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Original Article

Micro-Leakage of Fissure Sealant Following Thermo-Cycling Test: In Vitro

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Abstract *- In an in vitro experimental study, an occlusal fissure with 40 permanent human teeth was cleaned with a dry, sharp bristle brush and prophylaxis toothpaste using a low-speed handpiece and rinsed with water and dried by pressure without oil for the 20s. Half of the cavities are filled with low viscosity Resin sealant followed by light treatment for 20 seconds. According to the manufacturer's instructions, the remaining cavities were sealed with Resin Modified glass ionomer sealant, and the light was treated for 40 seconds. These teeth were subjected to microleakage testing, followed by SEM testing of the enamel-sealant optical connector. No microleakage (grade 0) was found in 17 cases (85.0%) in the sealed by resin-modified glass ionomer sealant and 16 cases (80.0%) in the light-cured resin sealant. In the Resin modified glass ionomer sealant, minor leakage was detected in 3 cases (Grade 1 = 2 & Grade 2 = 1), and in the resin sealant, minor leaks were detected in 4 (Grade 1 = 3). & Grade-2 = 1) cases. In conclusion, the recycled light cured resin modified glass ionomer sealant is slightly better than the light-cured resin sealant.*

Keywords *- Microleakage, Light-cured resin sealant, Light-cured resin-modified glass ionomer sealant, Thermometer.*

I. INTRODUCTION

Hollow areas in a tooth with cavities and cracks are at high risk of developing caries.[1] Ripa et al. [2] (1993) noted that although the hidden areas represent only 12.5% of the total number of permanent teeth, they make up about 50% of caries in school children. This can be explained by the morphological complexity of these areas, which allows their outer layer to accumulate to the point where they do not receive the same level of protection against caries in fluoride (F) as it does in its smooth surface, [2-3] chances of being at greater risk during molar eruptions, [4] and people infected with caries are therefore at risk of premature onset and rapid growth of caries in these areas. Following cavities and cracks, a sealant will provide a real barrier to the tooth and mouth area, thereby reducing the risk of tooth decay.

However, the long-term effects of sealant retention are still controversial. It has been reported that approximately 50% of the volume of sealant used is lost after 1 month, followed by 75% at the end of 2 years. Areas after general cleaning.[6-8] In addition, small leaks of fissure sealants due to reduced polymerization, insufficient material penetration, [9] saliva contamination, [10] and viscosity sealant, [11] may also adversely affect the success of fissure closure.

The marginal sealing ability is very important for successful treatment. Lack of sealing allows the emergence of marginal leakage, i.e., bacterial overgrowth, the presence of organic waste, fluids, molecules, and ions through the visible tooth connector, which may lead to the development of caries lesion under restoration.[8] It was thought to be successful in maintaining sealant relies on the ability of the material to promote proper closure of cracks, or damage at the enamel surface and to remain complete and fastened to the surface of the tooth.[12] Therefore, the seal can be expected to act as a preventative treatment as long as it stays in place.

II. METHODS

In an in vitro study, a brown stained occlusal fissure on 40 permanent teeth was cleaned with a sharp bristle brush and prophylaxis toothpaste using a low-pressure handpiece and rinsed with water and dried with an oil-free pressure for the 20s. Half cavities are filled with low viscosity cured resin sealant (Group A) and lightly treated for 20 seconds. The

remaining cavities were sealed with a resin modified glass ionomer sealant (Group B) and lightly treated for 40 seconds. According to the manufacturer's instruction, the remaining part was filled with Resin modified glass ionomer sealants. These teeth were subjected to microleakage testing followed by SEM testing of the enamel-sealant interface.

III. TABLES

Table 1. Microleakage (n=40)

	Grade 0	Grade 1	Grade 2	Mean ± SD	t, df	p-value
Group A	16 (80.0)	3 (15.0)	1 (5.0)	0.25±0.55	-0.295, 38	0.770
Group B	17 (85.0)	2 (10.0)	1 (5.0)	0.20±0.52		

An unpaired t-test was done to measure the level of significance.

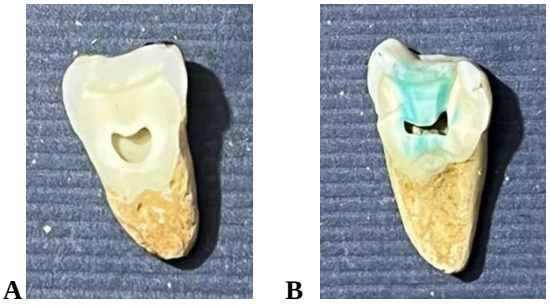

Fig. 1 Representative Stereoscopic photographs of microleakage at sealant-tooth tissue (A: score 0, B: score 2)

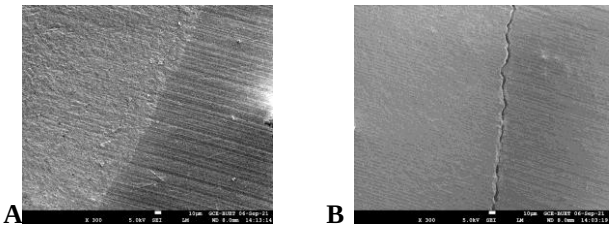

Fig. 2 Representative SEM photographs of microleakage at sealant-tooth tissue (A: score 0, B: score 2)

IV. RESULTS

The microleakage test confirms that light-cured resin-modified glass ionomer and light-cured resin sealant facilitated good adhesion with the restorative material. There was no significant difference between the light-cured resin-modified glass ionomer and light-cured resin sealant. The result of the microleakage score showed that no microleakage (score 0) was detected in 17(85%) light-cured resin-modified glass ionomer and 16(80%) light-cured resin sealant restoration, as seen in stereoscopic observation of the crosscut section of this restoration. SEM observation also showed no gaps between the sealant and dental hard tissues (Figure 2- A & B)

V. DISCUSSION

Previous studies have shown that the most critical time for sealant failure is early and the first 6 months after application. As a result, the study lasted 12 months. On the other hand, prolonged follow-up can undoubtedly increase confidence in the results. Microleakage can be defined as the passage of bacteria, liquids, molecules, or ions between the repaired tooth surface and the restorative materials used,[13,14,15,16], and the risk of developing secondary caries.[17,18,19] Microleakage is the primary parameter to evaluate the effectiveness of dental sealants.[20,21,22] Even though the clinical definition of in vitro microleakage testing should be interpreted with caution, despite their known limitations, these studies provide a valuable tool to test new products or technologies. The present study examined the in vitro microleakage of two different sealants to identify the most effective material used in general clinical practice. In 17 cases (85.0%) of light-cured resin-modified glass ionomer cement closed reconstruction and 16 cases (80.0%) light-cured resin sealant, no microleakage (grade 0) was found. Microleakage was detected in 2 (10.0%) cases of light-cured resin-modified glass ionomer sealed restoration and 3 (15.0%) of light-cured resin sealant. No statistically significant difference between groups. The Resin modified glass ionomer sealant showed a much lower microleakage than the light-cured resin sealant tested. The difference between the two seals was statistically significant ($p > 0.05$). Previous studies also noted that the modified glass ionomer sealant's flow, adaptability, and color match were slightly better than the light-cured resin sealant.[23,24,25]

VI. CONCLUSION

The findings of this study suggest that light-cured resin-modified glass ionomer sealants is slightly better than light-cured resin sealants. Still, no statistically significant differences were found between groups.

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