Gluma® Desensitizer

Content: 5 ml

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Introduction

Dentin hypersensitivity (DHS) is an extremely widespread phenomenon. It is estimated that in the United States of America more than forty million people suffer from dentin hypersensitivity. Statistics produced by the German Dental Association indicate that 10–15% of patients are treated for dentin hypersensitivity annually and that the trend has increased rapidly during the past few years. In addition, further increases in DHS are predictable as the population increases in age.

Dentin hypersensitivity

Definition
Tooth sensitivity or, to put it precisely, dentin hypersensitivity is defined clinically as being a painful reaction to a non-harmful, sensory stimulus. Hypersensitivity is a chronic condition with acute exacerbation which differs from dentin or pulpal pain in that the patient can localize the pain sensation accurately.

Causes
Dentin hypersensitivity is defined as being pain triggered off by chemical, thermal, tactile or osmotic stimuli which affects exposed dentin rather than by a tooth defect or other pathological cause.

From the etiologic point of view, elimination of the protective enamel layer is often caused by the following:
- Attrition due to forces acting on the occlusal surface
- Abrasion caused by incorrect toothbrushing techniques (depends on the frequency, type of brush and abrasiveness of the toothpaste)
- Eroded areas due to environmental effects or constituents of foodstuffs

Not only elimination of the enamel, but also elimination of the cementum in the root region may cause DHS. The following may eliminate the cementum:
- Acute or chronic periodontal diseases
- Incorrect toothbrushing techniques

Prior to commencing topical treatment for DHS, the etiologic and/or predisposing factors must be diagnosed and, if possible, modified or eliminated.

Theories about sensitivity

Theories about odontoblasts
Experts are not quite in agreement about what triggers off DHS. Up until a few decades ago, the theory that the pain reaction was a conventional, neural reply to a stimulus was popular (“Odontoblast Theory”). This theory is countered by the fact that, to date, no neurons have been found in dentin. Although nerve ends are in contact with the pulpal sections of the odontoblasts and possibly extend into the predentin, one has to assume that there is no nerve tissue in dentin.

Hydrodynamic theory
Dentin only becomes sensitive/hypersensitive when exposed in the mouth. Dentin hypersensitivity does not occur as long as the dentin is covered with enamel or cementum. The majority of oral physiologists are of the opinion that DHS is caused by liquid moving in open dentin tubules (“Hydrodynamic theory”). Dentin tubules are filled with liquid. Once the tubules on the surface are exposed to a stimulus, the liquid pillars transfer it hydraulically to the nerve receptors on the pulp/dentin boundary. For example, a stream of air passing over an exposed area of dentin moves the liquid pillar – the movement is transferred to the odontoblasts and exerts a direct or indirect stimulus on the nerve fibres thus causing pain.

Although this theory of hydraulics or hydrodynamics was published by Brännström during the sixties and has yet to be proven (Brännström 1966), it is the only hypothesis with which all scientific observations coincide. What also speaks in favour of this theory is that every reduction in or elimination of DHS coincides with the dentin tubules being sealed.
Methods of treating hypersensitive areas of teeth

**Conventional treatment**
The objective of all DHS treatment is to seal exposed dentin tubules. Should the dentin be exposed to such a degree that restorative treatment is required, this may also seal the tubules. A wide range of topical treatment is available for eliminating DHS, including:
- Special toothpaste
- Local fluoridation
- Precipitation of small-grained, antisoluble salts
- Sealing the surface with polymerising substances
- Intratubular obturation by precipitating proteins

(Duroux & Cimasoni 1991, Prati et al. 2001)

**Treating with Gluma Desensitizer**
Gluma Desensitizer is an especially effective alternative type of treatment. It functions by reducing the permeability of the dentin by precipitating plasma proteins to seal the peripheral dentin tubules. This halts movement of the tubule liquid which causes the pain. This is also referred to as “Intradentinal Sealing” (Schüpbach et al. 1997).

