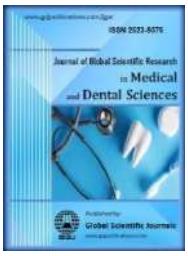
Journal of Global Scientific Research 7 (9) 2022/ 2679-2682

Contents lists available at www.gsjpublications.com

Journal of Global Scientific Research in Medical and Dental Sciences

journal homepage: www.gsjpublications.com/jgsr



# Fracture Resistance of Endodontically Treated Teeth Filled with Protaper Guttapercha and Using Two Different Types of Sealers (A Comparative Study)

**Eman Adil Abdul Qadir**

*Department of Conservative Dentistry, College of Dentistry, University of Mosul, Mosul, Iraq.*

ARTICLE INFO

*Received: 3 Aug 2022,*
*Revised: 7 Aug 2022,*
*Accepted: 17 Aug 2022,*
*Online: 27 Sep 2022*

*Keywords*:
bio ceramic, Gutta Flow, resistance to fracture, sealer.

ABSTRACT

**Objective:** This research set out to compare the ability of roots obturated with two different kinds of endodontic sealers.; Endo sequence bio ceramic and Gutta Flow silicon-based sealers to withstand vertical force. **Methods**: Thirty teeth with just one root were prepared and separated into 3 groups (n=10). Group I filled the root canals with protaper guttapercha\ Endo sequence bio ceramic sealer, group II filled the root canals with protaper guttapercha \Gutta Flow bioseal sealer: group III (control) canals were prepared only and left without obturation. The withstand of roots to break was assessed with a universal testing device by measuring the greatest load in Newtons used to break each root. ANOVA test was utilized to make a data analysis, then Tukey test was utilized to decide the significance value at (P≤0.05). **Results**: Endo sequence bio ceramic sealer group exhibited slightly better but not significant withstand to fracture than Gutta Flow sealer and control groups. while experimental and control groups did not show any statistically significant differences. **Conclusion:** protaper gutta percha / Endo sequence bio ceramic sealer reinforces the root canal more than protaper guttapercha /Gutta Flow sealer.

## 1. Introduction

Teeth that had endodontic treatment are more brittle and fragile than healthy teeth and resistance of these teeth to vertical load are reduced [1]. Therefore, root canal filling materials are used to support the remaining tooth structure [1]-[2].

The endodontic sealer is used to adapt and accommodate the spaces between the gutta percha cones and the canal walls [3]. Endodontic sealer also acts as a lubricant of the gutta percha to facilitate its place¬ment into the canal [4]. Root canal sealer also fills in lateral canals and grooves that gutta-percha cannot fill them, also increasing its peripheral adjustment to the canal dentin [1]-[3]-[5].

The most recent type of sealer is now available is the bio ceramic-based endodontic sealer. There have been many different types of sealers utilized with various chemical compositions. [6]-[7].

Corresponding author:
E-mail addresses: dremanadil@uomosul.edu.iq
doi: 10.5281/jgsr.2022.7111785

The Endo sequence bio ceramic sealer is a premixed ready pasty cement. it, s benefits are capacity to generate hydroxyapatite as the setting phases progress and generate a strong attachment between canal dentin and the bio ceramic sealer [1]-[3]-[7].

GuttaFlow is silicon based, chemical-cured, highly flow gutta-percha sealer, consist of gutta-percha particles, poly-dimethyl-siloxane, and Nano-silver particles.[8],[9]

The aim of this research was the comparison of break withstand of root canal sealed with 2 kinds of sealers, Endosequence bio ceramic sealer and Gutta Flow sealer with protaper gutta percha.

## 2. Material and methods

Thirty teeth with just one root were decoronated at the cemento-enamel junction to provide standardized root lengths of 14 millimeters using a diamond cutting disc. We omitted teeth having internal or external root resorption, calcifications, fractures and teeth with incompletely devel-oped apices. Rotary System Protaper Next (Dentsply, Maillefer, Switzerland) was used to prepare each root canal as directed by the manufacturer at 5N\Cm torque and a 400 RPM speed. Protaper next X1 file was glided down 3mm shorter than canal's entire working length, then the file was taken out of the canal and reinsertion was continued until the entire working length was obtained followed by protaper next X2 file which introduced into the canal using the similar approach as protaper next X1file (10). 2 mL of sodium hypochlorite solution (NaOCl) at 5.25 percent was used to irrigate the canals followed by 2ml of 17 percent of (EDTA) between both file size. Manual file size 15 was used to reopen the canal orifices occluded by debris. After the canal preparation was finished, any irrigation solution remnants were eliminated by washing the canals with 2 ml of distilled water. X2 taper paper point (Dentsply, Mailefer, Switzerland) was utilized to dry the canals.

