

EFFECT OF EPOXY RESIN BASED ROOT CANAL SEALER CONTAMINATED IN THE BONDING OF COMPOSITE RESIN TO DENTIN

*Epoksi Reçine Bazlı Kök Kanal Patı Kontaminasyonunun Kompozit Reçinenin Dentine Bağlanması
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ABSTRACT

Purpose: The effect of precleansing procedures for epoxy resin-based root canal sealer contaminated dentin surfaces for the evaluation of bond strength of a composite resin to dentin.

Material and Methods: Twenty-five extracted intact human molar crowns were prepared longitudinally on 4 sides (mesial, distal, buccal, and lingual) to produce flat dentin surfaces (25 teeth x 4 surfaces = 100 specimens) for bonding. Group A, B, C, and D were contaminated with sealer for 15 minutes; Group E was not contaminated. After contamination, Group A was cleaned with a dry cotton pellet, Group B was cleaned with 25% ethanol, Group C was cleaned with a dry cotton pellet and left for 3 days (to allow the sealer remnant polymerization), and Group D was cleaned with ethanol and left for 3 days. Composite resin specimens bonded to all the dentine specimens and loaded for shear bond strength.

Results: There were no significant difference among the groups (p=0.368).

Conclusion: Use of ethanol cleansing on epoxy-resin sealer contaminated surfaces before Clearfill SE Bond use had no positive effect on bonding strength of adhesive restoration.

Keywords: *Adhesive, epoxy resin root canal sealer, contamination, bond strength*

ÖZ

Amaç: Epoksi reçine bazlı kök kanal patı kontaminasyonunun kompozit reçinenin dentine bağlanması üzerine etkisinin değerlendirilmesi.

Gereç ve Yöntem: Yirmi beş adet çekilmiş çürüksüz insan molar dişi düzgün bağlama yüzeyleri elde etmek için dört tarafından (meziyal, distal, bukkal ve lingual) kesildi (25 diş x 4 yüzey = 100 örnek). Grup A, B, C ve D pat ile kontamine edildi; Grup E kontamine edilmedi. Kontaminasyon sonrasında Grup A kuru pamuk pelet ile temizlendi, Grup B %25'lik etanol ile temizlendi, Grup C kuru pamuk pelet ile temizlenip 3 gün bekletildi (pat kalıntılarının polimerizasyonu için) ve Grup D %25'lik etanol ile temizlenip 3 gün bekletildi. Kompozit reçine örnekleri dentin örnekleri üzerine uygulandı ve üniversal bir test cihazı ile yüke tabi tutuldu.

Bulgular: Gruplar arasında anlamlı fark yoktu (p=0.368).

Sonuç: Epoksi reçine bazlı kök kanal patı kontaminasyonunun kompozit reçinenin dentine bağlanma dayanımını azaltmadığı belirlendi.

Anahtar kelimeler: *Adezif, epoksi reçine kök kanal patı, kontaminasyon, bağlanma dayanımı*

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Introduction

Restoration of endodontically treated teeth is a key factor in the long-term prognosis. Vire (1) reported that 46.5% of endodontic failure was due to fracture of coronal restoration for 5-year period average. Studies have demonstrated an increase in the resistance to fracture in endodontically treated teeth restored with composite resins (2, 3). When restoring these teeth, composite resins are mostly have been used as a conservative restoration material because composite resin bonds to tooth structures and could prevent long-term fractures. However, the mechanism of bonding to dentin is complex and affected by numerous factors. These include are the age of the dentin and the orientation of the dentin tubule (4, 5), the depth of the dentin (4, 5), the use of chemical agents such as fluor (6) and chlorhexidine (6, 7), the use of provisional cements (8, 9), endodontic materials (10), dentin-cleaning agents (11), hemostatic agents (12, 13), saliva (14), and blood (15-17).

AH Plus root canal sealer is frequently used for obturation of root canals together with gutta-percha and is frequently smeared on dentin. This study was planned for the evaluation of whether AH Plus root canal sealer contamination effects bonding of composite resin to dentin with the precleaning of surfaces with ethanol before adhesive application.

