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Original Research

Assessment of microleakage in different restorative materials

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***ABSTRACT*:**
Background: Achieving a micromechanical and biomechanical bond between the restoration and tooth is considered effective and a standard procedure in clinical practice. The present study was conducted to assess the microleakage of different restorative materials. **Materials & Methods:** The present study was conducted on 30 mandibular premolars extracted for orthodontic purposes were selected. Lass I cavity was prepared in selected samples. Teeth were divided into 3 groups of 10 each. Group I teeth were restored with GC Fuji II LC, group II with Ketac Molar Easy Mix and group III with Filtek Z350. In all teeth, dye penetration was assessed. **Results:** The mean microleakage in group I was 0.51, in group II was 2.72 and in group III was 0.08. The difference was significant (P< 0.05). **Conclusion:** Microleakage was maximum in group II (Ketac Molar Easy Mix) followed by group I (GC Fuji II LC) and group III (Filtek Z350).
Key words: Dye, Microleakage, Restorative.

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INTRODUCTION

Increasing demand for more esthetic restorations has led to the invention of a variety of tooth-colored restorative materials. Instead of simple lathe-cut low copper amalgam or silicate cement, the menu of available materials has expanded to include hybrid, microfilled, or optimal size particle, flowable or packable composites, glass ionomers, resin-reinforced glass ionomers, and compomers in varying viscosities.[1] At either end of the spectrum are the traditional glass ionomers and resin composites and in between are a range of newer products with intermediate characteristics such as resin-modified glass ionomers and polyacrylic acid modified composite resins.[2]

Microleakage is defined as the clinically detectable passage of bacteria, fluids, molecules or ions between a cavity wall and the restorative materials applied to it and are the major problem in clinical dentistry. Achieving a micromechanical and biomechanical bond between the restoration and tooth is considered effective and a standard procedure in clinical practice. Instead of simply lathe-cut low copper amalgam or silicate cement, the menu of available materials has expanded to include hybrid, microfilled or optimal size particle, flowable or packable composites, glass ionomers, resin reinforced glass ionomers and compomers in varying viscosities.[3]

The ultimate success of a material is indicated by its longevity in the oral cavity. As the initial *in vitro* screening of new materials does not always reveal their full limitations or possibilities, clinical testing of new systems remains the ultimate proof of effectiveness. In the oral cavity, multiple and mutually interactive clinical variables related to tooth substrate and to its immediate environment, co-determine the eventual clinical effectiveness of newly developed adhesive materials.[4] The present study was conducted to assess the microleakage of different restorative materials.

MATERIALS & METHODS

The present study was conducted in the department of Endodontics. It comprised of 30 mandibular premolars

extracted for orthodontic purposes were selected. The study protocol was approved from institutional ethical committee. Class I cavity was prepared in selected samples. Teeth were divided into 3 groups of 10 each. Group I teeth were restored with GC Fuji II LC, group II with Ketac Molar Easy Mix and group III with Filtek Z350.
The teeth were subjected to the dye solution of 50 percent Silver nitrate in small dark bottles for 4 hours. The specimens were immersed in the photographic film developing solution for 4 hours under 200 watt bulb. The degree of dye penetration in the occlusal cavity walls was assessed separately under a binocular stereomicroscope at 10X magnification. Dye penetration was assessed as 0 : No dye penetration. 1 : Dye penetration between the restoration and the tooth into enamel only. 2 : Dye penetration between the restoration and the tooth in the enamel and dentin.
3: Dye penetration between the restoration and the tooth into the pulp chamber. Results were tabulated and subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of teeth

Groups	Group I	Group II	Group III
Materials	GC Fuji II LC	Ketac Molar Easy Mix	Filtek Z350
Number	10	10	10