Then roots will be separated into three groups (n=10):

***Group I:*** root canals filled with Endo sequence bioc-eramic sealer (BRASSELER, USA) and protaper guttaper-cha (Dentsply, Mailefer, Switzerland) inserted in to the canals using single cone obturation technique.

***Group II:*** root canals filled with Gutta flow bio seal, (Coltène/Whaledent, Germany) and protaper gutta-percha (Dentsply, Mailefer, Switzerland) inserted in to the canals using single cone obturation technique.

***Group III:*** control group the roots instrumented and left without obturation.

After that samples stored at 37oC for one day to allow complete set of sealers. Then 5mm of the roots embedded in cold cure acrylic resin in plastic rings. After setting of acrylic resin the samples fixed on universal testing device and subjected to vertical load by Instron Corp at speed (1mm\min) [11],[12], until breakage happened and the greatest load required to break each root was noted. The load was measured and expressed in Newtons unite.

## 3. Results

Descriptive statistic (mean and SD) of fracture resistance of the tested groups revealed that the roots that had been sealed with Endo sequence bio ceramic sealer had highest mean value of fracture resistance than Gutta flow bioseal sealer and control groups. (ANOVA) one way analysis of variance and Tukey's test revealed no significant value differences of fracture resistance in between groups ($p>0.05$).

Table (1) descriptive statistic and p value > 0.05 not significant

| Groups | Mean | SD | F | P value |
|---|---|---|---|---|
| bioceramic | 319.9425 | 7.16295 | 2.745 | .096 |
| Gutta flow | 233.3985 | 111.67959 | | |
| control | 227.3347 | 1.41421 | | |

## 4. Discussion

Mechanical root canal preparation weakens the tooth and make it more prone to fracture [13],[14]. Elimination of smear layer and opening of the tubular dentin of the root by various root canal irrigation allowing entrance of sealers into tubular dentin that led to increase the bond of sealers and strengthen the roots. Endodontic filling materials must have the capacity to strengthen the tooth structure and improve its resistance to fracture against the load of mastication [7]-[15].

Different root canal sealers have been made and devel-oped to strengthen the endodontic treated teeth [14]. (Endo sequence bio ceramic sealer) is one of the endodontic sealers that distinguished by its antimicrobial effectiveness, basic PH, and biocompatibility [15].

In this study group I which obturated with bioceramic sealer showed the greatest fracture resistance, this could be due to the fact that bioceramic sealer have a nano particle that could flow into the root canal discrepancies and infil-trate into the tubules of root dentin to form a mono block [13]-[15]-[16]. In the other hand bioceramic sealer have the ability for self-adhesion and chemical bond with the dentin of the root canal that led to making of hydroxyapatite after setting of the sealer [17]-[18].

In group II in which the canals sealed off with Gutta flow sealer showed lower fracture resistance than those obturated with bio ceramic sealer. Gutta flow is highly flowable sealer that enter the root canal system and seal the space between the canal wall and the gutta-percha. [19] In addition, Guttaflow bioseal have a characteristic feature of expansion about (0.2%) after setting resulted in excellent sealing ability.[20],[21]

Mohammed and Al-Zaka revealed that root canal treated teeth might have the same strength as untreated teeth when bio ceramic-based sealers and gutta percha cones were utilized [22].

Zhang *et al*. revealed that sealant molecules spreading along the dentinal tubules causes a bio ceramic mechanical interlocking bond. [23]. Han and Okiji stated that collagen fibers are denatured and a mineral infiltration zone is created when the mineral component of the bio ceramic sealer permeates into the inter tubular dentine [24]. Phukan *et al* suggested that in the mineral infiltration zone, phosphate partially reacts with calcium silicate hydrogel and calcium hydroxide to generate hydroxyapatite. [25].

## 5. Conclusion

This research conclusion was the break resistance of teeth undergone endodontic treatment depending on the kind of sealer used. Endosequence bioceramic sealer show more fracture resistance than Gutta flow bioseal sealer.

## 6. References

[1]. Ghoneim AG, Lutfy RA, Sabet NE, Fayyad DM. Resistance to fracture of roots obturated with novel canal-filling systems. *J Endod 2011; 37* (11):*1590–1592.*

[2]. Brosh T, Metzger Z, Pilo R. Circumferential root strains generated during lateral compaction with stainless steel vs.

nickel-titanium finger spreaders. *Eur J Oral Sci 2018; 126* (6):*518–525.*

[3]. Al-Haddad A, Che Ab Aziz ZA. Bioceramic-Based Root Canal Sealers: A Review. *Int J Biomater 2016; 97* (5):*321-332.*

[4]. Ashraf H, Momeni G, Moradi Majd N, Homayouni H. Fracture Resistance of Root Canals Obturated with Gutta-Percha versus Resilon with Two Different Techniques. *Iran Endod J 2013; 8* (3):*136–139.*

