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Original Article

Evaluation of Post-Operative Sensitivity of Nano Filled Composite Versus Bulk Filled Resin Composite in Posterior Class 2 Restoration

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ABSTRACT

Dental composites use adhesives to adhere and are thermally non-conductive. Despite advances in restorative dentistry, adhesive restorations may cause postoperative pain and fail. **Objective:** To compare and evaluate the post-operative sensitivity between nano resin composite using incremental technique and bulk filled resin composite using bulk filled technique in class 2 posterior restorations by assessing the post-operative pain and sensitivity. **Methods:** Two hundred and twenty patients who satisfied inclusion and exclusion criteria were lottery-divided into groups A and B. Nano resin composite was placed via incremental technique in Group A and bulk filled in Group B. Post-operative pain was assessed using Visual Analog Scale 0-10 at 24 hours and 7 days. **Results:** Male patients were 47 (42.7%) and 48 (43.6%), female patients were 63 (57.3%) and 62 (56.4%). Mean of pain was 2.39 ± 0.97 and 2.32 ± 0.81 at 24 hours postoperatively and 0.14 ± 0.63 and 0.00 at 7 days in group A and group B respectively. Pain level was mild in 97 (88.2%) and 105 (95.5%) patients, moderate in 13 (11.8%) and 5 (4.5%) after 24 hours, no pain in 105 (95.5%) and 110 (100.0%) and mild in 5 (4.5%) and 0 (0.0%) at 7 days in group A and group B, respectively. **Conclusion**: Bulk filled resin composite using bulk filled technique is more effective in class 2 posterior restorations as compared to nano resin composite using incremental technique.

INTRODUCTION

Patients frequently complain of sensitivity at various degrees and intensities, even when there is no indication of restoration failure [1]. Post-operative sensitivity after resin-based posterior restorations continues to be a concern for dentists, making it difficult to treat [2]. According to studies, post-operative sensitivity can occur in as little as 5% of cases and as much as 30% of case [3]. Nano resin composites are frequently applied materials in both anterior and posterior teeth for various restorative treatments [4]. However, because of the restricted light penetration, there are drawbacks such as difficulties in polymerizing deep cavities [5]. The application of an incremental technique, which is widely used for posterior tooth restorations, is the best way to overcome this problem [6]. To ensure adequate curing, this technique involves placing composite resin in increments with a maximum thickness of 2mm [7]. Despite being the most commonly used incremental technique for posterior tooth restoration, it has certain disadvantages, such as the time commitment, the lack of space between tooth layers, and

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the potential of contamination [8]. Recently, bulk filled resin with better mechanical and chemical properties have been introduced [4]. Bulk filled composites are a single component, fluoride-containing, clearly light cured radiopaque resin component that may be easily adapted to cavities in restoration [6]. It has conventional flowable composite handling properties, but it can be inserted in 4mm increments with minimum polymerization stress and increased curing depth [9]. According to certain research, placing composite resins in 4mm or 5mm thick increments might produce cuspal deformation and tension at the tooth-adhesive junction, which can manifest clinically as increased post-operative discomfort [7]. The viscosity of bulk fill composite resins is divided into two categories: high viscosity and low viscosity (flowable) compounds. Higher amounts of filler particles are present in high-viscosity bulk fill composites as compared to low-viscosity bulk fill composites. Thus, flowable composite resins conform more readily to cavity walls, but they exhibit more polymerization shrinkage and worse mechanical properties [10]. The findings of several in vitro investigations revealed that bulk fill composites do not increase marginal adaptation in class II cases; rather, the presence or lack of enamel at the restorative edge is a more relevant predictor of marginal adaptation [3]. Bulk-Fill resin has increased in popularity over the years because to its excellent characteristics, success in clinical performance, and flexibility of handling, and has therefore become the material of choice for dentists. Furthermore, its longevity indicates mechanical properties and resilience to tooth structure [11]. In one clinical research, the flowable bulk-fill composite technique was compared to the incremental composite technique in posterior restorations. They found no statistically significant difference between groups in the frequency of post-operative sensitivity following restoration procedure [12]. The purpose of this study is to compare the clinical effect of post-operative sensitivity between Bulk filled composite and incremental Nano resin composite. By comparing the Nano composite and Bulk filled composite we will be able to recommend the choice of restoration in class 2 posterior teeth with minimal post-operative sensitivity.