**Postoperative hypersensitivity**
Placing adhesive restorations may lead to postoperative hypersensitivity meaning that the restored tooth is sensitive to occlusal loading and is irritated by temperature changes. Postoperative sensitivity can be caused by inadvertently etching exposed dentin and/or inadequate sealing of the dentin surface with bonding agent resulting in the dentin liquid rushing out and associated irritation of the nerve ends. This movement of liquid can be blocked by applying Gluma Desensitizer.

**Preventing postoperative hypersensitivity**
There are various causes of postoperative hypersensitivity with adhesive filling techniques. Working carefully with the use of a rubber dam is always recommended to prevent contamination of the operating area.

Possible problems in the techniques used for adhesive filling treatment:
- **Overetching the dentin:** The longer the dentin is etched, the deeper the woven collagen fibrils which the adhesive must penetrate are exposed. If the dentin is etched for too long, the bonder cannot fully permeate the etched area, resulting in hydrolysis of the non-impregnated woven collagen fibrils.

- **Dehydrating the dentin:** After etching, the decalcified area of the dentin is mainly made up of a layer of loose collagen fibrils, which is supported by the stored water. If the dentin is dried excessively after etching and rinsing, this collagen matrix collapses to a dense, matted layer. These collapsed woven fibrils prevent the adhesive penetrating the exposed collagen matrix.

- **Inadequate marginal seal:** Inadvertent saliva contamination during filling treatment can cause marginal gaps. The use of a rubber dam is therefore recommended to prevent the cavity from becoming contaminated by saliva and blood.
Exceeding the expiry date: Adhesives exhibit a limited shelf life, particularly if they contain chemical compounds for self-curing. The materials should be stored according to instructions to ensure an optimum shelf life. Dispose of the materials immediately after the expiry date.

Failure of the dentin bonder: Using unsuitable products and ignoring the manufacturer’s recommendations, e.g. with regard to times and working procedure, can impair the dentin bond resulting in pain. Ensure that the practice personnel adhere to the correct working procedure.

Problems when light curing: Inadequate light output from the polymerization lamp, e.g. due to an old bulb, a contaminated fibre optic or deterioration in the performance of the filter, can affect the quality of polymerisation and consequently that of the whole restoration. Check the output of the polymerisation unit regularly.

Contamination caused by moisture or oil: Lubricating oil from the compressor or handpieces can contaminate a preparation and prevent successful bonding. The air used for drying the tooth structure and adhesive should not contain any oil or moisture. To check that the air does not contain any oil, test the air jet on a sheet of filter paper.

Cavity linings: (e.g. glass ionomer cement) can detach from the dentin beneath the filling, after the filling has been placed. This can result in microcracks, which lead to complaints when occlusal loading is applied. Applying a suitable bonder normally eliminates the need for additional cavity lining.
Gluma® Desensitizer

**Description of the product**

Gluma Desensitizer has been in the market for over 10 years and has been used in over 45 million restorations worldwide to reduce hypersensitivity. Gluma Desensitizer penetrates up to 200µm into the exposed dentin tubuli where it forms multiple layers of protein septa thereby preventing intratubular movement following osmotic changes and preventing hypersensibilities.

**Composition:**
- (−hydroxyethyl-)methacrylate
- Glutardialdehyde
- Purified water

**Indications:**
- Reduction of sensitivity of exposed cervical areas which do not require restoration
- Reduction or prevention of postoperative sensitivity following preparation of teeth for direct or indirect restorations

**Advantages:**
- Highly effective yet easily handled
- No mixing, at a reaction time of only 30–60 secs., no light-curing required
- Initial efficacy
- Immediate pain reduction
- More effective than pure fluoridation
- Intradentinal effect, no surface film
- Clinically proven to be effective for at least 12 months
- Also used to good effect in combination with bonding agents
Clinical application

**Hypersensitivity**

1. [Diagram of a tooth with a green area and an arrow indicating sensitivity.]

2. [Diagram of a tooth with a blue area and an arrow indicating sensitivity.]

3. [Diagram of a tooth with a blue area and an arrow indicating sensitivity.]

