



COMPARATIVE EVALUATION OF POST OPERATIVE SENSITIVITY USING TWO DIFFERENT MATERIALS AS A BASE IN CLOSED SANDWICH TECHNIQUE - AN IN VIVO STUDY

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ABSTRACT **Aim:** To compare and evaluate the post operative sensitivity using two different materials as a base in closed sandwich technique. **Materials And Methodology:** A total of 60 patients with class 1 caries were selected for the study. Under Rubber dam excavation of caries was done using round bur. Then patients were randomly divided into two groups (n=20): Group1-RMGIC(Base) Group2-SDR(Base). Following the caries excavation, base application followed by restoration was completed. Participants were recalled at the end of 21 days for the assessment of restorations. **Result:** SDR is associated with significantly reduced postoperative sensitivity compared to RMGIC. **Conclusion:** SDR is a suitable dentine replacement material for placing below a composite resin as it can achieve less post-operative sensitivity, with fewer steps required for completing the restoration.

KEYWORDS : Smart dentin replacement, RMGIC, Post operative sensitivity

INTRODUCTION

Restorative dentistry has been a standard change from the invasive surgical approach which is given by G V Black “extension for prevention” to a minimally invasive approach with improvement in diagnostic system and evolution in adhesive technology.¹

Loss of dentin hinders the physiological integrity of tooth structure. The lost coronal or radicular dentin should be replaced with an adhesive material to restore this physiological integrity. There has been a continuous enhancement in the restorative approach to repair and replace lost tooth structures.²

Dentin substitutes are substances, which are used to replace dentin in the crown and root region as these materials possesses the mechanical properties which are similar to dentin.³

The search for an ideal material to replace the lost dentine has inspired substantial efforts in the field of dental materials, resulting in the formulation of a wide variety of materials available for the clinician today.⁴

McLean et al. in 1985, introduce the sandwich technique or the laminate technique. Since its introduction GIC has been widely used as a base below RBCs.⁵ The main benefits of using glass ionomer cements (GICs) are:

- Excellent biocompatibility
- Bond chemically with the tooth structure
- Fluoride release.⁵

Modified resin due to their high strength, wear resistance, chemical adherence to tooth structure, fluoride release, and radio opacity have shown exceptional development potential and have been able to overcome most of the drawbacks of existing restorative materials.⁷

SDR offers a quick and safe substitute for the time-consuming incremental filling method and works chemically with all methacrylate based adhesive and composite.

Hence this study aims to evaluate the shear bond strength between two different bases (SDR bulk-fill flowable base and Fuji 2 LC) in sandwich composite restoration, along with one step self-etch adhesive system for improving the shear bond strength.

MATERIALS AND METHODS

Study Design

This interventional study has been conducted in the Department of Conservative Dentistry and Endodontics, Dr. HSRSM Dental college Hingoli, India. The Institutional Ethics Committee approved the study protocol (Ref. No. HDCH/Ethic/2024-2025/005). The trial is registered at central trial registry of India under reg. No. CTRI/2025/04/085103. The study enlisted the participation of patients who visited the outpatient department. It was mandatory to complete an informed consent form by all the patients.

Restorative Procedure:

Detailed case history of patients was recorded. All restorations were conducted by only one trained and experienced specialist. All of the individuals were required to complete their oral prophylaxis. A total of 60 patients with class 1 caries were selected for the study. A rubber dam was used to isolate the lesions, caries excavation was done using round bur. Then for base placement, patients were randomly divided into two groups (n=30):

Table 1: Comparison Of Postoperative Sensitivity Between RMGIC And SDR

Group	Mean + Standard Deviation	p value
RMGIC	2.06 ± 0.78	<0.001**
SDR	1.40 ± 0.56	

** Statistically highly significant

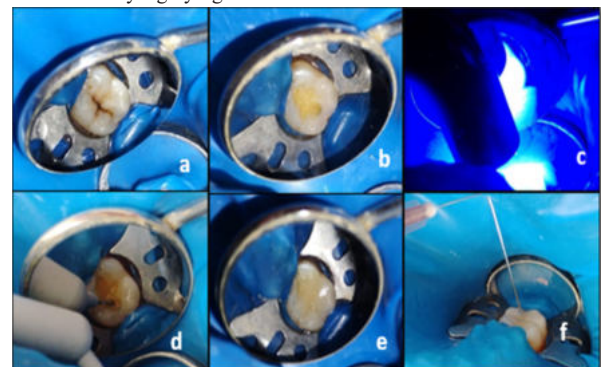
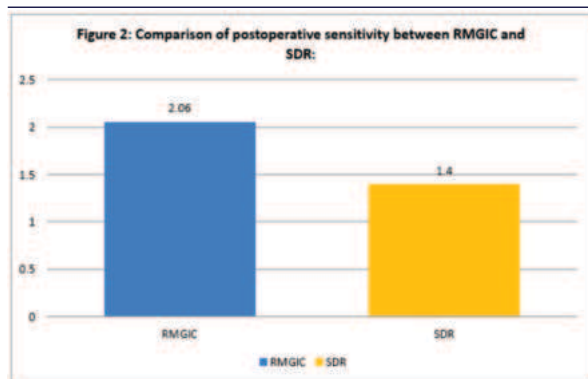


