

The Effect of Placing Clinpro™ or Fuji TRIAGE® Sealants over Class I Kerr Packable Composite Restorations on Marginal Integrity and Surface Roughness

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Introduction

In the pediatric population, Class I carious lesions are highly prevalent due to an imbalance of pathologic and protective factors. Pathologic factors include bacteria (*Streptococcus mutans* and *Lactobacillus*), occlusal anatomy, high carbohydrates, and poor brushing. Protective factors include salivary flow, topical and systemic fluoride, and sealants. Even with restoration of these lesions, studies show that over 70% of composite restorations are replaced because they fail, with an average span of 5 to 7 years (7). It has been studied that polymerization shrinkage is known to be the most common reason for microleakage (3). Some clinicians use sealants over the margins of composite restorations to help reduce microleakage and improve marginal integrity (2). The aim of this study was to assess how placing a sealant over the margins of a Class I composite restoration affects microleakage and surface roughness over time.

Materials and Methods

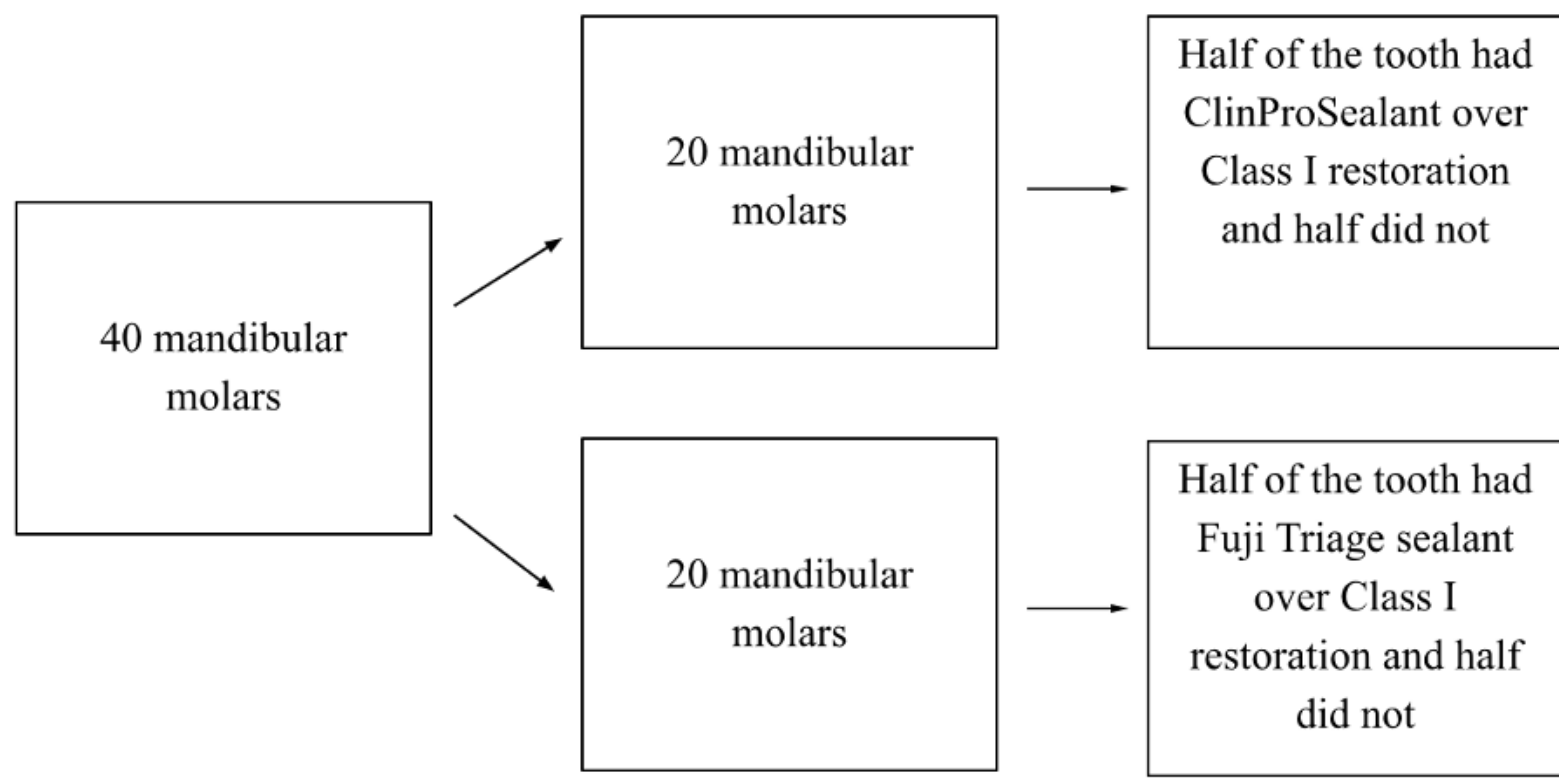


Figure 1: Sample Information

40 mandibular molars were used due to the symmetrical anatomy. The teeth had ideal Class I composite preparations and restorations completed. Kerr packable composite was used. Half of the restoration had sealant material over the composite margins and half did not. 20 teeth had the Clinpro™ Sealant (3M ESPE, St. Paul, MN) utilized; the other 20 teeth had the Fuji TRIAGE® Sealant (GC Corporation, Tokyo, Japan) (Figure 1). Teeth were polished, then placed in a thermoregulator. Cycles were completed to represent the wear at baseline immediately after restoration is completed, 1 year, 3 years, and 5 years (10,000 cycles run through 1 week is equivalent to 1 year). When not in the thermoregulator, the teeth were placed in individual containers consisting of artificial saliva. Marginal leakage and surface roughness of each tooth (treatment – with sealant versus control – without sealant) were obtained using the Keyence wide-area 3D measurement and noted in mm units for microleakage and µm units for surface roughness after each time interval (Figure 2).



Figure 2: Microleakage and Surface Roughness Measurements

The left image shows how microleakage was measured on each side of the restoration. The right image shows how surface roughness was measured on each side of the restoration.

Results, Discussion, and Conclusion