METHODS

In the period from January 2022 to December 2022, a comparative cross-sectional study using a non-probability convenience sampling method was carried out at the outpatient department (OPD) of the Institute of Dentistry, Department of Operative Dentistry, Liaquat University of Medical & Health Sciences (LUMHS), Jamshoro/ Hyderabad. The sample size calculation was done with equation [DEFF*Np(1-p)]/[(d2/Z21-α/2*(N-1)+ p*(1-p)]. The sample size calculated was 217. After adding 3 more samples to increase the power of study the final sample size was 220. Group A (Nano Resin Composite Using Incremental Technique): 110 Patients. Group B (Bulk Filled Resin Composite Using Bulk Filled Technique): 110 Patients. Patients that not exhibit any signs of deliberate/continuous dental pain with primary carious lesions and having shallow (2 to 3 mm) and mid-sized (3 to 5 mm) cavity depths were enrolled in the research. Patients who had class II molars and premolars in their maxilla and mandibles and needed resin composite restorations as well as those who occluded natural or crown-covered oppositional teeth were also considered. Patients having un-erupted tooth or partially erupted tooth, fractured or visibly cracked teeth patients with poor hygiene and having heavy bruxism habits, periodontal problems and pathologic pulpal diagnosis with pain (Non vital) were excluded from study. Before beginning treatment, all patients provide written informed consent. A brief explanation of the examinations was provided to participants. To evaluate the pulp condition, sensitivity tests with ethyl chloride were performed. For each selected tooth, periapical radiographs were taken to assess the cavity's proximity to the pulp. Local anaesthesia was applied (Inferior alveolar nerve block/infiltrate). Cotton rolls and a saliva aspirator were used to insulate the working field during the procedure. Cavity preparations were done using round-ended carbide bur was used to help create a rounded cavo surface. Using a (CPITN) periodontal probe against the mesial and distal marginal ridges, the depth of each cavity preparation was determined to be 3 mm and 5 mm, correspondingly. On the enamel edge and then the dentin walls of each cavity, 37 percent phosphoric acid was applied for 15 seconds, washed off, and then gently dried. Dentsply, Detrey, Germany's Prime and Bond was used, and it was exposed to light for 20 seconds to cure. Before to the restorative operations, sectional matrices (Palodent plus, Dentsply) were used. The lottery approach was used to split the patients into two groups. Nano resin composites were put in group A using an incremental approach, while bulk filled resin composites were inserted in group B using a bulk filled technique. Using a VAS of 0 to 10, the post-operative pain level was assessed at 24 hours and seven days after surgery. (0: no pain; 1-3: minor discomfort; 4–7: medium discomfort; 8–10: severe discomfort). Every patient received instructions to complete a VAS scale at home. The Statistical Package for Social Science (SPSS) software, version 23.0, was used to analyse the data. For qualitative factors including gender, post-operative discomfort, tooth type, and efficacy, frequencies and percentages were determined. Chi square test was used to compare the efficacy of the two groups,

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with p=0.05 being seen as a significant value. With stratification, cofounders like gender and tooth type will be managed.

RESULTS

In this study 47 (42.7%) and 48 (43.6%) patients were male and 63 (57.3%) and 62 (56.4%) patients were female in group A (nano resin composite using incremental technique) and group B (bulk filled resin composite using bulk filled technique) respectively. On applying chi-square test p-value was 0.892 (non-significant) (Table 1).

Table 1. Patients distribution according to gender (n=220)

Gender	Group A	Group B	P-Value
Male	47 (42.7%)	48 (43.6%)	0.892
Female	63 (57.3%)	62 (56.4%)	
Total	110 (100.0%)	110 (100.0%)	

Enrolled patients tooth were grouped as; maxillary 1st premolar in 10 (9.1%) and 17 (15.5%) patients, maxillary 2nd premolar in 23 (20.9%) and 16 (14.5%) patients, maxillary 1st molar in 19 (17.3%) and 16 (14.5%) patients, maxillary 2nd molar in 4 (3.6%) and 4 (3.6%) patients, mandibular 1st premolar in 12 (10.9%) and 18 (16.4%) patients, mandibular 2nd premolar in 17 (15.5%) and 17 (15.5%) patients, mandibular 1st molar in 21 (19.1%) and 17 (15.5%) patients and mandibular 2nd molar in 4 (3.6%) and 5 (4.5%) patients in group A and group B respectively (Table 2).