Material and Methods

Twenty-five extracted, intact human molars were hand-scaled to remove soft tissue and stored in room-temperature in tap water. Each tooth was embedded in autopolymerizing acrylic resin, with the coronal portion exposed (Figure 1). After complete polym-

erization of the resins, the crowns were cut longitudinally on all 4 sides (mesial, distal, buccal and lingual) to produce flat dentin surfaces (25 teeth x 4 surfaces = 100 specimens) for the evaluation of bonding. All the dentinal surfaces were first irrigated with 2% sodium hypochlorite for 3 minutes and 17% EDTA for 1 minute. The prepared specimens were then assigned to 5 groups: Group A, B, C, and D were contaminated with AH Plus (Dentsply, Konstanz, Germany) for 15 minutes; Group E not contaminated (control). After contamination with the sealer, Group A was cleaned with a dry cotton pellet, Group B was cleaned with 25% ethanol, Group C was cleaned with a dry cotton pellet and left for 3 days (for the sealer to set), and Group D was cleaned with ethanol and left for 3 days. Plastic cylinders (2 mm long x 3 mm inner diameter) were filled with a composite resin (Clearfill Photo Posterior, Kuraray, Japan) and bonded (Clearfill SE Bond, Kuraray, Japan) to all the dentine specimens. The plastic cylinders were removed after polymerization of the composite resins. The specimens were loaded in a universal testing machine, and shear force was applied to the base of the composite cylinders, parallel to the dentin surfaces, at a crosshead speed of 1 mm/min until fracture. Bond strength data were compared with analysis of variance and the Tukey test ($\alpha = .05$).

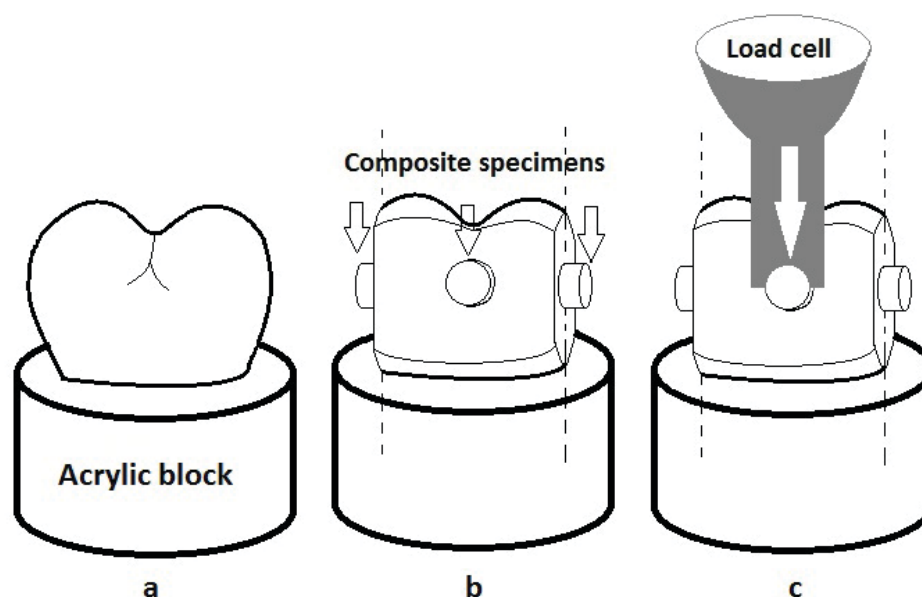


Figure 1. Specimen preparation and shear test design.

Results

Means (in MPa) were: for Group A: 17.84 (± 5.22); Group B: 20.06 (± 5.94); Group C: 16.51 (± 6.64); Group D: 17.10 (± 6.81); and Group E: 18.96 (± 6.13). AH Plus contamination produced no significant difference in bond strengths ($p = 0.368$).

Discussion

The results of this study showed that AH Plus root canal sealer contamination of coronal dentin and surface cleaning procedures had no deleterious effect on self-etch bonding to dentin. Specific scenarios were established for the study for sealer contamination. We set the duration of the sealer contamination for 15 minutes by taking consider of usual obturation period in clinical practice. In some clinical cases, coronal restoration of root canal treated teeth cannot be performed at the same appointment. In such situations,

the sealer applied to the dentin may set. To simulate this condition, we waited for 3 days before adhesive restoration. In the literature, we could not find any procedure to clean epoxy resin root canal sealer remnants from the coronal cavity. Thus, we preferred to use an ethanol as an organic solvent.

As the depth of the dentin affects the bond strength of adhesives to dentin (4, 5), the prepared dentin depth level was set as 2 mm from the external enamel surface (from the deepest pit).

To standardize the test specimens, we prepared flat dentin surfaces, which could easily be cleaned for the shear bond strength test. Smooth dentin surfaces were essential for standardization of the specimens and groups. However, these flat surfaces didn't simulate clinical conditions as real tooth cavities have undercuts and couldn't be possible to remove all the sealer easily. Therefore, sealer may have been removed from all surfaces easily in this study model because

of flat shape of test surfaces. However there were no difference between contaminated and non-contaminated surfaces.

The bonding material used in this study also contains organic solvents. These solvents may have be potentiated dissolving capacity of cleansing agent and contribute to cleaning of activity of sealer remnants.

Conclusion

Within the limitations of this study, we concluded that with the use of ethanol cleansing on sealer contaminated surfaces before Clearfill SE Bond use did not potentiate bonding strength of adhesive restoration.

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