

## Comparison of Mean Efficacy of Gluma and Ultraez Desensitizer to Decrease Hypersensitivity of Vital Abutment Teeth Prepared for Full Coverage Restoration

Hamid Bashir, Shoaib Rahim, Jawad Ali Shah, Zarah Afreen, Ammarah Afreen, Eruj Shuja

### ABSTRACT

**OBJECTIVE:** To compare the mean change in hypersensitivity between Gluma and Potassium Nitrate (UltraEz) desensitizers, on vital abutment teeth prepared for full coverage restorations.

**Study Design and Setting:** Randomized experimental study conducted at Watim Dental College, Rawalpindi, from February to August 2019.

**Methodology:** Total 100 patients were included in this study. Inclusion criteria consisted of both male and female patients with age ranging from 20-40 years, consisting of vital teeth and no active carious lesion. Two hours after tooth preparation, vital abutment tooth was stimulated with a blast of air and hypersensitivity of the vital abutment was measured using Visual Analog Scale (VAS). Then Gluma Desensitizer was applied on vital abutment for one minute, air dried and then rinsed. After Gluma Desensitizer application, the abutment tooth was again stimulated with a blast of air and hypersensitivity of the vital abutment was measured using VAS. All the data was entered and analysed using SPSS version 20.0. P values of less than or equal to 0.05 was considered significant.

**RESULTS;** All the teeth before tooth preparation had zero hypersensitivity. After preparation, Mean+ SD of hypersensitivity on VAS were 8.92 + 0.77 and 8.96 + 0.75 in Group A (Gluma) and Group B (UltraEz) respectively. After desensitizers application, Mean+ SD of hypersensitivity on VAS were 4.00 + 0.75 and 2.00 + 0.72 in Group A (Gluma) and Group B (UltraEz) respectively.

**CONCLUSION:** It was concluded that both desensitizers reduce Hypersensitivity but UltraEz Desensitizer (containing Potassium Nitrate) relieves Hypersensitivity to a greater extent than Gluma Desensitizer when used on vital teeth prepared for providing conventional Fixed Dental Prosthesis

**Keywords;** Desensitizer, Gluma, UltraEz, Potassium Nitrate, Hypersensitivity

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### INTRODUCTION:

Patients with missing teeth often report to the dental clinic for their replacement. One of the treatment options to replace

missing teeth is to provide conventional partial Fixed Dental Prosthesis (FDP) in which, one tooth (abutment) anterior to the edentulous span and one tooth (abutment) posterior to it are prepared to receive full coverage crowns (retainers). These abutments are often become hypersensitive during the pre-cementation period. The pre-cementation period is the time lapse between preparation of the abutments and the cementation of the FDP or restoration that could be 01 week to 10 days. This hypersensitivity during the pre-cementation period would not only cause discomfort to the patient but also could lead to necrosis of the pulp.<sup>1</sup> The preparation of tooth or abutment removes the protective layer enamel from the tooth and leaves the dentine exposed to the oral environment. Dentine is of sensitive nature due to its close association with the pulp and is usually not revealed because enamel or cementum normally covers the dentine.<sup>2</sup>

Dentine hypersensitivity is characterized by pain that arises from dentinal surfaces in reaction to various stimuli like hot and cold stimuli. Dentine hypersensitivity is confirmed only when all other likely conditions are clinically ruled out.<sup>3</sup> The most widely acknowledged theory to explain dentine hypersensitivity is the hydrodynamic theory. This theory describes that when a stimulus is applied to the exposed

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dentine surface, fluid flow in dentinal tubules is disturbed leading to stimulation of A- $\delta$  fibres near the odontoblasts.<sup>4</sup> This mechanism only works when dentinal tubules are opened at both ends, that is, exposed dentine surface and the pulp, and a stimulus on exposed dentine surface can stimulate the nerves near the odontoblasts through fluid flow alteration in the dentinal tubules. Sclerotic dentine, on the other hand, is non-sensitive.<sup>5</sup>

The relationship between the diameter of the dentinal tubule and the dentine hypersensitivity is described by Poiseuille law (fluid flow  $\times$  radius<sup>4</sup>) that two times increase in diameter would increase the fluid flow 16 times. Tubules in sensitive dentine are twice the diameter than that of non-sensitive dentine.<sup>6</sup> The two main treatment options for dentine hypersensitivity are either blocking the dentinal tubules or stabilizing the nerves. Gluma Desensitizer seals the dentinal tubules thus making hydrodynamic mechanism ineffective. Potassium Nitrate (UltraEz) increases the potassium ion concentration in the extracellular fluid, thereby causing the nerves to depolarize and also inhibiting their repolarization.<sup>7</sup> In a study conducted by Jalalian et al, the amount of hypersensitivity after applying Gluma Desensitizer was  $5.000 + 2.026$  (mean + S.D.) and for Potassium Nitrate was  $2.000 + 1.041$  (mean + S.D.).<sup>8</sup>

