variance by ranks ($P<0.05$). The correlation between the marginal adaptation and inorganic content of the composites was insignificant.

Conclusions: Most of the current composite tested exhibited complete marginal integrity in dentin cavity though still improvement should be required for two resin composites tested in this study.

MEMO

Gradia Direct LoFlo

3268 Polymerization Shrinkage and Flexural Modulus of New Flowable Composites

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Flowable composites have been advocated as a liner under composite restorations to improve marginal adaptation and to act as a stress-absorbing layer to potentially reduce the effects of polymerization shrinkage stresses from the overlying composite. New hybrid flowable composites with prepolymerized particles are being marketed with claims of lower polymerization shrinkage.

Objectives: The purpose of this study was to compare the polymerization shrinkage and flexural modulus of these new flowable composites (Premise Flow, SDS/Kerr; Gradia Direct LoFlo, GC America) and a nanofill flowable composite (Filtek Supreme Plus Flowable, 3M/ESPE) in comparison to two microhybrid and one microfill flowable composites (Revolution Formula 2, SDS/Kerr, Esthet-X Flow, Dentsply/Caulk, Heliomolar Flow, Ivoclar/Vivadent).

Methods: Ten specimens were created per composite group (n=10). Polymerization shrinkage: composite was placed on the pedestal in the AcuVol digital imaging device (Bisco), allowed to settle for five minutes, light-cured for 40 seconds (Bluephase 16i, Ivoclar), with shrinkage determined at five minutes. Flexural modulus: composite was placed in a 2x2x25mm aluminum mold, light cured 20 seconds in three over-lapping segments per side, stored 24-hrs in 37°C distilled water and tested in 3-point flexure at a crosshead-speed of 0.25 mm/min. Flexural modulus was determined from the slope of the linear region of the load-deflection curve. A mean and standard deviation were determined per group. A one-way ANOVA/Tukey was performed per physical property (alpha=0.05).

Results: Significant differences were found between groups per property ($p<0.015$). See table.
Conclusions: The lowest shrinkage was found with Premise Flow, however it had the highest flexural modulus. Lower flexural modulus was found with Gradia Direct LoFlo, Heliomolar Flow, and Revolution.

Discussion: For potential use as a liner under posterior composite resin restorations, the best overall combination of low shrinkage and low modulus may be found with Heliomolar Flow or Gradia Direct LoFlo.

Flowable Composite Shade (A-2)	Composite Type	Physical Property:Mean (std dev)	
		Shrinkage (%)	Flexural Modulus (GPa)
Revolution Formula 2	Microhybrid	6.79 (0.40) D	5.35 (0.61) a
Gradia Direct LoFlo	Microfilled Hybrid	5.63 (0.04) B	4.47 (0.87) a
Premise Flow	Nanofilled Hybrid	5.10 (0.14) A	7.75 (0.85) b
Heliomolar Flow	Microfill	5.72 (0.19) B	4.68 (0.52) a
Esthet-X Flow	Microhybrid	6.34 (0.21) C	6.90 (1.24) b
Filtek Supreme Plus Flowable	Nanofill	5.48 (0.15) B	6.98 (0.82) b

Groups with the same letter (by column) are not significantly different ($p>0.05$)

MEMO

UniFil core

1913 Fatigue Properties of Fiber-reinforced Post and Resin Core Build-up Materials

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Objective: The aim of this study was to evaluate the mechanical properties of unidirectional and bidirectional fiber-reinforced posts under static and cyclic loading. This study assessed the static mechanical properties and fatigue resistance of different types of fiber post and core system.