4. [Diagram of a tooth with a blue area and an arrow indicating sensitivity.]

5. [Diagram of a tooth with a blue area and an arrow indicating sensitivity.]

**Crown preparation**

1. [Diagram of a tooth with a green area and a hammer.]

2. [Diagram of a tooth with a green area and a hammer.]

3. [Diagram of a tooth with a green area and a hammer.]

4. [Diagram of a tooth with a green area and a hammer.]

5. [Diagram of a tooth with a green area and a hammer.]

**Inlay**

1. [Diagram of a tooth with a green area and an arrow indicating sensitivity.]

2. [Diagram of a tooth with a green area and an arrow indicating sensitivity.]

3. [Diagram of a tooth with a green area and an arrow indicating sensitivity.]

4. [Diagram of a tooth with a green area and an arrow indicating sensitivity.]

5. [Diagram of a tooth with a green area and an arrow indicating sensitivity.]

Awards

Received a 4.5 @ 91% rating in Vol. 18, No. 10
Received a 4.0 @ 88% rating in Vol. 7, No. 1
Objective
The clinical trial assessed the ability of Gluma Dentin Bond* (= Gluma Desensitizer) to inhibit dentinal sensitivity in teeth prepared to receive complete cast restorations.

Materials and Methods
20 patients provided 76 teeth for the study. Following tooth preparation, dentinal surfaces were coated with either sterile water (control) or two 30-second applications of Gluma Dentin Bond* (test) on either intact or removed smear layers. Patients were recalled after 14 days for a test of sensitivity of the prepared dentin to compressed air, osmotic stimulus (saturated CaCl₂ solution), and tactile stimulation via a scratch test under controlled loads.

Results
A significantly lower number of teeth responded to the test stimuli for both Gluma groups when compared to the controls (p<0.01). No difference was noted between teeth with smear layers intact or removed prior to treatment with Gluma Dentin Bond*.

<table>
<thead>
<tr>
<th>Degree of response</th>
<th>Gluma Desensitizer/smear layer intact</th>
<th>Gluma Desensitizer/smear layer removed</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*: No sensation to stimulation</td>
<td>25</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>2*: Mild to moderate sensation, but little discomfort (nonlingering)</td>
<td>10</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>3*: Severe sensation or discomfort (lingering)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Conclusion
Within the experimental limitations of this investigation, the following conclusions can be drawn: 1. Compared to sterile water, Gluma Dentin Bond provided a significant reduction in dentin sensitivity when placed on exposed dentin of complete veneer crown preparations. 2. The presence of a dentinal smear layer had no appreciable effect on dentin sensitivity responses for either Gluma treatment group.

* Gluma Dentin Bond was the former name of Gluma Desensitizer
The desensitizing effect of Gluma® Desensitizer on hypersensitive dentin

**Objective**

The aim of this clinical trial was to investigate the effects of topical applications of Gluma 3 Primer* (= Gluma Desensitizer) or Gluma 2000 conditioning solutions on hypersensitive erosion/abrasion lesions.

**Materials and Methods**

Thirty-four patients were included in the trial with at least two teeth each presenting severe sensitivity. From a total of 116 teeth, 40 were treated with Gluma 3 Primer* (Heraeus Kulzer), 42 with Gluma 2000 Conditioner and 34 served as the control. Sensitivity was recorded as response to tactile and cold air stimuli prior to treatment as baseline, immediately after the topical application of the agents, after 1 week, 1 month and 6 months.

**Conclusion**

Single topical treatments of hypersensitive erosion/abrasion lesions with Gluma 3 Primer* and Gluma 2000 conditioning solutions, respectively, eliminated or at least significantly reduced dentin sensitivity throughout the 6 month observation time.