There is not much literature available regarding the efficacy of desensitizing agents on vital abutment teeth prepared for full coverage restorations. Furthermore, the effect of desensitizing agents on prepared vital teeth has not been studied in our population. Therefore; the aim of this study was to compare the mean change in hypersensitivity between Gluma and Potassium Nitrate (UltraEz) desensitizers, on vital abutment teeth prepared for full coverage restorations.

#### **METHODOLOGY:**

It was a randomized experimental study and ethical approval was obtained before study conduction from the institute. Inclusion criteria consisted of both male and female patients with age ranging from 20-40 years, consisting of vital teeth and no active carious lesion. Exclusion criteria consisted of patients having tooth hypersensitivity before tooth preparation, patients having periodontal disease associated with the abutment tooth, pregnant patients and patients using desensitizing agents or drugs like anti-inflammatory, analgesics 06 weeks before or during the study. As a protocol all patients presenting to the hospital were examined in Outpatient Department (OPD) and those patients who fulfilled the criteria were referred to Prosthodontic department.

A total of 100 patients were selected for this study based on above mentioned criteria and were asked regarding previous history of denture usage. The patients underwent history and complete oral examination after informed consent. On the basis of this information the patients were selected for the study according to the exclusion and inclusion criteria. The patients were allocated into two groups, Group A and

Group B by random allocation method (Randomization was done by a computer-generated random allocation sequence). In Group A patients, local anaesthesia was administered and tooth preparation for full coverage restoration / Retainer was carried out. Two hours after tooth preparation, vital abutment tooth was stimulated with a blast of air and hypersensitivity of the vital abutment was measured using Visual Analog Scale (VAS). Then Gluma Desensitizer was applied on vital abutment for one minute, air dried and then rinsed. After Gluma Desensitizer application, the abutment tooth was again stimulated with a blast of air and hypersensitivity of the vital abutment was measured using VAS.

In Group B patients, local anaesthesia was administered and tooth preparation for full coverage restoration / Retainer was carried out. Two hours after tooth preparation, vital abutment tooth was stimulated with a blast of air and hypersensitivity of the vital abutment was measured using VAS. Then UltraEz Desensitizer was applied on vital abutment for five minutes and then rinsed. After UltraEz Desensitizer application, the abutment tooth was again stimulated with a blast of air and hypersensitivity of the vital abutment was measured using VAS. Abutment teeth were then provided with provisional restorations. Definitive restoration was provided after two weeks. The scores recorded were filled in the Proforma.

All the data was entered and analysed using SPSS version 20.0. Descriptive statistics were calculated for both qualitative and quantitative variables. For qualitative variable like frequency and percentages were calculated. For variables like degree of hypersensitivity of teeth (before and after application of desensitizers and change in hypersensitivity) paired sample t-test was used. P values of less than or equal to 0.05 was considered significant.

#### **RESULTS:**

A total of n=100 patients were selected for this study and distributed in two equal groups, Group A and Group B, both groups having 50 patients each. The Mean + SD age of the patients  $32.13+4.76$  years. Mean + SD and the frequency of the hypersensitivity in Group A, before and after Gluma application has been illustrated in Figure-I and Figure-II respectively. Mean + SD and the frequency of the hypersensitivity in Group B, before and after UltraEz application was  $8.96+0.754$  and  $2.00+0.728$  respectively. Statistically significant difference was found in Hypersensitivity before and after desensitizer application in both Groups as illustrated in Table-I. Statistically significant difference was also found in Hypersensitivity between Group A and Group B (after desensitizer application), as illustrated in Table-II.