Table 2. Patients distribution according to type of tooth (n=220)

Type of Tooth	Group A	Group B	P-Value
Maxillary 1st Premolar	10 (9.1%)	17 (15.5%)	0.71
Maxillary 2nd Premolar	23 (20.9%)	16 (14.5%)	
Maxillary 1st molar	19 (17.3%)	16 (14.5%)	
Maxillary 2nd molar	4 (3.6%)	4 (3.6%)	
Mandibular 1st Premolar	12 (10.9%)	18 (16.4%)	
Mandibular 2nd Premolar	17 (15.5%)	17 (15.5%)	
Mandibular 1st Molar	21 (19.1%)	17 (15.5%)	
Mandibular 2nd Molar	4 (3.6%)	5 (4.5%)	
Total	110 (100.0%)	110 (100.0%)	

Mean and standard deviation of post-operative pain after 24 hours was 2.39 ± 0.97 (1-5) and 2.32 ± 0.81 (1-4) in group A and group B respectively, p-value was 0.547 (non-significant). Mean and standard deviation of post-operative pain after 7 days was 0.14 ± 0.63 (0-3) and 0.00 in group A and group B respectively, p-value was 0.024 (significant) (Table 3).

Table 3. Mean and SD of postoperative pain

Mean ± SD	Group A	Group B	P-Value
After 24 Hours	2.39 ± 0.97	2.32 ± 0.81	0.547
After 7 Days	0.14 ± 0.63	0.00	0.024

Post-operative pain after 24 hours was distributed into; mild pain in 97 (88.2%) and 105 (95.5%) patients and moderate pain in 13 (11.8%) and 5 (4.5%) patients in group A) and group B) respectively (Table 4).

Table 4. Patients distribution according to post-operative pain level after 24 hours (n=220)

Pain	Group A	Group B	P-Value
Mild Pain	97 (88.2%)	105 (95.5%)	0.049
Moderate Pain	13 (11.8%)	5 (4.5%)	
Total	110 (100.0%)	110 (100.0%)	

Post-operative pain after 7 days was distributed into; no pain in 105 (95.5%) and 110 (100.0%) patients and mild pain in 5 (4.5%) and 0 (0.0%) patients in group A) and group B) respectively (Table 5).

Table 5. Patients distribution according to post-operative pain level after 7 days (n=220)

Pain	Group A	Group B	P-Value
No Pain	105 (95.5%)	110 (100.0%)	0.024
Mild Pain	5 (4.5%)	0 (0.0%)	
Total	110 (100.0%)	110 (100.0%)	

DISCUSSION

Post-operative sensitivity has increased with the introduction of posterior composite resin restorations and is now a common clinical issue [13]. Managing post-operative sensitivity may be challenging. Individuals frequently complained of sensitivity at various degrees and intensities, frequently without any obvious signs of the restoration's inadequacy [14, 15]. Technologies for composite resins and adhesives has advanced quickly. Considering these advancements, composite restorations' post-operative sensitivity remains a problem for clinicians [16]. Different studies from the world reports the different results regarding sensitivity associated with Resin Composite in Posterior Class 2 Restoration. When Opdam NJ [17] looked at premolar restorations that were planned for extraction utilizing two bonding agents and two composite implantation procedures, post-operative sensitivity was added as a secondary endpoint of concern. 14% of restorations showed sensitivity during the first recall, which lasted between 5 and 7 weeks, whereas 56% of restorations showed occlusal loading (mastication) sensitivity. A mix of Class I to Class V restorations totaling 356 were placed in 117 patients across 5 clinics for the clinical study of a novel RBC composition [18]. Significant sensitivity led to the replacement of 2% of the restorations overall, and another 5% of them still showed sensitivity after one week. 7% (4 of 57) of patients in another trial comparing RBC formulations experienced post-operative sensitivity; nevertheless, the study included no information on the severity of the problem [19]. Yet, in a 2-year clinical trial of RBC restorations with or without a flowable liner, there was no post-operative sensitivity found [20]. Yip et al identified at 1 week a cold sensitivity in 7% of restorations for one RBC formulation as opposed to 3% for another in a research assessing Class I and Class II