Methods: The fiber-reinforced posts used in this study were commercially available post and core systems. The prefabricated fiber posts used consisted of one unidirectional GC Fiber Post (f1.2 mm, GC Corp: GCF), one unidirectional FibreKor (f1.25 mm, Pentron Corp: JPF), and one bidirectional i-TFC (f1.3 mm, Sun Medical Co., Ltd: SMF) with UniFil Core (GC Corp: UC), BUILD-IT FR (Pentron Corp: BI) and i-TFC Post Resin (Sun Medical Co., Ltd: IP), respectively, as the composite resins for core. The composite resin specimens (f4.0 x 8.0 mm) were subjected to a compression test. The prefabricated fiber posts and prefabricated fiber posts with composite resin specimens (f2.0 x 20 mm) were subjected to a 3-point bending test and cyclic loading test (1000 times) under 0.1, 0.2 and 0.3 mm distortion.

Results: The compressive strengths (MPa) of the composite resins for cores were UC:276, BI:275, and IP:320. The flexure strengths (MPa) of the composite resins were UC:147, BI:183, and IP:150. The static flexure strengths (MPa) of the prefabricated fiber posts were GCF:1277, JPF:1150, and SMF:452. The flexure strengths of the prefabricated fiber posts with composite resin for cores showed improved strength over composite resins alone (GCF-UC:364, JPF-BI:489, SMF-IP:261, MPa). With cyclic loading, the flexure strengths of GCF-UC and JPF-BI were prone to decrease with increase in distortion, whereas no such tendency was seen with SMF-IP.

Conclusion: When compared to composite resin for core without fiber reinforcement, the addition of a prefabricated fiber post is effective in improving flexure strength in fiber-reinforced posts, regardless of fiber direction.

MEMO

UCA-106(UniFil core EM)

1826 Effect of indirect-post placement on bonding to root canal dentin

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Objectives: To evaluate the effect of placement of indirect composite post into root cavity on the microtensile bond strength of a dual-cure resin core material with or without light-curing.

Methods: Twelve extracted human premolars were decoronated at the cementoenamel junction, and post spaces were prepared to a depth of 8mm and a diameter of 1.5mm in the roots. A one-step dual-cure adhesive (Unfil Self-etching Bond) with chemical curing mode was applied to the root canal dentin in post space according to manufacturer's instruction. A dual-cure resin core material, Unifil Core (GC, Japan), was filled in post spaces with or without placement of pre-polymerized indirect composite post (diameter 1.0mm), and then light-cured by 10s irradiation from the top of the cavity or chemical-cured by placement in darkness for 30min. After storage in water at 37oC for 24h, each specimen was serially sliced perpendicular to the bonded interface into eight beams (0.6mm x 0.6mm, 4coronal & 4apical regions), and then subjected to the microtensile bond strength (μTBS) test. Data were analyzed using a three and two-way ANOVA ($p<0.05$).

Results: Values are in MPa±S.D. (n=12). Groups identified by the same superscript letter are not significantly different. ($p>0.05$)

	Shrinkage ratio (%)	Shrinkage force (N)
UCA-106	3.26(0.20)	8.44(0.20)
LU	4.98(0.27)	11.26(0.64)
BI	4.66(0.20)	11.28(0.72)
DC	3.33(0.05)	8.45(0.17)

Conclusion: In all experimental groups, there were no significant differences in the μTBS between the apical and coronal regions. When chemical-curing, the placement of composite post did not affect the μTBS to root canal dentin. On the other hand, when light-curing, the placement of composite post significantly decreased the μTBS.

MEMO

UCA-106(UniFil core EM)

2442 Polymerization shrinkage ratio and force of various core composites

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Objectives: Polymerization shrinkage of resin composite is in the focus of research in resin composite restoratives. At post and core restoration, there is concerned that polymerization shrinkage force can weaken the interfacial bond, affecting bond strength to the tooth and post surface. The aim of this study was to examine the polymerization shrinkage ratio and force of various core composites.

