THE ACID RESISTANT LAYER AND FLUORIDE CONTENT IN DENTIN AFTER RESTORATION WITH VARIOUS FLUORIDE RELEASING MATERIALS

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF SCIENCE
(OPERATIVE DENTISTRY)
FACULTY OF GRADUATE STUDIES
MAHIDOL UNIVERSITY
2006

ISBN 974-04-7597-3

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was submitted to the Faculty of Graduate Studies, Mahidol University
For the degree of Master of Science (Operative Dentistry)
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ACKNOWLEDGEMENT

The author would like to express my gratitude to Asst. Prof. Watcharaporn Kuphasuk, Assoc. Prof. Dr. Choltacha Harnirattisai, Dr. Pisol Senawongse, department of Operative Dentistry, Faculty of Dentistry, Mahidol University, and Assoc. Prof. Dr.Chaiwat Maneenut, department of Operative Dentistry, Faculty of Dentistry, Chulalongkorn University, for their advices, reading the documents, and their critical and stimulating comments. I am also very grateful to Miss Chayada thienchai for her assistance in my experimental procedures.

THE ACID RESISTANT LAYER AND FLUORIDE CONTENT IN DENTIN AFTER RESTORATION WITH VARIOUS FLUORIDE RELEASING MATERIALS

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ABSTRACT

The objectives of this study were to compare the thickness of the acid resistant layer and quantity of fluoride in dentin after restoration with fluoride releasing materials.

Twenty five caries-free human premolars were prepared for class I occlusal cavities. The teeth were randomly divided into five experimental groups of 5 teeth each, using five different restorative materials, a resin composite, a conventional glass ionomer cement, a resin-modified glass ionomer cement, a compomer, and a giomer. The specimens were analyzed for fluoride content after 1 week, 1 month, and 3 months at 10, 20, 30, 40, and 50µm beneath the restoration/dentin interface using EDS attached to the SEM. Then the slices were demineralized in demineralizing solution and sodium hypochlorite solution to observe the thickness of acid resistant layers in dentin using an SEM at 3500x magnification.

The results of fluoride content measurement revealed that within the distance of 50 µm beneath the restoration/dentin interface, there were no statistically significant differences at 10, 20, 30, 40, and 50 µm at all evaluation times for each restorative material. Within the material at 1 week, 1 month, and 3 months, there were no statistically significant changes in resin composite, compomer, and giomer, whereas there was a significant increase of fluoride contents in conventional and Resin-modified glass ionomer cement. The comparison of different materials at the same storage times exhibited that conventional and resin-modified glass ionomer cement produced fluoride contents in dentin greater than other materials.

The results of acid resistant layers observation showed that all selected fluoride releasing materials can create acid resistant layers. The thickness of these layers were not statistically significantly different.

KEY WORDS : ACID RESISTANT LAYER, FLUORIDE RELEASING MATERIALS, EDS.

146P. ISBN 974-04-7597-3

ชั้นที่ต้านทานต่อกรดและปริมาณฟลูออไรด์ในเนื้อฟันภายหลังการบูรณะด้วยวัสดุที่ปลดปล่อยฟลูออไรด์ชนิดต่างๆ (THE ACID RESISTANT LAYER AND FLUORIDE CONTENT IN DENTIN AFTER RESTORATION WITH VARIOUS FLUORIDE RELEASING MATERIALS)

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บทคัดย่อ

การศึกษาครั้งนี้มีวัตถุประสงค์เพื่อเปรียบเทียบความหนาของชั้นที่ต้านทานต่อกรดและปริมาณฟลูออไรด์ในเนื้อหลังบูรณะด้วยวัสดุบูรณะที่สามารถปลดปล่อยฟลูออไรด์ได้

นำฟันกรามน้อยของมนุษย์จำนวน ๒๕ ซี่มาทำการกรอแต่งโพรงฟันบนด้านบดเคี้ยว แบ่งฟันออกเป็นห้ากลุ่มกลุ่มละ ๕ ซี่และอุดด้วยวัสดุอุดชนิดต่างๆกัน ๕ ชนิด คือคอนเวนชัน นอลกลาสไอโอโนเมอร์ซีเมนต์ เรซินโมดิฟายด์กลาสไอโอโนเมอร์ซีเมนต์ คอมโพเมอร์ ไจโอเมอร์ และเรซินคอมโพสิต ชิ้นตัวอย่างจะถูกนำมาวัดปริมาณฟลูออไรด์ในเนื้อฟันโดยใช้เครื่องวัดปริมาณแร่ธาตุที่ต่อกับกล้องจุลทรรศน์อิเลคตรอนที่เวลา ๑ อาทิตย์ ๑ เดือน และ ๓ เดือนตามลำดับ ที่ระยะทาง ๑๐, ๒๐, ๓๐, ๔๐, และ ๕๐ ไมครอนจากรอยต่อระหว่างวัสดุอุดกับเนื้อฟัน จากนั้นนำชิ้นตัวอย่างมาแช่ในสารละลายที่ทำให้เกิดการละลายของแร่ธาตุในเนื้อฟันและโซเดียมไฮโปคลอไรท์ เพื่อตรวจดูชั้นที่ต้านทานต่อกรดโดยใช้กล้องจุลทรรศน์อิเลคตรอนที่กำลังขยาย ๓๕๐๐ เท่า

ผลการวัดปริมาณฟลูออไรด์ของวัสดุชนิดเดียวกันที่เวลาเดียวกันจะไม่พบความแตกต่างอย่างมีนัยสำคัญของปริมาณฟลูออไรด์ในเนื้อฟันที่ระยะ ๑๐ ๒๐ ๓๐ ๔๐ และ ๕๐ ไมครอนใต้ต่อรอยต่อของวัสดุบูรณะและเนื้อฟัน ปริมาณฟลูออไรด์ของวัสดุชนิดเดียวกันที่เวลาในการเก็บต่างกันไม่พบว่าคอมโพเมอร์ ไจโอเมอร์ และเรซินคอมโพสิตมีการเปลี่ยนแปลงของปริมาณฟลูออไรด์เมื่อเวลาในการเก็บเพิ่มขึ้น แต่พบว่าเนื้อฟันที่บูรณะด้วยคอนเวนชันนอลกลาสไอโอโนเมอร์ซีเมนต์ เรซินโมดิฟายด์กลาสไอโอโนเมอร์ซีเมนต์เพิ่มขึ้นเมื่อเวลานานขึ้น เมื่อวัดที่เวลาเดียวกันเปรียบเทียบวัสดุแต่ละชนิดพบว่าเนื้อฟันที่บูรณะด้วยคอนเวนชันนอลกลาสไอโอโนเมอร์ซีเมนต์ เรซินโมดิฟายด์กลาสไอโอโนเมอร์ซีเมนต์มีปริมาณฟลูออไรด์สูงกว่าวัสดุชนิดอื่น

ผลการทดลองที่ดูชั้นที่ต้านทานต่อกรดพบว่ามีชั้นนี้เกิดขึ้นในเนื้อฟันที่บูรณะด้วยวัสดุบูรณะในกลุ่มทดลองทุกกลุ่ม แต่ไม่พบความแตกต่างของความหนาของชั้นที่ต้านทานต่อกรดนี้ในทุกกลุ่มทดลองและในทุกช่วงเวลา

๑๔๖ หน้า . ISBN 974-04-7597-3

CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES (CONT.)

CHAPTER I
INTRODUCTION

Recently, concept of contemporary operative dentistry has shifted toward conservation, for example, caries removal means only infected dentin removal, the principle of extension for prevention has been outdated. In addition, there have also been concerned regarding to toxicity of mercury in amalgam restorations and patients are more esthetically oriented. With all those above mentioned points, attempts have been made to invent materials which bond to dentin, release fluoride, esthetically acceptable and are strong enough to function under extreme conditions in oral cavity. Attempts to achieve those properties were still continued, unfortunately to little avail at the present. Nowadays, there are many tooth-colored restorative materials available in the market. Glass ionomer cements can release fluoride in high quantity and chemically bond to dentin, but their strength and esthetics are lower than other groups of tooth-colored materials. Compomers are more esthetically acceptable than glass ionomer cements, but their ability of releasing fluoride is low (1). In term of strength and esthetics, resin composites are the material of choice, but they cannot release fluoride. Giomer is a newly developed material intending to overcome drawbacks of its predecessor restorative materials, such as fluoride releasing and esthetic properties.

Even though a manufacturer claims that the fluoride-releasing restorative materials, as mentioned above, have fluoride releasing properties, it has not been scientifically verified in a long-term study about the difference among the various materials in term of the acid resistant layer and the depth of fluoride penetration in dentin adjacent to the materials.

CHAPTER II
OBJECTIVES

The objectives of this study were

1. to compare the quantity of fluoride in dentin before and after restoration with a conventional glass-ionomer, a resin-modified glass ionomer, a compomer, a giomer and a resin composite.
2. to compare the thickness of acid resistant layer after restoration with a conventional glass-ionomer, a resin-modified glass ionomer, a compomer, a giomer and a resin composite.

HYPOTHESIS

Part I

H_o : In each material, at same distance beneath the material/dentin interface, there was no statistically significant difference between the quantity of fluoride in dentin adjacent to the material in every time interval.

H_1 : In each material, at same distance beneath the material/dentin interface, there was a statistically significant difference between the quantity of fluoride in dentin adjacent to the material in any time interval.

H_o : At the same time interval, at same distance beneath the material/dentin interface, there was no statistically significant difference of the quantity of fluoride in dentin adjacent to different materials.

H_1 : At the same time interval, at same distance beneath the material/dentin interface, there was a statistically significant difference between the quantity of fluoride in dentin adjacent to different materials.

H_o : In each material, at the same time, there was no statistically significant difference between the quantity of fluoride in dentin at 10, 20, 30, 40, and 50µm beneath material/dentin interface.

H_1 : In each material, at the same time, there was a statistically significant difference between the quantity of fluoride in dentin at 10, 20, 30, 40, and 50µm beneath material/dentin interface.

Part II

H_o : In each material, there was no statistically significant difference between the thickness of acid resistant layer in every time interval.

H_1 : In each material, there was a statistically significant difference between the thickness of acid resistant layer in any time interval.

H_o : At the same time interval, there was no statistically significant difference between the thickness of acid resistant layer of different materials.

H_1 : At the same time interval, there was a statistically significant difference between the thickness of acid resistant layer of different materials.

CHAPTER III
LITERATURE REVIEW

It has been established beyond doubt that caries initiation and caries progression rate will be significantly lower when mineral structures of enamel, dentin and cementum are enriched with fluoride. Many anticariogenic mechanisms of fluoride have been proposed, as follow. Firstly, fluoride decreases the demineralization rate. Secondly, it promotes remineralization by accommodating calcium and phosphate sedimentation on enamel surfaces (2). Thirdly, fluoride inhibits plaque colonisation. Forthly, fluoride inhibits bacterial glycolysis, the process that turns sugar into acid by bacterial fermentation. The studies have shown that metabolic activities of plaque around restoration margins can be altered by fluoride released from GI restorations; as a result, bacterial cariogenic potential will be decreased (3).

Contemporary concept of restorative dentistry has mainly focused on preservation for quite sometimes (4). Inner layer of caries or affected dentin is uninfected and recalcifiable (5). Slight and continuous release of fluoride from restorative materials can stop demineralization and promote remineralization of dentin (6). Thus, infected dentin removal and restoration of lesion with a fluoride-releasing material would be able to remineralize affected dentin. Inhibition zone was found in immediate adjacent to fluoride releasing material, glass ionomer (7). Fluoride has been reported to penetrate 300 μm deep into dentin during 10 week period (8).

It has been suggested that a favorable condition for fluoroapatite formation in sound enamel is a constant, low level of fluoride ions for at least 24 h (9), and that only 1 ppm fluoride is necessary for promotion of remineralization (10). With topical applications of agents containing high fluoride concentrations, calcium fluoride (CaF_2) is formed on tooth surfaces or within incipient lesions; subsequent dissolution of CaF_2 provides fluoride ions, which decrease demineralization or increase remineralization, depending upon both the pH and the calcium and phosphate concentrations of the fluid environment (11).

Since the mineral component of both enamel and dentin is hydroxyapatite, it has been suggested that the chemical reaction of both tissues with fluoride are similar. Greater uptake of fluoride in dentin than in enamel has been reported (10). Apparently, fluoride uptake in dentin is enhanced by its greater porosity, higher water content, and the smaller sizes of its crystallites (12). Tveit has been demonstrated that low pH increases fluoride uptake by dentin, probably because of the initial tissue demineralization and the deposition of greater amounts of fluoride into the hydroxyapatite crystals (13).

There are many groups of tooth-colored filling materials with fluoride releasing ability. The first one is conventional glass ionomer cement, first developed by Wilson and Kent in seventies. Conventional glass ionomer cement comprises powder-fluoroaluminosilicate glass, and liquid-polycarboxylic acid. This material requires acid-base reaction for setting. The advantages of this group of material are fluoride releasing ability and secondary caries prevention (8, 14). The material also chemically bonds to enamel and dentin. Restoration failure is usually cohesive, thus dentinal tubules are still protected from bacteria and bacterial by product penetration. Its thermal expansion coefficient is similar to that of tooth structures (15). The disadvantages of this material are short working time, long setting time, high moisture sensitivity, dissication after setting, brittleness, low wear resistance and lack of immediate polishability. The clinical application of this group of material is for base, liner, luting cement. It can be used as filling material in Pediatric Dentistry especially, in class III and V. This material cannot be used in stress bearing area due to abrasion resistance insufficiency (15). Even though this material is classified as tooth-colored, its actual color is quite opaque, so it has never been recommended to be used in esthetically crucial area (15).

All the above mentioned disadvantages of conventional glass ionomer cement inevitably lead to the development of resin-modified glass ionomer cements (RMGIC). Their physical properties are closer to those of resin composites but basic features of conventional glass ionomer cement still remain (15). RMGIC consists of powder-fluoroalumino silicate glass as in conventional glass ionomer cement, but water soluble resin monomers is added into the liquid component, which is mainly polyacrylic acid. Setting reaction is composed of two different processes, polymerization initiated by light exposure and acid-base reaction initiated by mixing procedure. Major advantages of RMGIC over conventional glass ionomer cement are longer working time, moisture resistance, fluoride releasing ability, better handling properties and it can be polished right after light curing. Esthetic and strength properties, however, are still lower than those of resin composite (16). The quantity of fluoride released from RMGIC is comparable to that from conventional glass ionomer cement. Clinical applications of RMGIC and conventional glass ionomer cement are similar (16).

The next fluoride releasing tooth-colored material is compomer, a polyacid-modified resin composite. It shares many characteristics with resin composite; the major difference is fluoride-releasing property (15), which is made possible by acid-base reaction. The reaction occurs only when water is absorbed into the material and an acidic monomer reacts with basic glass fillers. Even though acid-base reaction does occur in compomer, it is not classified as RMGIC because there is no water in the material from the beginning, and it cannot adhere to tooth structure by itself. compomer is one paste material, which is made up of fillers and matrix. The filler and matrix type are different from manufacturer to manufacturer, but principle constituents are quite the same. Fluoride is usually added into fillers for anticariogenic property, and strontium for radiopacity. Principle constituents in matrix are methacrylate monomer and catalyst, which quite resemble to resin composite matrix except acidic monomer, which is mainly responsible for acid- base reaction (16).

When the compomer exposes to light, monomer component will be polymerized initiating the setting reaction. After the setting complete, the material will absorb water in oral cavity commencing acid-base reaction between acidic polymer and glass fillers and fluoride will be finally released. Compomer is used primarily as a filling material. Its mechanical and handling properties are better than GI but worse than resin composite, its flowability is better than resin composite. Bonding agent is needed for compomer to adhere to tooth structure (16). The quantity of fluoride release from compomer is miniscule comparing to RMGIC because water is an essential prerequisite for acid-base reaction and water cannot be absorbed easily into compomer. The major compomer matrix component is hydrophobic resin such as urethane dimethacrylate, which does not accommodate water absorption(1). Moreover, silanization the filler surface modification process which enhances the bond between filler and matrix-is also another obstacle for fluoride releasing (17).

A recent addition to the continuum of hybrid materials is a novel class of anhydrous resin-based restorative material that uses pre-reacted glass-ionomer (PRG) technology. Known as "Giomers" in the Japanese market, these materials incorporate fillers that are produced from the complete or partial reaction of ion-leachable glasses with polyalkenoic acids. In the fully pre-reacted type (F-PRG), the remaining soft, siliceous hydrogel is freeze-dried, ball-milled, and silanized to form PRG fillers. Unreacted FASG particles, silica particles, and fumed silica are included to optimize the physical properties of this material. Since PRG fillers are already pre-reacted, acidic resin monomers are not necessary for in situ acid-base reactions. A hydrophilic monomer, hydroxyethyl methacrylate (HEMA), is included with urethane dimethacrylate to produce a resin matrix that is conductive to water uptake and ion exchange. It is postulated that this PRG phase promotes sustained fluoride release *via* ligand exchanges within the ion-rich hydrogel, without disrupting the integrity of the filler-matrix interface that was speculated to occur in materials such as compomers (17). The advantages of this material are high level of radiopacity, fluoride release and recharge, biocompatibility, high wear resistance and long term clinical stability. Additionally, aesthetic of the material is close to that of natural teeth. For the disadvantages, giomers do not have the initial fluoride "burst" effect associated with glass ionomer cements. As the long-term fluoride release of giomers is questionable (18), they may not be as beneficial as glass ionomer cements in patients who are at risk to recurrent caries (19). Clinical applications, mentioned by manufacturers, are restoration of class I, II, III, IV and V, restoration of cervical erosion and root caries, laminate veneers, core build-up, pedodontic restorations and repair of fractured porcelain and composite restorations.

Few published research is available on the properties of giomers. One recently published study compared the fluoride release of a glass ionomer, a resin-modified glass ionomer, a giomer, and a compomer. They found that the giomer did not have an initial "burst" type of fluoride release like glass ionomers, and its long-term (i.e 28-day) release was lower than that of the other materials (19). Another study found that, after polishing with Sof-Lex disks, giomer had a smoother surface than a glass ionomer, and one study that was comparable to that of a compomer and a resin composite (18).

Enormous amount of laboratory studies have confirmed the effectiveness of fluoride releasing property of restorative materials in secondary caries prevention. One laboratory study found that RMGIC and compomer could significantly reduce secondary caries rate compared to resin composite (20). Another study showed a high remineralization effect of RMGIC over amalgam (21). Clinical studies, on the other hand, showed conflicting reports (22). Two clinical studies found a better secondary caries inhibition effect of GI over amalgam (23, 24). Another clinical studies with the two-year follow up showed no secondary caries after restoration by laminated GI/resin composites and unlaminated composite restorations (25). One clinical study with three-year follow up also showed no difference in secondary caries formation between GI and resin composites (26). To make the picture even more complicated, some studies showed higher secondary caries rate in GI group over the control groups (amalgam or resin composite) (27, 28). The last, some studies showed no secondary caries inhibition effect of both GI and the control groups using resin composite or amalgam (29, 30). Many factors influence the results of clinical study. To single out cause and effect of only one factor restorative material is not easily possible. Fluoride releasing property might only reduce a chance of secondary caries, it is, however, impossible to obtain 100% inhibition.

One of several methods to evaluate secondary caries inhibition from fluoride releasing materials is the evaluation of acid resistant layer. This layer is highly resistance to acid or demineralizing solution (31). The terms ‘ion-exchange layer’ and ‘hybrid layer’ have been proposed for the acid resistant layer. The ion-exchange layer is intermediate layer between the pure glass ionomer cement and the pure hydroxyapatite (32), this layer appear to consist of calcium and phosphate ions from the tooth, and aluminium, silicic, fluoride and calcium and/or strontium ions from the glass ionomer cement (33). The hybrid layer is formed between resin composite and dentin. This layer is the organic components of the dentin that had been permeated by resin (34). The immersion of specimens in a buffered demineralizing solution is the techniques used to differentiate between normal tooth structures and the acid resistant layer (10, 35, 36). This layer can be observed using polarized light microscopy (8, 37), microradiography (10), and confocal laser microscopy (35).

The width and height of an acid resistant layer or observed an inhibition zone under the polarized light microscopy was significantly greater for Fuji II than for Fuji II LC and Vitremer. This inhibition zone was not observed adjacent to the adhesive resin system with fluoride releasing composite (38). In addition, a characteristic of 40 microns wide acid resistant zone was shown on the surfaces exposed to the GICs under microradiography (10). In contrast, the untreated control surfaces had lesions demineralized evenly from the surface to the intact tissue, without the higher-density zone at the surface of the lesion (10). Moreover, an inhibition zone and outer lesions were clearly detected under confocal laser microscopy around the glass-ionomer and resin-modified glass-ionomer restorations, but was not detected adjacent to the resin-based composite restoration (35). As a result, if fluoride can be released from material into adjacent dentin, the acid resistant layer should be created in that area (10).

Another method to prove the existing fluoride releasing from materials is the energy dispersive x-ray analysis (SEM-EDS). Energy dispersive x-ray microanalysis uses detection equipment to measure the energy values of the characteristic x-rays generated within the electron microscope. Using semiconductor material to detect the x-rays and a multichannel analyzer, an x-ray microanalysis system converts an x-ray energy into an electronic “count.” EDS is attached to SEM to provide rapid qualitative, or with adequate standards, quantitative analysis of elemental composition. X-rays may also be used to form maps or line profiles, showing the elemental distribution in a sample surface (39). The amount of fluoride in dentin adjacent to fluoride releasing materials should increase if they can be released from the materials.

As above, the current study implements the acid resistant layer observation, the scanning electron microscopy (SEM) method has been recommended for this purpose because of sufficient magnification and easy specimen preparation (36), and use SEM-EDS to detect the amount of fluoride to confirm the fluoride releasing property of material.

CHAPTER IV
MATERIALS AND METHODS

Twenty-five caries-free human premolars extracted due to orthodontic treatment reason were used in the experiment. The teeth were stored in tap water after extraction no longer than 3 months. Then the teeth were cleaned with blade no. 15, ultrasonic scaler, and a rubber cup and slurry of pumice. After cleaning, the teeth were stored in 0.1% thymol solution until the experimental procedures were performed.

1. Restorative procedures

The tooth was prepared for class I occlusal cavity by a straight diamond bur attached in a high speed handpiece with water coolant. The cavity dimension was 3 mm in bucco-lingual direction, 5 mm in mesio-distal direction, and 3 mm deep measured from the cavosurface margin to the pulpal floor. The cavity cavosurface angle was performed as butt-joint. After preparation, the cavity was cleaned with air/water spray, and gently blew with an air syringe. The teeth were randomly divided into 5 experimental groups of 5 teeth each, and restored with different five restorative materials. The restorative procedure of each material was strictly performed according to the manufacturer's recommendation as shown in table 1. The compositions of the materials are shown in table 2. The teeth were kept in deionizing water at 37^{o}C immediately after restoration. The solution was changed everyday during the storage time.

2. The specimens analysis

2.1 Part I Fluoride content measurement utilized Energy Dispersive X-ray Spectrometer (EDS) and a scanning electron microscope (SEM)

After 5 day storage time, 3 vertical slices sectioned parallel to the long axis of a tooth in buccolingual direction, approximately 1 mm thick, were made at the restorative area, using a low-speed diamond saw (Accutom-50, Struers,. Copenhagen, Denmark) under water cooling. After section, the slices were applied with nail vanish on mesial and distal surfaces, then stored in deionizing water at 37°C. The storage solution was changed everyday until the specimens were analyzed for the content of fluoride. The first, second, and third slices were analyzed for the fluoride at 1 week, 1 month, and 3 months respectively. After each storage time, the slices were ground on the mesial and distal surface to remove nail varnish and then embedded in epoxy resin with mesial side exposed. The specimens were repolished after 24 hrs with silicon carbide abrasive papers (600, 800, 1000, 1200, 1500-grit) and diamond pastes down to 0.25 µm. Subsequent to polishing procedures, the specimens were analyzed for fluoride content in dentin at 10, 20, 30, 40 and 50 µm beneath the restorative materials using EDS attached to the SEM, line scan EDS analyses were performed at the marked regions. The marked regions was the clearly identification of the material dentin interface, the fluoride contents were measured 3 points per an image in every 10 microns beneath the material dentin interface (10, 20, 30, 40, and 50 µm) under 120 seconds scan at 15 kV.

2.2 Part II Acid resistant layer observation using the SEM

Subsequent to fluoride content measurement utilized EDS and SEM procedures, the slices were stored in demineralizing solution for 2 hrs to demineralize any minerals in dentin. The compositions of demineralizing solution are 2.2 mmol/L $CaCl_2$ 0.3234 g., 2.2 mmol/L Na_2HPO_4 0.34321 g., and 50 mmol/L acetic acid 3.0025 g. The pH of this solution was kept at 4.5. After stored in demineralizing solution, the specimens were then transferred to 1% sodium hypochlorite (NaOCl) solution and kept for 5 minutes to remove all non protected demineralized dentinal matrix. The specimens were washed with clean water and kept in a desiccator for drying. The specimens were then gold-sputter coated. The thickness of acid resistant layers in dentin adjacent to the restorative material were evaluated in an SEM at 3500x magnification. Each specimen was measured for 3 positions at the most clearly defined image and then all data were calculated for the mean.