<table>
<thead>
<tr>
<th>Sensitivity score</th>
<th>Baseline</th>
<th>Post-treatment</th>
<th>1 week</th>
<th>1 month</th>
<th>6 months</th>
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<tbody>
<tr>
<td></td>
<td>GL</td>
<td>GT</td>
<td>CO</td>
<td>GL</td>
<td>GT</td>
</tr>
<tr>
<td>0</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>1</td>
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<td>14</td>
<td>10</td>
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<tr>
<td>3</td>
<td>22</td>
<td>24</td>
<td>10</td>
<td>–</td>
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</tr>
</tbody>
</table>

GL: Gluma 3 Primer*
GT: Gluma 2000 Conditioner
CO: Control Group

* identical to Gluma Desensitizer
Efficiency of desensitizing treatments with Gluma® Desensitizer

**Objective**
The purpose of this clinical investigation was to evaluate the effectiveness of four different treatments for teeth with severe sensitivity.

**Materials and Methods**
30 patients who already suffered from hypersensitive dentin for at least two months with unsuccessful treatments before that time were included in the study. 58 severe sensitive teeth were randomly assigned to four different treatment groups. A: 60s application of Gluma Primer® (= Gluma Desensitizer), B: 60s application of Gluma Primer® after using Gluma Cleanser, C: 60s application of Gluma 2000 Conditioner and D: application of the entire Gluma bonding system (Cleanser, Primer and Adhesive).

The treatment as described under D was used as a control since it was unethical to observe untreated hypersensitive dentin for one year. The sensitivity was recorded as a response to tactile and cold air stimuli before treatment, after the different topical applications, after one week, one month, six and twelve months.

**Conclusion**
Even a single topical application of Gluma Primer® without prior cleansing significantly reduced the severe hypersensitivity of exposed cervical dentin and was as effective as the more time consuming application of a total dentin adhesive system.

**Results**
All treatments showed a significant reduction of hypersensitivity between baseline and directly after application. No statistically significant difference could be calculated by Chi-square-tests between the four different groups up to the reevaluation after three months. The recording of the sensitivity after 6 and 12 months showed significantly more severely sensitive teeth in the group tested with Gluma 2000 Conditioner (group C). After one year for the group A (Gluma Primer*) 39 out of 48 teeth (81%), for group B (Gluma Cleaner + Gluma Primer*) 36 out of 44 (82%) and for group D (Gluma Bording System) 37 out of 48 teeth (77%) were still recorded without severe sensitivity but only 6 out of 49 teeth (11%) in group C (Gluma 2000 Conditioner). In this group the number of reapplications also was highest.

![Efficiency of Gluma Primer*](image)

<table>
<thead>
<tr>
<th>Level of pain:</th>
<th>Number of teeth</th>
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<tbody>
<tr>
<td>0–1</td>
<td>Baseline (60)</td>
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<tr>
<td>2–3</td>
<td>15 min (58)</td>
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<td></td>
<td>1 week (55)</td>
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<td></td>
<td>1 month (52)</td>
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<td>6 months (49)</td>
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<td>12 months (48)</td>
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</table>

* identical to Gluma Desensitizer
Clinical evaluation to
dentin hypersensitivity

Clinical Evaluation of Gluma 3 Primer to Dentin Hypersensitivity

Authors: Inoue, M., Yoshikawa, K., Okamoto, A., Kota, K., Fujii, B.,
Iwaku, M.

39: 768–776

Abridged version

Objective
The objective of this study was to evaluate pain reduction in
hypersensitive cervical regions immediately after applying
Gluma 3 Primer* (= Gluma Desensitizer) and during the
following 8 weeks.

Materials und Methods
This study was carried out at the conservative dentistry
departments of the Universities of Osaka and Niigata, using
the same protocol. A total of 82 teeth (60 patients) with
severe dentine hypersensitivity symptoms were involved in
this study. The pain causing stimulants were an air blast,
cold water or scratching with a dental probe. Gluma 3
Primer* was applied for 60 seconds. The effectiveness was
evaluated after intervals of 15 minutes, 1, 4 and 8 weeks.