Methods: Four dual-cured core composite resins [Experimental core composite (UCA-106, GC corporation), Luxacore-Dual smartmix (LU, DMG), Build-IT FR (BI, Pentron clinical technologies, LLC) and Clearfil DC Core Automix (DC, Kuraray Medical inc.)] were examined. The polymerization shrinkage ratio of core composite was determined in difference of density between before and after-cured through density determinations in accordance with the buoyancy method (Archimedes' principle). The polymerization shrinkage force was measured as tensile load generated at polymerization of core composite using universal testing machine with special apparatus for measuring shrinkage force. The test of polymerization shrinkage force was performed with the volume of 1.5ml each core composite, height of specimen was 3mm and contact area linking to load cell was isolated in 4mm diameter. Curing method of core composites was light-curing and self-curing. Statistical analysis was performed using one-way ANOVA (p-value<0.05).

Results: Mean values of polymerization shrinkage ratio and force by light-curing including standard deviations were shown as follows; (tests per material; n=5).

	Shrinkage ratio (%)	Shrinkage force (N)
UCA-106	3.26(0.20)	8.44(0.20)
LU	4.98(0.27)	11.26(0.64)
BI	4.66(0.20)	11.28(0.72)
DC	3.33(0.05)	8.45(0.17)

Polymerization shrinkage ratio and force by light-curing for UCA-106 and DC was significantly lower than those for LU and BI ($p<0.05$).

Conclusion: Polymerization shrinkage ratio and force were different between various core composites. UCA-106 and DC had significantly lower polymerization shrinkage ratio and force compared to LU and BI.

MEMO

newly developed flowable composite resin "GCUF-505"

3271 Wear Resistance of New Flowable Composite Resins

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Recently, we have developed two types of new flowable composite resins, experimental flowable composite resin (GCUF-505: higher viscosity for filling) and MI Flow (MF: lower viscosity for lining) (GC, Japan). The main filler in GCUF-505 was 390 nm strontium glass and in MI Flow was 700 nm strontium glass.

Objective: The aim of this study was to evaluate wear resistance of GCUF-505 and MF compared with other composite resins.

Methods: The composite resin materials examined in this study were GCUF-505, MF, Filtek Supreme XT Flowable (FSXF), Tetric Flow (TF) and Premise Flowable (PF) as flowable composite resins, and Filtek Supreme DL (FSD), Tetric EvoCeram (TEC) and Premise (PR) as composite resins. The specimens were prepared for these materials and cured according to the manufacturers' instructions for use. All specimens were stored in water of 37 degree Celsius for 24 hours and the three-body wear test were performed with original wear machine for 100,000 cycles. The slurry mixture of PMMA and Glycerin was applied to contact area. The data was analyzed by one-way ANOVA and Scheffe's test ($p<0.05$).

Results: Mean wear values and standard deviation were shown bellow. Same superscript means no statistically significant difference. GCUF-505 showed the highest wear resistance and MF and PF didn't have significant difference between composite resins. Meanwhile FSXF and TF were lower wear resistance than composite resins.

	Flowable Composite Resin					Composite Resin		
	GCUF-505	MF	FSXF	TF	PF	FSD	TEC	PR
Wear Value (μm)	6.0±1.4a	16.2±4.5ab	46.5±7.9d	31.5±7.6c	22.3±1.5bc	9.6±3.8ab	16.3±3.5ab	14.5±3.9ab

Conclusion: The results suggested that GCUF-505 and MF were suitable materials to be applied to occlusal surface as well as composite resins.

MEMO

Unifast Trad

1048 Bending strengths of repaired acrylic resin with reinforcing wire

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Objectives: When damaged dentures are repaired, a reinforcing wire is frequently embedded in and around the broken parts to prevent further damage. Reinforcing stainless steel wires have recently become commercially available and they are used instead of cobalt-chromium alloy ones. This study assessed the bending strengths of a repaired denture base with stainless steel wires.

