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Comparing Marginal Microleakage of Two Bulk Fill Composites in Class I Cavities: An in Vitro Study.

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ABSTRACT

Background: Microleakage is considered to be an important factor influencing the longevity of dental restorations. Bulk Fill composites possess specific characteristics, including more desirable flowability to attain consistent adaptation to the cavity preparation. Elasticity and low polymerization shrinkage in bulk fills minimizes microleakage, postoperative sensitivity, and secondary caries. Improved depth of curing of at least 4 mm eliminates the need for layering. The purpose of this study is to evaluate and compare the microleakage in two Bulk Fill composites - SonicFill (Kerr corp. USA) and TetricEvo Ceram Bulk Fill (IvoclarVivadent) using stereomicroscope. **Methods:** 40 caries/cracks free extracted human maxillary premolars were used. A class 1 cavity measuring 3mm by 3mm by 2mm was prepared in all the teeth and then teeth were divided into 2 groups of 20 each, Group I: SonicFill Bulk Fill composite and Group II: TetricEvo Ceram Bulk Fill composite. All specimens have been thermocycled for one thousand cycles (5/55ºC, 30 seconds) in Eppendorf Master Cycler gradient (Eppendorf AG, Hamburg, Germany). All samples were immersed in 2% methylene blue dye for 24 hours. Teeth were sectioned mesio-distally and observed under a stereomicroscope and dye leakage scored. **Results:** The mean microleakage of SonicFill(KERR) was 1.75 and of TetricEvoCeram (IVOCLAR) was 2.55.The mean microleakage was higher in Teric EvoCeram than in Sonic fill and the difference was statistically significant. **Conclusion:** Within the limitations of this study, it may be concluded that Sonic Bulk Fill composite shows lesser microleakage than Tetric EvoCeram.

Keywords: Cavity, Microleakage.

INTRODUCTION

Composites have been introduced in the 1960's and have been subjected to thorough research and developmental refinement. This has led to emergence of microhybrid composite, with particle size in the 0.6–0.7 micrometers range.[1]

The restoration of the large Class I restorations with resin bonded composites materials is time consuming, in terms of placement, light-curing every increment, and the operator time required for separate etching, priming, and bonding techniques.[2]

Microleakage is considered to be a foremost factor influencing the longevity of dental restorations. The limit of the polymerization shrinkage and consequent microleakage, can be acquired through use of incermental layering technique or cavity designs with a low C-factor.[3-5]

On the other hand, some modifications in restorative materials, made in the past, such as modified fillers, has led to increased performance of the composite materials.[6.7]

Bulk Fill composites possess specific characteristics, including more flowability to attain consistent adaptation to the cavity preparation, elasticity and low polymerization shrinkage. Improved depth of curing of at least 4 mm eliminates the need for layering.[8]

The latest introduction of the SonicFill (Kerr corp. USA) combines the attributes of a low viscosity composite and a universal composite. By activating the composite with sonic energy, it is possible to fill the cavity and then compact and model it whilst the composite adjust its consistency until it reaches a greater viscosity.

TetricEvoCeram Bulk Fill (IvoclarVivadent) is a nanohybrid composite with a monomer matrix (20-21% weight) and fillers (78%–81% by weight). TetricEvoCeram Bulk Fill contains in its composition an inhibitor of sensitivity to light and thus provides prolonged time for handling and compaction, an inhibitor of shrinkage stress in order to achieve optimal marginal seal and Ivocerin, polymerization photoinitiator allowing curing of 4 mm layers of material.

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The purpose of this study was to evaluate and compare the microleakage in Bulk Fill composites using a stereomicroscope.

MATERIALS & METHODS

Forty caries/cracks free human maxillary premolars extracted for periodontal/orthodontic reasons were collected, cleaned with a slurry of pumice and stored in normal saline at room temperature to be used within six months.

A class 1 cavity measuring 3mmx3mmx2mm was prepared in all the teeth, using No. 245 carbide bur (SS White, U.S.A) in high velocity hand piece (NSK, Japan) with water cooling. The bur was changed after 5 cavity preparations. The depth of the cavity was once measured from the centre of central fissure using UNC 15 probe (University of North Carolina U.S.A, Hu-Freidy Mfg. Co. Inc., Chicago, IL, USA). The breadth and width of the cavity were standardized using a divider and scale. The prepared 40 teeth were randomly divided into 2 groups of twenty teeth each. Group I: SonicFill Bulk Fill composite (Kerr/Sybron Orange, CA), Group II: TetricEvo Ceram Bulk Fill composite (IvoclarVivadent, Schaan, Liechtenstein).