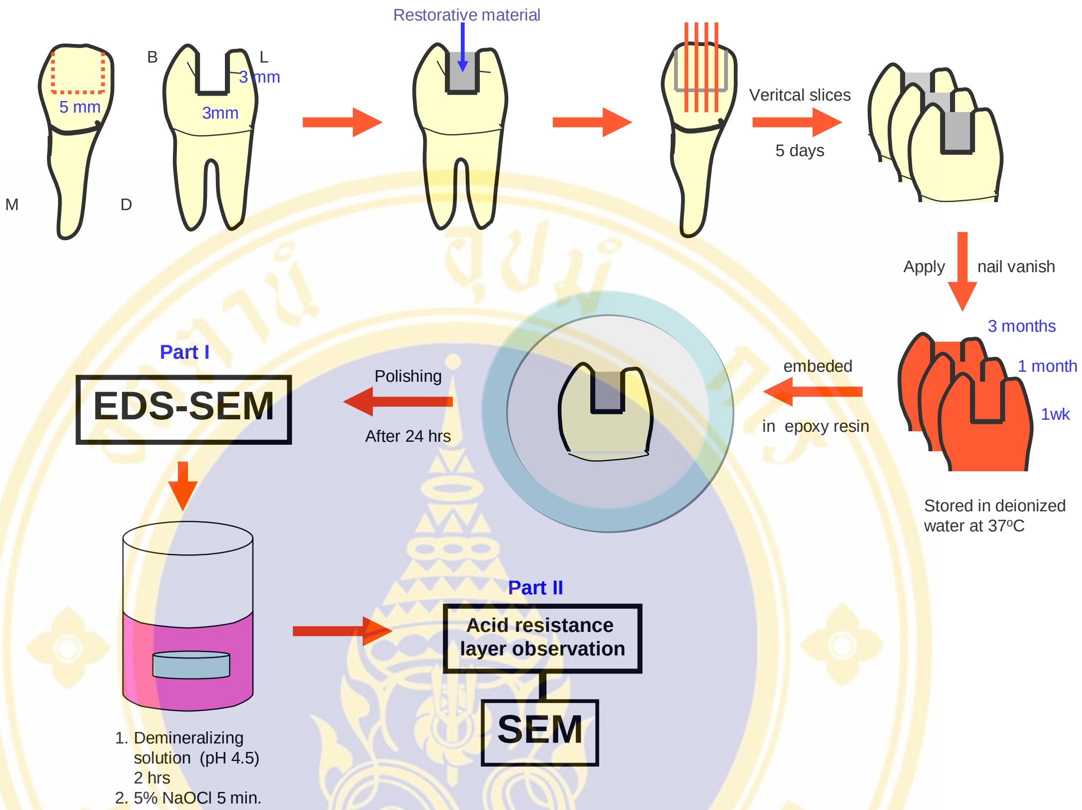


Figure 1. Specimen preparation

Table 1 Restorative techniques recommended by the manufacturers.

Material	Powder and liquid dispensing	Restorative technique
Conventional GIC (Fuji IX GP)	1 level scoop of powder to 1 drop of liquid.	1. Apply GC dentin conditioner (20 seconds) to the bonding surfaces using a cotton pellet 2. Rinse thoroughly with water. Dry by blotting with gently blowing with an air syringe. 3. Dispense powder and liquid onto the pad. Using the plastic spatula, divide the powder into 2 equal parts. Mix the first portion and mix the whole thoroughly for 15-20 seconds. Mix the required amount of Fuji IX GP. Working time is 2 minutes from the start of mixing at 23^{o}C (73.4^{o}F). Higher temperatures will be shorten working time. 4. Transfer cement to the preparation using a syringe. Avoid air bubbles. 5. Form the preliminary contour and cover with a matrix if required. 6. When set, immediately apply Fuji varnish (blow dry).

Table 1 Restorative technique recommended by the manufacturers. (Continue)

Material	Powder and liquid dispensing	Restorative technique
Resin-modified GIC (Fuji II LC)	One level scoop of powder to 1 drop of liquid.	1. Apply GC Cavity Conditioner (10 seconds) or GC Dentin Conditioner (20 seconds) to the bonding surfaces using a cotton pellet or sponge. 2. Rinse thoroughly with water. Dry blotting with a cotton pellet or gentle blowing with an air syringe. 3. Mix the first portion with All the liquid and mix for 10-15 seconds. Incorporate the remaining powder and mix the whole thoroughly for 20-25 seconds. Mix the required amount of cement. Working time is 3 minutes at 23^{o}C (73.4^{o}F). 4. Transfer cement to the preparation using a syringe or suitable placement instrument. Avoid air bubbles. 5. Form the contour and place a transparent matrix if required. 6. Light cure for 20 seconds using a visible light curing device (+/- 470 nm).

Table 1 Restorative technique recommended by the manufacturers. (Continue)

Material	Powder and liquid dispensing	Restorative technique
Compomer (Dyract AP)	-	1. Dispense Prime&Bond NT directly onto disposable brush and immediately apply to thoroughly wet all cavity surfaces. Leave the surface undisturbed for 20 seconds. 2. softly blowing with air from a dental syringe for at least 5 seconds. Surface should have a uniform, glossy appearance. If not, apply a second layer of Prime&Bond NT repeating steps 2 to 4. Light-cure for a minimum of 10 seconds. 3. Immediately place Dyract AP Compomer over the cured Prime&Bond NT. 4. Insert Compules Tip into the notched opening of the applicator gun barrel. 5. Dispense Dyract AP shade A3.5 directly into the cavity preparation. In deep cavities, incremental placement and curing (in 4 mm layers or less) is recommended to minimize polymerization shrinkage. 6. Cure each increment separately for 40 seconds.

Table 1 Restorative technique recommended by the manufacturers. (Continue)

Material	Powder and liquid dispensing	Restorative technique
Giomer (Reactmer)	-	**Bonding process** 1. Apply proper amount of first Bond A, then Bond B into a dish and 2. after mixing well apply it to the whole surface of cavity. (The time ability to operate is one minute.) 3. Leave it for 20 seconds, then flatten the layer of bonding by air. 4. Light cure the bonding for 10 seconds. **Placement Procedures** Place Reactmer paste in the cavity. Light cure with a light curing unit for 30 seconds.

Table 1 Restorative technique recommended by the manufacturers. (Continue)

Material	**Powder and liquid dispensing**	**Restorative technique**
Resin composite (Z250)	-	1. Apply 3M™ Scotchbond™ etchant to enamel and dentin; wait 15 seconds. Rinse and blot excess water, leaving tooth moist. 2. Using a fully saturated brush tip for each coat, apply 2 consecutive coats of Single Bond adhesive to enamel and dentin. Dry gently for 2-5 seconds and light cure for 10 seconds. Place 3M Filtek Z250 shade A4 in increments less than 2.5 mm. Light cure each increment for 20 seconds. 3. Finishing occlusal surface using an appropriate finishing instrument.

Table 2 Main components of restorative and adhesive materials.

Restorative Materials		**Adhesive**	
System (Manufacturer)	Main components	System (Manufacturer)	Main components
Fuji IX GP (GC, Tokyo, Japan) Shade A3 Batch no. Powder 0206071 Liquid 0205311 GC Dentin Conditioner (GC, Tokyo, Japan) Batch no. 0205301	Powder : Fluoroalumino-silicate glass. Liquid : Polyacrylic acid, Water. Polyacrylic acid	-	-
Fuji II LC Improve (GC, Tokyo, Japan) Shade A3 Batch no. Powder 0205281 Liquid 0205291	Powder : Fluoroalumino-silicate glass. Liquid : Polyacrylic acid, Water-soluble methacrylate monomer, Catalyst.	-	-

Table 2 Main components of restorative and adhesive materials. (Continue)

Restorative Materials		**Adhesive**	
System (Manufacturer)	Main components	System (Manufacturer)	Main components
Dyract AP (Dentsply. Detrey, GmbH, Dreieich.) Shade A4 Batch no. 0301001476	Urethan dimethacrylate (UDMA), Tetracarboxylic acid-hydroxyethylmethacrylate-ester (TCB Resin), Alkanoyl-poly-methacrylate, Strontium-fluoro-silicate glass, Strontium fluoride, Photo initiators, Butyl hydroxyl toluene, Iron oxide pigments	Prime&Bond NT (Dentsply, Detrey, GmbH, Dreieich.) Batch no. 0311001664	Di-and trimethacrylate resins functionalized amorphous silica, PENTA (dipentaerythritol penta acrylate monophosphate), Photoinitiators, Butyl hydroxyl toluene, Cetylamine hydrofluoride Acetone.

Table 2 Main components of restorative and adhesive materials.(Continue)

Restorative Materials		**Adhesive**	
System (Manufacturer)	Main components	System (Manufacturer)	Main components
Reactmer (Shofu, Kyoto, Japan..) Shade A3 Batch no. 110426	Fully-prereacted glass ionomer filler, Glass filler, UDMA, HEMA, Photo-initiator, etc.	Shake One (Shofu, Kyoto, Japan.)	BOND A : Batch no. A-551F-3 Solvent, Filler: Pre-reacted glass ionomer filler, Catalyst BOND B : Batch no. B-551F-3 Monomer, Adhesion promoting monomer, Catalyst, Solvent.
Filtek Z250 (3M ESPE, St.Paul. USA) Shade A4 Batch no.4KTJ	Bis-GMA, Filler, Catalyst, etc.	Single Bond (3M ESPE, St.Paul. USA)	Etchant (35% phosphoric acid) Batch no. 4JA Adhesive Batch no. 4KF Bis-GMA, HEMA, Vitremer copolymer, ethanol, water, initiator.

3. Statistical analysis

3.1 Part I Fluoride content measurement utilized Energy dispersive X-ray spectrometer (EDS) and SEM.

The means of fluoride content in each experimental group were determined and statistically analyzed with Factorial's PLSD test at 95% confidence interval.

3.2 Part II Acid resistant layer observation using SEM.

The mean thickness of acid resistant layer in each experimental group was determined and statistically analyzed with Two-way ANOVA at 95% confidence interval.

CHAPTER V

RESULTS

1. Part I Fluoride content measurement utilized energy dispersive X-ray spectrometer (EDS) and SEM.

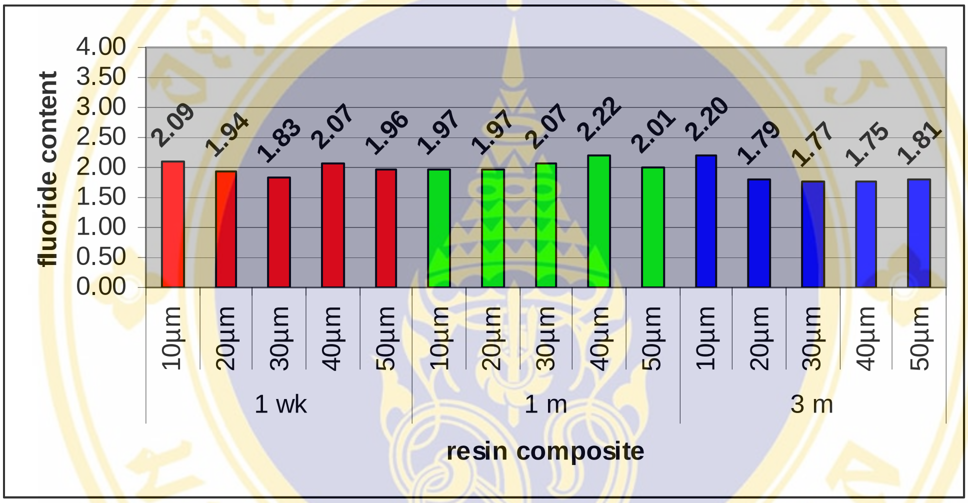


Figure 2 The fluoride contents in dentin measured at 10, 20, 30, 40, and 50 µm beneath the restoration/dentin interface after the teeth were restored with a resin composite for 1 week, 1 month, and 3 months (*p value < 0.05*)

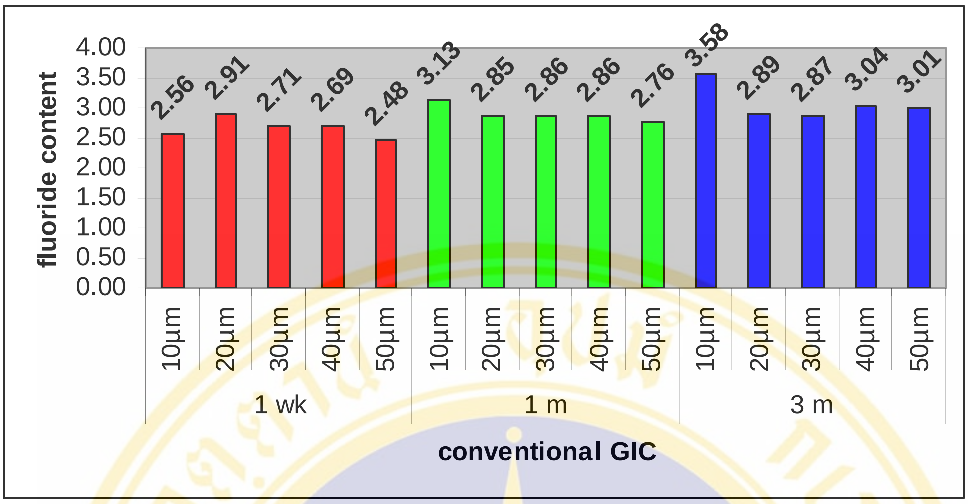


Figure 3 The fluoride contents in dentin measured at 10, 20, 30, 40, and 50 µm beneath the restoration/dentin interface after the teeth were restored with a conventional glass ionomer cement for 1 week, 1 month, and 3 months ($p\ value < 0.05$)

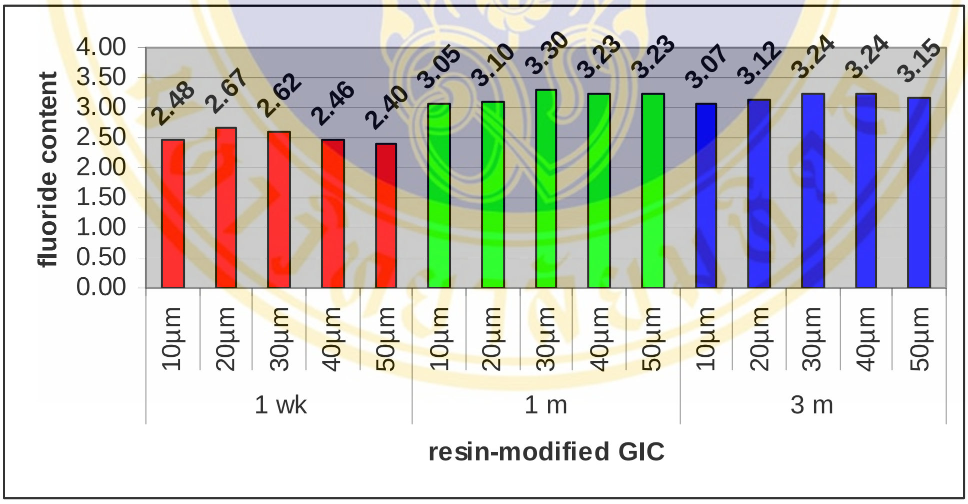


Figure 4 The fluoride contents in dentin measured at 10, 20, 30, 40, and 50 µm beneath the restoration/dentin interface after the teeth were restored with a resin-modified glass ionomer cement for 1 week, 1 month, and 3 months. ($p\ value < 0.05$)

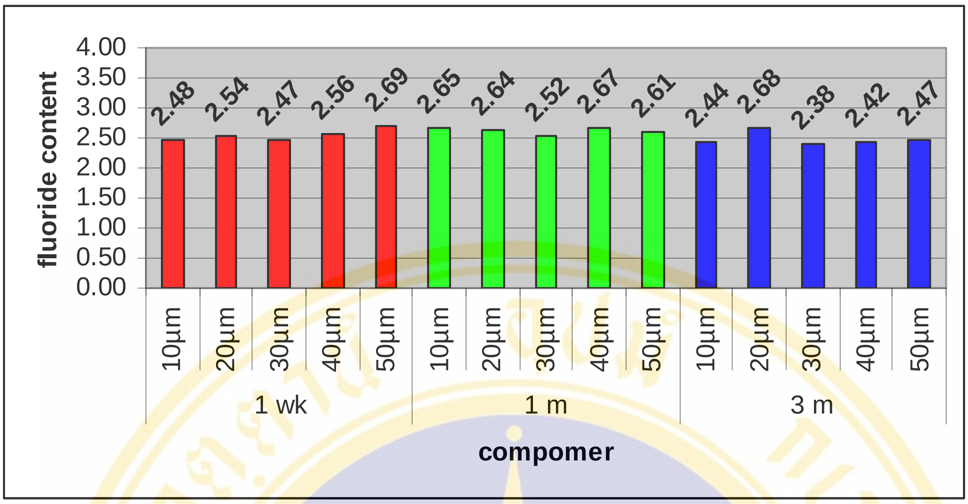


Figure 5 The fluoride contents in dentin measured at 10, 20, 30, 40, and 50 µm beneath the restoration/dentin interface after the teeth were restored with a compomer for 1 week, 1 month, and 3 months. (*p value* < *0.05*)

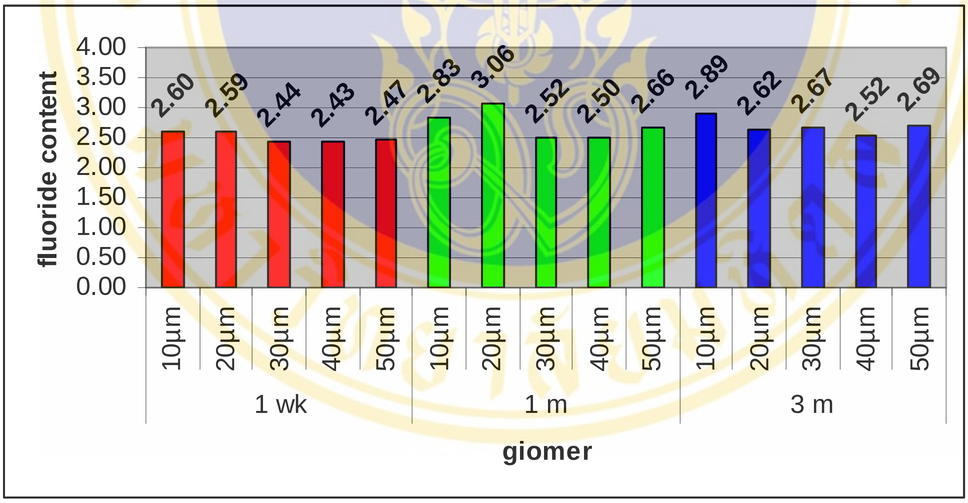


Figure 6 The fluoride contents in dentin measured at 10, 20, 30, 40, and 50 µm beneath the restoration/dentin interface after the teeth were restored with a giomer for 1 week, 1 month, and 3 months (*p value* < *0.05*)

As shown in Figure 2-6, for each restorative material, there were no statistically significant differences of the fluoride levels evaluated at 10, 20, 30, 40 or 50 µm beneath the restoration/dentin interface at all evaluation times.

When the statistical analysis were made within the material at different storage times, 1 week, 1 month and 3 months as shown in Figure 2-6, the result showed that there were no statistically significant changes in fluoride contents in resin composite, compomer, and giomer at 10, 20, 30, 40 or 50 µm and all evaluation times.

In conventional glass ionomer cement, at 10 µm, the fluoride content at 1 month and 3 months were significantly greater than that at1 week. At 50 µm, only the fluoride content at 3 months was significantly greater than that at 1 week, whereas there were no statistically significant changes in fluoride contents at 20, 30, 40 µm.

In resin-modified glass ionomer cement, at 10, 30, 40, and 50µm, the fluoride contents at 1 month and 3 months were significantly greater than those at 1 week, whereas there were no statistically significant changes in fluoride contents at 20 µm.

Table 3 Comparison of the fluoride contents in dentin adjacent to five different restorative materials at 1 week.

Material	**Fluoride (mean ± SD)**				
	10µm	**20µm**	**30µm**	**40µm**	**50µm**
Resin composite	2.09 ± 0.19^{a}	1.94 ± 0.61^{a}	1.83 ± 0.43^{a}	2.07 ± 0.21^{a}	1.96 ± 0.44^{a}
Conventional GIC	2.56 ± 0.32^{b}	2.91 ± 0.65^{b}	2.70 ± 0.73^{b}	2.69 ± 0.50^{b}	2.47 ± 0.43^{b}
Resin-modified GIC	2.48 ± 0.27^{b}	2.67 ± 0.48^{b}	2.62 ± 0.49^{b}	$2.46 \pm 0.52^{a,b}$	$2.39 \pm 0.46^{a,b}$
Compomer	$2.48 \pm 0.48^{a,b}$	2.55 ± 0.37^{b}	2.47 ± 0.47^{b}	2.56 ± 0.45^{b}	2.69 ± 0.51^{b}
Giomer	2.60 ± 0.27^{b}	2.59 ± 0.49^{b}	2.44 ± 0.41^{b}	$2.43 \pm 0.52^{a,b}$	2.47 ± 0.28^{b}

Note: Within the same column, the same superscript letters (^{a,b}) denote no statistically significant differences among different materials at the corresponding distances.

The fluoride contents within the distance of 50 µm beneath the restoration/dentin interface after five different restorative materials had been restored for 1 week are shown in Table 3, the comparative analysis of which indicates that the fluoride contents for the restorative treatment using resin composite was statistically significantly less than conventional glass ionomer cement at 10, 20, 30, 40, and 50 µm, less than resin-modified glass ionomer cement at 10 20, and 30 µm, less than compomer at 20, 30, 40, and 50 µm, and less than giomer at 10, 20, 30, and 50 µm.

Table 4 Comparison of the fluoride contents in dentin adjacent to five different restorative materials at 1 month.

Material	Fluoride (mean $\pm$ SD)				
	10µm	20µm	30µm	40µm	50µm
Resin composite	1.97 ± 0.31^{a}	1.98 ± 0.47^{a}	2.07 ± 0.71^{a}	2.21 ± 0.51^{a}	2.01 ± 0.28^{a}
Conventional GIC	3.14 ± 0.67^{b}	2.86 ± 0.37^{b}	$2.86\pm 0.65^{b,c}$	$2.86\pm 0.72^{a,b}$	2.76 ± 0.73^{b}
Resin-modified GIC	3.05 ± 0.35^{b}	3.10 ± 0.51^{b}	3.30 ± 0.52^{c}	3.23 ± 0.31^{b}	3.23 ± 0.64^{b}
Compomer	2.65 ± 0.47^{b}	2.64 ± 0.49^{b}	$2.53\pm 0.49^{a,b}$	2.67 ± 0.59^{a}	2.61 ± 0.57^{b}
Giomer	2.83 ± 0.33^{b}	3.06 ± 0.63^{b}	$2.52\pm 0.40^{a,b}$	2.50 ± 0.38^{a}	2.66 ± 0.39^{b}

Note: Within the same column, the same superscript letters (^{a,b,c}) denote no statistically significant differences among different materials at the corresponding distances.

The fluoride contents after five different restorative materials had been restored for 1 month are shown in Table 4. The comparative analysis of the fluoride contents at 10, 20, and 50µm beneath the restoration/dentin interface indicates that using resin composite produced the smallest amount. For the fluoride content at 30 µm, resin composite was statistically significantly less than conventional and resin-modified glass ionomer cement but was not significantly different from compomer and giomer, whereas the fluoride contents in resin-modified glass ionomer cement group was statistically significantly greater than resin composite, compomer and giomer. The fluoride contents in conventional glass ionomer cement group were only statistically significantly greater than that in resin composite but not significantly different from those in other materials. The fluoride contents at 40 µm in the resin-modified glass ionomer group was statistically significantly greater than those in resin composite, compomer and giomer but not significantly different from that in conventional glass ionomer cement. There were no significant differences among conventional glass ionomer cement, resin composite, compomer, and giomer.

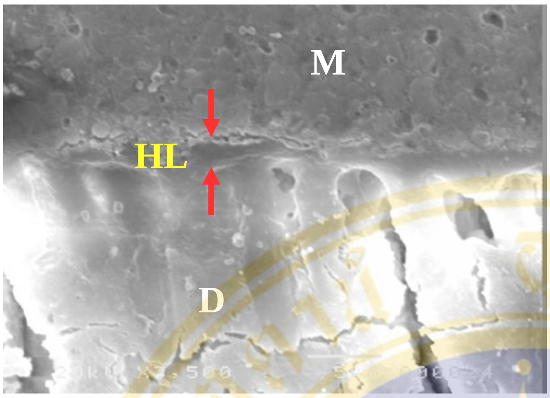
Table 5 Comparison of the fluoride contents in dentin adjacent to five different restorative materials at 3 months.

Material	Fluoride (mean ± SD)				
	10µm	20µm	30µm	40µm	50µm
Resin composite	2.20± 1.24[a]	1.79± 1.08[a]	1.77± 0.88[a]	1.75± 0.63[a]	1.81± 0.41[a]
Conventional GIC	3.58± 0.87[b]	2.89± 0.63[b]	2.87± 0.42[b,c]	3.04± 0.84[b,c]	3.01± 0.45[c]
Resin-modified GIC	3.07± 0.62[a,b]	3.12± 0.83[b]	3.24± 0.45[c]	3.24± 0.57[c]	3.15± 0.54[c]
Compomer	2.44± 0.82[a]	2.68± 1.67[a,b]	2.38± 0.59[a,b]	2.42± 0.71[a,b]	2.47± 0.33[b]
Giomer	2.89± 0.45[a,b]	2.62± 0.44[a,b]	2.67± 0.33[b]	2.52± 0.30[b]	2.69± 0.29[b,c]

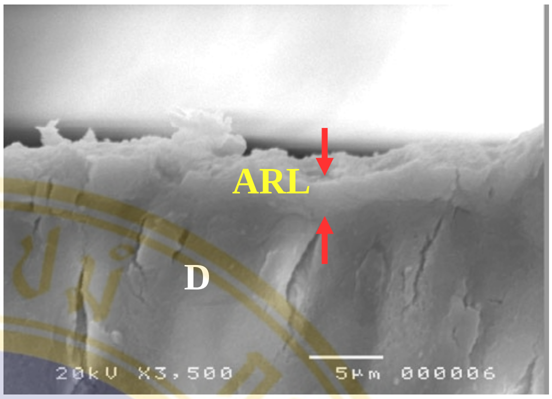
Note: Within the same column, the same superscript letters ([a,b,c]) denote no statistically significant differences among different materials at the corresponding distances.