Methods: Acrylic resin plates (2.5 x 10.0 x 65.0 mm, ParaXpress, Heraeus Kulzer) were fabricated and cut for making half-sized plates (2.5 x 10.0 x 31.5 mm). Paired cut plates were assembled while keeping a repair space of 2.0 mm in a jig; the plates were attached with three auto-polymerized resins [Unifast III (GC, Japan), Unifast Trad (GC), and Provinice (Shofu, Japan)] using a brush-on technique. The reinforcing stainless steel wires (semicircle of 2.0 mm in diameter, Yamahachi, Japan) were embedded so that they were vertically positioned to the joining surface. Before embedding, the wires were sandblasted with 50 mm alumina particles, and an Alloy Primer (Kurare, Japan) was applied on them. As controls, specimens were prepared without the wire and original resin plates. After the specimens had been stored in distilled water for 48 hours, the bending strengths were measured using the tree-point bending test (supporting lengths 30.0 mm) using autography (Instron 5565). The data were analyzed using a one-way ANOVA/ Tukey's Multiple Comparison Test (a=0.05).

Result: There were no significant differences in the repaired resins ($p > 0.05$). Specimens with reinforcing wires showed a significantly greater bending strength than those without them ($p < 0.05$).

Conclusion: The bending strengths of the repaired denture base with reinforcing wires using Unifast Trad were comparable to those of an undamaged denture base. Reinforcing wires should be embedded to prevent a repaired denture from becoming damaged again. Partially supported by a research grant from the Japan Dental Association.

MEMO

EXA'lence

3291 Dimensional Stability of New Elastomeric Impression Material

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Objective:The accuracy of impression is achieved by the various physical properties of an impression material, which is described by parameter like dimensional stability. The purpose of this study was to determine the dimensional stability and the effect of immersion in the disinfection for new impression material "EXA'lence" compared with other elastomeric impression materials.

Methods: EXA'lence (EX,Monophase,GC), Aquasil Ultra (AU,Monophase,Dentsply), Imprint 3 (I3,Monophase,3MESPE), Take 1 Advanced (T1,Monophase,Kerr) and Impregum Penta (IG,3M ESPE) were evaluated in this study.
The specimen of linear dimensional change test was prepared according to ISO/4823:2000. After that, the specimens were stored with room environment(23°C, 50%HUM) for 24 hours and then immersed in 2% glutaraldehyde solution for 1 hour. The specimens were removed, and the linear dimensional change was measured using a Comparator (SIMADZU).
The test of discrepancy was executed by comparing stone die with master model made of stainless steel designed to simulate an abutment tooth. Each material was mixed and placed to the stainless steel mold. The specimens were cured in the water bath at 35±1°C and were removed after the manufacturers' indicated setting time. Then, the specimens were immediately demolded and poured after 24 hour. The discrepancies were measured using aProfile Projector (Mitutoyo). The results were analyzed one-way ANOVA and Turkey test ($p<0.05$).

Results: The mean values were shown in the following table. In the table, asterisk (*) indicates significant difference ($n=5$, $p<0.05$) compared with EX in the same column. EX showed better mean values than the other materials.

	EX(S.D.)	AU(S.D.)	I3(S.D.)	T1(S.D.)	IG(S.D.)
23°C,50%HUM(%)	-0.132(0.020)	-0.325(0.033)*	-0.234(0.045)*	-0.350(0.016)*	-0.442(0.082)*
2%Glutaraldehyde(%)	-0.255(0.049)	-0.565(0.032)*	-0.274(0.057)	-0.451(0.093)*	-0.365(0.091)
Discrepancy(mm)	-0.098(0.027)	-0.166(0.030)*	-0.140(0.036)	-0.168(0.033)*	-0.273(0.051)*

Conclusion: "EXA'lence" has a better dimensional stability and compatibility than the other elastomeric impression materials.

MEMO

Aadva

530 Effect of block region and pressing technique on zirconia strength

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Objective: To evaluate the effect of region within the block and pressing technique on flexural strength of different Y-TZP materials.

