

How to Cite:

El-Ghany, A. A. A., Elsayed, H. M., Goda, A. A., Abogabal, A. D., Sadek, G. E. M., & Dewedar, K. S. A. (2021). Effect of two desensitizing agents on post-operative hypersensitivity of composite resin restorations. *International Journal of Health Sciences*, 5(S1), 763–769.
<https://doi.org/10.53730/ijhs.v5nS1.14297>

Effect of two desensitizing agents on post-operative hypersensitivity of composite resin restorations

Ahmed Ata Abd El-Ghany

Assistant Professor of Operative Dentistry Al-Azhar University (Assiut branch),
Egypt
Email: dr.ahmadata@yahoo.com

Hosam Muhammed Elsayed

Lecturer of Dental Biomaterial Department -Alazhar university, Assiut branch,
Egypt
Email: Hossamahmed.46@azhar.edu.eg

Ahmed Ali Goda

Lecturer, Department of operative dentistry Faculty of Dental Medicine, Al-Azhar
University, Assuit, Egypt
Email: Ahmed.goda.82@azhar.edu.eg

Ahmed Dahy Abogabal

Department of Dental Biomaterials, Faculty of Dental Medicine (Boys), Assuit, Al-
Azhar University, Egypt
Email: ahmeddahy.4419@azhar.edu.eg

Galal Eldeen Mosaad Sadek

Lecturer in Dental biomaterials, Faculty of Dentistry, Al-Azhar University, Egypt
Email: galalsadek@hotmail.com

Karim Sherif Adly Dewedar

Lecturer of Crown and Bridge Al-Azhar University Cairo-Boys
Email: Karimadly.209@azhar.edu.eg

Abstract---Post-operative hypersensitivity still occurs although the improvements in adhesive systems and their techniques, so the current study was conducted to evaluate the efficacy of two desensitizing systems. Materials and methods: A total No. of 48 patients were randomly divided into 3 groups (n=16); Gluma group, SAD group, and control group. Class I cavity preparation and self-etch bonding technique was used by Universal bonding system in the control group, before that desensitizing agent was applied in the two

desensitizing tested groups, light cured and composite placement incrementally (Tetric N-ceram) and light cured, finishing, and polishing of composite restorations, then VAS system was used to record post-operative hypersensitivity by patients, and after 1 day, 1 week and 1 month the data collected and statistically analyzed. Results: Total number of patients who suffered from post-operative hypersensitivity was 15 patients (31.25 %) after one day of treatment, the total number decreased to 9 patients (18.75 %) after one week postoperatively, and after one month the total number decreased again to 4 patients (8.33 %). In all the tested groups 1 day gave a significant difference than one week ($P = 0.011^*$), when comparing the control group to the gluma group, the t-test gave a significant difference (0.0003^*) after one day, postoperatively, and when comparing the control group to the SAD group there was also significant difference (0.01^*) by using t-test ($P \leq 0.05$), but when comparing all the tested groups after one week and one month by using One-Way ANOVA test, there was no significant difference (P -value = 0.36). Conclusion: Desensitizing agents can decrease early post-operative hypersensitivity.

Keywords---desensitizing agents, Gluma, post-operative pain, hypersensitivity.

Introduction

The dentistry field has noticeable advances in the last few decades as well as advances in restorative dentistry, especially in bonding systems and restorative materials ⁽¹⁾. The recent bonding systems can achieve bonding to enamel and dentin effectively, but post-operative hypersensitivity remains a major concern for dentists after the placement of composite restorations. Patients suffer from pain at different intensities, it may be mild, moderate, or severe pain to different stimuli even if it was hypersensitivity to cold or hot drinks also pain with mastication was recorded, that complain may continue for one week and more post-operatively ⁽²⁾. According to different clinical studies, nearly 30% of patients reported post-operative hypersensitivity in posterior teeth ⁽³⁾. The hydrodynamic theory which has been widely accepted since 1960s demonstrates that as the dentinal fluid movement stimulates the nerve receptors causing transmission of stimuli, ⁽⁴⁾ so opened dentinal tubules in numerously after acid etching which widens the dentinal tubules and removing the smear layer increasing passage of external stimuli to elicit the dentinal fluid movement and stimulation of nerve endings reaching to the pulp ⁽⁵⁾.