The fluoride contents after five different restorative materials had been restored for 3 months are shown in Table 5. At 10 µm beneath the restoration/dentin interface, the comparative analysis of which indicates that the fluoride content in the dentin restored with conventional glass ionomer cement was statistically significantly greater than those restored with resin composite and compomer but not statistically significantly different from those restored with resin-modified glass ionomer cement and giomer. At 20 µm, the fluoride contents in the dentin restored with conventional and resin modified-glass ionomer cement were significantly greater than only that restored with resin composite. At 30 and 40µm, the fluoride contents in the dentin filled with resin composite was significantly less than those filled with conventional glass ionomer cement, resin-modified glass ionomer cement and giomer. The fluoride contents in resin-modified glass ionomer cement were significantly greater than those in resin composite, compomer and giomer. At 50 µm, resin composite produced the statistically significant smallest amount, the fluoride contents in conventional and resin modified glass ionomer cement were significantly greater than that in compomer but not statistically significantly different from that in giomer.

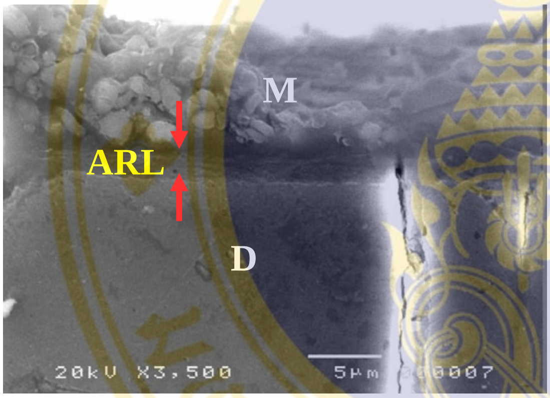
2. Part II Acid resistant layer observation using SEM.



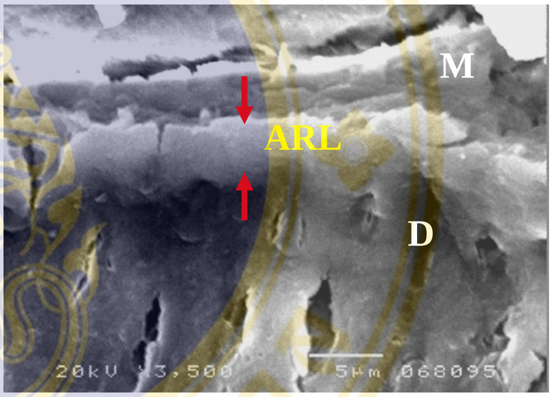
Resin Composite:



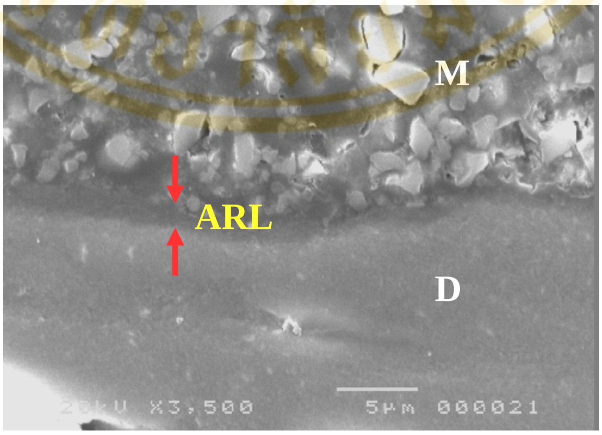
Conventional glass ionomer cement



Resin-modified glass ionomer cement

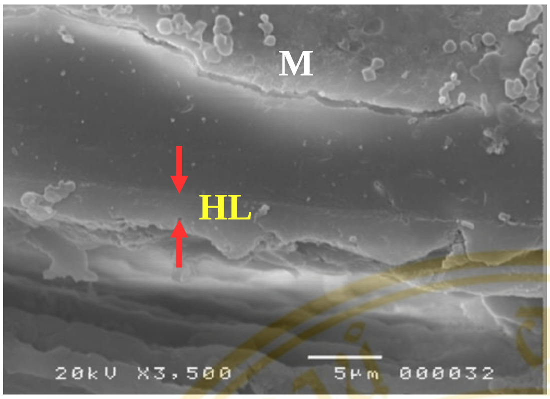


Compomer

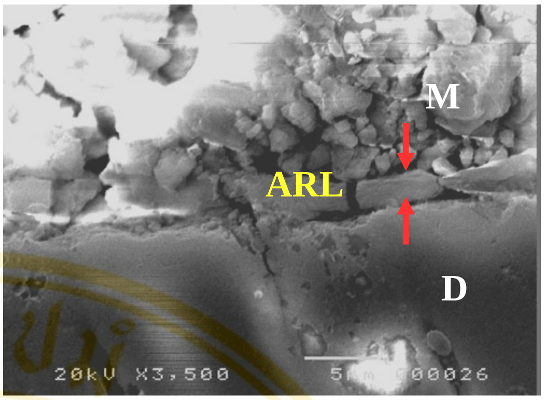


Giomer

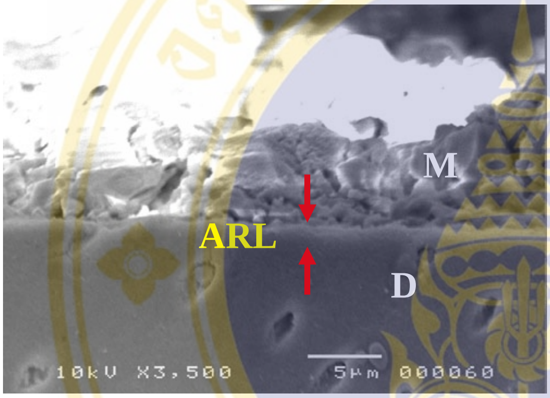
Figure 7 The acid resistant layers at first evaluation time, 1 week (original magnification 3500x) (D: Dentin; M: Restorative material; ARL: Acid resistant layer; HL: Hybrid layer)



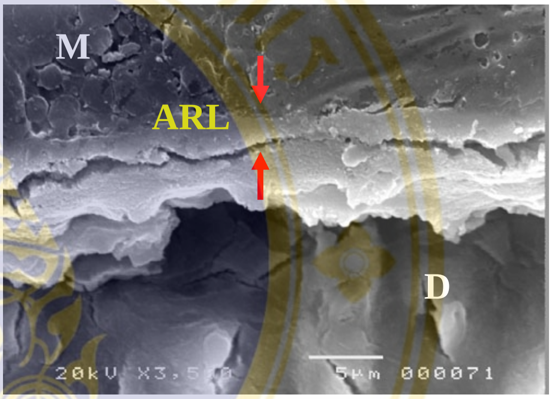
Resin composite



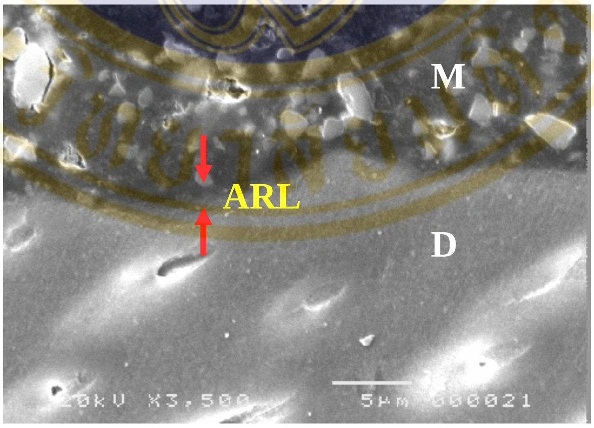
Conventional glass ionomer cement



Resin-modified glass ionomer cement

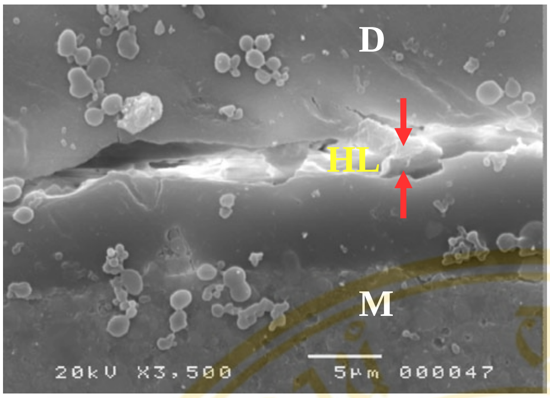


Compomer

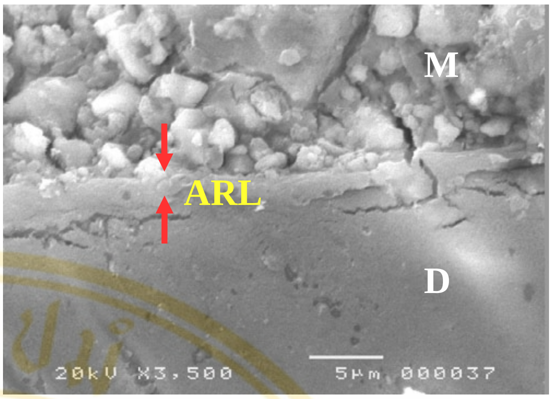


Compomer

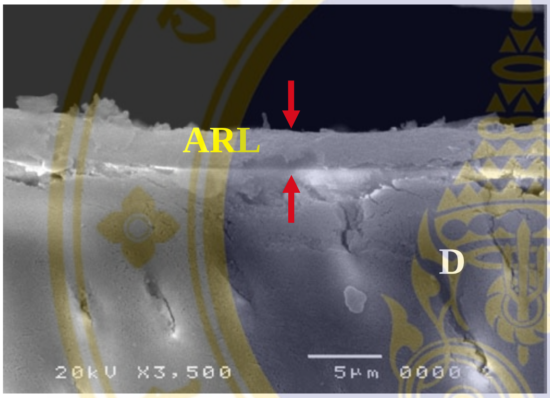
Figure 8 The acid resistant layers at second evaluation time, 1 month (original magnification 3500x) (D: Dentin; M: Restorative material; ARL: Acid resistant layer; HL: Hybrid layer)



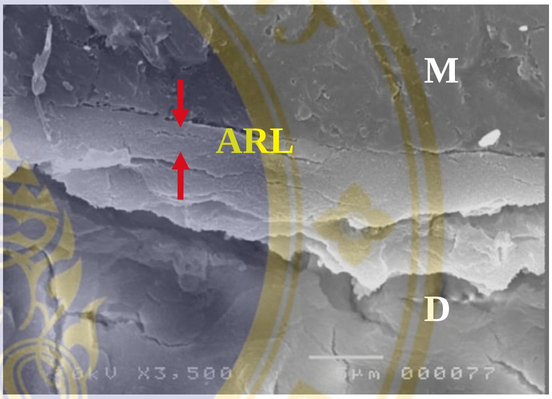
Resin composite



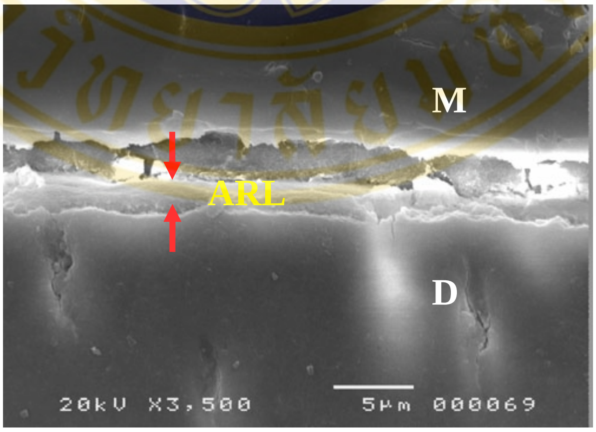
Conventional glass ionomer cement



Resin-modified glass ionomer cement



Compomer



Giomer

Figure 9 The acid resistant layers at third evaluation time, 3 months (original magnification 3500x) (D: Dentin; M: Restorative material; ARL: Acid resistant layer; HL: Hybrid layer)

Table 6 Comparison of the thickness of acid resistant layer (mean ± SD) in dentin adjacent to five different restorative materials, at 3 evaluation times, 1 week, 1 month, and 3 months.

Materials	**Thickness of acid resistant layer (µm)**		
	1 week	**1 month**	**3 months**
Resin composite	2.49 ± 0.58[a]	1.67 ± 0.48[a]	1.66 ± 0.52[a]
Conventional GIC	2.94 ± 0.52[a]	2.38 ± 0.51[a]	2.81 ± 0.91[a]
Resin-modified GIC	3.17 ± 1.71[a]	1.79 ± 0.68[a]	2.36 ± 0.57[a]
Compomer	3.88 ± 0.27[a]	3.19 ± 1.14[a]	3.52 ± 0.35[a]
Giomer	1.25 ± 0.80[a]	1.73 ± 0.44[a]	1.67 ± 1.08[a]

Note: Within the same column, the same superscript letters ([a]) denote no statistically significant differences among different materials at the corresponding distances.

The result of part II shows that all the selected fluoride releasing materials can create acid resistant layers, the dentin adjacent to the restorative material that was not dissolved in acid and base, as shown in figure 7-9. The mean thickness of these layers were shown in table 6. There were no statistically significant differences in all groups at all evaluation times.

CHAPTER VI
DISCUSSION

This study was divided into two parts. Part I dealt with the study of fluoride contents in dentin, measured at 10, 20, 30, 40, and 50 µm beneath the restoration/dentin interface when the teeth had been restored with the fluoride releasing materials (conventional glass ionomer cement, resin-modified glass ionomer cement, compomer, giomer) and resin composite (control group) for 1 week, 1 month, and 3 months respectively. The thickness of acid resistant layer of each material was observed in part II of this study.

Generally, teeth have the different initial fluoride levels (40, 41), even each tooth, the fluoride concentrations in inner dentin close to the vascularised pulp contains a higher concentration than the layers near the enamel-dentin junction (42). In this study, the same specimens were used for all parts of the experiment in order to control the initial fluoride level in dentin.

It is noted here that the quantity of fluoride found in part I of the study was not derived from the direct measurement of fluoride ions from the selected fluoride releasing materials. Instead, it was measured in dentin, based on the assumption that the fluoride content in dentin increases if fluoride ions penetrate into it.

The study in Part 1 revealed that, in all groups including the control group, there existed fluoride contents in dentin adjacent to the restorative materials used although the control group was restored with the resin composite (Z250), which is a non-fluoride releasing material, because an amount of initial fluoride is already present in any normal dentin (40, 41). The amount of fluoride in the control group, however, was less than other groups and there were no statistically significant changes in the fluoride content at any evaluation times. On the contrary, the fluoride contents detected after the dentin had been restored with fluoride releasing materials were statistically significantly greater than the fluoride content detected in the dentin in the control group at all evaluation times, suggesting that conventional glass ionomer cement, resin-modified glass ionomer cement, compomer, giomer can release fluoride into dentin within the distances established for the study (10, 20, 30, 40, 50 µm beneath the restoration/dentin interface). This was consistent with certain previous studies (10, 42-44). Specifically, the study showed that the dentin restored with conventional glass ionomer cement and resin-modified glass ionomer cement contains higher fluoride concentration than dentin restored with compomer and giomer. The latter finding had been anticipated because compomer behaves more like resin composite (45). Although giomer behaves more like resin-modified glass ionomer cement, the presence of silane coupling in the pre-reacted fillers may have obstructed the fluoride releasing ability of giomer (17).

Moreover, the study presented a comparative analysis of the fluoride releasing durations of each fluoride releasing material. According to the analysis, for the dentin restored with the conventional glass ionomer cement and the dentin restored with the resin-modified glass ionomer cement, the fluoride contents at 1 month and 3 months were not statistically significantly different. However, there were significantly greater than those at 1 week. The explanation might be that the fluoride releasing ability of these materials were high enough to measure the difference within 1 month and the ability decreases slightly afterwards. In comparison, there were no statistically significant changes in the cases of compomer and giomer groups at all evaluation times. It may be concluded therefore that fluoride release from compomer and giomer was minimal and constant. This finding of fluoride releasing duration was consistent with other previous studies (19, 46-48), which found that the fluoride release rates of conventional and resin-modified glass ionomer cement were initially high and then declined gradually in the ensuing time, while compomer and giomer maintained the low level of fluoride release. However, some studies showed a high initial fluoride of compomer and giomer (44, 49). In term of duration, some studies detected fluoride release from the selected fluoride releasing materials after 300 days (46). The observation under this study lasted 90 days.

In term of the distance, this study found no statistically significant differences at the distances of the fluoride levels detected at the distance of 10, 20, 30, 40, and 50 µm beneath the fluoride releasing material/dentin interface at all evaluation times. This was inconsistent with the study conducted by Tsanidis and Koulourides (1992), which presented an experimental model for studying interactions of glass ionomer cement with bovine dentin slab, using a specific-ion electrode attached to Ionanalyzer in assessing fluoride contents. The researchers suggested that fluoride incorporation was the highest at the first 10 µm beneath the glass ionomer cement/dentin interface, but decreased afterwards (10). However, the fluoride content at 10, 20, 30, 40, and 50 µm were not statistically significantly different in this experiment. The EDS was used to analyze the fluoride contents under this study. It is possible that EDS does not have enough sensitivity for detecting the difference of fluoride at different levels and fluoride is a light element which is recommended to be measured by a wavelength dispersive spectrometer (WDS) that was used in some previous studies (50).

The results of part I have confirmed that fluoride release from the fluoride releasing materials can penetrate into dentin. However, it can not establish the exact amount of fluoride because the line scan only present data in percentage, compared with Ca and P ratio.

Next is the results of Part 2 experiment concerning secondary caries prevention property of the fluoride releasing materials. After fluoride measurement by EDS, the study of secondary caries prevention ability of fluoride releasing materials was undertaken in which the specimens were placed in acetic acid pH 4.5 in order to create demineralization in dentin and subsequently in NaOCl in order to remove demineralized collagen. The thickness of the acid resistant layer was then assessed by means of SEM based on the assumption that the fluoride ions released from the materials into dentin form fluoroapatite crystal at this acid resistant layer, which makes it more resistant to demineralization, which in turn leads to reduce microleakage (32, 51), a cause of secondary caries. The experiment has confirmed that all the selected fluoride releasing material can create acid resistant layers but there were no statistically significantly different of the thickness in all groups and all evaluation times. The characteristic of the acid resistant layers can be differently seen dependent on observation method employed (36, 51). Also, this layer has been called differently such as ion-exchange layer, zone of interaction (32), interdiffusion zone (52), hybrid layer (53), interface, and intermediate layer (54). In our study, these layers were similar to the hybrid layer, a layer between the resin and dentin substrate that had been permeated by resin (34).

The thickness of acid resistant layer along the interface between the tested materials and dentin was approximately 1-4 μm. This was consistent with some previous studies (31, 55). Since there was no previous study about the thickness of acid resistant layer of giomer, therefore, the comparison can not be done. There was no relationship between thickness of acid resistant layer and quantity of fluoride in this study. The level of fluoride release from compomer and giomer were lower than conventional and resin-modified glass ionomer cement but the thickness of acid resistant layers were no statistically significantly different. It might be explained that the layer between compomer and dentin interface was the combination of ion-exchange layer and resin part of adhesive or hybrid layer. The acidic primer used prior to compomer application partially opened the dentinal tubules and dissolve the smear layer. Then the resin part of this primer penetrated into the collagen mesh exposed by the etching effect of the primer (56), as same reason for giomer group, whereas, acid resistant layer of conventional and resin-modified glass ionomer cement was a pure ion-exchange layer (31). In the control group, the resin composite, Z250, created a pure hybrid layer because it could not release fluoride. As a result of these 2 mechanisms to create the acid resistant layer, therefore, the relationship between fluoride release level and the thickness of acid resistant layer could not be detected.

Although this experiment has confirmed secondary caries inhibition property of all the selected fluoride releasing materials that they can release fluoride and create acid resistant layers in laboratory, in the future, we need more long term clinical studies to confirm this property for strong evidence.

CHAPTER VII
CONCLUSION

1. This study confirmed that the selected fluoride releasing materials (conventional glass ionomer cement, resin-modified glass ionomer cement, compomer, and giomer) can release fluoride into dentin within 50 µm beneath the fluoride releasing material/dentin interface, dentin restored with conventional glass ionomer cement and resin-modified glass ionomer cement contained higher fluoride concentration than dentin restored with compomer, and giomer.
2. The amount of fluoride release from conventional glass ionomer cement and resin-modified glass ionomer were significant enough to detect an increase of fluoride contents in the dentin within 3 months, while compomer and giomer maintained the low level of fluoride release.
3. This study confirmed that all selected fluoride releasing materials can created acid resistant layers, the thickness of these layers were not statistically significantly different, the characteristics of these layers were similar to hybrid layer in resin composite.

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APPENDIX

Part I Fluoride content measurement utilized EDS and SEM.

Data of fluoride content in dentin after restorations with selected materials.

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
Resin composite	1	1	10	61.18	36.60	2.22
	2	1	10	61.93	36.09	1.98
	3	1	10	68.39	29.05	2.56
	4	1	10	68.58	29.35	2.07
	5	1	10	67.98	30.03	1.99
	1	1	10	63.41	34.70	1.89
	2	1	10	60.68	37.00	2.32
	3	1	10	66.91	31.14	1.95
	4	1	10	68.28	29.72	2.00
	5	1	10	69.63	28.11	2.26
	1	1	10	61.19	36.70	2.11
	2	1	10	60.67	37.26	2.07
	3	1	10	63.52	34.26	2.22
	4	1	10	66.65	31.57	1.78
	5	1	10	66.76	31.22	2.02
	1	1	20	60.31	37.18	2.51
	2	1	20	61.92	37.07	1.01
	3	1	20	68.49	30.35	1.16
	4	1	20	66.42	31.36	2.22
	5	1	20	68.95	29.49	1.56
	1	1	20	61.18	37.15	1.67
	2	1	20	59.92	37.30	2.78
	3	1	20	68.10	29.58	2.32
	4	1	20	68.65	29.31	2.04
	5	1	20	67.50	31.82	0.68
	1	1	20	60.27	37.27	2.46
	2	1	20	60.24	37.30	2.46
	3	1	20	61.01	36.98	2.01
	4	1	20	64.54	33.28	2.18

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	5	1	20	63.01	34.90	2.09
	1	1	30	61.40	37.15	1.45
	2	1	30	58.70	39.19	2.11
	3	1	30	68.26	30.05	1.69
	4	1	30	69.84	28.72	1.44
	5	1	30	70.60	27.34	2.06
	1	1	30	60.65	37.34	2.01
	2	1	30	62.67	34.91	2.42
	3	1	30	68.05	30.07	1.88
	4	1	30	68.89	29.73	1.38
	5	1	30	69.06	29.26	1.68
	1	1	30	60.61	37.09	2.30
	2	1	30	65.88	32.79	1.33
	3	1	30	62.45	34.99	2.56
	4	1	30	69.41	29.49	1.10
	5	1	30	61.09	36.91	2.00
	1	1	40	60.99	37.07	1.94
	2	1	40	60.54	37.21	2.25
	3	1	40	68.42	29.67	1.91
	4	1	40	66.42	31.55	2.03
	5	1	40	66.45	31.12	2.43
	1	1	40	60.07	38.00	1.93
	2	1	40	60.56	37.05	2.39
	3	1	40	67.69	29.94	2.37
	4	1	40	68.31	29.71	1.98
	5	1	40	66.93	31.02	2.05
	1	1	40	62.92	35.34	1.74
	2	1	40	60.51	37.61	1.88
	3	1	40	63.00	35.11	1.89
	4	1	40	68.76	29.00	2.24
	5	1	40	65.78	32.15	2.07
	1	1	50	60.70	36.82	2.48
	2	1	50	59.51	38.92	1.57

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	3	1	50	67.70	29.95	2.35
	4	1	50	70.87	27.45	1.68
	5	1	50	64.74	32.49	2.77
	1	1	50	60.05	38.15	1.80
	2	1	50	59.20	38.86	1.94
	3	1	50	64.90	32.68	2.42
	4	1	50	68.40	30.11	1.49
	5	1	50	66.59	31.40	2.01
	1	1	50	61.02	37.14	1.84
	2	1	50	61.03	36.84	2.13
	3	1	50	60.91	36.78	2.31
	4	1	50	68.36	30.33	1.31
	5	1	50	64.34	34.31	1.35
	1	2	10	66.76	31.52	1.72
	2	2	10	68.09	29.95	1.96
	3	2	10	71.97	25.90	2.13
	4	2	10	69.08	28.66	2.26
	5	2	10	71.93	26.54	1.53
	1	2	10	69.06	29.22	1.72
	2	2	10	69.39	28.52	2.09
	3	2	10	66.19	31.75	2.06
	4	2	10	68.50	29.68	1.82
	5	2	10	71.18	27.28	1.54
	1	2	10	66.93	31.06	2.01
	2	2	10	66.92	30.88	2.20
	3	2	10	67.29	30.62	2.09
	4	2	10	69.24	29.12	1.64
	5	2	10	68.90	28.39	2.71
	1	2	20	67.25	30.75	2.00
	2	2	20	66.62	31.57	1.81
	3	2	20	67.67	30.40	1.93
	4	2	20	66.57	30.07	3.36
	5	2	20	72.02	25.89	2.09