The specimens in each group were restored with the corresponding Bulk Fill composite and cured for 20 s in accordance to manufacturer's instructions.

All specimens were thermocycled for one thousand cycles (5/55ºC, 30 seconds) in Eppendorf Master Cycler gradient (Eppendorf AG, Hamburg, Germany). After thermocycling, apices of the teeth were sealed with a layer of nanocomposite, and all the surfaces were coated with two coats of nail polish, with the exception of 1 mm region round the tooth-restoration interface. All samples were immersed in 2% methylene blue dye for 24 hours. Following immersion teeth were washed with distilled water, then dried and sectioned mesio-distally using diamond disc at gradual velocity .Samples were observed under a stereomicroscope. The cut sections were observed at 20X magnification and the place of maximum dye penetration was considered. Two examiners scored extent of dye penetration using an ordinal scale (0-4) (Table - 1 and Figure - 1, 2) by way of consensus. Examiners have been blind to material and/or method used. Results were analyzed using paired "t'' test and Mann Whitney test.

Table 1: Scoring criteria

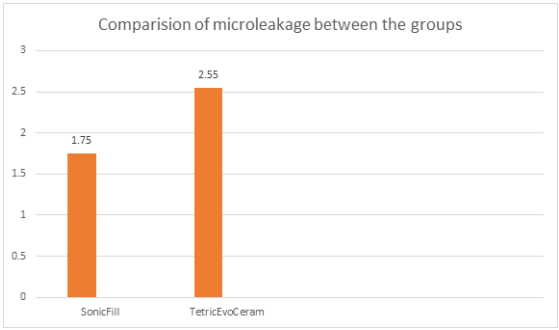
Score	Description
0	no evidence of dye penetration at tooth restoration interface
1	dye penetration along the cavity wall upto 1/3rd of cavity depth
2	dye penetration greater than 1/3rd, but less than 2/3rd of cavity depth.
3	dye penetration greater than 2/3rd of cavity depth but not along the dentinal tubules
4	dye penetration to the cavity depth and along the dentinal tubules.

RESULTS

Within the limitation of the study the results [Table 2] showed that there is statistically significant difference between the microleakage of the two groups. The mean microleakage of SonicFill (1.75±1.07) was less than that of Tetric EvoCeram (2.55±0.89).

Table 2: Inter group comparison

Groups	Mean	Standard deviation
SonicFill (KERR)	1.75	1.07
TetricEvoCeram(IVOCLAR)	2.55	0.89



Graph 1: Comparison of microleakage between the groups.

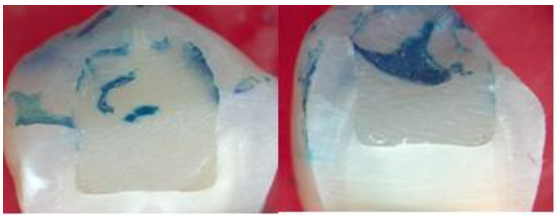


Figure 1 & Figure 2: Dye leakage in group1 and 2.

DISCUSSION

Marginal integrity is essential to increase the longevity of any restoration.[9] This integrity is compromised, when microleakage happens ensuing from polymerization shrinkage. Polymerization shrinkage is the most frequent cause of failure of direct posterior composite restorations. Polymerization shrinkage is based on various components such as the material's formulation, and the amount of material in the polymerization reaction.[10] This phenomenon happens due to the fact that monomer molecules are transformed into a polymer network and therefore, there is exchange of Van der Wall's spaces into covalent bond spaces, developing contraction stresses in the resin composite leading to microleakage.[1]

Different resin composites have distinct formulations and consequently unique polymerization shrinkage. Many researchers have advised the use of an incremental layering technique to reduce this shrinkage.[1,10,11] Nowadays, usual placement methods for composite resins consist of this technique.[11] Most practitioners advise placing composites in 2 mm increments. However, dentists would prefer use of Bulk Fill technique in posterior composite restorations as it is less time consuming.

The magnitude polymerization shrinkage additionally relies upon different factors, such as the configuration factor (C-factor) of the cavity and the effect of light-curing mode.[12]

In our study, the cavities were of the same dimensions having equal C-factor, and the light-curing mode was same for all the specimens.

In this study, we used SonicFill Bulk Fill composite and a conventional Bulk Fill composites. The results of the present study showed that SonicFill composite demonstrated statistically lower leakage than a conventional Bulk Fill composites and our result is in agreement with the previous studies.[13-15]

CONCLUSION

Within the limitations of this study, it may be concluded that Sonic Bulk Fill composite shows lesser microleakage than Tetric EvoCeram.

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