Is Adhesive Cementation of Endodontic Posts Necessary?

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Abstract

Recently, the appropriate, durable bond of adhesive systems and composite resin cements to retain endodontic posts was challenged. The question arises whether it would be possible to place glass fiber posts in a less technique sensitive conventional nonadhesive approach. The influence of nonadhesive, self-adhesive, and etch-and-rinse systems on load capability of postendodontic restorations was studied. Human maxillary central incisors were divided into 4 groups (n = 10). Teeth were endodontically treated and restored by using glass fiber posts luted with different cements/composite resin combinations: (1) RelyX Unicem (3M ESPE, Seefeld, Germany)/Clearfil Core (Kuraray Europe, Duesseldorf, Germany), (2) RelyX Unicem/LuxaCore, (3) zinc phosphate cement/Clearfil, and (4) LuxaCore (DMG, Hamburg, Germany)/Clearfil. A 2mm-ferrule preparation was performed. All specimens received adhesively luted all-ceramic crowns and were exposed to thermal cycling and mechanical loading before subsequent static loading. Significant differences between the experimental groups regarding load capability and fracture patterns were observed. The conventional nonadhesive post cementation is less reliable to withstand simulated functional forces compared to adhesive approaches. *(J Endod 2008;34:1006–1010)*

Key Words

Chewing simulation, conventional cementation, dowel, endodontic post, luting

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0099-2399/$0 - see front matter

doi:10.1016/j.joen.2008.05.010

The retentive effect of adhesive systems for endodontic post cementation was discovered rather by chance (1). It improves marginal adaption with improved apical seal (2–4), increases post retention (5) even with reduced post length (6), relieves stresses within the root (7), optimizes fracture patterns in regards to re-restoration (8, 9), and increases failure resistance compared with conventional cementation (10) at least for upper incisors (11).

However, there are unfavorable conditions regarding the application of adhesive techniques within the root dentin predominantly because of inadequate access. A visual control is not possible. Thus, remnants of the post space preparation and acid may remain within the root canal (12). Numerous voids and gaps were found within the cement interface (13, 14).

The root dentin can be conditioned by phosphoric acid. The formation of a hybrid layer is possible (15). Polymerization shrinkage stresses within the root canal with its unfavorable cavity configuration are similar to a deep class I cavity (16) and cannot be controlled when the cement thickness may be thin (17) or uneven (18).

Only slow-setting, chemical curing composite (4) or glass ionomer cements (19) provide sufficent viscoelastic properties to relief shrinkage stresses to achieve acceptable bond strength under these conditions (20, 21).

Recently, a pushout test with additional transmission electron microscopy (21), an SEM analysis (22), a retentive strength test (23), and a pushout test (24) challenged the efficiancy of the adhesive fiber post cementation. The test results indicated that predominatly frictional retention contributed to post retention. Thus, using zinc phosphate for fiber posts cementation would be a reasonable approach (22) because it is less time-consuming, less technique sensitive, and inexpensive compared with adhesive approaches. The following null hypothesises were tested: (1) conventional nonadhesive zinc phosphate cement is as reliable as a self-adhesive and etch-and-rinse adhesive cement during simulated functional force application and (2) there is no difference between the load capability of adhesive and nonadhesive cements.

Material and Methods

Specimen Pretreatment and Distribution

Human maxillary incisors were selected and stored at room temperature in a 0.5% chloramine solution. To ensure the use of teeth of comparable dimension within the groups, mesiodistal and facial-lingual dimensions were measured at the level of the cemento-enamel junction (CEJ). A size assessment was calculated from the product of mesiodistal × facial-lingual dimensions. Extreme small or large teeth were excluded. Specimens were randomly distributed into 4 groups (n = 10) by means of a 10-digit random table. Root canals were enlarged to size 60 (Antaeos; VDW, Munich, Germany) and rinsed with 2.5% sodium hypochlorite. Root canal filling was done by lateral condensation using gutta-percha (Roeko, Langenau, Germany) and sealer (AH 26; De Trey, Konstanz, Germany). The crowns were cut 2 mm coronal to the most incisal point of the proximal CEJ.

The roots of the specimens were blocked out with wax 2 mm below the CEJ. To imitate a human periodontium, the roots of the teeth were covered with a 0.1-mm thick layer of silicone (Anti-Rutsch-Lack; Wenko, Wensselaer, Germany). The teeth were embedded in acrylic resin (Technovit 4000; Kulzer, Wehrheim, Germany) directing their axes 135° from the horizontal line. To prevent overheating, the teeth were submerged in water for 5 minutes during resin polymerization.

Gutta-percha was removed (Gates-Glidden burs) leaving at least 4 mm of the root filling in the apical portion. The root canal was prepared with a tapered drill (∅ 1.4