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	1	2	20	66.11	32.13	1.76
	2	2	20	67.70	30.42	1.88
	3	2	20	65.15	32.71	2.14
	4	2	20	67.19	30.84	1.97
	5	2	20	71.52	27.43	1.05
	1	2	20	70.56	27.52	1.92
	2	2	20	67.75	30.37	1.88
	3	2	20	66.24	32.05	1.71
	4	2	20	69.66	28.09	2.25
	5	2	20	70.39	27.75	1.86
	1	2	30	67.85	30.10	2.05
	2	2	30	66.10	31.75	2.15
	3	2	30	68.10	29.57	2.33
	4	2	30	67.69	30.68	1.63
	5	2	30	69.06	28.31	2.63
	1	2	30	65.97	31.89	2.14
	2	2	30	70.89	27.32	1.79
	3	2	30	72.44	25.88	1.68
	4	2	30	68.42	29.29	2.29
	5	2	30	71.02	27.34	1.64
	1	2	30	66.66	31.75	1.59
	2	2	30	67.63	30.33	2.04
	3	2	30	68.55	29.25	2.20
	4	2	30	75.52	23.65	0.83
	5	2	30	67.28	28.61	4.11
	1	2	40	66.39	31.59	2.02
	2	2	40	67.22	31.01	1.77
	3	2	40	67.08	30.67	2.25
	4	2	40	66.40	29.96	3.64
	5	2	40	69.62	28.01	2.37
	1	2	40	67.30	30.62	2.08
	2	2	40	66.30	31.63	2.07
	3	2	40	65.85	31.66	2.49

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	4	2	40	66.41	31.25	2.34
	5	2	40	67.65	29.46	2.89
	1	2	40	65.98	32.08	1.94
	2	2	40	66.11	31.87	2.02
	3	2	40	66.85	31.19	1.96
	4	2	40	70.02	28.45	1.53
	5	2	40	69.65	28.48	1.87
	1	2	50	68.72	28.99	2.29
	2	2	50	66.66	31.20	2.14
	3	2	50	67.30	30.77	1.93
	4	2	50	69.52	28.11	2.37
	5	2	50	70.81	27.27	1.92
	1	2	50	67.58	30.36	2.06
	2	2	50	65.85	31.98	2.17
	3	2	50	68.61	29.48	1.91
	4	2	50	70.70	28.05	1.25
	5	2	50	70.26	27.92	1.82
	1	2	50	69.43	28.44	2.13
	2	2	50	68.02	29.63	2.35
	3	2	50	67.13	30.79	2.08
	4	2	50	67.75	30.54	1.71
	5	2	50	66.97	30.96	2.07
	1	3	10	70.93	26.60	2.47
	2	3	10	72.48	25.86	1.66
	3	3	10	74.11	25.34	0.55
	4	3	10	72.59	26.28	1.13
	5	3	10	68.29	29.65	2.06
	1	3	10	64.14	31.88	3.98
	2	3	10	69.43	28.57	2.00
	3	3	10	70.01	27.71	2.28
	4	3	10	72.68	26.36	0.96
	5	3	10	67.91	30.23	1.86
	1	3	10	61.74	33.60	4.66

MATERIAL	SPECIMEN	TIME	DISTANCE (μm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	2	3	10	69.65	25.94	4.41
	3	3	10	80.31	18.52	1.17
	4	3	10	68.96	29.04	2.00
	5	3	10	68.76	29.50	1.74
	1	3	20	80.26	19.10	0.64
	2	3	20	71.15	27.36	1.49
	3	3	20	72.90	26.72	0.38
	4	3	20	75.07	23.96	0.97
	5	3	20	67.44	30.52	2.04
	1	3	20	72.58	23.20	4.22
	2	3	20	72.98	25.95	1.07
	3	3	20	71.66	26.86	1.48
	4	3	20	71.57	26.40	2.03
	5	3	20	68.23	30.04	1.73
	1	3	20	63.27	32.70	4.03
	2	3	20	70.87	28.18	0.95
	3	3	20	72.98	25.04	1.98
	4	3	20	70.70	27.25	2.05
	5	3	20	68.48	29.74	1.78
	1	3	30	72.43	26.24	1.33
	2	3	30	68.17	29.35	2.48
	3	3	30	73.64	25.74	0.62
	4	3	30	72.45	26.40	1.15
	5	3	30	68.03	29.95	2.02
	1	3	30	73.08	24.24	2.68
	2	3	30	72.68	26.30	1.02
	3	3	30	71.33	27.80	0.87
	4	3	30	71.37	27.10	1.53
	5	3	30	68.39	29.78	1.83
	1	3	30	71.14	24.69	4.17
	2	3	30	68.86	29.12	2.02
	3	3	30	67.64	30.79	1.57
	4	3	30	69.82	28.23	1.95

MATERIAL	SPECIMEN	TIME	DISTANCE (μm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	5	3	30	69.31	29.34	1.35
	1	3	40	73.32	26.06	0.62
	2	3	40	67.42	30.88	1.70
	3	3	40	71.58	27.49	0.93
	4	3	40	71.50	26.46	2.04
	5	3	40	68.74	29.18	2.08
	1	3	40	73.46	24.68	1.86
	2	3	40	72.21	26.12	1.67
	3	3	40	71.35	25.28	3.37
	4	3	40	70.45	27.86	1.69
	5	3	40	68.64	29.50	1.86
	1	3	40	82.64	16.46	0.90
	2	3	40	70.14	28.10	1.76
	3	3	40	71.09	26.94	1.97
	4	3	40	70.30	27.77	1.93
	5	3	40	68.03	30.08	1.89
	1	3	50	72.47	26.24	1.29
	2	3	50	66.88	30.68	2.44
	3	3	50	73.39	25.72	0.89
	4	3	50	69.86	28.13	2.01
	5	3	50	68.93	29.63	1.44
	1	3	50	73.61	24.32	2.07
	2	3	50	73.35	24.87	1.78
	3	3	50	71.49	26.53	1.98
	4	3	50	72.34	26.03	1.63
	5	3	50	68.71	29.31	1.98
	1	3	50	82.20	15.48	2.32
	2	3	50	69.47	28.72	1.81
	3	3	50	70.13	27.65	2.22
	4	3	50	71.76	26.69	1.55
	5	3	50	68.55	29.67	1.78

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
Conventional glass	1	1	10	68.23	28.97	2.80
ionomer cement	2	1	10	68.20	28.73	3.07
	3	1	10	68.61	28.60	2.79
	4	1	10	69.93	27.93	2.14
	5	1	10	70.76	26.66	2.58
	1	1	10	67.65	30.15	2.20
	2	1	10	69.24	28.46	2.30
	3	1	10	66.73	30.27	3.00
	4	1	10	70.00	27.57	2.43
	5	1	10	68.42	29.45	2.13
	1	1	10	68.57	28.42	3.01
	2	1	10	66.05	31.57	2.38
	3	1	10	66.58	30.99	2.43
	4	1	10	69.97	27.47	2.56
	5	1	10	73.63	23.85	2.52
	1	1	20	66.44	30.16	3.40
	2	1	20	69.47	27.29	3.24
	3	1	20	67.56	29.12	3.32
	4	1	20	68.39	29.48	2.13
	5	1	20	69.79	28.78	1.43
	1	1	20	69.81	27.45	2.74
	2	1	20	67.28	29.08	3.64
	3	1	20	67.70	29.77	2.53
	4	1	20	67.88	28.64	3.48
	5	1	20	68.39	28.59	3.02
	1	1	20	69.59	27.83	2.58
	2	1	20	68.47	28.00	3.53
	3	1	20	68.08	29.53	2.39
	4	1	20	68.25	28.03	3.72
	5	1	20	70.89	26.66	2.45
	1	1	30	69.18	28.92	1.90
	2	1	30	69.27	27.72	3.01
	3	1	30	68.13	29.74	2.13

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	4	1	30	71.19	27.46	1.35
	5	1	30	70.91	27.59	1.50
	1	1	30	66.98	29.30	3.72
	2	1	30	66.54	29.99	3.47
	3	1	30	68.33	28.89	2.78
	4	1	30	67.51	29.24	3.25
	5	1	30	67.41	29.36	3.23
	1	1	30	67.38	29.60	3.02
	2	1	30	67.07	29.74	3.19
	3	1	30	68.80	28.87	2.33
	4	1	30	69.31	28.24	2.45
	5	1	30	67.80	28.94	3.26
	1	1	40	67.43	30.18	2.39
	2	1	40	67.21	29.46	3.33
	3	1	40	67.95	29.58	2.47
	4	1	40	69.72	27.76	2.52
	5	1	40	68.57	28.53	2.90
	1	1	40	69.51	27.67	2.82
	2	1	40	65.76	30.75	3.49
	3	1	40	67.93	30.06	2.01
	4	1	40	67.42	30.37	2.21
	5	1	40	70.00	27.67	2.33
	1	1	40	68.55	28.34	3.11
	2	1	40	71.97	25.59	2.44
	3	1	40	66.73	30.13	3.14
	4	1	40	67.41	29.33	3.26
	5	1	40	69.02	29.10	1.88
	1	1	50	69.44	28.38	2.18
	2	1	50	68.77	28.43	2.80
	3	1	50	69.06	29.02	1.92
	4	1	50	67.46	30.24	2.30
	5	1	50	68.11	29.18	2.71
	1	1	50	68.27	29.74	1.99

	2	1	50	67.09	29.80	3.11
	3	1	50	68.52	29.37	2.11
	4	1	50	67.19	29.67	3.14
	5	1	50	68.53	28.99	2.48
	1	1	50	67.75	30.53	1.72
	2	1	50	69.15	28.41	2.44
	3	1	50	67.47	29.80	2.73
	4	1	50	66.42	30.80	2.78
	5	1	50	67.99	29.29	2.72
	1	2	10	66.54	29.98	3.48
	2	2	10	66.36	30.00	3.64
	3	2	10	69.58	28.51	1.91
	4	2	10	69.76	27.19	3.05
	5	2	10	66.62	29.18	4.20
	1	2	10	67.68	29.77	2.55
	2	2	10	66.96	30.25	2.79
	3	2	10	68.65	28.77	2.58
	4	2	10	70.22	26.06	3.72
	5	2	10	66.39	30.62	2.99
	1	2	10	69.16	28.84	2.00
	2	2	10	66.99	29.83	3.18
	3	2	10	67.36	29.13	3.51
	4	2	10	66.24	30.22	3.54
	5	2	10	67.09	29.03	3.88
	1	2	20	68.79	28.52	2.69
	2	2	20	66.71	30.36	2.93
	3	2	20	68.73	29.17	2.10
	4	2	20	66.27	31.25	2.48
	5	2	20	69.33	27.61	3.06
	1	2	20	66.44	30.70	2.86
	2	2	20	66.94	30.14	2.92
	3	2	20	66.70	30.29	3.01
	4	2	20	67.06	29.85	3.09
	5	2	20	66.44	30.91	2.65
	1	2	20	66.94	30.72	2.34

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	2	2	20	66.26	30.65	3.09
	3	2	20	66.97	30.26	2.77
	4	2	20	65.41	31.41	3.18
	5	2	20	66.04	30.32	3.64
	1	2	30	68.07	30.12	1.81
	2	2	30	67.42	30.01	2.57
	3	2	30	68.10	29.32	2.58
	4	2	30	65.96	30.71	3.33
	5	2	30	65.97	31.12	2.91
	1	2	30	67.36	30.93	1.71
	2	2	30	66.82	30.41	2.77
	3	2	30	65.18	30.60	4.22
	4	2	30	66.31	30.50	3.19
	5	2	30	65.30	30.87	3.83
	1	2	30	66.04	31.09	2.87
	2	2	30	66.99	30.51	2.50
	3	2	30	67.39	30.01	2.60
	4	2	30	66.70	30.29	3.01
	5	2	30	66.17	30.89	2.94
	1	2	40	66.10	31.48	2.42
	2	2	40	66.67	30.70	2.63
	3	2	40	67.34	28.37	4.29
	4	2	40	65.40	31.19	3.41
	5	2	40	78.28	19.00	2.72
	1	2	40	66.41	31.66	1.93
	2	2	40	67.05	30.32	2.63
	3	2	40	65.41	30.50	4.09
	4	2	40	68.31	29.46	2.23
	5	2	40	68.73	28.78	2.49
	1	2	40	65.90	30.98	3.12
	2	2	40	67.14	30.14	2.72
	3	2	40	68.17	29.87	1.96
	4	2	40	66.08	30.25	3.67

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	5	2	40	66.52	30.89	2.59
	1	2	50	69.16	28.62	2.22
	2	2	50	66.68	30.52	2.80
	3	2	50	68.42	29.10	2.48
	4	2	50	68.56	28.99	2.45
	5	2	50	66.37	30.41	3.22
	1	2	50	66.89	30.95	2.16
	2	2	50	66.74	30.60	2.66
	3	2	50	69.60	29.00	1.40
	4	2	50	66.21	30.33	3.46
	5	2	50	65.12	31.00	3.88
	1	2	50	67.24	30.55	2.21
	2	2	50	66.79	30.56	2.65
	3	2	50	66.75	29.08	4.17
	4	2	50	68.29	29.41	2.30
	5	2	50	65.78	30.93	3.29
	1	3	10	76.40	18.04	5.56
	2	3	10	81.22	14.71	4.07
	3	3	10	73.55	23.22	3.23
	4	3	10	69.31	26.46	4.23
	5	3	10	69.36	26.00	4.64
	1	3	10	70.36	27.00	2.64
	2	3	10	64.64	31.75	3.61
	3	3	10	75.98	21.16	2.86
	4	3	10	71.43	23.90	4.67
	5	3	10	70.71	25.91	3.38
	1	3	10	71.98	25.10	2.92
	2	3	10	71.55	25.74	2.71
	3	3	10	71.23	25.74	3.03
	4	3	10	65.92	30.88	3.20
	5	3	10	73.42	23.64	2.94
	1	3	20	73.10	23.92	2.98
	2	3	20	71.10	26.61	2.29

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	3	3	20	74.88	22.12	3.00
	4	3	20	71.05	26.65	2.30
	5	3	20	71.14	26.11	2.75
	1	3	20	72.90	24.40	2.70
	2	3	20	77.80	19.61	2.59
	3	3	20	77.12	20.39	2.49
	4	3	20	69.58	26.10	4.32
	5	3	20	68.35	28.21	3.44
	1	3	20	75.55	21.73	2.72
	2	3	20	72.54	24.81	2.65
	3	3	20	71.39	26.15	2.46
	4	3	20	67.59	28.19	4.22
	5	3	20	72.67	24.92	2.41
	1	3	30	70.02	27.21	2.77
	2	3	30	67.78	28.86	3.36
	3	3	30	72.96	24.06	2.98
	4	3	30	68.37	27.94	3.69
	5	3	30	69.32	28.05	2.63
	1	3	30	71.43	25.36	3.21
	2	3	30	75.29	22.08	2.63
	3	3	30	69.15	28.07	2.78
	4	3	30	73.77	24.02	2.21
	5	3	30	68.80	28.12	3.08
	1	3	30	69.59	27.93	2.48
	2	3	30	70.51	26.98	2.51
	3	3	30	71.23	25.99	2.78
	4	3	30	69.65	26.86	3.49
	5	3	30	70.51	27.04	2.45
	1	3	40	73.48	24.43	2.09
	2	3	40	71.54	25.76	2.70
	3	3	40	72.29	24.93	2.78
	4	3	40	67.41	29.39	3.20
	5	3	40	70.38	26.90	2.72

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	1	3	40	75.46	21.95	2.59
	2	3	40	66.09	29.14	4.77
	3	3	40	68.45	28.44	3.11
	4	3	40	62.02	35.67	2.31
	5	3	40	67.79	29.04	3.17
	1	3	40	74.13	23.50	2.37
	2	3	40	71.65	25.31	3.04
	3	3	40	74.11	23.48	2.41
	4	3	40	68.46	28.22	3.32
	5	3	40	65.99	29.06	4.95
	1	3	50	73.86	23.40	2.74
	2	3	50	76.27	20.94	2.79
	3	3	50	78.45	19.10	2.45
	4	3	50	66.69	29.37	3.94
	5	3	50	70.02	27.28	2.70
	1	3	50	69.43	28.41	2.16
	2	3	50	72.92	24.04	3.04
	3	3	50	66.98	30.01	3.01
	4	3	50	75.32	21.97	2.71
	5	3	50	67.73	28.86	3.41
	1	3	50	74.01	22.82	3.17
	2	3	50	79.60	16.99	3.41
	3	3	50	72.01	24.87	3.12
	4	3	50	70.38	26.65	2.97
	5	3	50	67.04	29.48	3.48
Resin-modified glass	1	1	10	67.42	30.30	2.28
ionomer cement	2	1	10	68.99	28.95	2.06
	3	1	10	69.06	28.45	2.49
	4	1	10	69.55	28.30	2.15
	5	1	10	68.68	28.54	2.78
	1	1	10	69.35	28.33	2.32
	2	1	10	67.16	30.14	2.70
	3	1	10	69.89	27.54	2.57

MATERIAL	SPECIMEN	TIME	DISTANCE (μm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	4	1	10	69.91	27.89	2.20
	5	1	10	70.69	26.76	2.55
	1	1	10	68.68	28.37	2.95
	2	1	10	65.99	31.23	2.78
	3	1	10	68.03	29.80	2.17
	4	1	10	67.95	29.60	2.45
	5	1	10	69.82	27.48	2.70
	1	1	20	67.53	29.98	2.49
	2	1	20	67.03	29.72	3.25
	3	1	20	68.73	29.17	2.10
	4	1	20	69.66	28.29	2.05
	5	1	20	67.35	29.97	2.68
	1	1	20	68.76	28.34	2.90
	2	1	20	67.39	29.34	3.27
	3	1	20	71.26	25.91	2.83
	4	1	20	68.10	29.72	2.18
	5	1	20	70.23	26.39	3.38
	1	1	20	67.11	30.07	2.82
	2	1	20	66.20	30.96	2.84
	3	1	20	68.90	28.91	2.19
	4	1	20	69.33	28.70	1.97
	5	1	20	69.09	27.80	3.11
	1	1	30	67.47	29.57	2.96
	2	1	30	68.11	29.12	2.77
	3	1	30	68.44	29.40	2.16
	4	1	30	68.42	29.93	1.65
	5	1	30	67.40	29.12	3.48
	1	1	30	67.23	29.76	3.01
	2	1	30	67.99	29.82	2.19
	3	1	30	67.76	29.13	3.11
	4	1	30	68.47	28.89	2.64
	5	1	30	69.83	27.79	2.38
	1	1	30	66.17	30.89	2.94

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	2	1	30	66.88	30.20	2.92
	3	1	30	69.56	28.52	1.92
	4	1	30	68.89	28.43	2.68
	5	1	30	69.75	27.82	2.43
	1	1	40	67.35	29.77	2.88
	2	1	40	67.99	29.80	2.21
	3	1	40	72.08	26.33	1.59
	4	1	40	69.48	28.11	2.41
	5	1	40	67.26	30.23	2.51
	1	1	40	67.27	29.74	2.99
	2	1	40	67.05	30.32	2.63
	3	1	40	71.86	26.47	1.67
	4	1	40	70.08	28.00	1.92
	5	1	40	69.44	28.20	2.36
	1	1	40	67.32	29.29	3.39
	2	1	40	67.55	29.51	2.94
	3	1	40	69.62	27.95	2.43
	4	1	40	68.06	29.92	2.02
	5	1	40	67.83	29.19	2.98
	1	1	50	67.20	29.78	3.02
	2	1	50	67.03	29.99	2.98
	3	1	50	69.99	27.66	2.35
	4	1	50	71.84	25.83	2.33
	5	1	50	68.72	28.70	2.58
	1	1	50	68.32	28.72	2.96
	2	1	50	65.85	31.58	2.57
	3	1	50	69.88	28.54	1.58
	4	1	50	73.63	24.85	1.52
	5	1	50	67.25	30.05	2.70
	1	1	50	67.46	30.08	2.46
	2	1	50	67.29	30.24	2.47
	3	1	50	68.69	28.92	2.39
	4	1	50	69.76	28.30	1.94

MATERIAL	SPECIMEN	TIME	DISTANCE (μm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	5	1	50	69.35	28.57	2.08
	1	2	10	67.71	29.48	2.81
	2	2	10	67.56	29.53	2.91
	3	2	10	71.49	24.59	3.92
	4	2	10	67.36	29.49	3.15
	5	2	10	63.75	33.16	3.09
	1	2	10	69.24	27.95	2.81
	2	2	10	68.21	29.43	2.36
	3	2	10	72.15	24.80	3.05
	4	2	10	69.50	27.20	3.30
	5	2	10	67.18	29.81	3.01
	1	2	10	69.76	27.55	2.69
	2	2	10	69.53	27.20	3.27
	3	2	10	68.48	28.53	2.99
	4	2	10	68.97	27.96	3.07
	5	2	10	69.84	26.81	3.35
	1	2	20	68.19	28.56	3.25
	2	2	20	67.83	28.96	3.21
	3	2	20	68.68	29.06	2.26
	4	2	20	67.66	29.29	3.05
	5	2	20	67.58	29.80	2.62
	1	2	20	70.09	26.55	3.36
	2	2	20	69.40	28.36	2.24
	3	2	20	68.94	27.78	3.28
	4	2	20	67.86	29.20	2.94
	5	2	20	68.16	28.27	3.57
	1	2	20	69.42	26.61	3.97
	2	2	20	69.58	27.28	3.14
	3	2	20	69.00	27.23	3.77
	4	2	20	68.72	27.93	3.35
	5	2	20	67.60	29.90	2.50
	1	2	30	68.62	28.32	3.06
	2	2	30	65.58	31.72	2.70

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	3	2	30	69.11	27.67	3.22
	4	2	30	69.17	27.92	2.91
	5	2	30	68.62	28.33	3.05
	1	2	30	68.25	28.31	3.44
	2	2	30	67.68	28.75	3.57
	3	2	30	68.10	28.70	3.20
	4	2	30	69.05	28.49	2.46
	5	2	30	68.21	28.67	3.12
	1	2	30	68.26	28.32	3.42
	2	2	30	68.31	28.35	3.34
	3	2	30	68.55	27.85	3.60
	4	2	30	60.11	36.16	3.73
	5	2	30	68.45	26.81	4.74
	1	2	40	67.01	29.82	3.17
	2	2	40	68.93	28.17	2.90
	3	2	40	68.91	27.61	3.48
	4	2	40	67.68	29.25	3.07
	5	2	40	67.72	28.83	3.45
	1	2	40	68.26	28.04	3.70
	2	2	40	68.14	28.29	3.57
	3	2	40	68.85	27.80	3.35
	4	2	40	68.73	27.62	3.65
	5	2	40	67.81	28.89	3.30
	1	2	40	67.43	29.51	3.06
	2	2	40	68.24	28.84	2.92
	3	2	40	68.97	28.30	2.73
	4	2	40	68.71	28.05	3.24
	5	2	40	68.19	28.99	2.82
	1	2	50	67.82	28.33	3.85
	2	2	50	68.46	28.36	3.18
	3	2	50	69.67	28.04	2.29
	4	2	50	69.17	28.15	2.68
	5	2	50	68.37	28.42	3.21

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	1	2	50	68.08	27.63	4.29
	2	2	50	69.47	27.97	2.56
	3	2	50	68.29	28.29	3.42
	4	2	50	67.26	28.04	4.70
	5	2	50	70.47	26.61	2.92
	1	2	50	67.05	29.83	3.12
	2	2	50	69.49	27.33	3.18
	3	2	50	69.66	27.17	3.17
	4	2	50	70.06	27.22	2.72
	5	2	50	68.79	28.11	3.10
	1	3	10	69.94	26.38	3.68
	2	3	10	67.67	28.63	3.70
	3	3	10	82.03	16.54	1.43
	4	3	10	67.14	29.34	3.52
	5	3	10	72.08	25.09	2.83
	1	3	10	74.54	21.82	3.64
	2	3	10	73.94	22.86	3.20
	3	3	10	67.13	29.18	3.69
	4	3	10	72.92	24.27	2.81
	5	3	10	70.65	26.13	3.22
	1	3	10	78.47	18.97	2.56
	2	3	10	75.82	21.59	2.59
	3	3	10	74.23	22.81	2.96
	4	3	10	70.04	27.32	2.64
	5	3	10	75.80	20.64	3.56
	1	3	20	71.67	25.88	2.45
	2	3	20	72.57	25.05	2.38
	3	3	20	71.04	25.86	3.10
	4	3	20	66.12	30.36	3.52
	5	3	20	67.15	27.34	5.51
	1	3	20	72.90	23.73	3.37
	2	3	20	72.64	25.32	2.04
	3	3	20	72.29	23.71	4.00