Methods: Seven groups made with 5 different formulations of Y-TZP were tested: YZ. YZ 40 (Vita), I. Incoris (Sirona), K. Everest (Kavo), XU. Tosoh TZ-3YSB-E (Uniaxially pressed, BU), XC. Tosoh TZ-3YSB-E (Cold isostatically pressed, BU), AU. Aadva (Uniaxially pressed , GC), AC. Aadva (Cold isostatically pressed, GC). YZ, I, K, AU and AC were received as pre-sintered blocks from the manufacturer. XU and XC were processed at Boston University. Test bars measuring 2x3x25 mm were prepared by sectioning each block and dividing it into 3 groups according to the region within the block: corner, surface and center. Bars were sintered according to the manufacturer's instructions and tested for flexural strength (FS) using a 3-point bending test on an Instron machine with a 10/KN load cell (crosshead speed of 0.5 mm/min). One-way ANOVA and Tukey's unequal sample size procedure were used for statistical analysis.

Results: Mean FS values (MPa) and SDs are shown below:

	YZ	I	K	XU	XC	AU	AC
Center	791(144)	700(66)	811(89)	930(96)	906(120)	884(131)	892(90)
Surface	808(147)	702(109)	782(132)	847(145)	851(143)	851(128)	934(134)
Corner	762(205)	695(99)	783(102)	739(108)	777(104)	850(135)	850(135)

Anova revealed a significant difference in the flexural strength between test bars from center and corner regions (p=0.046). Although the effect was of various magnitudes among groups, the trend was universal. No significant difference in flexural strength was found between Zr blocks pressed cold uniaxially or isostatically.

Conclusion: Significant differences in flexural strength were found between the center and corner areas of Zr blocks. The pressing method - cold uniaxial vs. isostatical had no significant effect on flexural strength.

MEMO

MI Paste plus

268 Effect of Argon Laser and Remineralizing Paste on Root Caries

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Objectives: In vitro root surface caries formation in permanent teeth was evaluated to determine the treatment effects of argon laser (AL) irradiation and a remineralizing paste with fluoride (RPF) alone and in combination.

Methods: Caries-free permanent tooth root surfaces (n=10) underwent debridement and a fluoride-free prophylaxis. Acid-resistant varnish was place leaving 4 windows of sound permanent root surface exposed for study. Each sound root surface window was assigned to a treatment group: 1) No Treatment Control; 2) AL exposure of ~11.5 Joules/cm2 (231 mW, 5-mm beam size, 10 continuous seconds); 3) RPF treatment for 2 minutes [MI Plus Paste™ GC Corporation]; 4) AL exposure followed by RPF treatment. The tooth specimens were sectioned into quarters, rinsed in distilled/deionized water, and then exposed to synthetic saliva for 24h. In vitro caries were created in the sound root surface windows using a modified ten Cate's solution (2.2 mM calcium, 2.2 mM phosphate, 1.0 mM fluoride, pH 3.90, 10 days). Longitudinal sections (3 per tooth quarter, 30 per treatment group) were evaluated for mean lesion depths using water imbibition and polarized light microscopy (ANOVA, DMR).

Results: Mean lesion depths were 302±31µm for No Treatment Control; 188±23µm for AL alone; 208±26µm for RPF alone; and 156±33µm for AL followed by RPF. All treatment groups had mean lesion depths that were significantly less than that for the No Treatment Control (P<.05). The combined treatment with AL followed by RPF had mean depths significantly less than that for RPF alone or AL alone (P<.05).

Conclusions: A topical remineralizing paste with bioavailable calcium, phosphate and fluoride and argon laser treatment alone enhanced caries resistance against in vitro caries formation in root surfaces. Combining the remineralizing paste containing casein phosphopeptide-amorphous calcium phosphate with fluoride and argon laser irradiation markedly enhanced the caries resistance of root surfaces in vitro.