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restorations while employing the same dentin bonding agent [21]. Most recently, post-operative sensitivity caused 3% (1 each) of 35 Class I restorations of micro hybrid, packable, or nano filled composite restorations to be changed within six months (evaluated at baseline, 2 weeks, and 6 months post-operatively) [22]. Logistic regression revealed that the three variables used in the study—cavity depth, calcium hydroxide liner, and restorative material—had no statistically substantial impact on the emergence of pain or sensitivity in another study that included arbitrary utilization of a CaOH liner in 123 patients with 1 restoration each [23]. According to a research by Afifi et al, utilizing total-etch adhesive approach and self-etch adhesive approach, there was no statistically substantial difference between the two kinds of resin composites (bulk fill resin composite and incremental nano resin composite) after one day, one week, or one month [24]. Additionally, there was no statistically significant difference between the two adhesive systems after one day, one week, and one month when the two adhesive methods were tested utilizing incremental Nano resin composite and Bulk Fill resin composite. The reduced post-operative sensitivity was ascribed by Asghar et al to the bulk-fill composites' lesser post-gel shrinkage [25]. Nonetheless, it was noted that post-operative sensitivity is patient related, with variations in individuals' pain thresholds and levels of unpleasantness.

CONCLUSIONS

It was concluded from the study that bulk filled resin composite using bulk filled technique is more effective in class 2 posterior restorations in management of post-operative sensitivity as compared to nano resin composite using incremental technique measured post-operatively, at 24 hours and on 7th day post-operatively using Visual Analog Scale.

Authors Contribution

Conceptualization: FR, SC
Methodology: SA
Formal analysis: AB
Writing-review and editing: HJ, HF

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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REFERENCES

[1] Sabbagh J, Fahd JC, McConnell RJ. Post-operative sensitivity and posterior composite resin restorations: a review. Dental Update. 2018 Mar; 45(3): 207-13. doi: 10.12968/denu.2018.45.3.207

[2] Alomari Q, Omar R, Akpata E. Effect of LED curing modes on postoperative sensitivity after Class II resin composite restorations. Journal of Adhesive Dentistry. 2007 Oct; 9(5): 477-81.

[3] Anwer Bhatti U. The phenomenon of postoperative sensitivity and composite restorations - a review. Journal of the Pakistan Dental Association. 2019 Feb; 28(01): 33-40. doi: 10.25301/JPDA.281.33

[4] Gupta R, Tomer AK, Kumari A, Mullick S, Dubey S. Bulkfill flowable composite resins-A review. International Journal of Applied Dental Sciences. 2017; 3(2): 38-40.

[5] Monteiro GQDM, Montes MAJR, Rolim TV, Mota CCBDO, Kyotoku BDBC, Gomes ASL, et al. Alternative methods for determining shrinkage in restorative resin composites. Dental Material. 2011 Aug; 27(8): e176-85. doi: 10.1016/j.dental.2011.04.014

[6] Akarsu S and Karademir AS. Influence of bulk-fill composites, polimerization modes, and remaining dentin thickness on intrapulpal temperature rise. Biomed Research International. 2019 Dec; 2019: 1-7. doi: 10.1155/2019/4250284

[7] Costa TR, Rezende M, Sakamoto A, Bittencourt B, Dalzochio P, Loguercio AD, et al. Influence of adhesive type and placement technique on postoperative sensitivity in posterior composite restorations. Operative Dentistry. 2017; 42(2): 143-54. doi: 10.2341/16-010-C

[8] Reis AF, Vestphal M, AMARAL RC, Rodrigues JA, Roulet JF, Roscoe MG. Efficiency of polymerization of bulk-fill composite resins: a systematic review. Brazilian oral research. 2017 Aug; 31: 37-48. doi: 10.1590/1807-3107bor-2017.vol31.0059

[9] Par M, Repusic I, Skenderovic H, Klaric Sever E, Marovic D, et al. Real-time light transmittance monitoring for determining polymerization completeness of conventional and bulk fill dental composites. Operative Dentistry. 2018 Jan; 43(1): 19-31. doi: 10.2341/17-041-L

[10] Dionysopoulos D, Tolidis K, Gerasimou P. Bulk fill composite resins. A novelty in resin-based restorative materials. ARC Journal of Dental Science. 2016; 1(2): 1-3. doi: 10.20431/2456-0030.0102001