Figure 1: a) Pre-operative b) Caries Excavation c) RMGIC as a base d) SDR as a base e) Composite Restoration f) Evaluation of postoperative sensitivity

Group1-RMGIC



Group 2-SDR

The appropriate shade was selected using a shade selection guide. Composite restoration was done. Following that, finishing and polishing was used to complete the restoration under water spray. Proper brushing technique was advised to all the participants.

STATISTICAL ANALYSIS

Data was coded and entered into Microsoft Excel 2007. Data analysis was done using IBM Statistical Package for Social Sciences (Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.) Continuous data was presented by Mean and standard deviation (SD). Comparison of means was done among the groups using unpaired t test. For analysis, p-value less than 0.05 was considered statistically significant.

RESULT

The mean postoperative sensitivity for the RMGIC group was 2.06 ± 0.78 , while the SDR group demonstrated a lower mean sensitivity of 1.40 ± 0.56 . The comparison of postoperative sensitivity between RMGIC and SDR revealed a statistically highly significant difference ($p < 0.001$). This indicates that SDR is associated with significantly reduced postoperative sensitivity compared to RMGIC.

DISCUSSION

A wide range of different classes of materials has been introduced for replacement of loss dentin with each having its peculiarities. GIC is frequently utilized as a base material under RBCs. GICs are renowned for their continuous fluoride release and chemical adherence to dentin. An ion-exchange layer at the cement-tooth interface is the reason for this. However, because of their slow-setting reaction, GICs are extremely susceptible to moisture absorption.⁹

Two different materials RMGIC and SDR re-examined in this study. The restorations were assessed for postoperative sensitivity by the Schiff cold air sensitivity scale. The mean post-operative sensitivity of Group II (SDR) is 1.4 less than Group I (RMGIC) 2.06.

Several mechanisms are thought to be involved in the chemical adhesive bond between these materials and resin composites. The existence of unsaturated double bonds within the air-inhibited layer of the RMGIC could have played a role in facilitating chemical bonding with the resin bonding agent and resin composite. Unsaturated methacrylate groups on the polyacid chain within the polymerized RMGIC may have also form covalent bonds with the resin bonding agent.¹¹

However, the issues of weak strength and limited pharmacotherapeutic action on the pulp-dentin complex persist even with this type of material. Another recent class of material is flowable bulk fill composites. Marketed as Smart Dentin Replacement,¹² SDR features a patented modified UDMA oligomer with a high molecular weight of 848 g/mol. It also contains a 'polymerization modulator' which refers to photoactive groups within the oligomer backbone. When exposed to light, these groups undergo intramolecular photocleavage, creating several radicals. These radicals contribute to the polymerization reaction and cross-linking, while also allowing the molecule to adapt to polymerization stress.¹³

This mechanism facilitates enhanced conformational flexibility throughout the polymerization and delays the gel point of SDR. study conducted by **Havard J.H in 2020**, it was concluded that SDR bulk-fill flowable material exhibits outstanding mechanical properties,

including enhanced Flexural strength. This is attributed to its 'polymerization modulator'.¹⁴

The findings from this study shows that there is a significant difference in Post operative sensitivity between RMGIC and SDR with composite resin. Patients with SDR as a base shows less postoperative sensitivity compared to RMGIC. A chemical bond is more stable and less likely to separate than a micromechanical one and hence is the preferred mode of bonding for a successful "sandwich restoration."¹⁵

Therefore the null hypothesis that no difference exists in the post-operative sensitivity attained by the various dentin replacement materials to the overlying RBC was rejected.

CONCLUSION

Within the limitations of this in vivo study, the following conclusions were drawn.

SDR is a suitable dentine replacement material than RMGIC for placing below a composite resin as it can achieve less post-operative sensitivity, with fewer steps required for completing the restoration.

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