The composite resin restorations can cause pulp irritation, so bonding technique should be performed carefully, especially in posterior teeth, so using of glass ionomer or resin-modified glass ionomer and desensitizing agents decreases post-operative hypersensitivity and subsequent pulp irritation and even pulp death ⁽⁶⁾. Dentin desensitizing agents treat post-

operative hypersensitivity by blocking the dentinal tubules ⁽⁷⁾. Gluma desensitizing agent (Heraeus Kulzer) is composed of Glutraldehyde hydroxyl methacrylate (HEMA) and blocks the dentinal tubules by coagulating the plasma proteins ⁽⁸⁾, while the SAD (Prevest Denpro Ltd, India) is composed of 2-hydroxylethyl-methacrylate (HEMA), benzalkonium chloride, sodium fluoride, and Potassium nitrate. SAD mechanism is based on that (HEMA) physically blocks the dentinal tubules. This study aims to compare the effect of Gluma and SAD as dentin desensitizing agents in class I composite resin restorations

Materials and Methods

A total no. of 48 patients were divided into 3 groups (n=16), the Gluma group, the SAD (Shield Active desensitizer), and the control group. Pulp vitality test confirmed the pulp vitality of all the tested teeth, patients' age ranging from 25 to 42 years old, males and females with carious upper or lower first molars indicated for cavity class I preparation and composite resin restorations. The teeth were free from old restorations, cracks, and periodontal diseases. And a minimum of 1 mm dentin bridge thickness is remaining.

Blinding

Consent was assigned by all patients, and accepted to share in the current study. They took a VAS visual analyzing system to record their response and randomized grouping to the patients achieved blinded data by the patient. Well -skilled operator was selected to perform all cases of the study; he didn't know any data about the test, or the materials used. The operator used the tested materials in covered bottles marked by a code and was informed to use them for both the tested groups and not used in the control group to achieve a double-blinded study.

Procedure

Tooth isolation by rubber dam, then class I cavity preparation was prepared by round bur no.45 (Mani Inc. Japan) and fissure bur no 245 (Mani Inc. Japan) under copious coolant and a high-speed contra angle hand piece (NSK Japan), then tooth drying and selective acid etching to enamel for 15 seconds, and rinsing for 30 seconds, gentle dryness to cavity followed by application of desensitizing agent with a micro brush to dentin for 30 seconds then application of Universal bonding system (BISCO France) for 30 seconds by over soaked micro brush, a dry micro brush was used to remove excess adhesive, slight air thinning then curing by LED (Elipar 3M ESPE USA) for 20 seconds. Tetric N- ceram (Ivoclar Vivadent Switzerland) composite was placed in increments of 2 mm and cured. In the control group no desensitizing agent was used. Finishing and polishing by Soflex kit (3M ESPE United Kingdom) of composite followed by selective grinding of any high spots, then repolishing. Then the data was collected and statistically analyzed by One-Way ANOVA test and t-test paired two samples for means.

Results

The total number of patients who suffered from post-operative hypersensitivity was 15 patients (31.25 %) after one day of treatment, the total number decreased to 9 patients (18.75 %) after one week postoperatively, and after one month the total number decreased again to 4 patients (8.33 %).

Table (1): the results of the tested groups

	One day		One week		One month	
	No. of patients	Mean	No. of patients			
Control	7 patients	0.4375	5	0.3125	2	0.125
Gluma	3 patients	0.1875	2	0.125	1	0.0625
SAD	5 patients	0.3125	2	0.125	1	0.0625

