Riboflavin/UVA photo crosslinking versus conventional dentin biomodifiers: Comparative evaluation of shear bond strength and resin tag formation in artificially demineralized dentin

ABTRACT

AIMS AND OBECTIVES

The aim of the present inquiry is to evaluate the effect of different dentin bio modifiers i.e., Grape seed extract (GSE), Casein phosphopeptides-amorphous calcium phosphate (CPP-ACP) Riboflavin photosensitizer (RFP), and Hydroxyapatite nanoparticles (HANPs) on the shear bond strength (SBS) and resin tag length of 5^{th} generation adhesive bonded to artificially demineralized dentin in comparison to the control.

MATERIALS AND METHODS

Sixty non-carious first and second premolars from both the maxillary and mandibular arches were collected from the Oral and Maxillofacial Surgery Department of DIDC. The occlusal surface of each tooth was ground using a high-speed handpiece with a flame-shaped bur to expose the mid-coronal dentin. Artificial caries was induced on all the samples dentin surface using pH-cycling method. Afterwards, **s**amples were allocated randomly in to five groups based on the dentin biomodifer used. N=12 Group 1 (No dentin biomodifier), Group 2 (GSE), Group 3 (CPP-ACP), Group 4 (RFP/LED) and Group 5 (HAPNPs)**.** A fifth generation adhesive was applied to the prepared dentinal surfaces as per the instructions provided by the manufacturer on 12 samples from each group. The prepared dentin surfaces were then restored with composite resin. To simulate the aging caused by the oral environment, all the samples were subjected to thermocycling for 10,000 cycles**.** SBS and failure mode assessment was performed on ten samples from each

cohort using universal testing machine and stereomicroscope respectively. Two samples from each group were prepared for SEM analysis to identify the length of resin tags. Statistical analysis was performed using SPSS 19 software. The comparison among different groups was performed using one-way ANOVA and Tukey HSD post hoc tests. $p < 0.05$.

RESULTS

The longest resin tag length (131.23 ± 6.53 μm) and highest bond strength integrity (11.43 ± 1.28 MPa) was observed in Group 2 (GSE). Whereas, shortest resin tag length (53.11 ± 3.12 μm) and lowest SBS outcomes (6.21 ± 1.10 MPa) were demonstrated by group 4 (RFP/LED) treated samples. The intergroup comparison analysis revealed that Group 2 and Group 3 (CPP-ACP) (11.31 ± 0.96 MPa) treated teeth demonstrated no significant difference in their bond score outcomes and resin tag lengths. ($p>0.05$) Likewise, Group 4 and Group 5 HAPNPs (also displayed comparable scores of bond strength and resin tag length. ($p>0.05$) Group 1 (No dentin biomodifier) on the other hand presented significantly different bond strength and resin tags among all these tested groups. ($p <0.05$)

CONLCUSION

The application of Grape seed extract, Casein phosphopeptides-amorphous calcium phosphate as dentin pre-treatments appear to be a promising approach to improve the resin adhesive penetration and shear bond strength of 5th generation adhesive to artificially demineralized dentin.

Keywords: Grape seed extract, Casein phosphopeptides-amorphous calcium phosphate, Hydroxyapatite nanoparticles, Shear bond strength