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	4	3	20	68.11	28.54	3.35
	5	3	20	70.61	26.65	2.74
	1	3	20	71.28	25.75	2.97
	2	3	20	72.01	25.09	2.90
	3	3	20	71.12	26.53	2.35
	4	3	20	69.37	27.67	2.96
	5	3	20	78.86	17.92	3.22
	1	3	30	74.63	22.05	3.32
	2	3	30	72.12	25.29	2.59
	3	3	30	79.54	17.55	2.91
	4	3	30	70.13	26.78	3.09
	5	3	30	71.65	24.79	3.56
	1	3	30	72.27	23.79	3.94
	2	3	30	73.43	23.38	3.19
	3	3	30	77.72	19.66	2.62
	4	3	30	66.90	30.25	2.85
	5	3	30	71.56	24.57	3.87
	1	3	30	72.99	24.29	2.72
	2	3	30	72.10	24.79	3.11
	3	3	30	76.10	20.23	3.67
	4	3	30	69.07	27.40	3.53
	5	3	30	69.02	27.38	3.60
	1	3	40	70.90	25.31	3.79
	2	3	40	72.51	23.75	3.74
	3	3	40	70.89	25.36	3.75
	4	3	40	68.57	29.09	2.34
	5	3	40	69.80	27.14	3.06
	1	3	40	70.92	25.70	3.38
	2	3	40	69.22	28.59	2.19
	3	3	40	68.98	27.55	3.47
	4	3	40	71.97	25.95	2.08
	5	3	40	67.56	29.06	3.38
	1	3	40	72.02	24.39	3.59

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	2	3	40	78.10	18.68	3.22
	3	3	40	76.25	20.06	3.69
	4	3	40	68.09	28.57	3.34
	5	3	40	70.70	25.77	3.53
	1	3	50	71.64	26.04	2.32
	2	3	50	69.87	27.52	2.61
	3	3	50	82.55	13.54	3.91
	4	3	50	71.27	25.78	2.95
	5	3	50	68.06	28.58	3.36
	1	3	50	73.69	23.28	3.03
	2	3	50	79.72	17.17	3.11
	3	3	50	72.85	23.66	3.49
	4	3	50	72.79	25.03	2.18
	5	3	50	70.27	26.67	3.06
	1	3	50	68.06	28.38	3.56
	2	3	50	78.47	18.94	2.59
	3	3	50	77.23	18.99	3.78
	4	3	50	68.14	28.16	3.70
	5	3	50	70.89	25.48	3.63
Compomer	1	1	10	66.12	31.63	2.25
	2	1	10	66.50	30.01	3.49
	3	1	10	64.48	32.81	2.71
	4	1	10	65.17	32.55	2.28
	5	1	10	65.01	32.44	2.55
	1	1	10	67.78	30.14	2.08
	2	1	10	65.55	32.29	2.16
	3	1	10	65.28	32.51	2.21
	4	1	10	66.59	31.21	2.20
	5	1	10	66.60	31.31	2.09
	1	1	10	66.01	31.51	2.48
	2	1	10	66.07	31.82	2.11
	3	1	10	65.64	30.77	3.59
	4	1	10	65.31	32.41	2.28

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	5	1	10	66.98	30.31	2.71
	1	1	20	67.46	29.77	2.77
	2	1	20	66.28	31.26	2.46
	3	1	20	66.68	30.62	2.70
	4	1	20	67.24	30.92	1.84
	5	1	20	65.65	31.59	2.76
	1	1	20	68.07	29.61	2.32
	2	1	20	65.51	32.14	2.35
	3	1	20	66.96	30.31	2.73
	4	1	20	65.37	31.38	3.25
	5	1	20	65.52	32.47	2.01
	1	1	20	68.58	29.14	2.28
	2	1	20	65.80	31.36	2.84
	3	1	20	66.35	31.05	2.60
	4	1	20	65.38	31.68	2.94
	5	1	20	66.32	31.36	2.32
	1	1	30	67.54	30.60	1.86
	2	1	30	66.31	30.43	3.26
	3	1	30	66.37	30.83	2.80
	4	1	30	66.67	29.99	3.34
	5	1	30	65.41	31.87	2.72
	1	1	30	67.25	30.13	2.62
	2	1	30	66.23	31.64	2.13
	3	1	30	66.40	31.53	2.07
	4	1	30	65.80	31.72	2.48
	5	1	30	65.88	32.44	1.68
	1	1	30	66.42	30.86	2.72
	2	1	30	66.09	31.39	2.52
	3	1	30	65.78	31.94	2.28
	4	1	30	66.51	31.37	2.12
	5	1	30	65.89	31.61	2.50
	1	1	40	69.10	28.97	1.93
	2	1	40	66.68	30.58	2.74

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	3	1	40	67.67	30.25	2.08
	4	1	40	66.32	30.36	3.32
	5	1	40	66.05	31.31	2.64
	1	1	40	67.34	30.21	2.45
	2	1	40	66.37	31.61	2.02
	3	1	40	67.57	29.55	2.88
	4	1	40	66.97	30.05	2.98
	5	1	40	66.28	31.40	2.32
	1	1	40	67.92	29.48	2.60
	2	1	40	68.43	28.96	2.61
	3	1	40	66.53	31.39	2.08
	4	1	40	65.58	31.04	3.38
	5	1	40	65.89	31.76	2.35
	1	1	50	67.95	29.99	2.06
	2	1	50	65.99	30.59	3.42
	3	1	50	67.44	30.15	2.41
	4	1	50	67.38	29.80	2.82
	5	1	50	66.73	30.81	2.46
	1	1	50	68.02	30.09	1.89
	2	1	50	65.80	30.27	3.93
	3	1	50	66.58	30.91	2.51
	4	1	50	65.74	31.59	2.67
	5	1	50	66.08	31.50	2.42
	1	1	50	67.23	30.13	2.64
	2	1	50	66.95	30.46	2.59
	3	1	50	65.69	31.11	3.20
	4	1	50	66.65	30.53	2.82
	5	1	50	67.21	30.33	2.46
	1	2	10	68.75	27.87	3.38
	2	2	10	69.45	28.53	2.02
	3	2	10	66.84	30.96	2.20
	4	2	10	67.61	29.75	2.64
	5	2	10	68.98	28.04	2.98

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	1	2	10	67.52	29.60	2.88
	2	2	10	71.19	25.88	2.93
	3	2	10	71.36	25.67	2.97
	4	2	10	67.97	28.93	3.10
	5	2	10	65.34	31.66	3.00
	1	2	10	72.76	25.03	2.21
	2	2	10	68.11	29.15	2.74
	3	2	10	75.44	22.70	1.86
	4	2	10	65.47	31.66	2.87
	5	2	10	69.45	28.53	2.02
	1	2	20	68.38	29.03	2.59
	2	2	20	74.80	23.06	2.14
	3	2	20	68.88	28.59	2.53
	4	2	20	66.55	30.56	2.89
	5	2	20	71.73	26.09	2.18
	1	2	20	67.86	27.95	4.19
	2	2	20	68.27	29.36	2.37
	3	2	20	69.72	27.96	2.32
	4	2	20	66.86	30.48	2.66
	5	2	20	67.06	29.99	2.95
	1	2	20	67.72	29.89	2.39
	2	2	20	71.38	26.37	2.25
	3	2	20	64.04	33.26	2.70
	4	2	20	68.51	28.74	2.75
	5	2	20	67.82	29.44	2.74
	1	2	30	69.42	27.26	3.32
	2	2	30	67.04	29.78	3.18
	3	2	30	69.32	27.94	2.74
	4	2	30	66.71	30.59	2.70
	5	2	30	67.26	30.71	2.03
	1	2	30	68.90	28.42	2.68
	2	2	30	70.64	27.25	2.11
	3	2	30	67.27	29.92	2.81

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	4	2	30	70.18	27.98	1.84
	5	2	30	67.30	29.76	2.94
	1	2	30	67.28	29.87	2.85
	2	2	30	70.62	26.79	2.59
	3	2	30	68.23	29.63	2.14
	4	2	30	68.02	30.32	1.66
	5	2	30	68.43	29.29	2.28
	1	2	40	67.66	28.30	4.04
	2	2	40	68.02	28.73	3.25
	3	2	40	67.64	29.83	2.53
	4	2	40	68.00	29.84	2.16
	5	2	40	68.41	28.64	2.95
	1	2	40	70.00	26.33	3.67
	2	2	40	67.51	30.42	2.07
	3	2	40	69.20	28.03	2.77
	4	2	40	69.56	28.53	1.91
	5	2	40	69.78	27.94	2.28
	1	2	40	73.29	24.33	2.38
	2	2	40	68.90	28.76	2.34
	3	2	40	68.49	28.90	2.61
	4	2	40	67.12	30.32	2.56
	5	2	40	66.81	30.68	2.51
	1	2	50	67.53	28.60	3.87
	2	2	50	67.84	29.24	2.92
	3	2	50	67.65	30.23	2.12
	4	2	50	69.98	27.78	2.24
	5	2	50	76.58	21.80	1.62
	1	2	50	70.27	26.93	2.80
	2	2	50	68.69	28.50	2.81
	3	2	50	72.29	24.97	2.74
	4	2	50	69.59	28.16	2.25
	5	2	50	67.21	29.48	3.31
	1	2	50	68.85	29.15	2.00

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	2	2	50	68.96	28.39	2.65
	3	2	50	69.90	27.97	2.13
	4	2	50	68.17	28.85	2.98
	5	2	50	68.66	28.60	2.74
	1	3	10	73.58	25.12	1.30
	2	3	10	70.56	27.31	2.13
	3	3	10	71.23	26.12	2.65
	4	3	10	66.41	30.25	3.34
	5	3	10	73.11	24.80	2.09
	1	3	10	71.62	26.74	1.64
	2	3	10	72.46	26.04	1.50
	3	3	10	60.00	35.41	4.59
	4	3	10	70.17	26.79	3.04
	5	3	10	65.29	32.37	2.34
	1	3	10	71.90	25.57	2.53
	2	3	10	71.80	26.05	2.15
	3	3	10	72.56	24.46	2.98
	4	3	10	68.55	29.28	2.17
	5	3	10	72.09	25.79	2.12
	1	3	20	72.48	26.04	1.48
	2	3	20	71.67	26.98	1.35
	3	3	20	72.54	26.31	1.15
	4	3	20	64.43	31.40	4.17
	5	3	20	72.82	24.32	2.86
	1	3	20	72.33	25.95	1.72
	2	3	20	72.78	26.17	1.05
	3	3	20	64.83	29.23	5.94
	4	3	20	68.61	29.65	1.74
	5	3	20	64.04	31.00	4.96
	1	3	20	73.29	25.42	1.29
	2	3	20	70.82	27.16	2.02
	3	3	20	61.94	32.48	5.58
	4	3	20	69.07	28.95	1.98

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	5	3	20	71.23	25.90	2.87
	1	3	30	72.33	25.32	2.35
	2	3	30	72.66	25.30	2.04
	3	3	30	68.43	29.34	2.23
	4	3	30	70.38	27.23	2.39
	5	3	30	72.67	24.38	2.95
	1	3	30	72.59	25.65	1.76
	2	3	30	73.86	24.89	1.25
	3	3	30	70.15	26.77	3.08
	4	3	30	72.54	25.79	1.67
	5	3	30	69.32	27.28	3.40
	1	3	30	72.11	25.63	2.26
	2	3	30	73.82	23.29	2.89
	3	3	30	69.71	28.17	2.12
	4	3	30	72.58	24.49	2.93
	5	3	30	69.87	27.68	2.45
	1	3	40	71.76	25.60	2.64
	2	3	40	73.67	23.70	2.63
	3	3	40	74.08	23.50	2.42
	4	3	40	71.74	25.47	2.79
	5	3	40	66.49	29.24	4.27
	1	3	40	73.63	23.51	2.86
	2	3	40	71.33	27.58	1.09
	3	3	40	67.42	30.39	2.19
	4	3	40	73.03	25.55	1.42
	5	3	40	69.21	28.61	2.18
	1	3	40	73.97	23.80	2.23
	2	3	40	74.70	22.67	2.63
	3	3	40	74.96	22.38	2.66
	4	3	40	68.43	29.43	2.14
	5	3	40	73.43	24.41	2.16
	1	3	50	72.80	24.27	2.93
	2	3	50	70.71	26.46	2.83

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	3	3	50	72.85	25.16	1.99
	4	3	50	69.42	27.87	2.71
	5	3	50	68.12	29.06	2.82
	1	3	50	71.71	25.88	2.41
	2	3	50	74.81	22.56	2.63
	3	3	50	71.09	25.93	2.98
	4	3	50	69.70	28.01	2.29
	5	3	50	72.01	25.95	2.04
	1	3	50	71.01	26.71	2.28
	2	3	50	75.42	22.33	2.25
	3	3	50	69.44	28.50	2.06
	4	3	50	71.97	25.68	2.35
	5	3	50	72.62	24.95	2.43
Giomer	1	1	10	65.83	31.31	2.86
	2	1	10	65.94	31.69	2.37
	3	1	10	64.68	32.60	2.72
	4	1	10	64.07	33.15	2.78
	5	1	10	65.65	31.26	3.09
	1	1	10	66.04	31.15	2.81
	2	1	10	66.44	30.88	2.68
	3	1	10	66.53	30.79	2.68
	4	1	10	65.67	32.08	2.25
	5	1	10	65.67	31.90	2.43
	1	1	10	66.00	31.82	2.18
	2	1	10	65.56	32.23	2.21
	3	1	10	65.53	31.95	2.52
	4	1	10	65.31	32.15	2.54
	5	1	10	65.31	31.79	2.90
	1	1	20	66.20	31.12	2.68
	2	1	20	67.60	28.70	3.70
	3	1	20	67.81	29.94	2.25
	4	1	20	66.52	30.66	2.82
	5	1	20	66.52	30.66	2.82

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	1	1	20	66.45	30.80	2.75
	2	1	20	65.91	30.71	3.38
	3	1	20	67.01	31.03	1.96
	4	1	20	67.22	30.64	2.14
	5	1	20	65.84	31.88	2.28
	1	1	20	66.82	30.68	2.50
	2	1	20	66.19	31.66	2.15
	3	1	20	66.19	30.93	2.88
	4	1	20	65.90	31.58	2.52
	5	1	20	66.44	31.57	1.99
	1	1	30	66.20	31.01	2.79
	2	1	30	58.70	38.09	3.21
	3	1	30	68.02	29.65	2.33
	4	1	30	66.81	30.81	2.38
	5	1	30	65.68	31.42	2.90
	1	1	30	67.30	30.57	2.13
	2	1	30	67.95	30.24	1.81
	3	1	30	68.00	29.58	2.42
	4	1	30	66.61	31.40	1.99
	5	1	30	66.49	30.81	2.70
	1	1	30	65.59	31.93	2.48
	2	1	30	68.54	29.58	1.88
	3	1	30	65.86	31.27	2.87
	4	1	30	65.30	32.62	2.08
	5	1	30	65.01	32.33	2.66
	1	1	40	67.63	29.56	2.81
	2	1	40	67.33	31.39	1.28
	3	1	40	67.68	29.71	2.61
	4	1	40	66.22	31.08	2.70
	5	1	40	65.76	31.54	2.70
	1	1	40	65.75	31.44	2.81
	2	1	40	66.70	30.52	2.78
	3	1	40	66.98	30.78	2.24

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	4	1	40	67.09	29.87	3.04
	5	1	40	65.70	32.12	2.18
	1	1	40	67.13	30.37	2.50
	2	1	40	66.64	31.74	1.62
	3	1	40	67.23	31.09	1.68
	4	1	40	65.70	31.75	2.55
	5	1	40	67.22	29.89	2.89
	1	1	50	66.69	31.02	2.29
	2	1	50	67.76	29.83	2.41
	3	1	50	65.91	31.43	2.66
	4	1	50	65.66	31.72	2.62
	5	1	50	65.62	31.44	2.94
	1	1	50	66.53	30.90	2.57
	2	1	50	66.96	31.06	1.98
	3	1	50	66.66	31.22	2.12
	4	1	50	65.30	31.78	2.92
	5	1	50	66.90	30.87	2.23
	1	1	50	66.35	31.35	2.30
	2	1	50	66.45	31.05	2.50
	3	1	50	67.63	29.73	2.64
	4	1	50	67.03	30.40	2.57
	5	1	50	66.24	31.51	2.25
	1	2	10	68.90	27.87	3.23
	2	2	10	66.90	30.71	2.39
	3	2	10	66.67	30.69	2.64
	4	2	10	68.68	28.09	3.23
	5	2	10	67.46	30.16	2.38
	1	2	10	61.46	35.54	3.00
	2	2	10	68.20	29.28	2.52
	3	2	10	65.83	30.98	3.19
	4	2	10	66.65	30.89	2.46
	5	2	10	66.60	30.52	2.88
	1	2	10	65.24	31.80	2.96

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	2	2	10	67.15	29.85	3.00
	3	2	10	69.30	27.64	3.06
	4	2	10	65.06	32.56	2.38
	5	2	10	65.35	31.56	3.09
	1	2	20	64.24	33.59	2.17
	2	2	20	69.24	28.79	1.97
	3	2	20	66.83	29.47	3.70
	4	2	20	69.03	28.10	2.87
	5	2	20	67.12	29.02	3.86
	1	2	20	71.34	25.90	2.76
	2	2	20	66.87	30.54	2.59
	3	2	20	66.98	29.49	3.53
	4	2	20	68.42	28.65	2.93
	5	2	20	67.80	29.91	2.29
	1	2	20	68.79	28.20	3.01
	2	2	20	67.42	29.51	3.07
	3	2	20	67.36	29.21	3.43
	4	2	20	65.89	30.20	3.91
	5	2	20	65.71	30.50	3.79
	1	2	30	69.13	28.87	2.00
	2	2	30	68.44	29.49	2.07
	3	2	30	68.42	29.36	2.22
	4	2	30	70.28	27.37	2.35
	5	2	30	67.85	28.97	3.18
	1	2	30	69.88	27.55	2.57
	2	2	30	67.92	29.55	2.53
	3	2	30	67.48	29.70	2.82
	4	2	30	66.89	29.89	3.22
	5	2	30	68.57	29.00	2.43
	1	2	30	67.54	30.12	2.34
	2	2	30	67.45	30.34	2.21
	3	2	30	67.52	30.35	2.13
	4	2	30	68.59	28.80	2.61

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	5	2	30	66.74	30.21	3.05
	1	2	40	68.09	29.50	2.41
	2	2	40	68.34	29.33	2.33
	3	2	40	74.12	24.19	1.69
	4	2	40	67.36	29.21	3.43
	5	2	40	69.49	28.09	2.42
	1	2	40	64.67	33.20	2.13
	2	2	40	67.45	29.84	2.71
	3	2	40	68.42	28.81	2.77
	4	2	40	68.19	29.25	2.56
	5	2	40	69.05	28.31	2.64
	1	2	40	68.12	29.57	2.31
	2	2	40	68.60	29.23	2.17
	3	2	40	68.07	29.23	2.70
	4	2	40	68.09	29.29	2.62
	5	2	40	67.69	29.73	2.58
	1	2	50	59.45	37.69	2.86
	2	2	50	67.75	29.06	3.19
	3	2	50	67.35	29.55	3.10
	4	2	50	68.89	28.70	2.41
	5	2	50	67.71	29.00	3.29
	1	2	50	63.89	33.37	2.74
	2	2	50	69.55	27.86	2.59
	3	2	50	69.67	27.91	2.42
	4	2	50	68.39	29.37	2.24
	5	2	50	66.22	30.58	3.20
	1	2	50	67.43	30.39	2.18
	2	2	50	68.75	29.01	2.24
	3	2	50	68.46	29.35	2.19
	4	2	50	67.96	29.54	2.50
	5	2	50	69.33	27.95	2.72
	1	3	10	71.46	25.38	3.16
	2	3	10	73.82	23.62	2.56

MATERIAL	SPECIMEN	TIME	DISTANCE (μm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	3	3	10	71.43	26.19	2.38
	4	3	10	71.12	25.86	3.02
	5	3	10	75.56	21.22	3.22
	1	3	10	71.99	25.27	2.74
	2	3	10	68.70	27.92	3.38
	3	3	10	73.69	23.73	2.58
	4	3	10	71.80	25.33	2.87
	5	3	10	68.29	28.31	3.40
	1	3	10	70.39	26.78	2.83
	2	3	10	77.82	19.93	2.25
	3	3	10	71.22	26.53	2.25
	4	3	10	67.25	28.93	3.82
	5	3	10	66.88	30.29	2.83
	1	3	20	70.36	26.99	2.65
	2	3	20	68.93	28.52	2.55
	3	3	20	71.09	26.62	2.29
	4	3	20	73.62	24.19	2.19
	5	3	20	70.45	27.37	2.18
	1	3	20	74.50	23.20	2.30
	2	3	20	69.61	27.72	2.67
	3	3	20	71.43	26.25	2.32
	4	3	20	67.96	28.42	3.62
	5	3	20	69.13	27.90	2.97
	1	3	20	76.95	20.37	2.68
	2	3	20	71.37	26.15	2.48
	3	3	20	69.55	28.03	2.42
	4	3	20	69.92	27.58	2.50
	5	3	20	67.43	29.04	3.53
	1	3	30	73.89	23.22	2.89
	2	3	30	68.32	28.70	2.98
	3	3	30	70.25	27.29	2.46
	4	3	30	69.08	28.19	2.73
	5	3	30	68.42	28.34	3.24

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	1	3	30	69.08	28.66	2.26
	2	3	30	70.88	26.74	2.38
	3	3	30	69.53	27.90	2.57
	4	3	30	68.93	27.75	3.32
	5	3	30	71.61	25.57	2.82
	1	3	30	70.26	27.46	2.28
	2	3	30	69.30	28.01	2.69
	3	3	30	67.57	30.13	2.30
	4	3	30	70.30	27.09	2.61
	5	3	30	68.68	28.73	2.59
	1	3	40	70.57	26.91	2.52
	2	3	40	73.20	23.78	3.02
	3	3	40	67.88	29.40	2.72
	4	3	40	69.20	28.20	2.60
	5	3	40	75.95	21.29	2.76
	1	3	40	70.46	27.23	2.31
	2	3	40	70.89	26.92	2.19
	3	3	40	67.07	30.50	2.43
	4	3	40	68.00	28.94	3.06
	5	3	40	75.60	22.35	2.05
	1	3	40	70.79	26.95	2.26
	2	3	40	75.06	22.79	2.15
	3	3	40	70.73	26.73	2.54
	4	3	40	73.87	23.48	2.65
	5	3	40	72.61	24.81	2.58
	1	3	50	72.76	24.50	2.74
	2	3	50	72.38	24.93	2.69
	3	3	50	67.34	30.32	2.34
	4	3	50	69.12	28.04	2.84
	5	3	50	71.43	25.79	2.78
	1	3	50	71.97	25.37	2.66
	2	3	50	73.90	23.21	2.89
	3	3	50	70.31	26.81	2.88

MATERIAL	SPECIMEN	TIME	DISTANCE (µm)	CALCIUM (%)	PHOSPHATE (%)	FLUORIDE (%)
	4	3	50	71.08	25.70	3.22
	5	3	50	69.62	27.71	2.67
	1	3	50	72.71	24.20	3.09
	2	3	50	71.34	26.12	2.54
	3	3	50	68.99	28.87	2.14
	4	3	50	69.52	28.03	2.45
	5	3	50	68.91	28.70	2.39

Note time 1 = 1 week, 2 = 1 month, and 3 = 3 months.

Statistical analysis of fluoride content in dentin after restoration with various materials.

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.254	4	.563	5.150	.001
Within Groups	7.658	70	.109		
Total	9.911	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) Materials	(J) Materials	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Z250	Fuji IX	-.4027*	.10642	.010	-.7317	-.0736
	Fuji II LC	-.3807*	.08632	.002	-.6435	-.1178
	Compomer	-.3833	.13321	.086	-.8018	.0351
	Giomer	-.5053*	.08652	.000	-.7688	-.2418
Fuji IX	Z250	.4027*	.10642	.010	.0736	.7317
	Fuji II LC	.0220	.11725	1.000	-.3343	.3783
	Compomer	.0193	.15505	1.000	-.4515	.4902
	Giomer	-.1027	.11740	.989	-.4593	.2540
Fuji II LC	Z250	.3807*	.08632	.002	.1178	.6435
	Fuji IX	-.0220	.11725	1.000	-.3783	.3343
	Compomer	-.0027	.14202	1.000	-.4402	.4349
	Giomer	-.1247	.09955	.894	-.4253	.1760
Compomer	Z250	.3833	.13321	.086	-.0351	.8018
	Fuji IX	-.0193	.15505	1.000	-.4902	.4515
	Fuji II LC	.0027	.14202	1.000	-.4349	.4402
	Giomer	-.1220	.14214	.990	-.5598	.3158
Giomer	Z250	.5053*	.08652	.000	.2418	.7688
	Fuji IX	.1027	.11740	.989	-.2540	.4593
	Fuji II LC	.1247	.09955	.894	-.1760	.4253
	Compomer	.1220	.14214	.990	-.3158	.5598

*. The mean difference is significant at the .05 level.

Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
Materials	1	Z250	225
	2	Fuji IX	225
	3	Fuji II LC	225
	4	Compomer	225
	5	Giomer	225
timie	1	1week	375
	2	1month	375
	3		375
micron	10	10 micron	225
	20	20 micron	225
	30	30 micron	225
	40	40 micron	225
	50		225

Tests of Between-Subjects Effects

Dependent Variable: F

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	188.432[a]	74	2.546	7.547	.000
Intercept	7576.842	1	7576.842	22457.31	.000
MATERIAL	137.222	4	34.306	101.680	.000
TIME1	13.385	2	6.693	19.837	.000
DISTANCE	2.063	4	.516	1.529	.192
MATERIAL * TIME1	18.283	8	2.285	6.774	.000
MATERIAL * DISTANCE	6.355	16	.397	1.177	.280
TIME1 * DISTANCE	2.307	8	.288	.855	.555
MATERIAL * TIME1 * DISTANCE	8.817	32	.276	.817	.756
Error	354.258	1050	.337		
Total	8119.532	1125			
Corrected Total	542.690	1124			

a. R Squared = .347 (Adjusted R Squared = .301)

Mean of fluoride content at 1 week.

