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ORIGINAL RESEARCH

Marginal leakage of provisional restorative materials luted with different cements

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ABSTRACT:

Background: Provisional restorations have been demonstrated to function as an important component in the majority of the various dental disciplines. The present study assessed marginal leakage of provisional restorative materials luted with cements. **Materials & Methods:** Provisional crowns were fabricated and divided into two groups. In Group I, provisional crowns were fabricated by SC-10 (PMMA resin) and in group II, provisional crowns were fabricated by Prottemp 4 (BIS-GMA composite resin). The provisional crown samples were further subgrouped according to different luting cements used viz. Kalzinol (Samit) (zinc oxide and eugenol [ZOC], rely temp NE [zinc oxide and poly organic acid] and HY bond [zinc oxide and polycarboxylate]). **Results:** Grade 0 microleakage was seen I 3 in group I and 10 in group II, grade 1 in 2 in group I and 12 in group II, grade 3 in 6 in group I and 5 in group II, grade 4 in 4 in group I and 1 in group II. The difference was significant ($P < 0.05$). The mean microleakage was 3.1, 2.4 and 1.1 in subgroups in group I and 1.4, 1.3 and 0.4 in subgroups in group II. The difference was significant ($P < 0.05$). **Conclusion:** Authors found that SC-10 crowns showed more microleakage compared to Prottemp 4 crowns. SC-10 crowns cemented with Kalzinol showed maximum microleakage and Prottemp 4 crowns cemented with HY bond showed least microleakage.

Key words: Microleakage, Kalzinol, Prottemp

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INTRODUCTION

Provisional restorations have been demonstrated to function as an important component in the majority of the various dental disciplines. Provisional means established for the time being, pending a permanent arrangement. Provisional restorations are the prototype on which functional, occlusal and esthetic adjustments are made to optimize the definitive prosthesis.¹ Even though a definitive restoration may be placed as quickly as 2 weeks after tooth preparation, the provisional restorations must satisfy important needs of the patient and dentist. Materials used to fabricate provisional restorations can be classified as acrylics or resin composites.²

There has always been a keen interest in the adaptation of dental restorative materials to the walls of the cavity and the retentive ability of a material to seal the cavity against ingress of oral fluids and microorganisms.³ Microleakage around dental restorative materials is a major problem in clinical dentistry. It may be defined as the clinically undetectable passage of bacteria, fluids, molecules or ions between a cavity wall and the restorative materials

applied to it. This seepage can cause hypersensitivity of restored teeth, tooth discoloration, recurrent caries, pulpal injury and accelerated deterioration of some restorative materials.⁴

Microleakage is related to dimensional changes of provisional crown materials due to polymerization shrinkage, thermal contraction, absorption of water and mechanical stress and any marginal gap combined with an inherently weak provisional cement will provide an ideal site for microleakage to occur.⁵ The present study assessed marginal leakage of provisional restorative materials luted with cements.

MATERIALS & METHODS

The present in vitro study was conducted with the aim of assessing the marginal leakage of provisional restorative materials luted with cements. Provisional crowns were fabricated and divided into two groups. In Group I, provisional crowns were fabricated by SC-10 (PMMA resin) and in group II, provisional crowns were fabricated

by Protemp 4 (BIS-GMA composite resin). The provisional crown samples were further subgrouped according to different luting cements used viz. Kalzinol (Samit) (zinc oxide and eugenol [ZOC], rely temp NE [zinc oxide and poly organic acid] and HY bond [zinc oxide and polycarboxylate]). Each subgroup has 10 cemented provisional crowns therefore, making of 60 cemented provisional crowns. Specimens were thermocycled, submerged in a 2% methylene blue solution, then sectioned and observed under a stereomicroscope for the evaluation of marginal microleakage. A five-level scale was used to score dye penetration in the tooth/cement. Results were tabulated and subjected to statistical analysis. P value less than 0.05 was considered significant.

Results

Table I Comparison of microleakage

| Grade | Group I | Group II | P value |
|-------|---------|----------|---------|
| 0 | 3 | 10 | 0.01 |
| 1 | 2 | 12 | 0.02 |
| 2 | 6 | 5 | 0.91 |
| 3 | 15 | 2 | 0.01 |
| 4 | 4 | 1 | 0.05 |

Table I, graph I shows that grade 0 microleakage was seen I 3 in group I and 10 in group II, grade 1 in 2 in group I and 12 in group II, grade 3 in 6 in group I and 5 in group II, grade 4 in 4 in group I and 1 in group II. The difference was significant (P< 0.05).

