A COMPARATIVE STUDY BETWEEN MOISTURE INSENSITIVE AND SELF ETCHING PRIMERS ON DRY AND SALIVA CONTAMINATED ENAMEL SURFACES

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Introduction:

Conventional bonding systems are highly sensitivity to moisture which makes it mandatory for all the bonding steps to be performed in a completely dry field to avoid bond failures.1 Salivary contamination is considered the most common reason for bond failures.2 Salivary contamination of the etched enamel, even for a single second, results in an adherent coating that masks that can not be removed by rinsing and the surface has to be re-etched.3 Also, Conventional acid etching usually utilizes 37% phosphoric acid, which is blamed for enamel loss, demineralization, and initiating white spots and caries. Hydrophilic primers based on the concept of dentin bonding agents were introduced to the orthodontic market, in a trial to eliminate or minimize the bonding technique sensitivity. Two of these hydrophilic primers were used in this study; the moisture insensitive primer (MIP), that utilizes etchant and the self etching primer (SEP) that simultaneously etches and primes.

Aim:

To assess the effect of salivary contamination on shear bond strength of orthodontic brackets bonded using Conventional & Hydrophilic primers, and assess their respective resin tag formation and effect on enamel under dry and salivary contaminated conditions.

Materials & Methods:

Ninety two extracted human maxillary bicuspids were collected from adolescent and adult patients after obtaining consent at the orthodontic department, Faculty of Dentistry, Alexandria University.

Shear bond strength test: Seventy premolars were randomly divided into 7 equal groups. In groups utilizing conventional primer and MIP the teeth were etched using 37% phosphoric acid for 30 seconds. Groups utilizing SEP require no conditioner since the SEP etches and primes simultaneously. The Transbond XT conventional primer was used on dry enamel surface as the control group, while the MIP and the SEP were used on three different enamel conditions: Dry, saliva contaminated before and saliva contaminated after primer application. In groups designated for salivary contamination, a thin coat of fresh human saliva was applied with a brush to the labial surfaces. The saliva was collected from one donor. A force gauge was used to apply a standardized pressure force of 135 grams to seat brackets in place. Each bracket was light cured for 20 seconds mesially and distally according to the manufacturer, using the Ultra-Lume 5 LED, Ultra-Dent corporation, USA. Teeth were subjected to a total of 500 thermal cycles using a thermocycling machine at 5°C and 55°C. The specimens were mounted in an Instron universal testing machine (Commmten industries, Florida, USA), and tested in a shear mode applied perpendicularly to the bracket-tooth interface at a crosshead speed of 1mm/min until debonding. Shear bond strength values were calculated in megapascal units (MPa), from the peak load at failure in newtons divided by the bond surface area. SEM study of resin enamel interface: Teeth were sectioned longitudinally between bracket wings using a low-speed thin diamond disc, then polished with silicon carbide discs (600 grit). Samples were then immersed in 6 mol/L HCL for 30 seconds, followed by a 10 minute immersion in 1% sodium hypochlorite to enable visualization of a three dimensional resin-enamel interface relief.

SEM study of resin morphology on bracket base: Bonded specimens were completely decalcified by immersion in 6 mol/L HCL for 12 hours followed by immersion in 10% sodium hypochlorite (NaOCL) for 5 minutes. Samples were dried in critical drying apparatus before gold sputtering, then examined under scanning electron microscope JSM-5300.

Results:

Shear bond strength test: The shear bond strength values MPa, mean, and standard deviation were calculated for each of the seven test groups. One way analysis of variance (F = 1.958) showed no statistically significant difference between any of the seven groups (p = 0.085>0.05).

The highest mean shear bond strength values of all the groups were recorded when the self-etching primer was applied in salivary contaminated conditions. SEM study of resin enamel interface & resin on bracket base: sagittal section in resin-enamel interface and the bracket base shows numerous thick resin tags with lateral branches and cross linking of resin when Transbond XT primer is used for bonding on dry enamel. However, on salivary contaminated enamel surface, a clear gap which was evident between resin/enamel interface, with no sign of resin tags formation. The bracket base shows no resin tag formation, but only an imprint of normal enamel surface.

MIP on dry enamel surface showed similar resin tags to that formed with conventional primer. but with no lateral branching and cross linking on bracket base.

On salivary contaminated enamel , resin enamel interface showed no gaps and longer, thinner resin tags compared to dry enamel.

SEP When used on dry enamel surface, resin enamel interface shows less evident resin tags than the other two primers, with a less definite pattern and numerous micro tags on the bracket base. On salivary contaminated enamel the resin tags become more evident, and of thicker and longer morphology which might indicate that the saliva enhances the primer penetration. The bracket base shows more uniform and multiple resin tags in case of salivary contaminated enamel.

Conclusion:

Both MIP and SEP could be used to bond orthodontic attachments equally well in dry and salivary contaminated conditions. By eliminating the etching step, the self etching primer might provide less chair time, more patient compliance, less technique sensitivity, with the added advantage of more enamel conservation when compared to systems utilizing phosphoric acid etching.

References: