Available online at www.sciencedirect.com

SciVerse ScienceDirect

Journal of Prosthodontic Research 57 (2013) 20–23

Journal of Prosthodontic Research

www.elsevier.com/locate/jpor

Original article

Polymerization efficiency through translucent and opaque fiber posts and bonding to root dentin

Cássia F. Reginato DDS, Aline S. Oliveira DDS, Marina R. Kaizer DDS, MS, Patrícia S. Jardim DDS, MS, PhD, Rafael R. Moraes DDS, MS, PhD*

School of Dentistry, Federal University of Pelotas, Brazil

Received 3 January 2012; received in revised form 16 April 2012; accepted 23 May 2012

Available online 30 October 2012

Abstract

Purpose: To investigate the polymerization efficiency through translucent and opaque glass fiber posts and the bond strength of a self-adhesive resin to root dentin.

Methods: Translucent and opaque silanated conical posts, identical in length, diameter and shape ($n = 8$), were cemented to incisor bovine roots using RelyX Unicem Clicker. Photoactivation was performed only through the posts. The roots were transversally sectioned (cervical, middle and apical thirds) and the push-out test was carried out. Data were analyzed using two-way ANOVA and Fisher's LSD method (5%). Failure modes were classified under magnification. An elastomer mold of a bovine incisor root was filled with flowable composite and the posts inserted into the mold. After photoactivation through the post and removal of unpolymerized material, the polymerization efficiency was estimated by percentage of mass gain ($n = 5$). Data were analyzed using t-test (5%).

Results: The bond strength of the translucent post was higher than the opaque post for all root thirds. For both posts the bond strength at the cervical third was higher than at the middle and apical thirds. A predominance of adhesive failures was detected for all conditions. Mixed failures were more frequently observed for the opaque post. Almost all the composite polymerized and bonded to the extension of the translucent post, whereas polymerization of the composite was restricted to the cervical area of the opaque post.

Conclusions: The use of translucent post may positively influence the polymerization efficiency and bond strength of resin cement to intraradicular dentin.

© 2012 Japan Prosthodontic Society. Published by Elsevier Ireland. All rights reserved.

Keywords: Light-curing; Endodontically treated teeth; Glass-fiber post; Resin luting agent; Root dentin

---

1. Introduction

The use of dual-cure resin cements to lute glass fiber posts into root canals is a common clinical procedure [1,2]. In the last few years, self-adhesive resin cements (SARCs) emerged as an alternative to conventional resin cements. SARCs simplify the luting procedures by eliminating the etching, priming and bonding steps of the tooth structure [3–5]. The adhesive properties of SARCs are attributed to acidic functional monomers that demineralize and simultaneously infiltrate the substrate. Secondary reactions have been suggested to provide additional chemical bonding to the hard dental tissues [6].

During luting of posts using resin cements, a significant reduction in light polymerization irradiance occurs as a result of the attenuation promoted by the tooth structure and the post itself [7–9]. In situations of attenuated light, dual-cure resin cements have been shown to be more dependent on the self-cure mechanism [8,10–12]. It has been reported that the curing efficiency of SARCs is lower compared with conventional resin cements, especially in the self-cure mode [13]. This effect may be critical when luting fiber posts, as the cement in the most apical area of the root canal relies mostly on the self-polymerization rather than on the physical cure [14].

A method used in an endeavor to improve the polymerization efficiency of resin cements into root canals is the use of the light-transmitting, translucent fiber posts. Previous studies have reported that translucent posts may increase the depth of cement cure [7,8,15], but the combined use of translucent posts and SARCs has been seldom investigated. The aim of this study

---

* Corresponding author at: School of Dentistry, Federal University of Pelotas, Rua Gonçalves Chaves 457, 96015-560 Pelotas-RS, Brazil.
Tel.: +55 53 3225 6741; fax: +55 53 3225 6741.
E-mail address: moraesrr@gmail.com (R.R. Moraes).

1883-1958/$ – see front matter © 2012 Japan Prosthodontic Society. Published by Elsevier Ireland. All rights reserved.
http://dx.doi.org/10.1016/j.jpor.2012.05.003

was to evaluate the polymerization efficiency through translucent and opaque posts and the bond strength of a SARC used to lute the posts to root dentin. The hypotheses tested were that (i) the polymerization efficiency through the translucent post would be greater than through the opaque post and that (ii) higher bond strengths would be observed for the translucent compared with the opaque post.

2. Materials and methods

2.1. Preparation of specimens

Sixteen bovine incisors with no curves and similar root diameter were selected. The crowns were removed to obtain a remaining 17-mm-height root, and the apices were sealed with a photoactivated resin composite. For the endodontic treatment, Gates-Glidden drills #4 (Dentsply Maillefer; Ballaigues, Switzerland) were used. Translucent and opaque fiber glass-reinforced epoxy posts (Exacto; Angelus, Londrina, PR, Brazil) were tested ($n = 8$ per post type). The posts were identical in shape (tapered conical), length (15 mm) and diameter (3 mm), except for their translucency/opacity. A 15-mm-depth post space was prepared in the root canals with pre-shaping Exacto drills #3 (Angelus). The pre-shaping procedure allowed standard positioning and well fitting of the posts into the spaces.