Graph I Comparison of microleakage

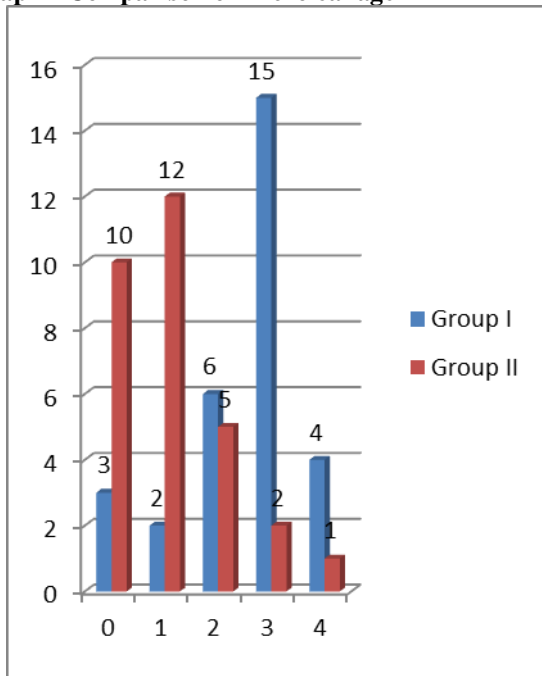


Table II Comparison of mean microleakage of different subgroups

| Subgroups | Group I | Subgroups | Group II | P value |
|-----------|---------|-----------|----------|---------|
| 1a | 3.1 | 2a | 1.4 | 0.01 |
| 1b | 2.4 | 2b | 1.3 | 0.02 |
| 1c | 1.1 | 2c | 0.4 | 0.05 |

Table II, graph II shows that mean microleakage was 3.1, 2.4 and 1.1 in subgroups in group I and 1.4, 1.3 and 0.4 in subgroups in group II. The difference was significant (P< 0.05).

DISCUSSION

The word “LUTING” is derived from a Latin word lutum-which means mud. Dental luting agents provide a link between the restoration and the prepared tooth, bonding them together through some form of attachment, which may be mechanical, micro-mechanical, chemical or combination.⁶ This is necessary to prevent microleakage and pulpal irritation and mechanically lock the restoration in place to prevent its dislodgment during mastication. Provisional crowns cemented with temporary cements are, however, susceptible to cement washout, marginal leakage, bacterial infiltration and caries, especially when placed for prolonged periods. There is a constant search for the material and technique that ensures adhesion to the tooth structure in order to minimize the leakage potential. Microleakage is used as a measure by which clinicians and researchers can predict the performance of a restorative material.⁷ The present study assessed marginal leakage of provisional restorative materials luted with cements.

In this study grade 0 microleakage was seen I 3 in group I and 10 in group II, grade 1 in 2 in group I and 12 in group II, grade 3 in 6 in group I and 5 in group II, grade 4 in 4 in group I and 1 in group II. Arora et al⁸ in their study provisional crowns were prepared using the wax pattern fabricated from computer aided designing/computer aided manufacturing milling machine following the tooth preparation. Sixty provisional crowns were made, thirty each of SC-10 and Protemp 4 and were then cemented with three different luting cements. Specimens were thermocycled, submerged in a 2% methylene blue solution, then sectioned and observed under a stereomicroscope for the evaluation of marginal microleakage. A five-level scale was used to score dye penetration in the tooth/cement interface. Marginal leakage was significant in both provisional crowns cemented with three different luting cements along the axial walls of teeth (P < 0.05) confidence interval -95%.

We found that mean microleakage was 3.1, 2.4 and 1.1 in subgroups in group I and 1.4, 1.3 and 0.4 in subgroups in group II. In vitro studies evaluating the microleakage of provisional restorations cemented with various temporary luting cements have been reported. Luting cements were chosen because there are very few studies related to evaluation of microleakage of provisional crowns cemented with luting cements which is important as leakage occurring at the tooth-cement interface has greater biological significance since it causes dentinal sensitivity, secondary caries formation, corrosion or dissolution of dental materials, discoloration of dental materials and surrounding tooth structure, and percolation of fluid and if leakage is severe it may lead to the irritation of pulp and inflammatory pulpal lesions.⁹

The marginal accuracy of provisional crowns is due to a combination of factors that include: Material properties,

fabrication techniques and dynamic loading factors. Any marginal gap combined with inherently weak provisional cement will provide an ideal site for microleakage to occur.¹⁰ In the past, mostly studies were related to marginal discrepancy of interim restorations and microleakage of permanent luting cements but in this study instead of the permanent luting cements, microleakage of provisional crowns cemented with different temporary luting cements had been assessed.

CONCLUSION

Authors found that SC-10 crowns showed more microleakage compared to Protemp 4 crowns. SC-10 crowns cemented with Kalzinol showed maximum microleakage and Protemp 4 crowns cemented with HY bond showed least microleakage.

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