* identical to Gluma Desensitizer

Conclusion
The authors confirmed that Gluma 3 Primer* is an effective
and reliable topical desensitizer for treating dentin hyper-
sensitivity. No side-effects were recorded in cases where
the site was kept completely dry with a rubber dam or where
it was kept relatively dry with cotton rolls.

Results
15 minutes after topical application, the dentin hypersensitivity had already been reduced considerably or eliminated
in 79 % of the teeth. This high initial effectiveness remained unchanged throughout the ensuing 8 week observation
period.

Pain reduction (stimulant air blast)

Pain reduction in %

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>20</th>
<th>40</th>
<th>60</th>
<th>80</th>
<th>100</th>
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<tbody>
<tr>
<td>15 min</td>
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<tr>
<td>1 week</td>
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<tr>
<td>4 weeks</td>
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<tr>
<td>8 weeks</td>
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</table>
Clinical effectiveness of Gluma® Desensitizer on tooth cervical hypersensitivity

Objective
To investigate the desensitising ability of a one-bottle agent and a glutaraldehyde-based HEMA formulation on sensitive tooth cervical areas for a period up to 9 months.

Materials and Methods
The sample consisted of 40 patients with cervical hypersensitivity. Three sensitive teeth per patient were treated; one received One-Step (one-bottle bonding agent, Bisco), the other Gluma Desensitizer (glutaraldehyde-based agent, Heraeus Kulzer) and the third distilled water (control group). The hypersensitivity level was determined before, immediately after the desensitising session, at 8 weeks, and 9 months post-treatment. Measurements of sensitivity were determined by the patient’s response to tactile and air-blast stimuli. A verbal rating scale was used and scored as follows: 0, no discomfort; 1, discomfort but no severe pain; 2, severe pain during stimulation; 3, severe pain after stimulation. The results were subjected to statistical analysis by Kruskal-Wallis test (α=0.05).

Conclusion
Even though the one-bottle agent tested may offer a short-term, adequate reduction of hypersensitivity, a significant reversal of the sensitivity may occur long-term, particularly for air-blast stimulation. The glutaraldehyde-based agent was proven more efficient in treating cervical sensitivity up to the 9-month follow-up.

Results
Both treatment procedures resulted in reduction of hypersensitivity to both stimuli, for up to 9 months. No significant differences were recorded between One-Step and Gluma Desensitizer at immediate and 8-week examinations, whereas Gluma Desensitizer produced lower hypersensitivity than One-Step at the 9-month assessment. In general, a lower level of reduction was found for the 9-month interval compared to the 8-week hypersensitivity score for both agents tested. A placebo effect was effected with water treatment, ranging from 4.7 to 27.5% reduction of hypersensitivity.
Effectiveness after periodontal therapy

Objective
The effectiveness of two desensitising agents were analyzed on 48 teeth of male and female patients who had presented with hypersensitive dentin after periodontal therapy.

Materials and Methods
Teeth were selected and divided into two groups of twenty-four according to the substance applied: group I (Oxagel, Art Dent) and group II (Gluma Desensitizer, Heraeus Kulzer). For the first section, all patients were instructed in oral hygiene, prophylaxis and their sensibility was evaluated using criteria proposed by Uchida et al. (J. Periodontol., 51: 10, p. 578–81, 1980). For evaluation tactile stimulus (pathfinder), air jet and thermic stimulus (cold) were employed. Solutions were applied and after seven days the patients returned for measuring the degree of sensitivity again and re-applying the desensitizing agents. This was continued for a period of four weeks and after this period a new evaluation was carried out after 60 days.

Conclusion
These data indicate that desensitising agents were efficient to decrease hypersensitive dentin after periodontal therapy.

Comment of Heraeus Kulzer:
Gluma Desensitizer effectively reduces hypersensitivity of dentin after periodontal therapy.

Results
Results of the present study corroborate that both groups underwent a medium percentual decrease exceeding 81% between initial and final analysis (two months).

![Reduction in sensitivity graph](image)

The references to the manufacturer’s name have been expanded by Heraeus Kulzer.
Influence of retention of cemented castings

Objective
This study determined whether a non-resin sealer applied to prepared dentin affected the retention of cemented castings.