Trends of microleakage and surface roughness are shown in Figure 3. An analysis of variance (ANOVA) test was conducted for each subgroup to assess microleakage over time. The results showed a significant difference in microleakage from post-restoration to 5 years for all subgroups: Clinpro™ (no sealant), Clinpro™ (sealant), Fuji TRIAGE® (no sealant), and Fuji TRIAGE® (sealant). One-tailed t-tests at a 0.05 significance level were conducted to test if adding sealant affected microleakage. In the Clinpro™ group, there was no significant difference in microleakage between the sealed and unsealed sides for all time intervals. The same result was found for Fuji TRIAGE®. To compare Clinpro™ and Fuji TRIAGE® sealant groups, t-tests showed no significant difference between them across the time intervals.

The ANOVA results showed no significant difference in surface roughness from post-restoration to 5 years for all subgroups: Clinpro™ (no sealant), Clinpro™ (sealant), Fuji TRIAGE® (no sealant), and Fuji TRIAGE® (sealant). One-tailed t-tests at a 0.05 significance level were conducted to check if adding sealant affected surface roughness. In the Clinpro™ group, there was no significant difference in surface roughness between the sealed and unsealed sides for all time intervals. The same result was found for Fuji TRIAGE®. Comparing Clinpro™ and Fuji TRIAGE® sealants, t-tests showed no significant difference between them over time.

Clinicians use sealants over composite restorations to fill microcracks and reduce microleakage (2). Resin-based sealants last longer than glass ionomer sealants because of better bonding (1). The hypothesis is that resin-based sealants offer better protection and durability. In this study, the only statistically significant result was the increase in microleakage for all subgroups (Clinpro™ and Fuji TRIAGE® with and without sealants). However, there was no significant difference in microleakage between groups, and adding sealant did not prevent it. Studies show that surface sealants wear over time and may detach due to incompatibility (5,7,10). Surface roughness results were also not significant. Both Clinpro™ and Fuji TRIAGE® sealants showed no preference for reducing microleakage or roughness, supporting that either sealant performs similarly. Some studies suggest sealants improve surface finishing, while others find no effect (4,6,9). Limitations include possible operator error in measurements and a sample size that could impact results. Future research could expand the sample size and refine measurement techniques for more accurate outcomes.