[11] De Matos JD, Nakano LJ, Lopes GD, Bottino MA, de Vasconcelos JE, de Jesus RH, et al. Characterization of Bulk-Fill resin composites in terms of physical, chemical, mechanical and optical properties and clinical behavior. International Journal of Odontostomatology. 2021; 15(1): 226-33. doi: 10.4067/S0718-381X2021000100226

DOI: https://doi.org/10.54393/pjhs.v4i04.645

[12] Ragab H. Postoperative sensitivity and clinical evaluation of posterior composite restorations in medium and deep cavities placed using two insertion techniques (two-years-randomized clinical study). Egyptian Dental Journal. 2018; 64(1): 753-65. doi: 10.21608/edj.2018.78087

[13] Sabbagh J, Fahd JC, McConnell RJ. Post-operative sensitivity and posterior composite resin restorations: a review. Dental Update. 2018 Mar; 45(3): 207-13. doi: 10.12968/denu.2018.45.3.207

[14] Porto IC. Post-operative sensitivity in direct resin composite restorations: clinical practice guidelines. International Journal of Development Research. 2012; 1: 1-2.

[15] Akpata ES, Sadiq W. Post-operative sensitivity in glass-ionomer versus adhesive resin-lined posterior composites. American Journal of Dentistry. 2001 Feb; 14(1): 34-8.

[16] 16.Aboelenein AZ, Riad MI, Haridy MF. Effect of a self-etch adhesive containing nanobioglass on postoperative sensitivity of posterior composite restorations-a randomized trial. Open access Macedonian journal of medical sciences. 2019 Jul; 7(14): 2313-30. doi: 10.3889/oamjms.2019.585

[17] Opdam NJ, Feilzer AJ, Roeters JJ, Smale I. Class I occlusal composite resin restorations: in vivo post-operative sensitivity, wall adaptation, and microleakage. American journal of dentistry. 1998 Oct; 11(5): 229-34.

[18] Rosin M, Steffen H, Konschake C, Greese U, Teichmann D, Hartmann A, et al. One-year evaluation of an Ormocer restorative-a multipractice clinical trial. Clinical Oral Investigations. 2003 Mar; 7: 20-6. doi: 10.1007/s00784-002-0189-9

[19] van Dijken JW and Sunnegårdh-Grönberg K. A two-year clinical evaluation of a new calcium aluminate cement in Class II cavities. Acta Odontologica Scandinavica. 2003 Jan; 61(4): 235-40. doi: 10.1080/00016350310004575

[20] Efes BG, Dörter C, Gömec Y, Koray F. Two-year clinical evaluation of ormocer and nanofill composite with and without a flowable liner. Journal of Adhesive Dentistry. 2006 Mar 1; 8(2): 119-26.

[21] Poon EC, Smales RJ, YIP KH. Clinical evaluation of packable and conventional hybrid posterior resin-based composites: results at 3.5 years. The Journal of the American Dental Association. 2005 Nov; 136(11): 1533-40. doi: 10.14219/jada.archive. 2005. 0083

[22] Sadeghi M, Lynch CD, Shahamat N. Eighteen-month clinical evaluation of microhybrid, packable and nanofilled resin composites in Class I restorations. Journal of oral rehabilitation. 2010 Jul; 37(7): 532-7. doi: 10.1111/j.1365-2842.2010.02073.x

[23] Wegehaupt F, Betke H, Solloch N, Musch U, Wiegand A, Attin T. Influence of cavity lining and remaining dentin thickness on the occurrence of postoperative hypersensitivity of composite restorations. Journal of Adhesive Dentistry. 2009 Mar 1; 11(2): 137-41.

[24] Afifi SMH, Haridy MF, Farid MR. Evaluation of post-operative sensitivity of bulk fill resin composite versus nano resin composite: a randomized controlled clinical study. Open access Macedonian journal of medical sciences. 2019 Jul; 7(14): 2335-42. doi: 10.3889/oamjms.2019.656

[25] Asghar S, Ali A, Rashid S. Assessment of post-operative sensitivity in posterior resin-based composite restorations with two placement techniques. Journal of the Pakistan Dental Association. 2013 Apr; 22(2): 98-103.