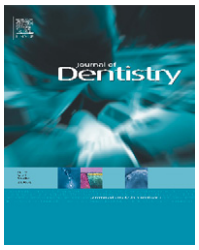
available at www.sciencedirect.com

ScienceDirect

journal homepage: www.intl.elsevierhealth.com/journals/jden



An evaluation of luting agent application technique effect on fibre post retention

Camillo D'Arcangelo [a,*], Maurizio D'Amario [b], Mirco Vadini [a], Simone Zazzeroni [a], Francesco De Angelis [a], Sergio Caputi [c]

[a] Department of Restorative Dentistry, School of Dentistry, University G. D'Annunzio, Via dei Vestini 31, 66100 Chieti, Italy
[b] Department of Restorative Dentistry, Odontostomatological Clinic, University of L'Aquila, L'Aquila, Italy
[c] Department of Oral Science, University G. D'Annunzio, Chieti, Italy

ARTICLE INFO

Article history:
Received 18 September 2007
Received in revised form
23 December 2007
Accepted 9 January 2008

Keywords:
Fiber post
Post retention
Resin-based luting agent
Root dentin
Push-out test

ABSTRACT

Objective: Aim of the study was to assess the bond strengths of three adhesive/resin cement/fibre post systems by using different application methods of the luting agent.
Methods: Three types of fibre post systems were selected for this study. ENA Post (Micerium), Anatomical Post (Dentalica), and Endo Light-Post (RTD) were luted in prepared root canals, using proprietary adhesive system and resin cement. Each group was divided into three subgroups ($n = 10$). For each subgroup, a different technique was used to place the luting agent into post space: using a lentulo spiral; applying the cement onto the post surface; injecting the material with a specific syringe. A push-out test was performed on sections from apical, middle and coronal parts of each specimen. All fractured specimens were observed using a scanning electron microscope to identify the types of failure.
Results: Bond strengths were not statistically influenced by root region ($p > 0.05$) but were significantly affected both by post/adhesive/cement system and by the application technique of the luting agent ($p < 0.05$). The microscopic analysis of the specimens revealed a prevalence of post/cement and mixed failures.
Conclusions: The best results with the push-out test were obtained when the luting agent was brought into the post space with lentulo spirals or specific syringes. Only ENA Post system showed similar bond strength values independently from the application method of the luting agent.

1. Introduction

Retention of fibre-reinforced composite (FRC) posts within root canals is affected by several factors: type of post, its adaptation into the post space, type of adhesive and operative procedures.[1–5] The distribution of resin cement into the post space during the luting procedure and the anatomical and histological characteristics of the root dentine seemed to influence bond strength between resin luting agent and root canal regions.[6,7] An adequate polymerisation of luting agent is necessary to provide its mechanical properties, that clinically ensure post retention. Many current resin luting agents polymerise through a dual-curing process that requires light exposure to initiate the reaction.[8,9] It has been reported that the mechanical properties of dual-cure type resin agents appear improved after photo-activation compared with chemical-activation alone.[10] Dual-cure resin cements are different in their handling characteristics, compositions and properties (such as polymerisation ability, flexural strength, hardness).[11]

* *Corresponding author*. Tel.: +39 085 4549652; fax: +39 085 4541279.
E-mail address: cdarcang@unich.it (C. D'Arcangelo).
0300-5712/$ – see front matter
doi:10.1016/j.jdent.2008.01.004

These differences may have an effect on the adhesion to root dentine substrate. Also the viscosity of the resin cement and the way the cement was placed into the post space seemed to be important factors that could affect the complete setting of fibre posts[12] and consequently the strength of the post retentive force. Although the mechanical properties of dual-cure resin cement have been evaluated, little information is available on the role of the application methods of dual-cure resin cements into the post space and their effect on the regional bond strength of fibre post.

Therefore, the aim of this study was to evaluate the bond strengths of three adhesive/resin cement/fibre post systems to coronal, middle and apical thirds of post space dentine by using different application methods of the luting agent. The null hypothesis tested was that the push-out bond strengths would not be affected by post/adhesive/cement system, luting cement application technique and post space regions.