Statistically no significant difference was found in Hypersensitivity between males and females in Group-A before and after application of GLUMA with a p value of 0.525 and 0.710 respectively. Statistically no significant

difference was found in Hypersensitivity between males and females in Group-B before and after application of ULTRAEZ with a p value of 0.976 and 1.000 respectively. Statistically significant difference was found in Hypersensitivity between Group A Male and Group B Male, & Group A Female and Group B Female (after desensitizer application), with a p value of 0.001 for both. Group A and Group B were further stratified into two age-groups; Group 1: 20-30 years and Group 2: 31-40 years. Statistically no significant difference was found in Hypersensitivity between two age groups in Group A before and after application of GLUMA with a p value of 0.535 and 0.435 respectively. Statistically no significant difference was found in Hypersensitivity between two age groups in Group B before and after application of ULTRAEZ with a p value of 0.773

Figure-I: Histogram Illustrating Mean Hypersensitivity (Vas) Before Desensitizer (Gluma) Application In Group A Patients

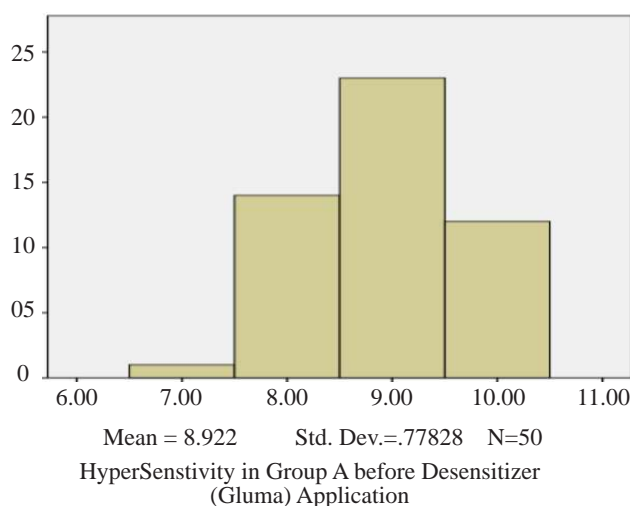


Figure-II: Histogram Illustrating Mean Hypersensitivity (Vas) After Desensitizer (Gluma) Application In Group A Patients

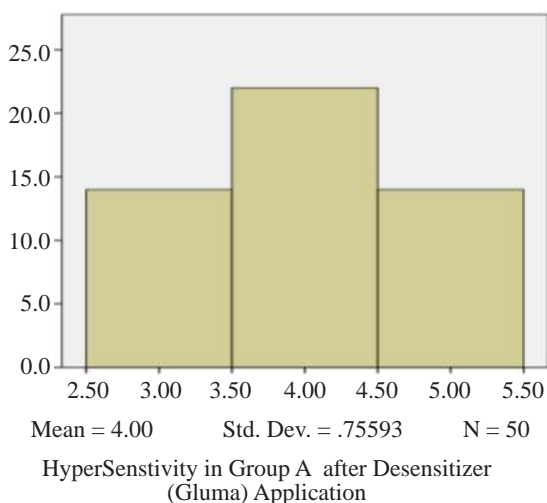


Table-I: Comparison of Mean Hypersensitivity (Vas) Before and After Application of Desensitizer

	Mean Hypersensitivity	P Value (Paired Sample t-test)
<b>Group A (GLUMA)</b>		
Before Application	8.92+0.77	0.001
After Application	4.00+0.75	
<b>Group B (ULTRAEZ)</b>		
Before Application	8.96+0.75	0.001
After Application	2.00+0.72	

Table-II: Comparison Of Mean Hypersensitivity (Vas) Between Group A And Group B After Desensitizer Application

	Mean Hypersensitivity	P value (Paired t-test)
After GLUMA Application	4.00+0.75	0.001
After ULTRAEZ Application	2.00+0.72	

and 0.429 respectively. Statistically significant difference was found in Hypersensitivity between Group A (20-30 Age Group) and Group B (20-30 Age Group), & Group A (31-40 Age Group) and Group B (31-40 Age Group) (after desensitizer application), with a p value of 0.001 both.

**DISCUSSION:**

Dentinal sensitivity is a common finding. It is often under-reported by the dental patient population or it is not diagnosed properly. The prevalence of dentin hypersensitivity has been reported to be 14.3% in all-dental patients. Maxillary premolars are found to be the most commonly affected teeth by dentin hypersensitivity. The maxillary first molars follow it with the incisors being the least sensitive. Pain and sensitivity is elicited on a vital tooth following tooth modification procedures.<sup>9,10</sup> Depending on the extent of preparation, the pain may be mild to severe. Mild pain can be managed with use of analgesics whereas severe pain may require elective endodontic procedures. Dentinal desensitizers have been introduced to counter the pain and hypersensitivity arising due to dentin hypersensitivity. Dentinal desensitizer may include lasers, calcium hydroxide and wide range of sealing systems. The nerve desensitization can be achieved with potassium nitrate, whereas agents such as HEMA and Glutaraldehyde can block dentinal tubules.<sup>11</sup> Desensitizing agents not only occlude the dentinal tubules at the surface (at the tubular orifice) but also at the subsurface (within the dentinal tubules) level thereby preventing the fluid flow. It has been suggested that prior to recording the impression, sealing of the dentinal tubules should be considered for tooth preparation on vital teeth.<sup>12</sup>