[5]. Kumar P, Kaur NM, Arora S, Dixit S. Evaluation of fracture resistance of roots obturated with resilon and thermoplasticized gutta-percha: An in vitro study. *J Conserv Dent 2014; 17* (4):*354–358.*

[6]. Uzunoglu E, Aktemur S, Uyanik MO, Durmaz V, Nagas E. Effect of ethylenediaminetetraacetic acid on root fracture with respect to concentration at different time exposures. *J Endod 2012; 38* (8):*110–113.*

[7]. Al mohaimede A., Almanie D., Alaathy S., Almadi E. Fracture resistance of bioceramic sealers. *EUR Endod J 2020; 18* (2): *134-137.*

[8]. Kontakiotis, EG; Tzanetakis, GN; Loizides, AL. A l2-month longitudinal in vitro leakage study on a new silicon-based root canal filling material (Gutta-Flow). *Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2007;10 (*3*):854-859.*

[9]. Vasiliadis, L; Kodonas, K; Economides, N; Gogos, C; Stavrianos, C. Short- and long-term sealing ability of Gutta-flow and AH-Plus using an ex vivo fluid transport model. *Int Endod J 2010;43 :377-381.*

[10]. Abdulqadir EA,Sulaiman AR,Abduljawad JA.The sealing ability of Bio ceramic Sealer Using Different Irrigation Solutions (A Comparative Study).*J Res Med Dent Sci,2022;10(6):229-323.*

[11]. Fathi U, Strength Evaluation of Different Dental Pulp Capping Materials. *Journal of Global Scientific Research. 2022;7(7).2464-2467.*

[12]. Younis ZM, Ibrahim NK, AbdulJawad JA. Effect of Home Bleach on Zirconia Physical Properties. *Journal of Global Scientific Research. 2022;7(6):2430-2434.*

[13]. Dibaji F, Afkhami F, Bidkhori B, Kharazifard MJ. Fracture Resistance of Roots after Application of Different Sealers. *Iran Endod J 2017; 12* (1):*50–54.*

[14]. Topcuoglu HS, Tuncay O, Karatas E, Arslan H, Yeter K. In vitro fracture resistance of roots obturated with epoxy resin-based, mineral trioxide aggregate-based, and bioceramic root canal sealers. *J Endod 2013; 39* (12):*1630–1633.*

[15]. Patil P, Banga KS, Pawar AM, Pimple S, Ganeshan R. Influence of root canal obturation using guttapercha with three different sealers on root reinforcement of endodontically treated teeth. An in vitro comparative study of mandibular incisors. *J Conserv Dent 2017; 20* (4)*:241–244.*

[16]. Khalil W., Alghamd F., Alghamd E. Strengthening effect of bioceramic cement when used to repair simulated internal resorption cavities in endodontically treated teeth. *Dent Med Probl. 2020;57* (2):*165–169.*

[17]. Torabinejad M, Parirokh M, Dummer PMH. Mineral trioxide aggregate and other bioactive endodontic cements: an updated overview – part II: other clinical applications and complications. *Int Endod J 2018;51* (3):*284–317.*

[18]. Yendrembam B, Mittal A, Sharma N. Relative assessment of fracture resistance of endodontically treated teeth with epoxy resin-based sealers, AH plus, MTA Fillapex, and bioceramic sealer: an in vitro study. *Indian J Dent Sci 2019;11* (1):*46–50.*

[19]. Kandaswamy D, Venkateshbabu N, Reddy GK, Hannah R, Arathi G, Roohi R. Comparison of laterally condensed, vertically compacted thermoplasticized, cold free-flow GP obturations-A volumetric analysis using spiral CT. *Journal of Conservative Dentistry. 2009;12(*4*):145-150.*

[20]. Hammad M, Qualtrough A, Silikas N. Extended setting shrinkage behavior of endodontic sealers. *Journal of endodontics. 2008;34(*1*):90-93.*

[21]. Zielinski TM, Baumgartner JC, Marshall JG. An evaluation of Guttaflow and gutta-percha in the filling of lateral grooves and depressions. *Journal of endodontics. 2008 ;34(3):295-298.*

[22]. Mohammed y., Al-Zaka I. Fracture Resistance of Endodontically Treated Teeth Obturated with Different Root Canal Sealers (A Comparative Study). *J Contemp Dent Pract 2020;21* (5):*490–493.*

[23]. Zhang W, Li Z, Peng B. Assessment of a new root canal sealer's apical sealing ability. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2009; 107* (6):*79–82.*

[24]. Han L, Okiji T. Uptake of calcium and silicon released from calcium silicate-based endodontic materials into root canal dentine. *Int Endod J 2011; 44* (12):*181–187.*

[25]. Phukan AH, Shivani M, Sandhu M. The effect of different root canal sealers on the fracture resistance of endodontically treated teeth-in vitro study. *Dent Res J 2017;14* (6):*382–388.*