MEMO

MI Paste plus, MI Paste

2047 CPP-ACP Paste and ACP-Fluoride Varnish: In Vitro Root Caries

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Objective: This study evaluated the effects of a fluoride varnish containing amorphous calcium phosphate (ACP), and pastes with casein phosphoprotein-amorphous calcium phosphate (CPP-ACP) without fluoride and with fluoride on in vitro root surface caries.

Methods: 20 teeth with caries-free root surfaces were divided into 4 portions. Each tooth portion was assigned to a treatment group: 1) No Treatment Control; 2) Enamel ProVarnish (Premier Products Co, Plymouth Meeting, PA 19462); 3) MI Paste without fluoride (GC America Inc, Alsip IL 60803); 4) MI Paste Plus with Fluoride (GC America Inc, Alsip IL 60803). ProVarnish was applied to the tooth portions per the manufacturers' recommendations. Fluoride-free pumice mechanical toothbrushing was performed with the ProVarnish group to remove visibly and macroscopically (dissecting microscope at 16x) detectable varnish. MI paste with and without fluoride were applied for 2 minutes twice daily. Tooth portions were exposed to synthetic saliva with daily replenishing over a 7 day period. In vitro root caries were created using a modified ten Cate's solution. 3 longitudinal sections from each tooth portion were taken for mean lesion depth determination (water imbibition, polarized light, digital imaging capture system), and for comparison among the groups (ANOVA, DMR).

Results: Mean lesion depths were: Control 329±36um; ProVarnish 218±27um; MI Paste (no Fl) 203±31um; MI Paste Plus (Fl) 143±19um. Significant differences in mean lesion depths was found between the Control Group and All Treatment Groups ($P<.05$). Lesion depth for MI Plus was significantly less than those for MI Paste and Enamel ProVarnish ($P<.05$).

Conclusions: ACP containing varnish and CPP-ACP remineralizing pastes provided considerable protection for root surfaces against an artificial caries challenge ($P<.05$). The incorporation of fluoride into the CPP-ACP remineralizing paste further enhanced caries resistance of root surfaces ($P<.05$).

MEMO

GC Tooth Mousse

2048 Effects of CPP-ACP on Enamel pH and Salivary Cariogenic Bacteria

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Objectives: To evaluate the effects of casein phosphopeptide-amorphous calcium phosphate (CPP-ACP) on surface pH and salivary cariogenic bacteria during intra-oral application for enamel remineralization.

Methods: Approval for the study was obtained from the Human Ethics Research committee of the Tokyo Medical and Dental University. Seven healthy subjects (1 males and 6 females) having white spot enamel lesion (WSEL) were recruited (19-64 years). Each subject was recommended to apply a CPP-ACP dental crème (GC Tooth Mousse, GC Corp., Japan) daily with a custom tray for more than 6 months and remineralization progress was assessed. The surface pH values of WSELs before and after CPP-ACP treatment were directly measured using a micro-pH sensor composed of an Ion Sensitive Field Effect Transistor (Horiba Ltd., Japan). On each appointment stimulated whole saliva samples were collected from each subject. On isolation of genomic DNA from each saliva sample a real-time polymerase chain reaction (RT-PCR) assay was performed for quantitative detection of target bacteria; Streptococcus mutans (S. mutans), Streptococcus sobrinus (S. sobrinus) and mutans streptococci (MS). The average surface pH of WSELs between initial measurement and after 6 months was compared statistically by using repeated measures ANOVA test.

Results: Remarkable remineralization progress was observed and surface pH of WSELs after 6 months was significantly higher than that of the initial measurement ($p<0.05$). The detection frequencies of bacteria were; S. mutans 87.8%, S. sobrinus 46.3% and MS 100%. However, there was no difference in the amount of the any targeted microorganisms all through the experimental periods in any subjects.

Conclusion: As the micro-pH sensor could evaluate the change of pH, it might play a potential role in the assessment of WSEL remineralization. Daily use of CPP-ACP with custom tray appears to be useful for WSEL remineralization. This study was supported by the GCOE Program, ICTB at TMDU.