In 2009 Jalalian E et al compared three agents (Gluma, Potassium Nitrate and control) to decrease hypersensitivity

of vital teeth prepared for full coverage restorations.<sup>8</sup> Mean + SD of VAS on teeth treated with Gluma Desensitizer and Potassium Nitrate Desensitizer was 4.76 + 2.02 and 2.20 + 1.04 respectively whereas it was 3.71 + 1.00 and 1.71 + 0.91 in our study. Both desensitizers reduce the hypersensitivity significantly however ePotassium Nitrate (UltraEz) was found to be more effective in reducing sensitivity in this study as well as in our study<sup>8</sup>

In 2005, Pamir et al compared three desensitizing agents (5% Potassium Nitrate, 2% Sodium Flouride and Prompt L Pop) and found all the agents to be effective in reducing pain and discomfort with Mean +SD pain 1.6+0.3, 1.7+0.3 and 1.8+0.3 to thermal stimuli respectively. The results of this study showed that 5% Potassium Nitrate was mildly more effective than other two agents<sup>13</sup> In 2003, Frechoso et al compared two desensitizing agents (5% Potassium Nitrate Gel and 10% potassium Nitrate Gel) found the 10% potassium nitrate to be more effective and for longer duration than the 5% potassium Nitrate.<sup>14</sup> In another study three desensitizing agents were compared namely Bis Block Dentin Desensitizer (oxalate based), Systemp Desensitizer (glutaraldehyde based), and Tooth Mousse Desensitizer. Application of Systemp and GC Tooth Mousse Desensitizer resulted in 100% reduction in sensitivity level at the end of one week compared to Systemp Desensitizer (86%) .<sup>1</sup>

In 2008, Tengrungsun et al compared the desensitizing effect of GaAlAs Laser with Dentine bonding Agent and found the laser therapy to be less effective than dentine bonding agent.<sup>15</sup> In 2013, Joshi et al compared the dentinal tubules occlusion by NovaMin Desensitizer which is powder based, with Gluma Desensitizer which is liquid based under electron microscope. It was found that NovaMin Desensitizer occluded dentinal tubules almost completely and Gluma Desensitizer occluded dentinal tubules partially. Thus, NovaMin may be considered more effective in dealing with dentinal hypersensitivity compared to Gluma in relation to this study.<sup>16</sup>

In 2004, Duran et al compared five desensitizing agents including Gluma desensitizer and found VAS after gluma application to be 2.33 + 2.32 whereas it was 3.71 + 1.00 in our study.<sup>17</sup> In 2013, Larson et al compared the efficacy of Gluma Desensitizer with Potassium Nitrate in patients requiring crowns and FDPs before cementation and found Gluma to be more effective than Potassium Nitrate.<sup>18</sup> In a study conducted by Jamshed and colleagues in Altamash institute of Dental Medicine it was found that GLUMA desensitizer was statistically more effective in reducing the hypersensitivity compared to Flouride varnish with Mean+SD pain score 2.95+0.86 and 4.01+0.79 respectively.<sup>19</sup> In 2012, LMS Al-saud compared the occluding effect of Nd:YAG Laser with different desensitizers including Gluma Desensitizer. It was found that laser produced dentinal tubules occlusion in most areas whereas gluma produced dentinal tubules occlusion to lesser degree.<sup>20</sup>

The strength of our study was that it was a randomized experimental study and single operator applied the desensitizers to the subjects. The limitation of our study was that placebo effect could not be ruled out because of the absence of Control Group. Secondly, our study was limited only to conventional Fixed Dental Prosthesis. Teeth prepared for partial coverage restorations were not included in our study Similarly Resin Bonded Fixed Dental Prosthesis were also not included in the study as the amount of dentine exposed in such preparations is variable depending upon the preparation design.

## CONCLUSION:

The results of our study demonstrate that both desensitizers reduce Hypersensitivity but UltraEz Desensitizer (containing Potassium Nitrate) relieves Hypersensitivity to a greater extent than Gluma Desensitizer when used on vital teeth prepared for providing conventional Fixed Dental Prosthesis.

### Authors Contribution:

Hamid Bashir: Original Idea of research, statistics Literature Review  
Shoaib Rahim: Data collection statistics  
Jawad Ali Shah: Statistics literature review  
Zarah Afreen: Data collection literature review  
Ammarah Afreen: Data collection literature review  
Eruj Shuja: Literature review

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