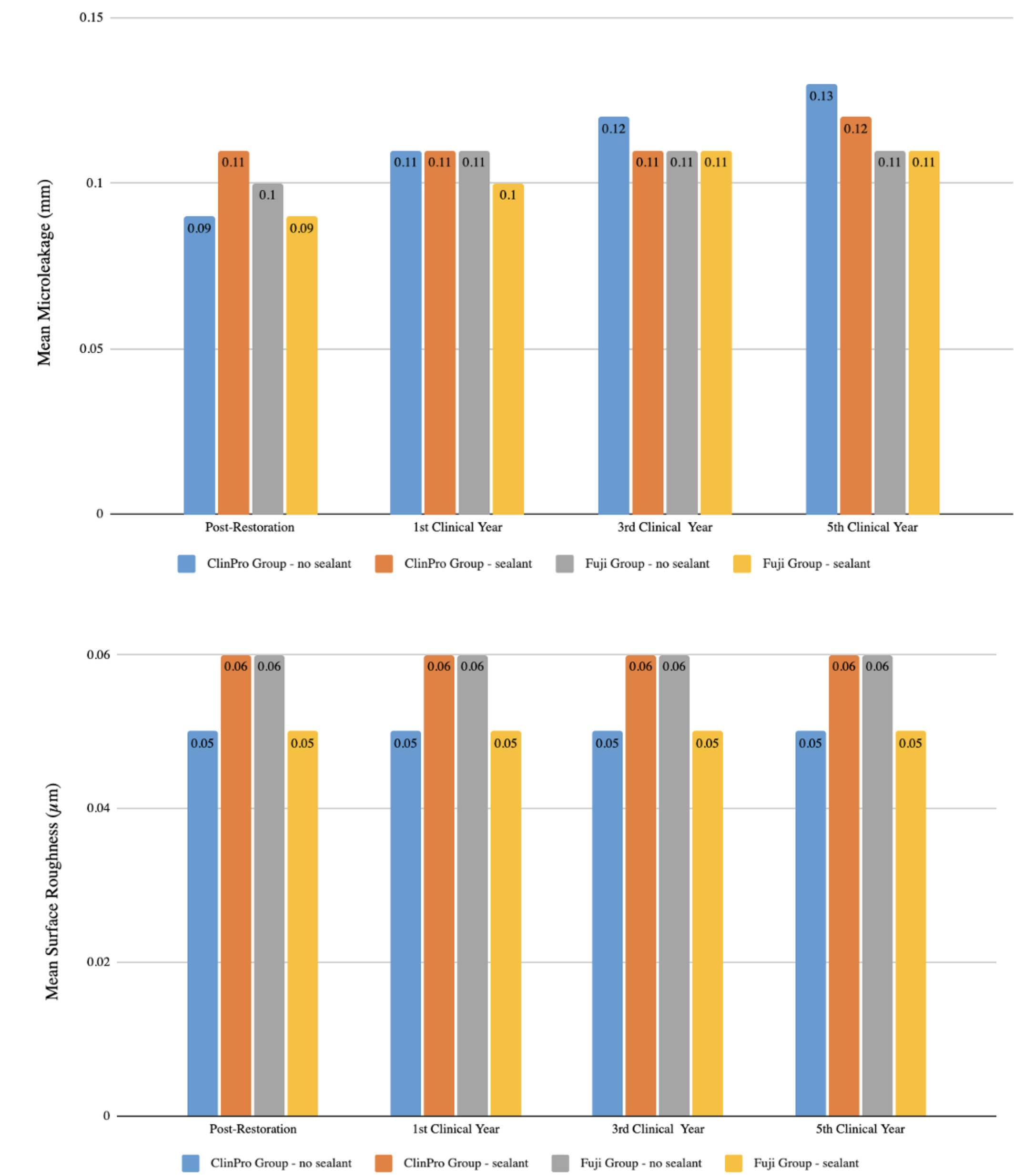


Figure 3: Trends in Microleakage and Surface Roughness

Top chart is microleakage and bottom chart is surface roughness. From left to right, the groups are: ClinPro Group - no sealant, ClinPro Group - sealant, Fuji Group - no sealant, and Fuji Group - sealant.

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