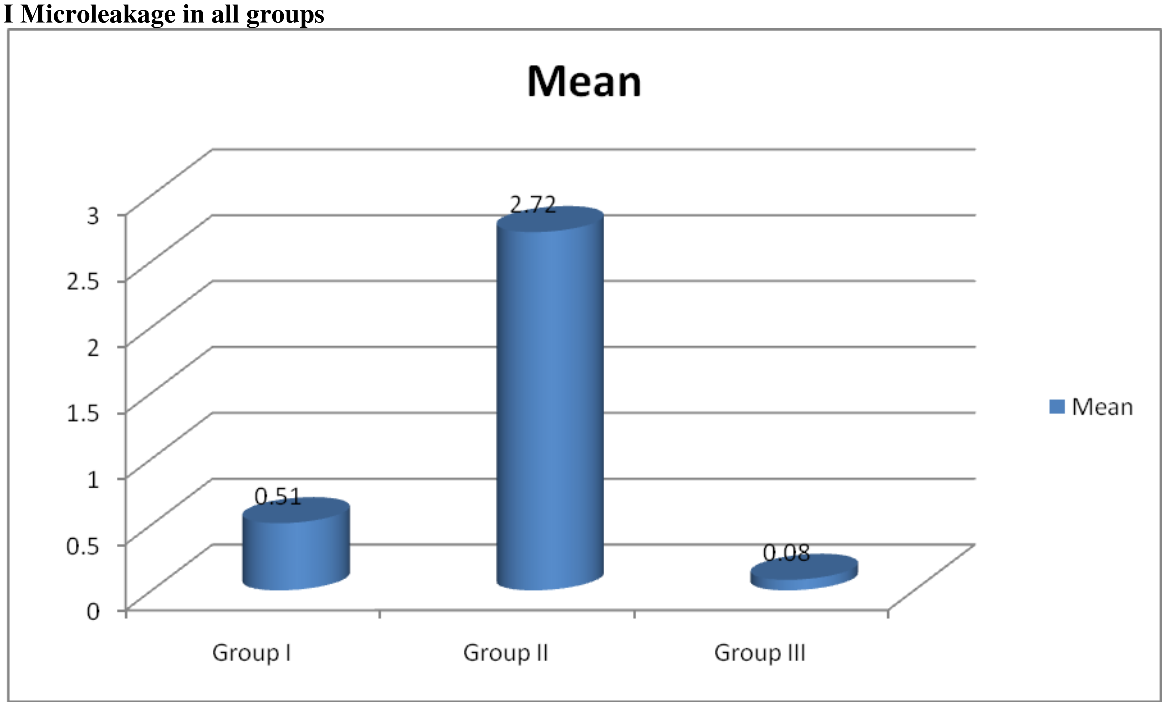
Table I shows that group I teeth were restored with GC Fuji II LC, group II with Ketac Molar Easy Mix and group III with Filtek Z350. Each group comprised of 10 teeth.

Table II Microleakage in all groups

Groups	Mean	S.D	P value
Group I	0.51	0.12	0.01
Group II	2.72	0.18	
Group III	0.08	0.24	

Table II, graph I shows that mean microleakage in group I was 0.51, in group II was 2.72 and in group III was 0.08. The difference was significant (P< 0.05).

Graph I Microleakage in all groups



DISCUSSION

The choice of materials for restoring teeth is very expansive and complex. The only available options several years ago were limited to silver amalgam or stainless steel crowns, whereas, today, there are numerous materials.[5] Available since 1993, compomers were evolved from composite materials, developed as a need for new materials that could replace silver amalgam. Compomers or polyacid modified composite resins are direct light-cured restorative materials. They possess some properties in common with glass ionomer cement and others with hybrid composites. Adhesion to enamel and dentin is possible due to the use of bonding systems. In addition, the restoration should act as a protective material with long-term secondary caries prevention and 3–5-year longevity in the primary dentition.[6] The present study was conducted to assess the microleakage of different restorative materials.

In present study, group I teeth were restored with GC Fuji II LC, group II with Ketac Molar Easy Mix and group III with Filtek Z350. Each group comprised of 10 teeth. Parbhakar et al[7] conducted a study to evaluate and compare the microleakage of six restorative materials viz., GC Fuji II LC, Ketac Molar Easy Mix, Filtek Z350, Filtek P60, Durafill VS and Dyract Restorative. Sixty caries-free premolars were divided into six groups (n = 10) and standard Class I cavities were restored with six different materials. Observation for marginal leakage was done under Stereomicroscope at 10X and data collected was subjected to statistical analysis. The sealing ability in terms of microleakage was summarized as: Self-cured GIC (Ketac Molar Easy Mix) < Compomer (Dyract) < Packable composite (Filtek P60) < Resin modified Glass ionomer cement (GC Fuji II LC) d" Microfilled composite (Durafill VS) < Nanocomposite (Filtek Z350).

Santini et al[8] assessed the microleakage associated with bulk-fill, horizontal-incremental, and oblique-incremental compomer placement techniques in primary molars. Ninety specimens were divided into three groups of thirty for each of the placement techniques. Nearly 86.6% of the specimens presented with microleakage involving the entire axial wall and pulpal floor in the bulk-fill group, whereas 56.6% and 46.6% of the specimens in the horizontal-incremental and oblique-incremental groups showed microleakage up to two-third and one-third of the axial walls, respectively. A significant difference in scores was observed between groups ($P < 0.001$). Microleakage was observed with all the three techniques but was comparatively lower with the incremental placement techniques. The oblique-incremental technique offered the least microleakage.

Korkmaz[9] proposed that the incremental placement technique is the preferred restorative technique over the bulk-fill technique for posterior resin restorations as it results in better marginal adaptation. It has shown a proportional relationship between the stress relief in thin resin increments to the amount of resin porosity.

CONCLUSION

Microleakage was maximum in group II (Ketac Molar Easy Mix) followed by group I (GC Fuji II LC) and group III (Filtek Z350).

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