Materials und Methods
Extracted molars were prepared with a flat occlusal, 20-degree taper and 4 mm axial length. The axial surface area of each preparation was determined and samples were distributed to achieve equivalent groups. Gluma Desensitizer (Heraeus Kulzer) sealer was used to seal the dentin before provisionalization and again before crown cementation. An Olympia alloy casting was produced for each preparation and cemented with a seating force of 20 KG with either Mizzy’s zinc phosphate (Mizzy Inc.), Ketac Cem glass ionomer (3M ESPE) or Resinomer material (Bisco) in combination with One Step adhesive (Bisco). Castings were thermocycled, then removed along the path of insertion with an Instron testing machine. A two-factor analysis of variance was used with $\alpha=0.05$ and $n=9–10$.

Conclusion
The use of the glutaraldehyde-based system as a desensitizing treatment for prepared teeth had no effect on crown retention for any of the three cements evaluated and the modified resin cement produced the highest mean dislodgement stress that exceeded the strength of the tooth.

Results
Mean dislodgement stresses for unsealed and sealed conditions were 6.3 and 6.4 MPa for zinc phosphate, 9.1 and 10.1 MPa for glass ionomer, and 12.1 and 12.6 MPa for the resin cement. The means for the three cements were statistically different ($p<0.001$). The effect of sealer ($p=0.369$) and cross product interactions ($p=0.820$) were not significant.

The references to the manufacturer’s name have been expanded by Heraeus Kulzer.
Influence of Desensitizers on Bond Strength of 2 Adhesive Systems at Dentin

Authors: Bedran de Caastro, A.K.B.; Aramal, C.M.; Shinohara, M.S.; Ambrosano, G.M.B.; Pimenta, L.A.F.
Abridged version

Objective
The aim of this study was to evaluate the influence of desensitizer agent treatment on the bond strength of two adhesive systems.

Materials und Methods
One hundred and fifty bovine incisors were mounted, their dentin polished, and divided into 10 groups (n=15): G1 – Singlebond/3M (SB); G2 – Excite/Vivadent (EX); G3 – Oxagel (OXA)+ SB; G4 – OXA + EX; G5 – Gluma Desensitizer/Heraeus Kulzer (GLU) + SB; G6 – GLU + EX; G7 – Desensibilizer/FGM (DES) + SB; G8 – DES + EX; G9 – Experimental/FGM (EXP) + SB; G10 – EXP + EX. In all groups, the dentin was etched with 37 % phosphoric acid. Soon after, the desensitiser, respectively the adhesive, was applied according to manufacturers' instructions. Then a resin (Z100, 3M ESPE) was inserted in a teflon matrix and cured. The specimens were stored under humidity for 7 days at 37 °C. The SBS tests were performed in an EMIC universal test machine with a crosshead speed at 0.5 mm/min. The mean values were analyzed with two-way ANOVA and Tukes Test (p<0.05) and the differences were expressed by different letters (p<0.05).

Conclusion
No significant difference was observed between the adhesive, the use of Gluma Desensitizer presented the higher values and OXA presented the lower values. It could be concluded that the use of desensitizer agents does not interfere with the bond strength of two adhesives.

Comment of Heraeus Kulzer:
The adhesives showed the highest bond strength in combination with Gluma Desensitizer.

Results
The values in MPa (SD) were: G1 = 13.07 (5.82); G2 = 13.00 (4.83); G3 = 10.21 (5.01); G4 = 10.57 (3.94); G5 = 15.77 (4.09); G6 = 13.55 (4.19); G7 = 11.17 (4.17); G8 = 13.31 (3.11); G9 = 12.18 (5.22); G10 = 12.57 (4.43).

<table>
<thead>
<tr>
<th>Bond strength in MPa</th>
<th>Gluma Desensitizer</th>
<th>Oxagel</th>
<th>Desensibilizer</th>
<th>Experimental</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPa</td>
<td></td>
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