2. Materials and methods

2.1. Specimen preparation

Ninety freshly extracted human maxillary incisors were selected. The inclusion criteria were as follows: absence of severe root curvatures, root decay, defects, cracks, previous endodontic treatment and root length measured from the cementoenamel junction (CEJ) of at least 14 mm. External debris was removed using an ultrasound device (Suprasson P-max; Satelec/Acteon Equipment, Merignac, France). Selected specimens were stored in 0.5% chloramine T aqueous solution at 4 °C. Crown surfaces of each tooth were sectioned below the CEJ perpendicular to their long axis to obtain 14 mm long roots. A cylindrical diamond rotary cutting instrument (Intensiv 314, Ø ISO 014, L.8.0 mm; Intensiv, Grancia, Switzerland) mounted on a high-speed hand-piece (Bora L; Bien-Air, Bienne, Switzerland) with water-spray cooling was used. Crown sectioning allowed to have direct access to the root canals, that were mechanically enlarged to ISO size 25, 0.06 taper (MTwo; VDW GmbH, Munich, Germany), following the whole procedure suggested for this Ni–Ti instruments. Five percent sodium hypochlorite (Ogna, Muggiò, Milan, Italy) and 17% EDTA (Pulpdent, Watertown, MA, USA) were used as irrigants. Enlarged canals were rinsed with distilled water, dried with paper points (Roeko, Langenau, Germany) and sealed with gutta-percha (Lexicon Gutta Percha Points; Dentsply Tulsa Dental, Tulsa, OK, USA) using the System-B HeatSource (Analytic Technology, Redwood City, CA, USA) and endodontic sealer (Pulp Canal Sealer EWT; Kerr, Romulus, MI, USA). Backfilling was performed with Obtura II (Spartan, Fenton, MO, USA).

2.2. Bonding of fibre posts

After 24 h, gutta-percha was removed with warm endodontic pluggers (Sybron Dental Specialties, Romulus, MI, USA). Teeth were randomly assigned to one of three groups (ENA, DEN, RTD; $n = 30$ each), depending on the types of post/adhesive/resin cement (Table 1). Post spaces were prepared to a depth of 10 mm measured from the sectioned surfaces using the drills from the respective post manufacturers. Post space preparations were rinsed with 5% NaOCl. A final irrigation was accomplished with distilled water, and post spaces were dried with paper points. Before cementation procedures, each post was marked at a distance of 10 mm from the apical end corresponding to the length of the post space preparation and horizontally sectioned with a water-cooled diamond rotary cutting instrument (R879.014; Diaswiss, Geneva, Switzerland). In this way, the complete seating of the posts could be verified. Every canal was etched with phosphoric acid (Table 1)

Table 1 – Summary of the procedures employed for fibre post cementation, according to the manufacturer's instructions

Group ENA: Micerium, Avegno, Genova, Italy (post type: ENA Post)	Group DEN: Dentalica, Milano, Italy (post type: Anatomical Post)	Group RTD: RTD, St. Egrève, France–Dentsply DeTrey, Konstanz, Germany (post type: Endo Light-Post)
Prepare post space to a depth of 10 mm using EnaPost Drill ISO 100 taper 2% (batch no. 4105001)	Prepare post space to a depth of 10 mm using Anatomical Shaper Large (batch no. PR0032ASS)	Prepare post space to a depth of 10 mm using Torpan Drill ISO 100 Yellow (batch no. 042190611)
Acid-etch post space with EnaEtch (batch no. 2006104947) for 60 s	Acid-etch post space with Axia Etch (batch no. 41144114QEUF) for 60 s	Acid-etch post space with Conditioner 36 (Dentsply DeTrey, Konstanz, Germany) (batch no. 0507002142) for 60 s
Water/rinse without desiccation	Water/rinse without desiccation	Water/rinse without desiccation
Mix EnaBond light curing (batch no. 2006105578) + EnaBond Catalyst (batch no. 2006104878) (1:1) for 2 s and apply to the root canal for 30 s	Mix One-Q-Bond C.G.T. (batch no. 4118PQB) + One-Q-Bond C.G.T. Activator (batch no. 4109ACA) (1:1) for 2 s and apply to the root canal for 30 s	Mix XP Bond (batch no. 065001399) + SelfCure Activator (batch no. 0510061) (1:1) for 2 s and apply to the root canal for 30 s
Gently air dry for 5 s	Gently air dry for 5 s	Gently air dry for 5 s
Apply EnaCem HF cement (batch no. LP1a/b) following the different proposed techniques	Apply Nano Core Dual cement (batch no. 4124QCLVA3) following the different proposed techniques	Apply FluoroCore 2 cement (batch no. 0610021) following the different proposed techniques
Place Ena Post (1–1.45)[a] (batch no. CP050202)	Place Anatomical Post Large (0.7–1.56)[a] (batch no. PR0032ASS)	Place Endo Light-Post #2 (1–1.36)[a] (batch no. 0610021)
Light cure with minimum output intensity of 600 mW/cm^2 for 40 s	Light cure with minimum output intensity of 600 mW/cm^2 for 40 s	Light cure with minimum output intensity of 600 mW/cm^2 for 40 s

[a] Minimum/maximum cross-section post diameter in mm.