MEMO

GC Tooth Mousse plus

2050 Tooth Mousse Plus Versus Cervitec GEL

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TOOTH MOUSSE PLUS VERSUS CERVITEC GEL

In the battle against dental caries various products with fluoride have been introduced.

OBJECTIVE: Hence the present study was conducted to assess and compare the effect of two recently introduced products, GC Tooth Mousse Plus and Cervitec gel on Streptococcus mutans.

METHODS: Thirty normal and healthy children aged 13 to 18 years, from a residential school and having a DMFT score equal to or more than 3 were selected for the study. Prior to application of the two products plaque samples were collected from each child, processed and inoculated into Mitis Salivaris agar. The pour plate technique was followed and agar plates incubated anaerobically at 370C for 48 hours. Colonies of Streptococcus mutans were counted. The children were divided into two groups of 15 children each. One group received daily application of GC Tooth Mousse Plus and the other group received Cervitec gel for 15 days. At the end of the study plaque samples were collected for Streptococcus mutans count.

RESULTS: There was a reduction in streptococcus Mutans counts with both products. A higher reduction was seen with application of Tooth Mousse Plus.

CONCLUSION: Daily application of Tooth Mousse Plus was found to be more effective in reducing the Streptococcal Mutan counts than Cervitec gel.

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Saliva-Check Buffer

2064 Effects of methamphetamine on salivary characteristics: a pilot study

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Drug-induced hyposalivation is suspected of contributing to rampant caries in methamphetamine (meth) users. Anecdotal evidence suggests that xerostomia combined with sugar cravings increases sugared beverage intake contributing to a high caries risk. Salivary flow and other salivary characteristics associated with meth use have not been thoroughly investigated.

OBJECTIVE: To describe saliva characteristics and xerostomic perceptions in meth users.

METHODS: New clients whose primary drug of choice and reason for admission was meth abuse were recruited from the Iowa City Mid-Eastern Council on Chemical Abuse inpatient facility. Subjects completed an interview-administered questionnaire assessing demographics; meth-associated dietary habits; meth-associated perceptions of xerostomia; tobacco, alcohol, and other drug including xerostomic medications use; and oral hygiene behaviors. An oral exam was conducted to quantify cavitated lesions (NIDR Diagnostic Criteria and Procedures protocol) and salivary characteristics (Saliva Check, GC America, Inc.).

RESULTS: Preliminary, descriptive data are reported for 7 subjects aged 21-40 years and 71% female. Although meth was all subjects' primary drug, other drugs abused included alcohol (71%), marijuana (57%), crack/cocaine (29%), and heroin (14%). Symptoms of xerostomia reported by subjects as occurring fairly often or very often during meth use included feelings of dry lips (86%), mouth (71%), and eyes (71%). In addition, 86% of subjects reported getting up at night to drink. Resting salivary flow was low in 43% of subjects and resting salivary pH was less than 6.8 in 43%. Salivary consistency was sticky and/or had an increased viscosity in 29% of subjects. Stimulated saliva quantity was low in 14% of subjects and stimulated salivary pH was 6.8 or above in all subjects. However, 71% of subjects had a low stimulated saliva buffering capacity.

CONCLUSION: Our descriptive pilot data support anecdotal reports of xerostomia in meth users, and suggest changes in salivary characteristics that could increase caries risk. Funding: T32 DEO14678-06.

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Real-time PCR method

2160 Relationship between Salivary Porphyromonas gingivalis and Periodontal Conditions

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Objective:Quantitative analysis with identification of periodontopathic bacteria is important for the diagnosis, therapeutic evaluation and risk assessment of periodontal disease. We have developed a highly sensitive and specific method using real-time PCR (″Periodontopathic Bacteria Detection Set″, GC) to detect and quantify Porphyromons gingivalis (Pg). The purpose of this clinical study was to evaluate the relationship between salivary Pg level and periodontal conditions in elderly population.

