

Compare the Percentage of Postoperative Sensitivity Between Amalgam and Composite in Patients Undergoes Dental Restorative Treatment

Postoperative Sensitivity Between Amalgam and Composite in Dental Restorative Treatment

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ABSTRACT

Objective: To compare the percentage of postoperative sensitivity between amalgam and composite in patients undergoes dental restorative treatment.

Study Design: Randomized Control Trial study

Place and Duration of Study: This study was conducted at the Department of Operative Dentistry, Bibi Aseefa Dental College @ Shaheed Mohtarma Benazir Bhutto Medical University, Larkana, Sindh, from March 2022 to February 2023.

Materials and Methods: Permission was taken from the ethical committee of the hospital. Fully informed written consent was taken from all the patients. Complete history and physical examination was carried out in all the patients. Patients were divided into two groups, group A was treated with composite material and B was treated with amalgam restorative material. SPSS version 23 was used for data analysis. Tests of significance chi square and t-test were applied. P-value ≤ 0.05 was taken as statistically significant.

Results: POS after 24 h was 15.0%, 38.5%, 47.6% for shallow, medium, and deep cavities, respectively with no significant differences ($P > 0.05$). However, in all studied periods the percentage was 8.8%, 14.6%, 22.6% for shallow, medium, and deep cavities, respectively and revealed significant differences ($P < 0.05$).

Conclusion: It is concluded that POS% (Postoperative Sensitivity) is higher in amalgam restorations particularly in deep cavities and it doesn't depends on preparation design.

Key Words: Composite, Amalgam, Class I, II caries, Post-operative sensitivity, Percentages.

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INTRODUCTION

Post-operative sensitivity can occur after dental restorations, including different restorations¹. The sensitivity experienced by a patient can vary based on several factors, including the individual's oral health, the size and location of the restoration, and the technique used during the procedure². Historically, dental schools commonly taught the use of amalgam (a mixture of metals) as the primary restorative material for Class I and II cavities.

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However, there has been a shift in dental education to promote the use of resin composite restorations as an alternative³.

Amalgam restorations are made of a mixture of metals, including silver, tin, copper, and mercury⁴. Post-operative sensitivity associated with amalgam restorations is relatively low. The metallic nature of amalgam restorations provides good thermal conductivity, which helps minimize sensitivity to temperature changes⁵. However, some patients may experience mild sensitivity after an amalgam restoration. This sensitivity is usually temporary and can be attributed to the galvanic response, leakage⁶.

Composite resin restorations are tooth-colored restorations made of a mixture of plastic and glass particles⁷. They are bonded to the tooth structure using adhesive techniques. While composite resin restorations offer excellent esthetics, they can be more prone to post-operative sensitivity compared to amalgam restorations⁸.

The potential causes of post-operative sensitivity for composite resin restorations include polymerization shrinkage, bonding technique and depth of the restoration. If the composite restoration is deep and

close to the tooth pulp, it can cause more post-operative sensitivity than shallower restorations⁹. Dentists take several precautions to minimize post-operative sensitivity, such as using desensitizing agents, ensuring proper isolation and bonding techniques, and managing any underlying dental conditions¹⁰.

MATERIALS AND METHODS

Ethical approval was obtained from the Ethical Committee at Bibi Aseefa Dental College @ Shaheed Mohtarma Benazir Bhutto Medical University, Larkana, Sindh. Study was conducted at department of Operative Dentistry from March 2022 to February 2023. Informed consent was obtained from each patients before proceeding with the treatment. Postoperative sensitivity was defined as pain (VAS>3) in a tooth associated with mastication or with contact with hot, cold, sweet or sour stimuli that occurs 1 week or more post-treatment. Class I Restoration: Class I restoration involving pits and fissures on occlusal third or occlusal two thirds of molars and premolars. Class I Restoration: Class I restoration involving the proximal surfaces of molars and premolars. Visual analog score is an instrument 0-10, which is to measure a characteristic that varies gradually over a range of values and cannot be easily measured. Score >3 will be taken as sensitivity positive. A total sample size of 150 is selected, 75 in both groups. Confidence level is set at 95%, power of study 80% frequency of postoperative sensitivity in composite and amalgam restorations as 8.5% and 23.3% respectively.

Both male and female were included, amalgam and composite Class I and II restorations in posterior teeth. A restoration in which pain associated with clenching in restored teeth is usually excluded because it indicates a restoration in hyper occlusion. Teeth were prepared for restorations based on the extension of caries. The choice of restoration material, either amalgam or composite, was determined randomly according to the specific cases requested by the students involved. Caries evacuation was done by using high speed

rotating cutting instruments and after removal of caries prepared depth was measured by using Williams probe inserting it to the deepest point of cavity and cavities were classified as shallow, medium and deep. Following standard protocols cavities were restored with amalgam in group A and composite in group B. After 24 hours time period patients were assessed for post operative sensitivity using USPHS criteria.

Analysis of data was done with SPSS-11 software. Standard deviation and mean values of different parameters such as VAS score, age and duration of caries were calculated. Qualitative variables like post-operative sensitivity and gender were represented in the form of frequency and percentage. Comparison between both groups was done with chi square test for categorical data and with t test for numerical data. Level of significance was 5%. Probability value less or equal to 0.05 was considered as significant.