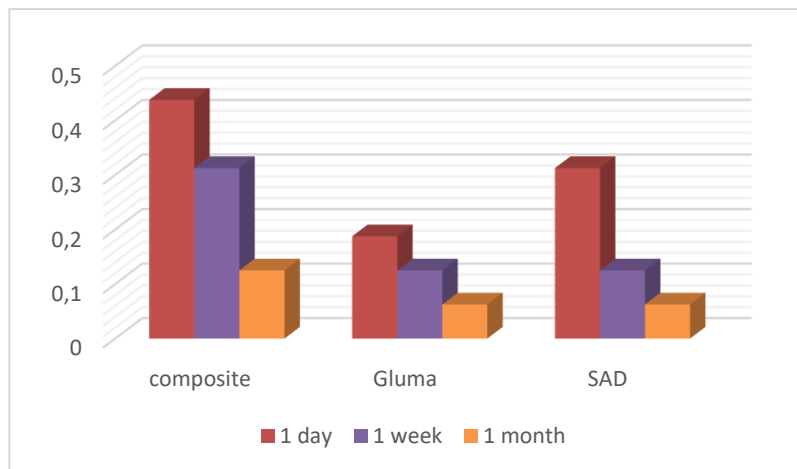


Figure (1): Chart showing mean values of post-operative pain in the tested groups

In all the tested groups 1 day gave a significant difference than one week ($P= 0.011^*$), when comparing the control group to the gluma group, t-test gave a significant difference (0.0003^*) after one day, postoperatively, and when comparing the control group to the SAD group there was also significant difference (0.01^*) by using t-test ($P \leq 0.05$), but when comparing all the tested groups after one week and one month by using One-Way ANOVA test, there was no significant difference ($P\text{-value}= 0.36$).

Discussion

The recent advances in adhesives and composite resin restorations increased the total number of composite restorations done. Many studies confirmed that there are three main factors for post-operative hypersensitivity: polymerization shrinkage, microleakage, and internal stresses that occur in tooth structure post

curing to composite resin ⁽⁹⁾ and more than 6% of sensitivity is related to the depth of cavity when increasing ⁽¹⁰⁾.

Total etch technique to dentin increases resin infiltration but it increased post-operative hypersensitivity, so self-etch introduced to practice but still, the complaint occurs, also the internal stresses of tooth structures during polymerization of composite resin may lead to internal cracks on pulpal floor causing pain with mastication, so the need for dentin desensitizing agents continued which doesn't interfere with bonding procedures and decrease the complaint postoperatively.

The component HEMA found in Gluma and SAD acts as a wetting agent for both glutaraldehyde and benzalkonium chloride. HEMA can penetrate the dentinal tubules and seals them, it also soluble in water so it allows penetration of glutaraldehyde to tubules to do a function of biological fixation by coagulating the proteins of the plasma in dentinal fluids and also glutaraldehyde inhibits the growth or any invasion of bacteria through the tooth restoration interface, the coagulated plasmatic proteins forming septa to prevent the disturbance of dentinal fluids by stimuli and canceling the hydrodynamic effect and so it desensitizes the tooth. The benzalkonium chloride has an antimicrobial effect and it precipitates in the cross-linking process of the bonding ⁽¹¹⁾.

In this study, Gluma and SAD desensitizing agents were compared in an in vivo study at one day, one week, and one month by using the Visual Analyzing System (VAS) to evaluate the subjective perception of post-operative hypersensitivity in a score of 0-10 recorded by the patient.

It was observed that decrease in sensitivity by time in all groups, but the control group at one day has significant higher results ($P \leq 0.05$) than that in desensitizing groups, Gluma groups achieved the least records for one day post-operatively. However, after one week, there is no significant difference between all the tested groups and also after one month, no significant difference was recorded between all the tested groups.

But overall Gluma has better performance than the control group and SAD group, that in agreement with Dondi and Malferrari ⁽¹²⁾. In a previous study conducted by Sobral et al ⁽¹³⁾, there is disagreement with the result of Gluma they found no significant difference with gluma for any stimulus.

According to the current study, only a small percentage of restored teeth undergo postoperative sensitivity when the restorative procedure is properly performed. That in agreement with Opdam et al., who proposed the postoperative sensitivity is one of the major factors determining the clinical success of composite resin restoration which is mainly related to the restorative technique employed by the clinician ⁽¹⁴⁾.

Limitations of the current study include short duration and limited sample size. Glutaraldehyde and HEMA in previous studies have cytotoxic reactions giving a question about the biocompatibility of desensitizing agents ^(15, 16); future research needs to answer this question.