10 µm

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
F * Materials	75	100.0%	0	.0%	75	100.0%

Report

F

Materials	Mean	N	Std. Deviation
Z250	2.0960	15	.19419
Fuji IX	2.5560	15	.31545
Fuji II LC	2.4767	15	.27215
Compomer	2.4793	15	.47798
Giomer	2.6013	15	.27310
Total	2.4419	75	.36039

20 µm

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
F * Materials	75	100.0%	0	.0%	75	100.0%

Report

F

Materials	Mean	N	Std. Deviation
Z250	1.9433	15	.60752
Fuji IX	2.9067	15	.65413
Fuji II LC	2.6707	15	.48005
Compomer	2.5447	15	.36822
Giomer	2.5880	15	.49695
Total	2.5307	75	.60828

30 µm

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
F * Materials	75	100.0%	0	.0%	75	100.0%

Report

F

Materials	Mean	N	Std. Deviation
Z250	1.8273	15	.43267
Fuji IX	2.7060	15	.72711
Fuji II LC	2.6160	15	.49187
Compomer	2.4733	15	.46837
Giomer	2.4420	15	.41268
Total	2.4129	75	.59256

40 µm

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
F * Materials	75	100.0%	0	.0%	75	100.0%

Report

F

Materials	Mean	N	Std. Deviation
Z250	2.0733	15	.21259
Fuji IX	2.6867	15	.50161
Fuji II LC	2.4620	15	.52074
Compomer	2.5587	15	.44998
Giomer	2.4260	15	.52317
Total	2.4413	75	.49002

50 µm

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
F * Materials	75	100.0%	0	.0%	75	100.0%

Report

F

Materials	Mean	N	Std. Deviation
Z250	1.9633	15	.44162
Fuji IX	2.4753	15	.43010
Fuji II LC	2.3953	15	.45998
Compomer	2.6867	15	.51433
Giomer	2.4667	15	.27583
Total	2.3975	75	.48345

Mean of fluoride content, 1 month

10 µm

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
F * Materials	75	100.0%	0	.0%	75	100.0%

Report

F

Materials	Mean	N	Std. Deviation
Z250	1.9653	15	.31434
Fuji IX	3.1347	15	.67074
Fuji II LC	3.0520	15	.35004
Compomer	2.6533	15	.46835
Giomer	2.8273	15	.32895
Total	2.7265	75	.60398

20 µm

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
F * Materials	75	100.0%	0	.0%	75	100.0%

Report

F

Materials	Mean	N	Std. Deviation
Z250	1.9740	15	.46832
Fuji IX	2.8540	15	.37422
Fuji II LC	3.1007	15	.51333
Compomer	2.6433	15	.49664
Giomer	3.0587	15	.63259
Total	2.7261	75	.64065

30 µm

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
F * Materials	75	100.0%	0	.0%	75	100.0%

Report

F

Materials	Mean	N	Std. Deviation
Z250	2.0733	15	.70698
Fuji IX	2.8560	15	.65161
Fuji II LC	3.3040	15	.52395
Compomer	2.5247	15	.49049
Giomer	2.5153	15	.39527
Total	2.6547	75	.68662

40 µm

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
F * Materials	75	100.0%	0	.0%	75	100.0%

Report

F

Materials	Mean	N	Std. Deviation
Z250	2.2160	15	.51025
Fuji IX	2.8600	15	.71735
Fuji II LC	3.2273	15	.30756
Compomer	2.6687	15	.59193
Giomer	2.4980	15	.38240
Total	2.6940	75	.61314

50 µm

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
F * Materials	75	100.0%	0	.0%	75	100.0%

Report

F

Materials	Mean	N	Std. Deviation
Z250	2.0133	15	.28278
Fuji IX	2.7567	15	.72891
Fuji II LC	3.2260	15	.63998
Compomer	2.6120	15	.56765
Giomer	2.6580	15	.39349
Total	2.6532	75	.65985

Mean of fluoride content at 3 months

10 µm

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
F * Materials	75	100.0%	0	.0%	75	100.0%

Report

F

Materials	Mean	N	Std. Deviation
Z250	2.1953	15	1.23541
Fuji IX	3.5793	15	.86640
Fuji II LC	3.0687	15	.62465
Compomer	2.4380	15	.82147
Giomer	2.8860	15	.45340
Total	2.8335	75	.95390

20 µm

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
F * Materials	75	100.0%	0	.0%	75	100.0%

Report

F

Materials	Mean	N	Std. Deviation
Z250	1.7893	15	1.08704
Fuji IX	2.8880	15	.63539
Fuji II LC	3.1240	15	.83533
Compomer	2.6773	15	1.67746
Giomer	2.6233	15	.44047
Total	2.6204	75	1.09890

30 µm

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
F * Materials	75	100.0%	0	.0%	75	100.0%

Report

F

Materials	Mean	N	Std. Deviation
Z250	1.7727	15	.87831
Fuji IX	2.8700	15	.42290
Fuji II LC	3.2380	15	.44517
Compomer	2.3847	15	.58609
Giomer	2.6747	15	.32987
Total	2.5880	75	.74112

40 µm

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
F * Materials	75	100.0%	0	.0%	75	100.0%

Report

F

Materials	Mean	N	Std. Deviation
Z250	1.7513	15	.63394
Fuji IX	3.0353	15	.82530
Fuji II LC	3.2367	15	.57412
Compomer	2.4207	15	.70755
Giomer	2.5227	15	.29915
Total	2.5933	75	.80818

50 µm

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
F * Materials	75	100.0%	0	.0%	75	100.0%

Report

F

Materials	Mean	N	Std. Deviation
Z250	1.8127	15	.40935
Fuji IX	3.0067	15	.44636
Fuji II LC	3.1520	15	.54342
Compomer	2.4667	15	.33023
Giomer	2.6880	15	.28616
Total	2.6252	75	.62198

Resin composite

1. Comparison between the different distances beneath material dentin interface.

1 week

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.706	4	.177	1.058	.384
Within Groups	11.679	70	.167		
Total	12.385	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) micron	(J) micron	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
10 micron	20 micron	.1527	.16468	.981	-.3706	.6759
	30 micron	.2687	.12245	.307	-.1139	.6512
	40 micron	.0227	.07434	1.000	-.2020	.2473
	50	.1327	.12456	.955	-.2569	.5222
20 micron	10 micron	-.1527	.16468	.981	-.6759	.3706
	30 micron	.1160	.19258	.999	-.4704	.7024
	40 micron	-.1300	.16619	.994	-.6559	.3959
	50	-.0200	.19393	1.000	-.6100	.5700
30 micron	10 micron	-.2687	.12245	.307	-.6512	.1139
	20 micron	-.1160	.19258	.999	-.7024	.4704
	40 micron	-.2460	.12447	.430	-.6328	.1408
	50	-.1360	.15963	.991	-.6181	.3461
40 micron	10 micron	-.0227	.07434	1.000	-.2473	.2020
	20 micron	.1300	.16619	.994	-.3959	.6559
	30 micron	.2460	.12447	.430	-.1408	.6328
	50	.1100	.12655	.988	-.2837	.5037
50	10 micron	-.1327	.12456	.955	-.5222	.2569
	20 micron	.0200	.19393	1.000	-.5700	.6100
	30 micron	.1360	.15963	.991	-.3461	.6181
	40 micron	-.1100	.12655	.988	-.5037	.2837

1 month

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.636	4	.159	.686	.604
Within Groups	16.216	70	.232		
Total	16.852	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) micron	(J) micron	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
10 micron	20 micron	-.0087	.14563	1.000	-.4534	.4360
	30 micron	-.1080	.19977	1.000	-.7324	.5164
	40 micron	-.2507	.15474	.673	-.7253	.2240
	50	-.0480	.10917	1.000	-.3780	.2820
20 micron	10 micron	.0087	.14563	1.000	-.4360	.4534
	30 micron	-.0993	.21896	1.000	-.7684	.5697
	40 micron	-.2420	.17883	.844	-.7824	.2984
	50	-.0393	.14125	1.000	-.4731	.3944
30 micron	10 micron	.1080	.19977	1.000	-.5164	.7324
	20 micron	.0993	.21896	1.000	-.5697	.7684
	40 micron	-.1427	.22512	.999	-.8278	.5424
	50	.0600	.19660	1.000	-.5581	.6781
40 micron	10 micron	.2507	.15474	.673	-.2240	.7253
	20 micron	.2420	.17883	.844	-.2984	.7824
	30 micron	.1427	.22512	.999	-.5424	.8278
	50	.2027	.15063	.846	-.2621	.6675
50	10 micron	.0480	.10917	1.000	-.2820	.3780
	20 micron	.0393	.14125	1.000	-.3944	.4731
	30 micron	-.0600	.19660	1.000	-.6781	.5581
	40 micron	-.2027	.15063	.846	-.6675	.2621

3 months

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.085	4	.521	.644	.633
Within Groups	56.683	70	.810		
Total	58.768	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) micron	(J) micron	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
10 micron	20 micron	.4060	.42488	.979	-.8789	1.6909
	30 micron	.4227	.39138	.954	-.7692	1.6145
	40 micron	.4440	.35853	.897	-.6673	1.5553
	50	.3827	.33604	.932	-.6834	1.4488
20 micron	10 micron	-.4060	.42488	.979	-1.6909	.8789
	30 micron	.0167	.36084	1.000	-1.0768	1.1102
	40 micron	.0380	.32491	1.000	-.9617	1.0377
	50	-.0233	.29991	1.000	-.9691	.9224
30 micron	10 micron	-.4227	.39138	.954	-1.6145	.7692
	20 micron	-.0167	.36084	1.000	-1.1102	1.0768
	40 micron	.0213	.27968	1.000	-.8298	.8725
	50	-.0400	.25020	1.000	-.8199	.7399
40 micron	10 micron	-.4440	.35853	.897	-1.5553	.6673
	20 micron	-.0380	.32491	1.000	-1.0377	.9617
	30 micron	-.0213	.27968	1.000	-.8725	.8298
	50	-.0613	.19484	1.000	-.6575	.5348
50	10 micron	-.3827	.33604	.932	-1.4488	.6834
	20 micron	.0233	.29991	1.000	-.9224	.9691
	30 micron	.0400	.25020	1.000	-.7399	.8199
	40 micron	.0613	.19484	1.000	-.5348	.6575

2. Comparison between the different storage times.

10 μm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.399	2	.200	.360	.700
Within Groups	23.279	42	.554		
Total	23.678	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
1week	1month	.1307	.09540	.446	-.1139	.3752
	3	-.0993	.32290	.985	-.9632	.7646
1month	1week	-.1307	.09540	.446	-.3752	.1139
	3	-.2300	.32915	.862	-1.1034	.6434
3	1week	.0993	.32290	.985	-.7646	.9632
	1month	.2300	.32915	.862	-.6434	1.1034

20 μm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.294	2	.147	.249	.781
Within Groups	24.781	42	.590		
Total	25.075	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
1week	1month	-.0307	.19806	.998	-.5342	.4728
	3	.1540	.32153	.949	-.6738	.9818
1month	1week	.0307	.19806	.998	-.4728	.5342
	3	.1847	.30561	.905	-.6116	.9809
3	1week	-.1540	.32153	.949	-.9818	.6738
	1month	-.1847	.30561	.905	-.9809	.6116

30 μm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.770	2	.385	.791	.460
Within Groups	20.419	42	.486		
Total	21.188	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
1week	1month	-.2460	.21401	.587	-.7947	.3027
	3	.0547	.25280	.995	-.6000	.7093
1month	1week	.2460	.21401	.587	-.3027	.7947
	3	.3007	.29112	.664	-.4386	1.0399
3	1week	-.0547	.25280	.995	-.7093	.6000
	1month	-.3007	.29112	.664	-1.0399	.4386

40 μm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.700	2	.850	3.604	.036
Within Groups	9.904	42	.236		
Total	11.604	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
1week	1month	-.1427	.14272	.687	-.5151	.2297
	3	.3220	.17264	.212	-.1323	.7763
1month	1week	.1427	.14272	.687	-.2297	.5151
	3	.4647	.21012	.101	-.0689	.9982
3	1week	-.3220	.17264	.212	-.7763	.1323
	1month	-.4647	.21012	.101	-.9982	.0689

50 μm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.327	2	.164	1.109	.339
Within Groups	6.196	42	.148		
Total	6.523	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1week	1month	-.0500	.13540	.976	-.3965	.2965
	3	.1507	.15548	.705	-.2432	.5445
1month	1week	.0500	.13540	.976	-.2965	.3965
	3	.2007	.12846	.336	-.1271	.5284
3	1week	-.1507	.15548	.705	-.5445	.2432
	1month	-.2007	.12846	.336	-.5284	.1271

Conventional glass ionomer cement

1. Comparison between the different distances beneath material dentin interface.

1 week

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.626	4	.407	1.362	.256
Within Groups	20.897	70	.299		
Total	22.523	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) micron	(J) micron	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
10 micron	20 micron	-.3507	.18751	.500	-.9340	.2327
	30 micron	-.1500	.20465	.997	-.7905	.4905
	40 micron	-.1307	.15300	.990	-.5994	.3381
	50	.0807	.13772	1.000	-.3382	.4995
20 micron	10 micron	.3507	.18751	.500	-.2327	.9340
	30 micron	.2007	.25253	.995	-.5627	.9640
	40 micron	.2200	.21284	.965	-.4261	.8661
	50	.4313	.20213	.329	-.1865	1.0492
30 micron	10 micron	.1500	.20465	.997	-.4905	.7905
	20 micron	-.2007	.25253	.995	-.9640	.5627
	40 micron	.0193	.22808	1.000	-.6762	.7149
	50	.2307	.21812	.959	-.4399	.9012
40 micron	10 micron	.1307	.15300	.990	-.3381	.5994
	20 micron	-.2200	.21284	.965	-.8661	.4261
	30 micron	-.0193	.22808	1.000	-.7149	.6762
	50	.2113	.17061	.900	-.3049	.7275
50	10 micron	-.0807	.13772	1.000	-.4995	.3382
	20 micron	-.4313	.20213	.329	-1.0492	.1865
	30 micron	-.2307	.21812	.959	-.9012	.4399
	40 micron	-.2113	.17061	.900	-.7275	.3049

1 month

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.214	4	.304	.737	.570
Within Groups	28.846	70	.412		
Total	30.061	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) micron	(J) micron	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
10 micron	20 micron	.2807	.19832	.807	-.3311	.8924
	30 micron	.2787	.24145	.933	-.4506	1.0080
	40 micron	.2747	.25357	.954	-.4915	1.0408
	50	.3780	.25576	.770	-.3949	1.1509
20 micron	10 micron	-.2807	.19832	.807	-.8924	.3311
	30 micron	-.0020	.19402	1.000	-.5995	.5955
	40 micron	-.0060	.20891	1.000	-.6529	.6409
	50	.0973	.21156	1.000	-.5584	.7531
30 micron	10 micron	-.2787	.24145	.933	-1.0080	.4506
	20 micron	.0020	.19402	1.000	-.5955	.5995
	40 micron	-.0040	.25022	1.000	-.7603	.7523
	50	.0993	.25244	1.000	-.6638	.8625
40 micron	10 micron	-.2747	.25357	.954	-1.0408	.4915
	20 micron	.0060	.20891	1.000	-.6409	.6529
	30 micron	.0040	.25022	1.000	-.7523	.7603
	50	.1033	.26406	1.000	-.6942	.9009
50	10 micron	-.3780	.25576	.770	-1.1509	.3949
	20 micron	-.0973	.21156	1.000	-.7531	.5584
	30 micron	-.0993	.25244	1.000	-.8625	.6638
	40 micron	-.1033	.26406	1.000	-.9009	.6942

3 months

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.064	4	1.266	2.860	.030
Within Groups	30.990	70	.443		
Total	36.054	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) micron	(J) micron	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
10 micron	20 micron	.6913	.27741	.167	-.1523	1.5350
	30 micron	.7093	.24893	.087	-.0646	1.4832
	40 micron	.5440	.30895	.571	-.3893	1.4773
	50	.5727	.25165	.263	-.2072	1.3525
20 micron	10 micron	-.6913	.27741	.167	-1.5350	.1523
	30 micron	.0180	.19707	1.000	-.5840	.6200
	40 micron	-.1473	.26893	1.000	-.9636	.6690
	50	-.1187	.20049	.999	-.7295	.4922
30 micron	10 micron	-.7093	.24893	.087	-1.4832	.0646
	20 micron	-.0180	.19707	1.000	-.6200	.5840
	40 micron	-.1653	.23944	.998	-.9076	.5769
	50	-.1367	.15876	.990	-.6163	.3429
40 micron	10 micron	-.5440	.30895	.571	-1.4773	.3893
	20 micron	.1473	.26893	1.000	-.6690	.9636
	30 micron	.1653	.23944	.998	-.5769	.9076
	50	.0287	.24226	1.000	-.7200	.7773
50	10 micron	-.5727	.25165	.263	-1.3525	.2072
	20 micron	.1187	.20049	.999	-.4922	.7295
	30 micron	.1367	.15876	.990	-.3429	.6163
	40 micron	-.0287	.24226	1.000	-.7773	.7200

2. Comparison between the different storage times.

10 µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.899	2	3.949	9.114	.001
Within Groups	18.201	42	.433		
Total	26.100	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1week	1month	-.5787*	.19138	.020	-1.0753	-.0820
	3	-1.0233*	.23807	.001	-1.6480	-.3987
1month	1week	.5787*	.19138	.020	.0820	1.0753
	3	-.4447	.28291	.330	-1.1638	.2745
3	1week	1.0233*	.23807	.001	.3987	1.6480
	1month	.4447	.28291	.330	-.2745	1.1638

*. The mean difference is significant at the .05 level.

20 µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.021	2	.011	.033	.968
Within Groups	13.603	42	.324		
Total	13.624	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1week	1month	.0527	.19458	.990	-.4478	.5531
	3	.0187	.23546	1.000	-.5776	.6150
1month	1week	-.0527	.19458	.990	-.5531	.4478
	3	-.0340	.19040	.997	-.5230	.4550
3	1week	-.0187	.23546	1.000	-.6150	.5776
	1month	.0340	.19040	.997	-.4550	.5230

30 μm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.248	2	.124	.329	.722
Within Groups	15.850	42	.377		
Total	16.098	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
1week	1month	-.1500	.25210	.909	-.7889	.4889
	3	-.1640	.21718	.833	-.7221	.3941
1month	1week	.1500	.25210	.909	-.4889	.7889
	3	-.0140	.20057	1.000	-.5270	.4990
3	1week	.1640	.21718	.833	-.3941	.7221
	1month	.0140	.20057	1.000	-.4990	.5270

40 μm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.912	2	.456	.945	.397
Within Groups	20.263	42	.482		
Total	21.174	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1week	1month	-.1733	.22601	.827	-.7497	.4031
	3	-.3487	.24936	.429	-.9882	.2909
1month	1week	.1733	.22601	.827	-.4031	.7497
	3	-.1753	.28234	.898	-.8912	.5405
3	1week	.3487	.24936	.429	-.2909	.9882
	1month	.1753	.28234	.898	-.5405	.8912

50 µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.120	2	1.060	3.473	.040
Within Groups	12.817	42	.305		
Total	14.937	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1week	1month	-.2813	.21852	.498	-.8425	.2799
	3	-.5313*	.16005	.007	-.9367	-.1260
1month	1week	.2813	.21852	.498	-.2799	.8425
	3	-.2500	.22069	.598	-.8158	.3158
3	1week	.5313*	.16005	.007	.1260	.9367
	1month	.2500	.22069	.598	-.3158	.8158

*. The mean difference is significant at the .05 level.

Resin-modified glass ionomer cement

1. Comparison between the different distances beneath material dentin interface.

1 week

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.789	4	.197	.959	.436
Within Groups	14.409	70	.206		
Total	15.198	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) micron	(J) micron	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
10 micron	20 micron	-.1940	.14248	.838	-.6331	.2451
	30 micron	-.1393	.14515	.977	-.5873	.3086
	40 micron	.0147	.15171	1.000	-.4551	.4844
	50	.0813	.13800	.999	-.3429	.5056
20 micron	10 micron	.1940	.14248	.838	-.2451	.6331
	30 micron	.0547	.17746	1.000	-.4813	.5907
	40 micron	.2087	.18287	.937	-.3439	.7613
	50	.2753	.17167	.684	-.2432	.7939
30 micron	10 micron	.1393	.14515	.977	-.3086	.5873
	20 micron	-.0547	.17746	1.000	-.5907	.4813
	40 micron	.1540	.18495	.992	-.4047	.7127
	50	.2207	.17388	.887	-.3047	.7460
40 micron	10 micron	-.0147	.15171	1.000	-.4844	.4551
	20 micron	-.2087	.18287	.937	-.7613	.3439
	30 micron	-.1540	.18495	.992	-.7127	.4047
	50	.0667	.17940	1.000	-.4758	.6091
50	10 micron	-.0813	.13800	.999	-.5056	.3429
	20 micron	-.2753	.17167	.684	-.7939	.2432
	30 micron	-.2207	.17388	.887	-.7460	.3047
	40 micron	-.0667	.17940	1.000	-.6091	.4758

1 month

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.636	4	.159	.682	.606
Within Groups	16.306	70	.233		
Total	16.942	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) micron	(J) micron	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
10 micron	20 micron	-.0487	.16042	1.000	-.5381	.4408
	30 micron	-.2520	.16270	.722	-.7489	.2449
	40 micron	-.1753	.12031	.783	-.5392	.1885
	50	-.1740	.18834	.983	-.7556	.4076
20 micron	10 micron	.0487	.16042	1.000	-.4408	.5381
	30 micron	-.2033	.18939	.956	-.7754	.3687
	40 micron	-.1267	.15451	.993	-.6013	.3480
	50	-.1253	.21183	.999	-.7674	.5168
30 micron	10 micron	.2520	.16270	.722	-.2449	.7489
	20 micron	.2033	.18939	.956	-.3687	.7754
	40 micron	.0767	.15687	1.000	-.4058	.5591
	50	.0780	.21356	1.000	-.5689	.7249
40 micron	10 micron	.1753	.12031	.783	-.1885	.5392
	20 micron	.1267	.15451	.993	-.3480	.6013
	30 micron	-.0767	.15687	1.000	-.5591	.4058
	50	.0013	.18333	1.000	-.5691	.5718
50	10 micron	.1740	.18834	.983	-.4076	.7556
	20 micron	.1253	.21183	.999	-.5168	.7674
	30 micron	-.0780	.21356	1.000	-.7249	.5689
	40 micron	-.0013	.18333	1.000	-.5718	.5691

3 months

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.324	4	.081	.212	.931
Within Groups	26.755	70	.382		
Total	27.078	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) micron	(J) micron	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
10 micron	20 micron	-.0553	.26931	1.000	-.8737	.7630
	30 micron	-.1693	.19805	.990	-.7724	.4337
	40 micron	-.1680	.21906	.996	-.8300	.4940
	50	-.0833	.21377	1.000	-.7299	.5633
20 micron	10 micron	.0553	.26931	1.000	-.7630	.8737
	30 micron	-.1140	.24440	1.000	-.8699	.6419
	40 micron	-.1127	.26171	1.000	-.9109	.6856
	50	-.0280	.25730	1.000	-.8149	.7589
30 micron	10 micron	.1693	.19805	.990	-.4337	.7724
	20 micron	.1140	.24440	1.000	-.6419	.8699
	40 micron	.0013	.18758	1.000	-.5679	.5706
	50	.0860	.18138	1.000	-.4634	.6354
40 micron	10 micron	.1680	.21906	.996	-.4940	.8300
	20 micron	.1127	.26171	1.000	-.6856	.9109
	30 micron	-.0013	.18758	1.000	-.5706	.5679
	50	.0847	.20411	1.000	-.5319	.7013
50	10 micron	.0833	.21377	1.000	-.5633	.7299
	20 micron	.0280	.25730	1.000	-.7589	.8149
	30 micron	-.0860	.18138	1.000	-.6354	.4634
	40 micron	-.0847	.20411	1.000	-.7013	.5319

2. Comparison between the different storage times.

10 µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.409	2	1.704	8.714	.001
Within Groups	8.215	42	.196		
Total	11.624	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
1week	1month	-.5753*	.11448	.000	-.8663	-.2844
	3	-.5920*	.17593	.010	-1.0501	-.1339
1month	1week	.5753*	.11448	.000	.2844	.8663
	3	-.0167	.18488	1.000	-.4926	.4593
3	1week	.5920*	.17593	.010	.1339	1.0501
	1month	.0167	.18488	1.000	-.4593	.4926

*. The mean difference is significant at the .05 level.

20 µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.955	2	.977	2.460	.098
Within Groups	16.684	42	.397		
Total	18.639	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
1week	1month	-.4300	.18147	.072	-.8897	.0297
	3	-.4533	.24876	.220	-1.0930	.1863
1month	1week	.4300	.18147	.072	-.0297	.8897
	3	-.0233	.25315	1.000	-.6723	.6256
3	1week	.4533	.24876	.220	-.1863	1.0930
	1month	.0233	.25315	1.000	-.6256	.6723

30 µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.323	2	2.161	9.074	.001
Within Groups	10.005	42	.238		
Total	14.328	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
1week	1month	-.6880*	.18556	.003	-1.1580	-.2180
	3	-.6220*	.17129	.003	-1.0560	-.1880
1month	1week	.6880*	.18556	.003	.2180	1.1580
	3	.0660	.17752	.975	-.3843	.5163
3	1week	.6220*	.17129	.003	.1880	1.0560
	1month	-.0660	.17752	.975	-.5163	.3843

*. The mean difference is significant at the .05 level.

