

ORIGINAL RESEARCH

Influence of Sealer Placement Technique on the Quality of Root Canal Filling

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Introduction: The aim of the study was to evaluate the influence of two sealer placement techniques on the quality of root canal filling using Single Cone (SC). **Materials and Methods:** The study sample consisted of 20 mandibular premolars with round root canal, which were instrumented and randomly distributed into two experimental groups according to the root canal sealer placement technique, Group 1: Injectable technique (Endosequence bioceramic sealer, Brasseler, USA); Group 2: Master GP cone Technique (BioRoot RCS, Septodont, France). The prepared samples were obturated with single cone technique after sealer placement was done. Then the samples were scanned under CBCT and 3-D analysis was done to check the effect of sealer placement technique on the quality of root canal filling. Data was statistically analyzed then. **Results:** **Injectable technique** (Endosequence bioceramic sealer) group presented nonsignificantly lower number of voids than compared to the Master GP group ($P = 0.482$). **Conclusion:** The Injectable group (Endosequence BCS root canal sealer) provided better filling ability compared to the Master GP group (BioRoot RCS).

Keywords: bioceramic sealers, sealer placement technique, root canal, filling ability

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Corresponding author: Tahseena Ashraf, Post graduate student, Department of Conservative Dentistry and Endodontics, Govt. Dental College and Hospital, Srinagar, India**This article may be cited as:** Ashraf T, Farooq R, Purra AR, Ahmed F. Influence of Sealer Placement Technique on the Quality of Root Canal Filling. J Adv Med Dent Scie Res 2021;9(7):189-192.**INTRODUCTION**

Successful endodontic treatment is achieved by proper cleaning, shaping and seal of the root canal system. A proper filling prevents the penetration of microorganisms and their toxins, allows for periapical repair and prevents reinfection.¹

The combination of gutta-percha (GP) and an endodontic sealer is usually employed for root canal filling. Furthermore, not only does this combination contribute to an effective filling, but also the dimensional stability of the endodontic sealer,² the filling technique^{3,4}, and the sealer placement method.⁵ Thus, the filling process can be optimized by choosing a high-performance sealer combined with GP, an adequate filling technique and a more efficient sealer placement method.

Several methods have been used for placing endodontic sealer into the root canal, including files and reamers, GP cones, paper points, Lentulo spirals, and ultrasonic files. Said et al⁵, Hall et al.⁶ and Wiemann and Wilcox⁷, in their studies, used Lateral Compaction (LC) and compared different placement

techniques; all of them found similar results, concluding that these different placement techniques provide comparable seals. However, Kahn et al.⁸ used LC and compared six sealer placement methods, and concluded that the Lentulo spiral was the most effective method, followed by ultrasonic and sonic files; and the least effective methods were paper points and K-files. Considering these different results obtained in studies related to placement techniques, other evaluations are necessary to determine whether or not some placement techniques are more effective than others.

Among the most varied filling techniques, the Single Cone (SC) has been used after root canal preparation with rotatory instruments, not only because it allows better adaptation in three-dimensional preparation⁹, but especially because it reduces the time spent on lateral compaction of GP.¹⁰ Moreover, the new bioceramic sealers in the market are recommended to be used with single cone technique.

The newest generation of calcium silicate and phosphate-based root canal sealers so called

“premixed bioceramic sealers” (EndoSequence BC Sealer), do not require mixing.. Endosequence BC Sealer (Brasseler, Savannah, GA, USA) is one of the most used bioceramic sealers around the world. It is a premixed and injectable sealer based on a tricalcium silicate matrix.

More recently, a new tricalcium silicate-based sealer was introduced. BioRoot RCS (Septodont, Saint-Maur-des-Foss es, France) is a water-based sealer composed of tricalcium silicate and zirconium oxide (Camilleri 2015, Xuereb et al. 2015). BioRoot RCS releases calcium hydroxide after setting. It also forms a calcium phosphate phase when in contact with physiologic solution (Xuereb et al. 2015). BioRoot RCS has less toxic effects on periodontal ligament cells than Pulp Canal Sealer (SybronEndo, Orange, CA, USA) and induced secretion of angiogenic and osteogenic growth factors indicating a higher bioactivity than Pulp Canal Sealer (Camps et al. 2015).According to the manufacturer the sealer is applied with master GP cone.

The above mentioned sealers are the two most commonly used sealers due to their good physcobiological properties.Till date to the best of our knowledge no study has compared these two sealer placement techniques especially using CBCT.So the aim of this research was the assessment of these two Sealer Placement Techniques on the Quality of Root Canal Filling.