The fiber posts were used as-received, following the manufacturer directions. A layer of silane coupling agent (Angelus) was applied in the surfaces and air-dried for 30 s. The dual-cure resin cement RelyX Unicem Clicker (3M ESPE, St. Paul, MN, USA) was used for cementation. A SARC was used because it simplifies the adhesive cementation of posts; this type of cement is increasingly being use for that purpose. The resin cement was mixed for 10 s and applied into the root canals using a Centrix syringe (DFL, Rio de Janeiro, RJ, Brazil). The posts were cemented applying digital pressure for 30 s, according to the cement manufacturer's instructions. Excess luting material was removed and photoactivation was performed through the upper portion of the post for 40 s using a quartz–tungsten–halogen unit (XL3000; 3M ESPE) with 500 mW/cm^2 irradiance. Black cardboard was used to cover the cervical portion of the root and restrict the curing light transmission only through the post. The specimens were stored in distilled water at 37 °C, for 24 h.

2.2. Push-out test and failure analysis

After storage, the specimens were sectioned traversal to the long axis of the teeth. Six 1.5-mm-thick slabs were obtained per root and identified as cervical, medium or apical specimens, two for each root third, as shown in Fig. 1A. Each slab was positioned on a push-out jig placed on a mechanical testing machine (DL500; EMIC, São José dos Pinhais, PR, Brazil). A compressive load was applied using a cylinder-shaped plunger touching the post only, at a crosshead speed of 0.5 mm/min until the post was dislodged. Bond strength data were recorded in MPa. The bond strengths of the two slabs tested for each root third were averaged. Data were submitted to two-way ANOVA (post type *vs.* root third). All pairwise multiple comparison procedures were performed using the Fisher's LSD method ($P < 0.05$). After the test, the fractured specimens were observed with a stereomicroscope under a 40× magnification. Failure modes were classified as adhesive failure (intraradicular dentin free of resin cement, Fig. 1B), or mixed failure (remnants of cement in the intraradicular dentin, Fig. 1C).

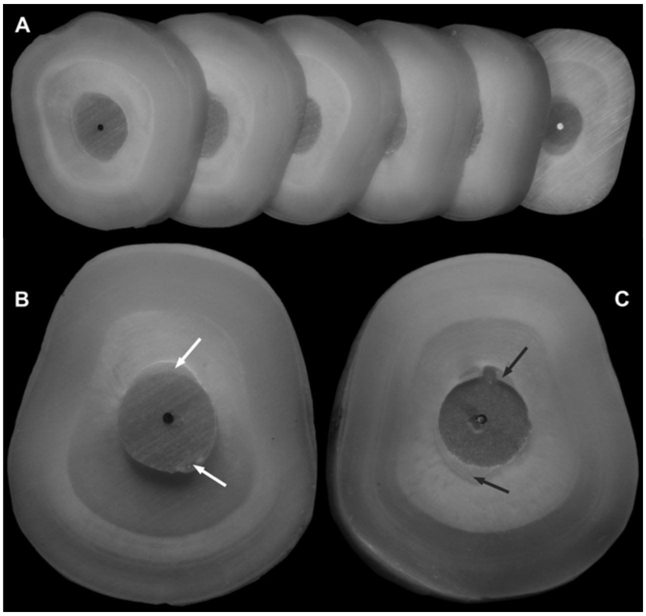

Fig. 1. (A) Six 1.5-mm-thick slabs were obtained for each root and divided into root thirds (2 slabs for each third); (B) representative picture of an adhesive mode of failure (all cement is attached to the post surface, as shown by the white arrows); (C) representative picture of a mixed mode of failure (remnants of cement are left on the intraradicular dentin, as indicated by the black arrows).

2.3. Polymerization efficiency through the posts

In order to investigate the photopolymerization efficiency through the posts, an elastomer mold with the shape of a bovine incisor root with no curves (height 16 mm, cervical diameter 7 mm, medial diameter 4 mm, apical diameter 2 mm) was obtained. Opaque and translucent fiber posts ($n = 5$) were silanated as described. The posts were weighed in an analytical digital balance (AUW220D; Shimadzu, Kyoto, Japan) accurate to 0.01 mg to record their initial mass. The elastomer mold was filled with a flowable photoactivated resin composite (Natural Flow; DFL) and the post inserted into the mold. A photoactivated composite was used in this test to create a worst-case curing scenario (no self-cure mechanism) and estimate the polymerization efficiency by light transmission through the posts only. An elastomer stop was used to ensure correct positioning of the post in the center of the mold and restrict the curing light transmission only through the post. Photoactivation was performed as described. The specimens were extracted from the mold and the unpolymerized material (if any) was scraped with a spatula and gauze. The specimens were weighed again whereby the final mass was recorded. Polymerization efficiency was estimated by percentage of mass gain after polymerization of the composite. Mass gain data were submitted to a t-test ($P < 0.05$).

Download English Version:

https://daneshyari.com/en/article/10167519

Download Persian Version:

https://daneshyari.com/article/10167519

Daneshyari.com