Methods:Paraffin wax-stimulated whole saliva samples were collected from elderly subjects (age 79-80, n=316). Periodontal status was investigated by assessing pocket depth (PD) and bleeding on probing (BOP). The amount of Pg was determined by real-time PCR. Data was analyzed for statistical significance by Wilcoxon rank-sum nonparametric test and Steel-Dwass method.

Results:Real-time PCR method results revealed that subjects with the PD³6mm (median; 2.1x106 cell/mL) had significantly higher Pg level than the subjects with PD<6mm (median; 2.2x105 cell/mL) (Wilcoxson; P<0.01) and the threshold Pg level for severe periodontitis (PD³6mm) was 9.0x105 cell/mL from ROC curve. Subjects with PD³4mm and <6mm (median;2.8x105 cell/mL) had significantly higher Pg level than the subjects with PD<4mm (median;1.6x104 cell/mL) (Wilcoxson; P<0.01) and the threshold Pg level for mild periodontitis (6 mm>PD³4mm) was 4.0x104 cell/mL from ROC curve. Furthermore, subjects with PD³6mm group (median;2.1x106 cell/mL),6 mm>PD³4mm group (median;2.8x105 cell/mL) and PD<4mm group (median;1.6x104 cell/mL) were correlated positively and significantly with the amount of Pg in saliva (Steel Dwass; P<0.05). Pg level had also a positive correlation with the percentage of sites with BOP (%BOP) (Wilcoxson; P<0.01).

Conclusion: The results indicate that increase in amount of salivary Pg associated with the current condition of PD and %BOP. This clinical study suggested that detecting salivary Pg level would be a useful indicator and a non-invasive method to distinguish periodontal conditions.

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Scaffold for Laboratory Study

401 Tissue regeneration on a high strength porous biodegradable polymer scaffold

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Objective: The appropriate physical support provided by scaffolds creates a supportive environment that directs differentiation and organization of stem cells. Thus, selection of the most appropriate material to produce a scaffold is important in construction of a tissue-engineered product. This in vitro study was aimed to examine the effect of high strength porous poly (DL-lactic-co-glycolic acid) (PLGA) scaffold (HSP-PS) on differentiation of human mesenchymal stem cells (hMSCs).

Methods: HSP-PS (GC scaffold (Block), GC) was synthesized according to an established protocol. In order to examine the interaction between the scaffold and hMSC, the scaffolds were seeded with hMSCs and compared to 2-dimensional cultures for up to 28 days, with osteogenic and chondrogenic growth supplements respectively. PLGA plate (PP) (GC scaffold (Plate), GC)) and cell culture plate (CCP) (BD falcon) were 2-dimensional cultures control. Calcium deposition contents and alkaline phosphatase (ALP) activity were used as osteogenic differentiation markers. And glycosaminoglycan (GAG) contents was used as chondrogenic differentiation markers. Statistical analysis was done by one-way ANOVA followed by T test, and the significance was considered when $p<0.05$.

Results: There was no significant difference of ALP activities at 14 days between HSP-PS (22.38±2.86 U/mg DNA), PP (17.96±1.02 U/mg DNA) and CCP (20.19±4.51 U/mg DNA). However, Calcium deposition content at 28 days was significantly higher on HSP-PS (395.84±77.65 mg/mg DNA) compared to PP (49.82±9.90 mg/mg DNA) and CCP (15.14±2.72 mg/mg DNA). GAG content at 28 days was higher on HSP-PS (1.32±0.24 mg/mg DNA) compared to PP (0.94±0.55 mg/mg DNA) and CCP (0.37±0.05 mg/mg DNA).

Conclusion: The osteogenic differentiation and chondrogenic differentiation on HSP-PS were significantly higher than PP and CCP. These results indicate that HSP-PS effectively support hMSCs differentiation in vitro, thus making this novel HSP-PS a promising candidate and alternative matrix for bone and cartilage regeneration.

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