RESULTS

A total of 150 patients enrolled and divided into two groups as Group A (Composite restoration) n=75 (50.0%) and Group B (amalgam restoration) n=75 (50.0%). The mean age of Group A was 42.81±9.24 years. There were more males than females i.e. n=41 (54.7%) and n=34 (45.3%) respectively. The mean duration of caries of Group A was 2.85±1.69 months. Type of prepared cavity noted as shallow, medium and deep in n=26 (34.7%), n=31 (41.3%) and n=18 (24.0%) patients, respectively. The mean VAS score of the Group A was 1.67±1.04. Mean age of Group B was 30.09±5.11 years. There were n=53 (70.7%) patients between 20-40 years and n=22 (29.3%) patients between 41-60 years of age. There were males n=31 (41.3%) and n=44 (58.7%) females. The mean duration of caries of Group B was 5.52±1.71 months. There were n=34 (45.3%) patients had duration of caries <3 months and n=41 (54.7%) had >3 months. Type of prepared cavity noted as shallow, medium and deep in n=23 (30.7%), n=28 (37.3%) and n=24 (32.0%) patients, respectively.

Table No.1: Demographics and study variables

Characteristics	Group A	Group B	P Value
Age	42.81±9.24 years	30.09±5.11	0.000
Duration of carries	2.85±1.69	5.52±1.71	0.000
Mean ± S.D	1.67±1.04	2.31±2.23	0.026
Male	n=41 (54.7%)	n=31 (41.3%)	0.102
Female	n=34 (45.3%)	n=44 (58.7%)	
Type of prepared cavity			
Shallow	n=26 (34.7%)	n=23 (30.7%)	0.551
Medium	n=31 (41.3%)	n=28 (37.3%)	
Deep	n=18 (24.0%)	n=24 (32.0%)	
Postoperative sensitivity			
Yes	n=11 (14.7%)	n=25 (33.3%)	0.007
No	n=64 (85.3%)	n=50 (66.7%)	

The mean VAS score of the Group A was 2.31 ± 2.23 . The differences were statistically significant except type of prepared cavity, ($p=0.551$). Post-operative sensitivity in Group A and Group B was observed as $n=11$ (14.7%) and $n=25$ (33.3%), respectively. The difference was statistically significant, ($p=0.007$). It was concluded that composite restoration was better than amalgam restoration (Table. 1).

DISCUSSION

Retention for amalgam restorations, the dentist typically needs to create undercuts, grooves, or slots within the tooth structure¹¹. These features help to lock the amalgam material in place and prevent it from dislodging during normal oral functions like chewing. However, the process of creating these retention features may require the removal of sounder tooth structure compared to other restorative materials that rely on bonding.

In this study mean age of Group A was 42.81 ± 9.24 years and post-operative sensitivity was observed in 33.3% cases in amalgam group and 14.7% in composite group and in 30.09 ± 5.11 years in amalgam group. A study was conducted by Al-Nahlawi et al¹² and reported similar finding, more sensitivity was found in amalgam group as compared to composite 18.1% and 9% respectively. Contrast findings were reported in an other study that there was no difference in terms of post operative sensitivity between amalgam and composite.

Overall, bonding agents can provide sealing to dentinal tubules, reducing sensitivity and minimizing microleakage. Composite resin, when compared to amalgam, has less thermal conductivity, which can be beneficial for patients in terms of sensitivity to temperature changes¹³. Regarding thermal conductivity, amalgam and composite resin have different properties. It is known for its good thermal conductivity, which means it can quickly transfer heat or cold from the tooth to the surrounding environment. This characteristic can lead to sensitivity when consuming hot or cold substances.

Type of prepared cavity noted as shallow, medium and deep in 30.7%, 37.3% and 32.0% patients, respectively. Studies conducted by Auschill et al¹⁴ and Unemori et al¹⁵ reported that depth of cavity is also associated with sensitivity, as observed in both studies deep cavity is more prone to vascular supply and sensitivity factors. But in Al-Nahlawi et al¹² study sensitivity is common in shallow cavities.

In another study by Briso et al¹⁶ it was reported that occurrence of sensitivity is correlated with the complexity of the restoration is not universally true. While there may be instances where more complex restorations can contribute to increased sensitivity. In another study by Kemaloglu et al²⁰ reported that composite restorations have capabilities to decrease

post operative sensitivity. Amalgam restorations also have ability but comparatively lesser efficacy.

CONCLUSION

Amalgam restorations have a higher incidence of postoperative sensitivity compared to composite restorations, each patient's experience can vary. Factors such as individual sensitivity, the dentist's skill, proper isolation during the procedure, and the quality of materials used can influence the occurrence of postoperative sensitivity in both types of restorations.

Limitations: Small sample and single center range of sample are main limitation of this study, Secondly, mostly population of this study belongs to remote or backward areas of region they refuse to participate in research process because of social and religious restrictions.

Clinical Implications: Amalgam restorations, which require more removal of tooth structure to achieve sufficient retention, can indeed result in a higher incidence of postoperative sensitivity (POS) compared to composite restorations.

Author's Contribution:

Concept & Design of Study:	Nadia Bashir
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Data Analysis:	Sarah Arshad, Mehwish Khoso, Asfar Hussain
Revisiting Critically:	Nadia Bashir, Permanand
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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