HOSTED BY
ELSEVIER

Available online at www.sciencedirect.com

ScienceDirect

Tanta Dental Journal 12 (2015) 185–191

www.elsevier.com/locate/tdj

Push-out bond strength of different root canal obturation systems to root canal dentin

H.M. Abada [a,*], A.M. Farag [b], H.A. Alhadainy [b], A.M. Darrag [b]

[a] *Ministry of Health, Egypt*
[b] *Department of Endodontics, Faculty of Dentistry, Tanta University, Egypt*

Received 6 March 2015; revised 22 May 2015; accepted 25 May 2015
Available online 28 June 2015

Abstract

Aim: To evaluate and compare push-out bond strength of four obturation systems; Gutta-percha/AH Plus, GuttaFlow, RealSeal and EndoREZ system to root canal dentin.
Materials and methods: Human freshly extracted 80 mandibular premolars were prepared and assigned to experimental groups ($n = 20$), designated as Group I: Gutta-percha/AH Plus, Group II: GuttaFlow system, Group III: RealSeal points/RealSeal Self-etch and EndoREZ obturation system. After obturation, each tooth was prepared for push-out assessment with root slices of 2 mm thickness using universal testing machine. Data were analyzed using one way ANOVA in a level of confident at 95%.
Results: Gutta-percha/AH Plus root fillings showed significantly highest bond strength. Whereas root segment location did not have a significant influence on bond strength except with Group III.
Conclusion: The adhesiveness quality to root dentin promoted by newer methacrylate resin-based obturation systems like RealSeal and EndoREZ systems is compromised even when teeth with simple anatomic features were obturated under well-monitored laboratory conditions.
© 2015, Hosting by Elsevier B.V. on behalf of the Faculty of Dentistry, Tanta University.

Keywords: AH plus; EndoREZ; RealSeal; GuttaFlow; Push-out bond strength

1. Introduction

Many obturation systems were proposed for endodontics to approach the good sealing ability and adhesion to dentin. An ideal root canal sealer should adhere firmly to both dentin and core filling materials [1]. The bond strength of endodontic sealer to dentin is important to maintain the integrity of root canal seal. Since, direct relationship between the endodontic sealer bond and leakage has been reported [2]. Many types of sealers are available, which may be broadly classified into zinc oxide eugenol, calcium hydroxide, epoxy resin, glass ionomer, silicon, bioceramic and mineral trioxide aggregate based sealer [3]. These sealers can be used in conjunction with core filling material as Gutta-percha (GP).

Recently, adhesive obturation systems have been introduced in endodontics in an attempt to obtain a "monoblock" in which the core material, sealing agent and root canal dentin form a single cohesive unit

* Corresponding author. Tel.: +20 (0)100377242.
E-mail address: hisham.dentist@gmail.com (H.M. Abada).
Peer review under the responsibility of the Faculty of Dentistry, Tanta University.

http://dx.doi.org/10.1016/j.tdj.2015.05.006
1687-8574/© 2015, Hosting by Elsevier B.V. on behalf of the Faculty of Dentistry, Tanta University.

within the root canal [4]. Increased adhesive properties to dentin might lead to greater strength of the restored tooth, which may provide greater resistance to root fracture and clinical longevity of an endodontically treated tooth [5]. Differences in the adhesive properties of endodontic sealers are expected because their interaction with either dentin or root core materials may vary with their chemical composition [6]. Adhesion depends on a multitude of interacting factors including the surface energy of the adherend (dentin or core materials), surface tension of the adhesive (sealer), the adhesive ability to wet the surfaces and the cleanliness of the adherend surface. Moreover, stresses caused by differences in thermal expansion coefficients and dimensional changes during setting of the adhesive may affect adhesive bonds [7].

GP with a sealer has universally been accepted as the gold standard for root canal filling materials. However, GP still has some problems as a core material such as it does not have a complete dentinal seal [8]. Recent advances in adhesive technology have led to the introduction of a new generation of endodontic sealers and filling materials that are based on adhesive properties and polymer resin technology. These materials are capable of bonding to radicular dentin by forming a hybrid layer and penetrating deep into dentinal tubules by virtue of their hydrophilic properties [9]. Resin based sealers may be either epoxy-resin or methacrylate-resin based sealer (MRBS).

AH Plus is an epoxy-resin based sealer that showed better long-term sealing ability compared to conventional sealers due to its reported expansion over time. It is biocompatible and more radiopaque, has a shorter setting time (approximately 8 h), lower solubility, and a better flow characteristics compared with AH26 [10].

Recently, MRBS has been developed, and is derived from polymer chemistry technology. The predominant adhesive mechanism of theses sealers to radicular dentin is their micromechanical retention where they infiltrate partially demineralized collagen matrix [11]. EndoREZ (ER) is the second generation of bondable MRBS. It is a two-component (base and catalysts), dual-curing self-priming sealer with favorable low viscosity properties [9]. Also, it is nonetching and does not require adjunctive use of dentin adhesive, it is hydrophilic in nature and flow into accessory canals and dentinal tubules facilitating resin tag and hybrid layer formation after smear layer removal [12]. The sealer can be used with either GP or resin-coated GP cones (ER points). Despite it bonds well to root canal walls but not to GP, which constitutes a potential weakness of pathway for bacterial leakage, using ER points with its sealer establishes the so-called monoblock and is the reason for the superior sealing properties of the system [9].

RealSeal self-etch (RS SE) sealer is fourth generation MRBS and is functionally analogous to a similar class of recently introduced self-adhesive resin luting composites in that they have further eliminated the separate etching/bonding step [13]. Acidic resin monomers that are originally present in dentin adhesive primers are now incorporated into the resin-based sealer to render them self-adhesive to dentin substrate. The combination of an etchant, a primer, and a sealer into an all-in-one self-etching, self-adhesive sealer is advantageous in that it reduces the application time as well as errors that might occur during each bonding step [14]. This sealer uses the concept of incorporating smear layers created by hand/rotary instruments along the sealer–dentin interface [15]. It might be used with RS cones or pellets by either using cold lateral and warm vertical techniques or with the more recently introduced RS 1 which is carrier-based RS obturator system [16].

One of the most recent techniques for root canal obturation is using cold injectable silicon-based filling system “GuttaFlow” (GF) because it is cold, flowable at room temperature and contains GP in particle form combined with polydimethylsiloxane based sealer into one injectable system. It can be used alone as a sole obturator or in combination with a master GP cone and does not require any form of manual compaction for placement. In addition, no heat is used with placement of the material, so no shrinkage occurs. Moreover the material expands 0.2% upon setting, so it provides an adequate adaptability to root canal walls [17].

Bond-strength testing had become a popular method for determining the effectiveness of adhesion between endodontic materials and tooth structure [18]. A variety of bond strength testing methods have been used; the most common are the tensile and shear bond strength testing. Test designed to measure shear bond strength includes the planar interface shear test and push-out test. Regarding push-out test, the material to be evaluated is placed in cylindrical holes drilled in tooth substrate and the force required to dislodge the test material when pushed out of the holes is measured. Root canal dentin cylinders used in the push-out test is an interesting option to test root canal filling systems [19].

The study hypothesis was that adhesive root canal filling systems form a monoblock and obtained a superior adhesiveness to root canal dentin than non-adhesive root canal filling systems. Therefore, this

Download English Version:

https://daneshyari.com/en/article/3179633

Download Persian Version:

https://daneshyari.com/article/3179633

Daneshyari.com