Conclusion

Desensitizing agents can decrease early post-operative hypersensitivity.

References

1. Bhatti UA: The phenomenon of postoperative sensitivity and composite restorations-a review. JPDA. 2019, 28:34. 10.25301/JPDA.281.33
2. Sancakli HS, Yildiz E, Bayrak I, Ozel S: Effect of different adhesive strategies on the post-operative sensitivity of class I composite restorations. Eur J Dent. 2014, 8:15-22. 10.4103/1305-7456.126234
3. Ali M, Hussain S, Abdullah F, Baloch J, Soomro ZA, Sheikh A, Khan S: A comparison of post-operative sensitivity in composite resin restorations using total-etch and self-etch adhesive in posterior teeth. J Adv Med Res. 2020, 28:1-6. 10.9734/jammr/2020/v32i2330710
4. Perdigão J, Swift EJ Jr: Critical appraisal: post-op sensitivity with direct composite restorations. J Esthet Restor Dent. 2013, 25:284-8. 10.1111/jerd.12045
5. Swift EJ Jr, Lloyd AH, Felton DA: The effect of resin desensitizing agents on crown retention. J Am Dent Assoc. 1997, 128:195-200. 10.14219/jada.archive.1997.0164
6. Survashe M, Parekh M: Immediate post-operative sensitivity after composite resin restoration-a review of treatment protocol. Int J Dent Oral Heal. 2016, 2:16-23. 10.25141/2471-657X-2016-2.0046
7. Jayashankara CM, Imroze R, Jyothi KN: A comparative evaluation of vivasens and system desensitizers on shear bond strength of composite resin to human dentin: an in vitro study. IOSR J Dent Med Sci. 2018, 17:73. 10.9790/0853-1704167377
8. Akca T, Yazici AR, Celik C, Ozgünaltay G, Dayangaç B: The effect of desensitizing treatments on the bond strength of resin composite to dentin mediated by a self-etching primer. Oper Dent. 2007, 32:451-6. 10.2341/06-130
9. Deliperi S, Bardwell DN: An alternative method to reduce polymerization shrinkage in direct posterior composite restorations. J Am Dent Assoc. 2002, 133:1387-98. 10.14219/jada.archive.2002.0055
10. Auschill TM, Koch CA, Wolkewitz M, Hellwig E, Arweiler NB: Occurrence and causing stimuli of postoperative sensitivity in composite restorations. Oper Dent. 2009, 34:3-10. 10.2341/08-7
11. Dijkman GE, Jongebloed WL, de Vries J, Ogaard B, Arends J: Closing of dentinal tubules by glutardialdehyde treatment, a scanning electron microscopy study. Scand J Dent Res. 1994, 102:144-50. 10.1111/j.1600-0722.1994.tb01170.x
12. Patil SA, Naik BD, Suma R: Evaluation of three different agents for in-office treatment of dentinal hypersensitivity: a controlled clinical study. Indian J Dent Res. 2015, 26:38-42. 10.4103/0970-9290.156796

13. Sobral MA, Garone-Netto N, Luz MA, Santos AP: Prevention of postoperative tooth sensitivity: a preliminary clinical trial. *J Oral Rehabil.* 2005, 32:661-8. 10.1111/j.1365-2842.2005.01479.x
14. Opdam NJM, Roetrs FJM, Feizer AJ, Verdonschot EH: Marginal integrity and postoperative sensitivity in Class II resin composite restorations in vivo. *J Dent.* 1997, 26:562. 10.1016/s0300-5712(97)00042-0
15. Costa CA, Vaerten MA, Edwards C, Hanks CT: Cytotoxic effects of current dental adhesive systems on immortalized odontoblast cell line MDPC-23. *Dent Mater.* 1999, 1:434-41. 10.1016/s0109-5641(99)00071-8
16. Hanks CT, Strawn SE, Wataha JC, Craig RG: Cytotoxic effects of resin components on cultured mammalian fibroblasts. *J Dent Res.* 1991, 70:1450-5. 10.1177/00220345910700111201