40 μm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.930	2	2.965	12.791	.000
Within Groups	9.735	42	.232		
Total	15.665	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
1week	1month	-.7653*	.15616	.000	-1.1664	-.3643
	3	-.7747*	.20013	.002	-1.2818	-.2676
1month	1week	.7653*	.15616	.000	.3643	1.1664
	3	-.0093	.16817	1.000	-.4431	.4245
3	1week	.7747*	.20013	.002	.2676	1.2818
	1month	.0093	.16817	1.000	-.4245	.4431

*. The mean difference is significant at the .05 level.

50 μm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.340	2	3.170	10.377	.000
Within Groups	12.830	42	.305		
Total	19.171	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1week	1month	-.8307*	.20349	.001	-1.3491	-.3122
	3	-.7567*	.18383	.001	-1.2230	-.2904
1month	1week	.8307*	.20349	.001	.3122	1.3491
	3	.0740	.21678	.981	-.4758	.6238
3	1week	.7567*	.18383	.001	.2904	1.2230
	1month	-.0740	.21678	.981	-.6238	.4758

*. The mean difference is significant at the .05 level.

Compomer

1. Comparison between the different distances beneath material dentin interface.

1 week

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.445	4	.111	.529	.715
Within Groups	14.706	70	.210		
Total	15.151	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) micron	(J) micron	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
10 micron	20 micron	-.0653	.15579	1.000	-.5382	.4075
	30 micron	.0060	.17279	1.000	-.5159	.5279
	40 micron	-.0793	.16950	1.000	-.5914	.4327
	50	-.2073	.18129	.936	-.7551	.3404
20 micron	10 micron	.0653	.15579	1.000	-.4075	.5382
	30 micron	.0713	.15383	1.000	-.3953	.5379
	40 micron	-.0140	.15013	1.000	-.4688	.4408
	50	-.1420	.16332	.989	-.6392	.3552
30 micron	10 micron	-.0060	.17279	1.000	-.5279	.5159
	20 micron	-.0713	.15383	1.000	-.5379	.3953
	40 micron	-.0853	.16770	1.000	-.5919	.4212
	50	-.2133	.17961	.921	-.7562	.3295
40 micron	10 micron	.0793	.16950	1.000	-.4327	.5914
	20 micron	.0140	.15013	1.000	-.4408	.4688
	30 micron	.0853	.16770	1.000	-.4212	.5919
	50	-.1280	.17645	.997	-.6616	.4056
50	10 micron	.2073	.18129	.936	-.3404	.7551
	20 micron	.1420	.16332	.989	-.3552	.6392
	30 micron	.2133	.17961	.921	-.3295	.7562
	40 micron	.1280	.17645	.997	-.4056	.6616

1 month

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.198	4	.049	.179	.948
Within Groups	19.309	70	.276		
Total	19.506	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) micron	(J) micron	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
10 micron	20 micron	.0100	.17626	1.000	-.5225	.5425
	30 micron	.1287	.17511	.997	-.4003	.6576
	40 micron	-.0153	.19489	1.000	-.6063	.5757
	50	.0413	.19001	1.000	-.5341	.6168
20 micron	10 micron	-.0100	.17626	1.000	-.5425	.5225
	30 micron	.1187	.18023	.999	-.4257	.6630
	40 micron	-.0253	.19951	1.000	-.6293	.5786
	50	.0313	.19474	1.000	-.5576	.6203
30 micron	10 micron	-.1287	.17511	.997	-.6576	.4003
	20 micron	-.1187	.18023	.999	-.6630	.4257
	40 micron	-.1440	.19849	.997	-.7451	.4571
	50	-.0873	.19370	1.000	-.6733	.4986
40 micron	10 micron	.0153	.19489	1.000	-.5757	.6063
	20 micron	.0253	.19951	1.000	-.5786	.6293
	30 micron	.1440	.19849	.997	-.4571	.7451
	50	.0567	.21176	1.000	-.5830	.6963
50	10 micron	-.0413	.19001	1.000	-.6168	.5341
	20 micron	-.0313	.19474	1.000	-.6203	.5576
	30 micron	.0873	.19370	1.000	-.4986	.6733
	40 micron	-.0567	.21176	1.000	-.6963	.5830

3 months

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.802	4	.200	.226	.923
Within Groups	62.186	70	.888		
Total	62.988	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) micron	(J) micron	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
10 micron	20 micron	-.2393	.48226	1.000	-1.7383	1.2597
	30 micron	.0533	.26055	1.000	-.7400	.8467
	40 micron	.0173	.27993	1.000	-.8296	.8642
	50	-.0287	.22860	1.000	-.7471	.6898
20 micron	10 micron	.2393	.48226	1.000	-1.2597	1.7383
	30 micron	.2927	.45879	.999	-1.1594	1.7447
	40 micron	.2567	.47007	1.000	-1.2169	1.7302
	50	.2107	.44143	1.000	-1.2128	1.6342
30 micron	10 micron	-.0533	.26055	1.000	-.8467	.7400
	20 micron	-.2927	.45879	.999	-1.7447	1.1594
	40 micron	-.0360	.23722	1.000	-.7544	.6824
	50	-.0820	.17370	1.000	-.6175	.4535
40 micron	10 micron	-.0173	.27993	1.000	-.8642	.8296
	20 micron	-.2567	.47007	1.000	-1.7302	1.2169
	30 micron	.0360	.23722	1.000	-.6824	.7544
	50	-.0460	.20161	1.000	-.6744	.5824
50	10 micron	.0287	.22860	1.000	-.6898	.7471
	20 micron	-.2107	.44143	1.000	-1.6342	1.2128
	30 micron	.0820	.17370	1.000	-.4535	.6175
	40 micron	.0460	.20161	1.000	-.5824	.6744

2. Comparison between the different storage times.

10 µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.392	2	.196	.523	.596
Within Groups	15.717	42	.374		
Total	16.109	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
1week	1month	-.1740	.17278	.681	-.6116	.2636
	3	.0413	.24540	.998	-.5893	.6720
1month	1week	.1740	.17278	.681	-.2636	.6116
	3	.2153	.24415	.761	-.4127	.8433
3	1week	-.0413	.24540	.998	-.6720	.5893
	1month	-.2153	.24415	.761	-.8433	.4127

20 µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.142	2	.071	.067	.935
Within Groups	44.745	42	1.065		
Total	44.888	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
1week	1month	-.0987	.15963	.900	-.5050	.3076
	3	-.1327	.44343	.986	-1.3131	1.0478
1month	1week	.0987	.15963	.900	-.3076	.5050
	3	-.0340	.45170	1.000	-1.2276	1.1596
3	1week	.1327	.44343	.986	-1.0478	1.3131
	1month	.0340	.45170	1.000	-1.1596	1.2276

30 μm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.150	2	.075	.281	.756
Within Groups	11.248	42	.268		
Total	11.399	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1week	1month	-.0513	.17511	.987	-.4948	.3922
	3	.0887	.19371	.955	-.4033	.5807
1month	1week	.0513	.17511	.987	-.3922	.4948
	3	.1400	.19733	.857	-.3606	.6406
3	1week	-.0887	.19371	.955	-.5807	.4033
	1month	-.1400	.19733	.857	-.6406	.3606

40 μm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.463	2	.232	.660	.522
Within Groups	14.749	42	.351		
Total	15.212	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
1week	1month	-.1100	.19198	.918	-.5983	.3783
	3	.1380	.21650	.891	-.4162	.6922
1month	1week	.1100	.19198	.918	-.3783	.5983
	3	.2480	.23819	.658	-.3563	.8523
3	1week	-.1380	.21650	.891	-.6922	.4162
	1month	-.2480	.23819	.658	-.8523	.3563

50 µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.375	2	.188	.809	.452
Within Groups	9.742	42	.232		
Total	10.117	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
1week	1month	.0747	.19778	.974	-.4265	.5758
	3	.2200	.15782	.431	-.1838	.6238
1month	1week	-.0747	.19778	.974	-.5758	.4265
	3	.1453	.16956	.776	-.2904	.5811
3	1week	-.2200	.15782	.431	-.6238	.1838
	1month	-.1453	.16956	.776	-.5811	.2904

Giomer

1. Comparison between the different distances beneath material dentin interface.

1 week

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.418	4	.104	.620	.649
Within Groups	11.783	70	.168		
Total	12.201	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) micron	(J) micron	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
10 micron	20 micron	.0133	.14641	1.000	-.4387	.4653
	30 micron	.1593	.12777	.895	-.2311	.5498
	40 micron	.1753	.15238	.931	-.2965	.6472
	50	.1347	.10022	.850	-.1680	.4374
20 micron	10 micron	-.0133	.14641	1.000	-.4653	.4387
	30 micron	.1460	.16679	.989	-.3590	.6510
	40 micron	.1620	.18631	.989	-.4008	.7248
	50	.1213	.14675	.992	-.3315	.5741
30 micron	10 micron	-.1593	.12777	.895	-.5498	.2311
	20 micron	-.1460	.16679	.989	-.6510	.3590
	40 micron	.0160	.17205	1.000	-.5058	.5378
	50	-.0247	.12816	1.000	-.4161	.3668
40 micron	10 micron	-.1753	.15238	.931	-.6472	.2965
	20 micron	-.1620	.18631	.989	-.7248	.4008
	30 micron	-.0160	.17205	1.000	-.5378	.5058
	50	-.0407	.15271	1.000	-.5133	.4319
50	10 micron	-.1347	.10022	.850	-.4374	.1680
	20 micron	-.1213	.14675	.992	-.5741	.3315
	30 micron	.0247	.12816	1.000	-.3668	.4161
	40 micron	.0407	.15271	1.000	-.4319	.5133

1 month

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.313	4	.828	4.288	.004
Within Groups	13.520	70	.193		
Total	16.833	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) micron	(J) micron	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
10 micron	20 micron	-.2313	.18410	.889	-.8015	.3389
	30 micron	.3120	.13278	.219	-.0900	.7140
	40 micron	.3293	.13024	.152	-.0647	.7234
	50	.1693	.13242	.882	-.2316	.5702
20 micron	10 micron	.2313	.18410	.889	-.3389	.8015
	30 micron	.5433	.19260	.086	-.0470	1.1336
	40 micron	.5607	.19086	.067	-.0254	1.1467
	50	.4007	.19235	.360	-.1890	.9904
30 micron	10 micron	-.3120	.13278	.219	-.7140	.0900
	20 micron	-.5433	.19260	.086	-1.1336	.0470
	40 micron	.0173	.14200	1.000	-.4116	.4463
	50	-.1427	.14401	.974	-.5776	.2923
40 micron	10 micron	-.3293	.13024	.152	-.7234	.0647
	20 micron	-.5607	.19086	.067	-1.1467	.0254
	30 micron	-.0173	.14200	1.000	-.4463	.4116
	50	-.1600	.14167	.941	-.5879	.2679
50	10 micron	-.1693	.13242	.882	-.5702	.2316
	20 micron	-.4007	.19235	.360	-.9904	.1890
	30 micron	.1427	.14401	.974	-.2923	.5776
	40 micron	.1600	.14167	.941	-.2679	.5879

3 months

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.057	4	.264	1.944	.113
Within Groups	9.517	70	.136		
Total	10.574	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) micron	(J) micron	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
10 micron	20 micron	.2627	.16321	.680	-.2303	.7556
	30 micron	.2113	.14477	.781	-.2291	.6518
	40 micron	.3633	.14025	.139	-.0653	.7920
	50	.1980	.13843	.799	-.2261	.6221
20 micron	10 micron	-.2627	.16321	.680	-.7556	.2303
	30 micron	-.0513	.14208	1.000	-.4831	.3804
	40 micron	.1007	.13748	.997	-.3189	.5202
	50	-.0647	.13562	1.000	-.4795	.3501
30 micron	10 micron	-.2113	.14477	.781	-.6518	.2291
	20 micron	.0513	.14208	1.000	-.3804	.4831
	40 micron	.1520	.11498	.861	-.1955	.4995
	50	-.0133	.11275	1.000	-.3544	.3277
40 micron	10 micron	-.3633	.14025	.139	-.7920	.0653
	20 micron	-.1007	.13748	.997	-.5202	.3189
	30 micron	-.1520	.11498	.861	-.4995	.1955
	50	-.1653	.10689	.724	-.4882	.1576
50	10 micron	-.1980	.13843	.799	-.6221	.2261
	20 micron	.0647	.13562	1.000	-.3501	.4795
	30 micron	.0133	.11275	1.000	-.3277	.3544
	40 micron	.1653	.10689	.724	-.1576	.4882

2. Comparison between the different storage times.

10 μm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.678	2	.339	2.618	.085
Within Groups	5.437	42	.129		
Total	6.115	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1week	1month	-.2260	.11039	.141	-.5061	.0541
	3	-.2847	.13666	.135	-.6353	.0660
1month	1week	.2260	.11039	.141	-.0541	.5061
	3	-.0587	.14463	.968	-.4271	.3097
3	1week	.2847	.13666	.135	-.0660	.6353
	1month	.0587	.14463	.968	-.3097	.4271

20 μm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.061	2	1.031	3.676	.034
Within Groups	11.776	42	.280		
Total	13.837	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1week	1month	-.4707	.20771	.091	-.9984	.0571
	3	-.0353	.17146	.996	-.4699	.3992
1month	1week	.4707	.20771	.091	-.0571	.9984
	3	.4353	.19903	.108	-.0723	.9430
3	1week	.0353	.17146	.996	-.3992	.4699
	1month	-.4353	.19903	.108	-.9430	.0723

30 µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.424	2	.212	1.463	.243
Within Groups	6.095	42	.145		
Total	6.519	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1week	1month	-.0733	.14755	.944	-.4470	.3004
	3	-.2327	.13641	.264	-.5791	.1138
1month	1week	.0733	.14755	.944	-.3004	.4470
	3	-.1593	.13293	.554	-.4966	.1779
3	1week	.2327	.13641	.264	-.1138	.5791
	1month	.1593	.13293	.554	-.1779	.4966

40 µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.076	2	.038	.223	.801
Within Groups	7.132	42	.170		
Total	7.208	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
1week	1month	-.0720	.16732	.962	-.4981	.3541
	3	-.0967	.15561	.898	-.4969	.3035
1month	1week	.0720	.16732	.962	-.3541	.4981
	3	-.0247	.12536	.996	-.3432	.2939
3	1week	.0967	.15561	.898	-.3035	.4969
	1month	.0247	.12536	.996	-.2939	.3432

50 µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.432	2	.216	2.074	.138
Within Groups	4.379	42	.104		
Total	4.812	44			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) timie	(J) timie	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1week	1month	-.1913	.12407	.346	-.5077	.1251
	3	-.2213	.10262	.112	-.4812	.0386
1month	1week	.1913	.12407	.346	-.1251	.5077
	3	-.0300	.12562	.993	-.3499	.2899
3	1week	.2213	.10262	.112	-.0386	.4812
	1month	.0300	.12562	.993	-.2899	.3499

Comparison between the materials.

1 week

10µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.410	4	.603	5.858	.000
Within Groups	7.201	70	.103		
Total	9.611	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) Materials	(J) Materials	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Z250	Fuji IX	-.4600*	.09565	.001	-.7534	-.1666
	Fuji II LC	-.3807*	.08632	.002	-.6435	-.1178
	Compomer	-.3833	.13321	.086	-.8018	.0351
	Giomer	-.5053*	.08652	.000	-.7688	-.2418
Fuji IX	Z250	.4600*	.09565	.001	.1666	.7534
	Fuji II LC	.0793	.10757	.997	-.2461	.4048
	Compomer	.0767	.14787	1.000	-.3752	.5286
	Giomer	-.0453	.10773	1.000	-.3712	.2806
Fuji II LC	Z250	.3807*	.08632	.002	.1178	.6435
	Fuji IX	-.0793	.10757	.997	-.4048	.2461
	Compomer	-.0027	.14202	1.000	-.4402	.4349
	Giomer	-.1247	.09955	.894	-.4253	.1760
Compomer	Z250	.3833	.13321	.086	-.0351	.8018
	Fuji IX	-.0767	.14787	1.000	-.5286	.3752
	Fuji II LC	.0027	.14202	1.000	-.4349	.4402
	Giomer	-.1220	.14214	.990	-.5598	.3158
Giomer	Z250	.5053*	.08652	.000	.2418	.7688
	Fuji IX	.0453	.10773	1.000	-.2806	.3712
	Fuji II LC	.1247	.09955	.894	-.1760	.4253
	Compomer	.1220	.14214	.990	-.3158	.5598

*. The mean difference is significant at the .05 level.

20µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.641	4	1.910	6.774	.000
Within Groups	19.739	70	.282		
Total	27.381	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) Materials	(J) Materials	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Z250	Fuji IX	-.9633*	.23050	.003	-1.6598	-.2669
	Fuji II LC	-.7273*	.19992	.011	-1.3336	-.1210
	Compomer	-.6013*	.18342	.031	-1.1644	-.0382
	Giomer	-.6447*	.20266	.035	-1.2586	-.0308
Fuji IX	Z250	.9633*	.23050	.003	.2669	1.6598
	Fuji II LC	.2360	.20950	.941	-.4011	.8731
	Compomer	.3620	.19382	.499	-.2355	.9595
	Giomer	.3187	.21211	.754	-.3255	.9628
Fuji II LC	Z250	.7273*	.19992	.011	.1210	1.3336
	Fuji IX	-.2360	.20950	.941	-.8731	.4011
	Compomer	.1260	.15621	.994	-.3482	.6002
	Giomer	.0827	.17840	1.000	-.4562	.6215
Compomer	Z250	.6013*	.18342	.031	.0382	1.1644
	Fuji IX	-.3620	.19382	.499	-.9595	.2355
	Fuji II LC	-.1260	.15621	.994	-.6002	.3482
	Giomer	-.0433	.15970	1.000	-.5288	.4421
Giomer	Z250	.6447*	.20266	.035	.0308	1.2586
	Fuji IX	-.3187	.21211	.754	-.9628	.3255
	Fuji II LC	-.0827	.17840	1.000	-.6215	.4562
	Compomer	.0433	.15970	1.000	-.4421	.5288

*. The mean difference is significant at the .05 level.

30µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	7.118	4	1.780	6.603	.000
Within Groups	18.865	70	.269		
Total	25.983	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) Materials	(J) Materials	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Z250	Fuji IX	-.8787*	.21846	.005	-1.5500	-.2073
	Fuji II LC	-.7887*	.16914	.001	-1.3002	-.2772
	Compomer	-.6460*	.16464	.005	-1.1435	-.1485
	Giomer	-.6147*	.15438	.004	-1.0810	-.1483
Fuji IX	Z250	.8787*	.21846	.005	.2073	1.5500
	Fuji II LC	.0900	.22666	1.000	-.6018	.7818
	Compomer	.2327	.22332	.963	-.4507	.9160
	Giomer	.2640	.21587	.904	-.4012	.9292
Fuji II LC	Z250	.7887*	.16914	.001	.2772	1.3002
	Fuji IX	-.0900	.22666	1.000	-.7818	.6018
	Compomer	.1427	.17537	.993	-.3871	.6724
	Giomer	.1740	.16578	.962	-.3279	.6759
Compomer	Z250	.6460*	.16464	.005	.1485	1.1435
	Fuji IX	-.2327	.22332	.963	-.9160	.4507
	Fuji II LC	-.1427	.17537	.993	-.6724	.3871
	Giomer	.0313	.16118	1.000	-.4561	.5187
Giomer	Z250	.6147*	.15438	.004	.1483	1.0810
	Fuji IX	-.2640	.21587	.904	-.9292	.4012
	Fuji II LC	-.1740	.16578	.962	-.6759	.3279
	Compomer	-.0313	.16118	1.000	-.5187	.4561

*. The mean difference is significant at the .05 level.

40µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.151	4	.788	3.772	.008
Within Groups	14.618	70	.209		
Total	17.769	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) Materials	(J) Materials	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Z250	Fuji IX	-.6133*	.14067	.003	-1.0542	-.1725
	Fuji II LC	-.3887	.14523	.129	-.8447	.0674
	Compomer	-.4853*	.12850	.011	-.8856	-.0851
	Giomer	-.3527	.14581	.210	-.8107	.1053
Fuji IX	Z250	.6133*	.14067	.003	.1725	1.0542
	Fuji II LC	.2247	.18669	.915	-.3392	.7886
	Compomer	.1280	.17399	.997	-.3980	.6540
	Giomer	.2607	.18714	.822	-.3046	.8260
Fuji II LC	Z250	.3887	.14523	.129	-.0674	.8447
	Fuji IX	-.2247	.18669	.915	-.7886	.3392
	Compomer	-.0967	.17770	1.000	-.6342	.4409
	Giomer	.0360	.19059	1.000	-.5396	.6116
Compomer	Z250	.4853*	.12850	.011	.0851	.8856
	Fuji IX	-.1280	.17399	.997	-.6540	.3980
	Fuji II LC	.0967	.17770	1.000	-.4409	.6342
	Giomer	.1327	.17818	.997	-.4064	.6717
Giomer	Z250	.3527	.14581	.210	-.1053	.8107
	Fuji IX	-.2607	.18714	.822	-.8260	.3046
	Fuji II LC	-.0360	.19059	1.000	-.6116	.5396
	Compomer	-.1327	.17818	.997	-.6717	.4064

*. The mean difference is significant at the .05 level.

50µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.244	4	1.061	5.691	.001
Within Groups	13.051	70	.186		
Total	17.295	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) Materials	(J) Materials	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Z250	Fuji IX	-.5120*	.15917	.031	-.9928	-.0312
	Fuji II LC	-.4320	.16464	.124	-.9293	.0653
	Compomer	-.7233*	.17504	.003	-1.2529	-.1938
	Giomer	-.5033*	.13444	.010	-.9154	-.0913
Fuji IX	Z250	.5120*	.15917	.031	.0312	.9928
	Fuji II LC	.0800	.16260	1.000	-.4113	.5713
	Compomer	-.2113	.17311	.908	-.7354	.3128
	Giomer	.0087	.13193	1.000	-.3951	.4124
Fuji II LC	Z250	.4320	.16464	.124	-.0653	.9293
	Fuji IX	-.0800	.16260	1.000	-.5713	.4113
	Compomer	-.2913	.17816	.662	-.8299	.2473
	Giomer	-.0713	.13848	1.000	-.4967	.3541
Compomer	Z250	.7233*	.17504	.003	.1938	1.2529
	Fuji IX	.2113	.17311	.908	-.3128	.7354
	Fuji II LC	.2913	.17816	.662	-.2473	.8299
	Giomer	.2200	.15069	.779	-.2459	.6859
Giomer	Z250	.5033*	.13444	.010	.0913	.9154
	Fuji IX	-.0087	.13193	1.000	-.4124	.3951
	Fuji II LC	.0713	.13848	1.000	-.3541	.4967
	Compomer	-.2200	.15069	.779	-.6859	.2459

*. The mean difference is significant at the .05 level.

<u>1 month</u>

10µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	13.012	4	3.253	16.284	.000
Within Groups	13.983	70	.200		
Total	26.995	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) Materials	(J) Materials	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Z250	Fuji IX	-1.1693*	.19126	.000	-1.7653	-.5733
	Fuji II LC	-1.0867*	.12148	.000	-1.4539	-.7195
	Compomer	-.6880*	.14564	.001	-1.1327	-.2433
	Giomer	-.8620*	.11748	.000	-1.2169	-.5071
Fuji IX	Z250	1.1693*	.19126	.000	.5733	1.7653
	Fuji II LC	.0827	.19535	1.000	-.5223	.6876
	Compomer	.4813	.21123	.254	-.1624	1.1251
	Giomer	.3073	.19289	.691	-.2922	.9068
Fuji II LC	Z250	1.0867*	.12148	.000	.7195	1.4539
	Fuji IX	-.0827	.19535	1.000	-.6876	.5223
	Compomer	.3987	.15097	.122	-.0601	.8574
	Giomer	.2247	.12403	.534	-.1500	.5994
Compomer	Z250	.6880*	.14564	.001	.2433	1.1327
	Fuji IX	-.4813	.21123	.254	-1.1251	.1624
	Fuji II LC	-.3987	.15097	.122	-.8574	.0601
	Giomer	-.1740	.14777	.923	-.6243	.2763
Giomer	Z250	.8620*	.11748	.000	.5071	1.2169
	Fuji IX	-.3073	.19289	.691	-.9068	.2922
	Fuji II LC	-.2247	.12403	.534	-.5994	.1500
	Compomer	.1740	.14777	.923	-.2763	.6243

*. The mean difference is significant at the .05 level.

20µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	12.596	4	3.149	12.401	.000
Within Groups	17.776	70	.254		
Total	30.372	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) Materials	(J) Materials	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Z250	Fuji IX	-.8800*	.15478	.000	-1.3492	-.4108
	Fuji II LC	-1.1267*	.17941	.000	-1.6689	-.5844
	Compomer	-.6693*	.17625	.007	-1.2018	-.1369
	Giomer	-1.0847*	.20322	.000	-1.7025	-.4669
Fuji IX	Z250	.8800*	.15478	.000	.4108	1.3492
	Fuji II LC	-.2467	.16402	.752	-.7456	.2523
	Compomer	.2107	.16056	.865	-.2771	.6984
	Giomer	-.2047	.18977	.953	-.7881	.3787
Fuji II LC	Z250	1.1267*	.17941	.000	.5844	1.6689
	Fuji IX	.2467	.16402	.752	-.2523	.7456
	Compomer	.4573	.18442	.167	-.0997	1.0144
	Giomer	.0420	.21035	1.000	-.5954	.6794
Compomer	Z250	.6693*	.17625	.007	.1369	1.2018
	Fuji IX	-.2107	.16056	.865	-.6984	.2771
	Fuji II LC	-.4573	.18442	.167	-1.0144	.0997
	Giomer	-.4153	.20766	.406	-1.0452	.2145
Giomer	Z250	1.0847*	.20322	.000	.4669	1.7025
	Fuji IX	.2047	.18977	.953	-.3787	.7881
	Fuji II LC	-.0420	.21035	1.000	-.6794	.5954
	Compomer	.4153	.20766	.406	-.2145	1.0452

*. The mean difference is significant at the .05 level.

30µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	12.546	4	3.137	9.828	.000
Within Groups	22.341	70	.319		
Total	34.887	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) Materials	(J) Materials	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Z250	Fuji IX	-.7827*	.24825	.036	-1.5328	-.0325
	Fuji II LC	-1.2307*	.22721	.000	-1.9213	-.5400
	Compomer	-.4513	.22217	.388	-1.1287	.2260
	Giomer	-.4420	.20914	.345	-1.0870	.2030
Fuji IX	Z250	.7827*	.24825	.036	.0325	1.5328
	Fuji II LC	-.4480	.21589	.360	-1.1023	.2063
	Compomer	.3313	.21058	.705	-.3084	.9711
	Giomer	.3407	.19678	.594	-.2634	.9448
Fuji II LC	Z250	1.2307*	.22721	.000	.5400	1.9213
	Fuji IX	.4480	.21589	.360	-.2063	1.1023
	Compomer	.7793*	.18531	.002	.2195	1.3392
	Giomer	.7887*	.16946	.001	.2739	1.3034
Compomer	Z250	.4513	.22217	.388	-.2260	1.1287
	Fuji IX	-.3313	.21058	.705	-.9711	.3084
	Fuji II LC	-.7793*	.18531	.002	-1.3392	-.2195
	Giomer	.0093	.16265	1.000	-.4836	.5023
Giomer	Z250	.4420	.20914	.345	-.2030	1.0870
	Fuji IX	-.3407	.19678	.594	-.9448	.2634
	Fuji II LC	-.7887*	.16946	.001	-1.3034	-.2739
	Compomer	-.0093	.16265	1.000	-.5023	.4836

*. The mean difference is significant at the .05 level.

40μm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.693	4	2.173	7.954	.000
Within Groups	19.126	70	.273		
Total	27.819	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) Materials	(J) Materials	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Z250	Fuji IX	-.6440	.22729	.081	-1.3362	.0482
	Fuji II LC	-1.0113*	.15383	.000	-1.4837	-.5389
	Compomer	-.4527	.20178	.267	-1.0631	.1578
	Giomer	-.2820	.16464	.606	-.7823	.2183
Fuji IX	Z250	.6440	.22729	.081	-.0482	1.3362
	Fuji II LC	-.3673	.20152	.533	-.9985	.2638
	Compomer	.1913	.24013	.994	-.5359	.9186
	Giomer	.3620	.20989	.599	-.2871	1.0111
Fuji II LC	Z250	1.0113*	.15383	.000	.5389	1.4837
	Fuji IX	.3673	.20152	.533	-.2638	.9985
	Compomer	.5587*	.17224	.036	.0252	1.0922
	Giomer	.7293*	.12671	.000	.3453	1.1134
Compomer	Z250	.4527	.20178	.267	-.1578	1.0631
	Fuji IX	-.1913	.24013	.994	-.9186	.5359
	Fuji II LC	-.5587*	.17224	.036	-1.0922	-.0252
	Giomer	.1707	.18196	.981	-.3860	.7274
Giomer	Z250	.2820	.16464	.606	-.2183	.7823
	Fuji IX	-.3620	.20989	.599	-1.0111	.2871
	Fuji II LC	-.7293*	.12671	.000	-1.1134	-.3453
	Compomer	-.1707	.18196	.981	-.7274	.3860

*. The mean difference is significant at the .05 level.

50μm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	11.249	4	2.812	9.388	.000
Within Groups	20.971	70	.300		
Total	32.220	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) Materials	(J) Materials	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Z250	Fuji IX	-.7433*	.20187	.016	-1.3790	-.1077
	Fuji II LC	-1.2127*	.18065	.000	-1.7775	-.6478
	Compomer	-.5987*	.16375	.014	-1.1071	-.0902
	Giomer	-.6447*	.12511	.000	-1.0255	-.2638
Fuji IX	Z250	.7433*	.20187	.016	.1077	1.3790
	Fuji II LC	-.4693	.25045	.490	-1.2267	.2881
	Compomer	.1447	.23854	.999	-.5791	.8684
	Giomer	.0987	.21388	1.000	-.5623	.7596
Fuji II LC	Z250	1.2127*	.18065	.000	.6478	1.7775
	Fuji IX	.4693	.25045	.490	-.2881	1.2267
	Compomer	.6140	.22088	.088	-.0538	1.2818
	Giomer	.5680	.19398	.068	-.0270	1.1630
Compomer	Z250	.5987*	.16375	.014	.0902	1.1071
	Fuji IX	-.1447	.23854	.999	-.8684	.5791
	Fuji II LC	-.6140	.22088	.088	-1.2818	.0538
	Giomer	-.0460	.17834	1.000	-.5897	.4977
Giomer	Z250	.6447*	.12511	.000	.2638	1.0255
	Fuji IX	-.0987	.21388	1.000	-.7596	.5623
	Fuji II LC	-.5680	.19398	.068	-1.1630	.0270
	Compomer	.0460	.17834	1.000	-.4977	.5897

*. The mean difference is significant at the .05 level.

3 months

10µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	17.670	4	4.418	6.226	.000
Within Groups	49.664	70	.709		
Total	67.334	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) Materials	(J) Materials	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Z250	Fuji IX	-1.3840*	.38961	.015	-2.5712	-.1968
	Fuji II LC	-.8733	.35744	.194	-1.9823	.2356
	Compomer	-.2427	.38306	.999	-1.4129	.9276
	Giomer	-.6907	.33979	.400	-1.7635	.3822
Fuji IX	Z250	1.3840*	.38961	.015	.1968	2.5712
	Fuji II LC	.5107	.27578	.507	-.3286	1.3500
	Compomer	1.1413*	.30827	.009	.2101	2.0726
	Giomer	.6933	.25248	.106	-.0884	1.4751
Fuji II LC	Z250	.8733	.35744	.194	-.2356	1.9823
	Fuji IX	-.5107	.27578	.507	-1.3500	.3286
	Compomer	.6307	.26646	.213	-.1785	1.4398
	Giomer	.1827	.19929	.984	-.4237	.7890
Compomer	Z250	.2427	.38306	.999	-.9276	1.4129
	Fuji IX	-1.1413*	.30827	.009	-2.0726	-.2101
	Fuji II LC	-.6307	.26646	.213	-1.4398	.1785
	Giomer	-.4480	.24227	.512	-1.1958	.2998
Giomer	Z250	.6907	.33979	.400	-.3822	1.7635
	Fuji IX	-.6933	.25248	.106	-1.4751	.0884
	Fuji II LC	-.1827	.19929	.984	-.7890	.4237
	Compomer	.4480	.24227	.512	-.2998	1.1958

*. The mean difference is significant at the .05 level.

20µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	15.287	4	3.822	3.612	.010
Within Groups	74.074	70	1.058		
Total	89.361	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) Materials	(J) Materials	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Z250	Fuji IX	-1.0987*	.32510	.025	-2.0988	-.0986
	Fuji II LC	-1.3347*	.35397	.008	-2.4092	-.2602
	Compomer	-.8880	.51611	.601	-2.4668	.6908
	Giomer	-.8340	.30284	.111	-1.7854	.1174
Fuji IX	Z250	1.0987*	.32510	.025	.0986	2.0988
	Fuji II LC	-.2360	.27098	.989	-1.0589	.5869
	Compomer	.2107	.46315	1.000	-1.2494	1.6708
	Giomer	.2647	.19962	.858	-.3439	.8733
Fuji II LC	Z250	1.3347*	.35397	.008	.2602	2.4092
	Fuji IX	.2360	.27098	.989	-.5869	1.0589
	Compomer	.4467	.48385	.982	-1.0558	1.9491
	Giomer	.5007	.24383	.381	-.2539	1.2553
Compomer	Z250	.8880	.51611	.601	-.6908	2.4668
	Fuji IX	-.2107	.46315	1.000	-1.6708	1.2494
	Fuji II LC	-.4467	.48385	.982	-1.9491	1.0558
	Giomer	.0540	.44780	1.000	-1.3793	1.4873
Giomer	Z250	.8340	.30284	.111	-.1174	1.7854
	Fuji IX	-.2647	.19962	.858	-.8733	.3439
	Fuji II LC	-.5007	.24383	.381	-1.2553	.2539
	Compomer	-.0540	.44780	1.000	-1.4873	1.3793

*. The mean difference is significant at the .05 level.

30µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	18.235	4	4.559	14.239	.000
Within Groups	22.411	70	.320		
Total	40.645	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) Materials	(J) Materials	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Z250	Fuji IX	-1.0973*	.25170	.003	-1.8804	-.3142
	Fuji II LC	-1.4653*	.25425	.000	-2.2540	-.6767
	Compomer	-.6120	.27263	.271	-1.4447	.2207
	Giomer	-.9020*	.24225	.015	-1.6660	-.1380
Fuji IX	Z250	1.0973*	.25170	.003	.3142	1.8804
	Fuji II LC	-.3680	.15854	.230	-.8469	.1109
	Compomer	.4853	.18661	.134	-.0826	1.0532
	Giomer	.1953	.13848	.811	-.2248	.6155
Fuji II LC	Z250	1.4653*	.25425	.000	.6767	2.2540
	Fuji IX	.3680	.15854	.230	-.1109	.8469
	Compomer	.8533*	.19003	.001	.2762	1.4304
	Giomer	.5633*	.14306	.005	.1285	.9982
Compomer	Z250	.6120	.27263	.271	-.2207	1.4447
	Fuji IX	-.4853	.18661	.134	-1.0532	.0826
	Fuji II LC	-.8533*	.19003	.001	-1.4304	-.2762
	Giomer	-.2900	.17365	.638	-.8254	.2454
Giomer	Z250	.9020*	.24225	.015	.1380	1.6660
	Fuji IX	-.1953	.13848	.811	-.6155	.2248
	Fuji II LC	-.5633*	.14306	.005	-.9982	-.1285
	Compomer	.2900	.17365	.638	-.2454	.8254

*. The mean difference is significant at the .05 level.

40µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	20.295	4	5.074	12.667	.000
Within Groups	28.038	70	.401		
Total	48.333	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) Materials	(J) Materials	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Z250	Fuji IX	-1.2840*	.26870	.001	-2.0997	-.4683
	Fuji II LC	-1.4853*	.22083	.000	-2.1528	-.8179
	Compomer	-.6693	.24529	.098	-1.4109	.0722
	Giomer	-.7713*	.18099	.004	-1.3351	-.2075
Fuji IX	Z250	1.2840*	.26870	.001	.4683	2.0997
	Fuji II LC	-.2013	.25958	.995	-.9926	.5899
	Compomer	.6147	.28068	.294	-.2346	1.4639
	Giomer	.5127	.22666	.279	-.2035	1.2288
Fuji II LC	Z250	1.4853*	.22083	.000	.8179	2.1528
	Fuji IX	.2013	.25958	.995	-.5899	.9926
	Compomer	.8160*	.23526	.017	.1031	1.5289
	Giomer	.7140*	.16715	.003	.1963	1.2317
Compomer	Z250	.6693	.24529	.098	-.0722	1.4109
	Fuji IX	-.6147	.28068	.294	-1.4639	.2346
	Fuji II LC	-.8160*	.23526	.017	-1.5289	-.1031
	Giomer	-.1020	.19835	1.000	-.7237	.5197
Giomer	Z250	.7713*	.18099	.004	.2075	1.3351
	Fuji IX	-.5127	.22666	.279	-1.2288	.2035
	Fuji II LC	-.7140*	.16715	.003	-1.2317	-.1963
	Compomer	.1020	.19835	1.000	-.5197	.7237

*. The mean difference is significant at the .05 level.

50µm

Oneway

ANOVA

F

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	16.685	4	4.171	24.449	.000
Within Groups	11.943	70	.171		
Total	28.627	74			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: F
Dunnett T3

(I) Materials	(J) Materials	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Z250	Fuji IX	-1.1940*	.15638	.000	-1.6666	-.7214
	Fuji II LC	-1.3393*	.17566	.000	-1.8730	-.8057
	Compomer	-.6540*	.13580	.001	-1.0655	-.2425
	Giomer	-.8753*	.12896	.000	-1.2683	-.4823
Fuji IX	Z250	1.1940*	.15638	.000	.7214	1.6666
	Fuji II LC	-.1453	.18157	.994	-.6953	.4047
	Compomer	.5400*	.14336	.008	.1042	.9758
	Giomer	.3187	.13690	.234	-.1003	.7377
Fuji II LC	Z250	1.3393*	.17566	.000	.8057	1.8730
	Fuji IX	.1453	.18157	.994	-.4047	.6953
	Compomer	.6853*	.16419	.004	.1814	1.1893
	Giomer	.4640	.15858	.072	-.0268	.9548
Compomer	Z250	.6540*	.13580	.001	.2425	1.0655
	Fuji IX	-.5400*	.14336	.008	-.9758	-.1042
	Fuji II LC	-.6853*	.16419	.004	-1.1893	-.1814
	Giomer	-.2213	.11282	.430	-.5626	.1200
Giomer	Z250	.8753*	.12896	.000	.4823	1.2683
	Fuji IX	-.3187	.13690	.234	-.7377	.1003
	Fuji II LC	-.4640	.15858	.072	-.9548	.0268
	Compomer	.2213	.11282	.430	-.1200	.5626

*. The mean difference is significant at the .05 level.

Part II Acid resistant layer observation using SEM.

Data of thickness of acid resistant layer

MATERIAL	TIME	THICKNESS (μm)
Resin composite	1 week	2.73
		3.28
		2.63
		1.87
		1.97
	1 month	1.16
		1.21
		1.77
		2.32
		1.87
	3 months	1.36
		1.97
		1.06
		2.37
		1.52
conventional glass	1 week	3.13
ionomer cement		2.68
		3.48
		2.17
		3.23
	1 month	3.18
		2.53
		2.07
		2.27
		1.87
	3 months	2.27
		1.92
		3.64
		2.27
		3.94

MATERIAL	TIME	THICKNESS (µm)
resin-modified	1 week	3.33
glass ionomer cemnent		5.96
		3.03
		1.77
		1.77
	1 month	1.21
		1.62
		1.26
		2.88
		1.97
	3 months	2.58
		2.17
		1.52
		3.08
		2.47
compomer	1 week	1.72
		2.12
		1.87
		1.62
		1.41
	1 month	2.98
		4.24
		2.07
		1.26
		2.02
	3 months	2.98
		2.17
		2.22
		2.42
		2.73
giomer	1 week	0
		0.96
		2.07

MATERIAL	TIME	THICKNESS (μm)
		1.57
		1.67
	1 month	2.12
		1.31
		1.72
		1.26
		2.22
	3 months	1.31
		2.02
		2.88
		2.12
		0

Statistical analysis

Univariate Analysis of Variance

Between-Subjects Factors

		Value Label	N
material	1	Z250	15
	2	Fuji IX	15
	3	Fuji II LC	15
	4	Compomer	15
	5	Giomer	15
time	1	1 week	25
	2	1 month	25
	3	3 months	25

Tests of Between-Subjects Effects

Dependent Variable: layer

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	22.759[a]	14	1.626	2.579	.006
Intercept	356.081	1	356.081	564.960	.000
MATERIAL	12.171	4	3.043	4.827	.002
TIME	1.186	2	.593	.941	.396
MATERIAL * TIME	9.402	8	1.175	1.865	.083
Error	37.817	60	.630		
Total	416.656	75			
Corrected Total	60.575	74			

a. R Squared = .376 (Adjusted R Squared = .230)

Means

Case Processing Summary

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
layer thickness * group	75	100.0%	0	.0%	75	100.0%

Report

layer thickness

group	Mean	N	Std. Deviation
Z250, 1wk	2.4960	5	.58222
Z250, 1m	1.6660	5	.48583
Z250, 3m	1.6560	5	.51714
Fuji IX, 1wk	2.9380	5	.51775
Fuji IX, 1m	2.3840	5	.50762
Fuji IX, 3m	2.8080	5	.91393
Fuji II, 1wk	3.1720	5	1.71386
Fuji II, 1m	1.7880	5	.68313
Fuji II, 3m	2.3640	5	.57457
Compomer, 1wk	1.7480	5	.26678
Compomer, 1m	2.5140	5	1.14126
Compomer, 3m	2.5040	5	.34530
Giomer, 1wk	1.2540	5	.80587
Giomer, 1m	1.7260	5	.44427
Giomer, 3m	1.6660	5	1.08484
Total	2.1789	75	.90476

1. Comparison between the different storage times.

Resin composite

1 week

Oneway

ANOVA

layer

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2.324	2	1.162	4.139	.043
Within Groups	3.370	12	.281		
Total	5.694	14			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: layer
Dunnett T3

(I) time	(J) time	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
1 week	1 month	.8300	.33912	.109	-.1804	1.8404
	3 months	.8400	.34826	.114	-.1934	1.8734
1 month	1 week	-.8300	.33912	.109	-1.8404	.1804
	3 months	.0100	.31732	1.000	-.9295	.9495
3 months	1 week	-.8400	.34826	.114	-1.8734	.1934
	1 month	-.0100	.31732	1.000	-.9495	.9295

Conventional glass ionomer cement

Oneway

ANOVA

layer

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.839	2	.420	.925	.423
Within Groups	5.444	12	.454		
Total	6.283	14			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: layer
Dunnett T3

(I) time	(J) time	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
1 week	1 month	.5540	.32427	.309	-.4053	1.5133
	3 months	.1300	.46975	.989	-1.3459	1.6059
1 month	1 week	-.5540	.32427	.309	-1.5133	.4053
	3 months	-.4240	.46754	.751	-1.8981	1.0501
3 months	1 week	-.1300	.46975	.989	-1.6059	1.3459
	1 month	.4240	.46754	.751	-1.0501	1.8981

Resin-modified glass ionomer cement

Oneway

ANOVA

layer

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.833	2	2.417	1.942	.186
Within Groups	14.936	12	1.245		
Total	19.770	14			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: layer
Dunnett T3

(I) time	(J) time	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
1 week	1 month	1.3840	.82510	.351	-1.3725	4.1405
	3 months	.8080	.80839	.700	-1.9640	3.5800
1 month	1 week	-1.3840	.82510	.351	-4.1405	1.3725
	3 months	-.5760	.39920	.435	-1.7647	.6127
3 months	1 week	-.8080	.80839	.700	-3.5800	1.9640
	1 month	.5760	.39920	.435	-.6127	1.7647

Compomer

Oneway

ANOVA

layer

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.931	2	.965	1.940	.186
Within Groups	5.972	12	.498		
Total	7.902	14			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: layer
Dunnett T3

(I) time	(J) time	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
1 week	1 month	-.7660	.52415	.457	-2.6369	1.1049
	3 months	-.7560*	.19514	.015	-1.3416	-.1704
1 month	1 week	.7660	.52415	.457	-1.1049	2.6369
	3 months	.0100	.53324	1.000	-1.8432	1.8632
3 months	1 week	.7560*	.19514	.015	.1704	1.3416
	1 month	-.0100	.53324	1.000	-1.8632	1.8432

*. The mean difference is significant at the .05 level.

Giomer

Oneway

ANOVA

layer

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.660	2	.330	.489	.625
Within Groups	8.095	12	.675		
Total	8.755	14			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: layer
Dunnett T3

(I) time	(J) time	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1 week	1 month	-.4720	.41154	.610	-1.7712	.8272
	3 months	-.4120	.60437	.869	-2.2338	1.4098
1 month	1 week	.4720	.41154	.610	-.8272	1.7712
	3 months	.0600	.52426	.999	-1.6837	1.8037
3 months	1 week	.4120	.60437	.869	-1.4098	2.2338
	1 month	-.0600	.52426	.999	-1.8037	1.6837

<u>2. Comparison between the different materials.</u>

1 week

Oneway

ANOVA

layer

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	13.012	4	3.253	3.814	.018
Within Groups	17.060	20	.853		
Total	30.072	24			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: layer
Dunnett T3

(I) material	(J) material	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Z250	Fuji IX	-.4420	.34844	.867	-1.7220	.8380
	Fuji II LC	-.6760	.80948	.981	-4.1941	2.8421
	Compomer	.7480	.28641	.252	-.4294	1.9254
	Giomer	1.2420	.44461	.175	-.4295	2.9135
Fuji IX	Z250	.4420	.34844	.867	-.8380	1.7220
	Fuji II LC	-.2340	.80067	1.000	-3.7763	3.3083
	Compomer	1.1900*	.26048	.028	.1451	2.2349
	Giomer	1.6840*	.42837	.045	.0408	3.3272
Fuji II LC	Z250	.6760	.80948	.981	-2.8421	4.1941
	Fuji IX	.2340	.80067	1.000	-3.3083	3.7763
	Compomer	1.4240	.77569	.578	-2.2175	5.0655
	Giomer	1.9180	.84697	.366	-1.5452	5.3812
Compomer	Z250	-.7480	.28641	.252	-1.9254	.4294
	Fuji IX	-1.1900*	.26048	.028	-2.2349	-.1451
	Fuji II LC	-1.4240	.77569	.578	-5.0655	2.2175
	Giomer	.4940	.37963	.841	-1.1628	2.1508
Giomer	Z250	-1.2420	.44461	.175	-2.9135	.4295
	Fuji IX	-1.6840*	.42837	.045	-3.3272	-.0408
	Fuji II LC	-1.9180	.84697	.366	-5.3812	1.5452
	Compomer	-.4940	.37963	.841	-2.1508	1.1628

*. The mean difference is significant at the .05 level.

1 month

Oneway

ANOVA

layer

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.210	4	.803	1.631	.206
Within Groups	9.841	20	.492		
Total	13.051	24			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: layer
Dunnett T3

(I) material	(J) material	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Z250	Fuji IX	-.7180	.31423	.325	-1.8687	.4327
	Fuji II LC	-.1220	.37489	1.000	-1.5348	1.2908
	Compomer	-.8480	.55471	.730	-3.1624	1.4664
	Giomer	-.0600	.29442	1.000	-1.1399	1.0199
Fuji IX	Z250	.7180	.31423	.325	-.4327	1.8687
	Fuji II LC	.5960	.38062	.709	-.8289	2.0209
	Compomer	-.1300	.55860	1.000	-2.4403	2.1803
	Giomer	.6580	.30168	.372	-.4515	1.7675
Fuji II LC	Z250	.1220	.37489	1.000	-1.2908	1.5348
	Fuji IX	-.5960	.38062	.709	-2.0209	.8289
	Compomer	-.7260	.59484	.883	-3.0393	1.5873
	Giomer	.0620	.36443	1.000	-1.3328	1.4568
Compomer	Z250	.8480	.55471	.730	-1.4664	3.1624
	Fuji IX	.1300	.55860	1.000	-2.1803	2.4403
	Fuji II LC	.7260	.59484	.883	-1.5873	3.0393
	Giomer	.7880	.54770	.776	-1.5367	3.1127
Giomer	Z250	.0600	.29442	1.000	-1.0199	1.1399
	Fuji IX	-.6580	.30168	.372	-1.7675	.4515
	Fuji II LC	-.0620	.36443	1.000	-1.4568	1.3328
	Compomer	-.7880	.54770	.776	-3.1127	1.5367

3 months

Oneway

ANOVA

layer

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.350	4	1.338	2.451	.079
Within Groups	10.916	20	.546		
Total	16.266	24			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: layer
Dunnett T3

(I) material	(J) material	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Z250	Fuji IX	-1.1520	.46962	.286	-2.9993	.6953
	Fuji II LC	-.7080	.34571	.435	-1.9771	.5611
	Compomer	-.8480	.27809	.130	-1.9072	.2112
	Giomer	-.0100	.53746	1.000	-2.2014	2.1814
Fuji IX	Z250	1.1520	.46962	.286	-.6953	2.9993
	Fuji II LC	.4440	.48278	.973	-1.4155	2.3035
	Compomer	.3040	.43692	.994	-1.5606	2.1686
	Giomer	1.1420	.63437	.571	-1.1981	3.4821
Fuji II LC	Z250	.7080	.34571	.435	-.5611	1.9771
	Fuji IX	-.4440	.48278	.973	-2.3035	1.4155
	Compomer	-.1400	.29979	1.000	-1.3049	1.0249
	Giomer	.6980	.54900	.860	-1.4916	2.8876
Compomer	Z250	.8480	.27809	.130	-.2112	1.9072
	Fuji IX	-.3040	.43692	.994	-2.1686	1.5606
	Fuji II LC	.1400	.29979	1.000	-1.0249	1.3049
	Giomer	.8380	.50914	.669	-1.3974	3.0734
Giomer	Z250	.0100	.53746	1.000	-2.1814	2.2014
	Fuji IX	-1.1420	.63437	.571	-3.4821	1.1981
	Fuji II LC	-.6980	.54900	.860	-2.8876	1.4916
	Compomer	-.8380	.50914	.669	-3.0734	1.3974

BIOGRAPHY

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