MATERIALS AND METHODS

Ten pairs of mandibular premolars with fully formed roots extracted for orthodontic reasons were used.The specimens were cleaned of soft tissue and calculus

using an ultrasonic device. The teeth were then decoronated standardizing the root length to 15 mm. The root canals were instrumented with the Protaper Universal System up to size F3, 1 mm shorter than the root length (14 mm). The canals were irrigated with 2 mL of 5% NaOCl (Pyrex Polykem ,India) between the changes of the rotary files using a 30-gauge needle (NeoEndo). The final rinse was performed with 2 mL of 17% EDTA(Prevest Dentpro,India) for 5 min, followed by 2 mL of distilled water. The root canals were dried with paper points.

FILLING PROCEDURE

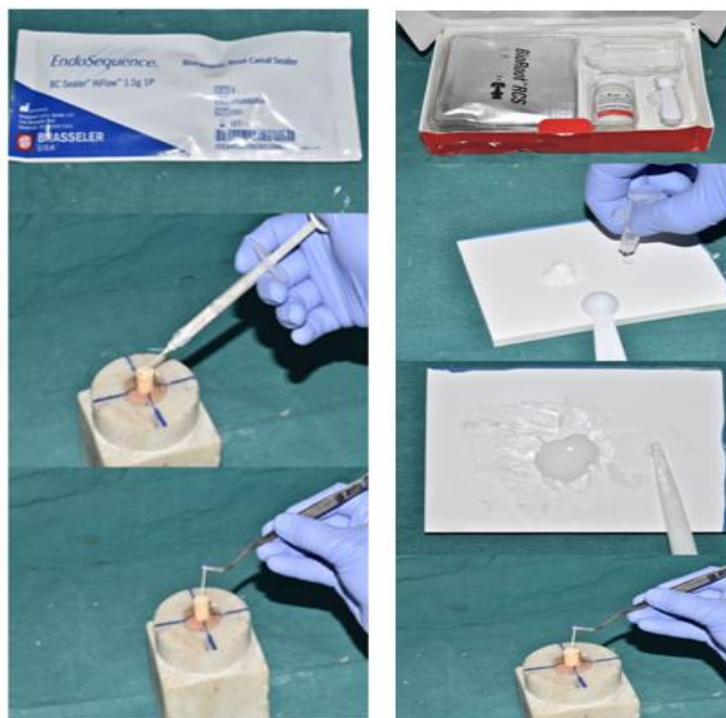
The prepared samples were randomly distributed into two groups ($n = 10$ /each) according to the sealer used.

Group 1: Injectable technique (ENDOSEQUENCE BC SEALER)

Upto 2 markings on the syringe the sealer was injected in the middle of the canal with a corresponding plastic extension(recommended as per the manufacturer) Then, the master GP gutta- percha cone Protaper F3 (Dentsply,Maillefer) was inserted into the root canal to the working length with light pressure.

GROUP 2: Master GP Cone technique (BIOROOT RCS)

The specimens were filled with another sealer, BioRoot RCS (Septodont, Saint Maur- des- Fosses, France) using a single- cone technique, according to the manufacturer’s recommendation. The sealer was mixed and introduced into the canal with sealer coated master gutta- percha cone (Protaper F3,Dentsply) to the working length.



GroupI:Injectable technique(Endosequence BC Sealer)

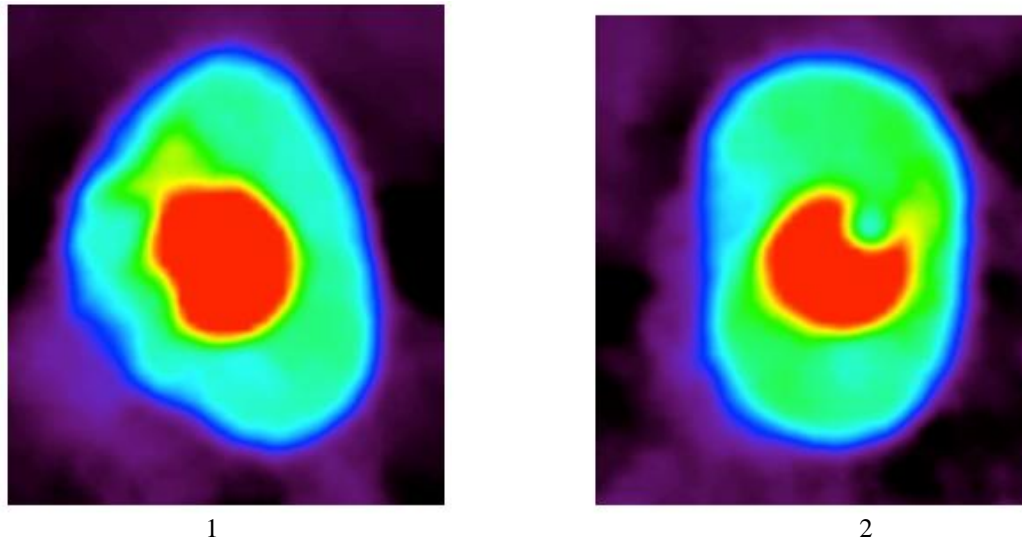
GroupII:GP cone technique(BioRoot RCS Sealer)

After the filling process, roots were stored at 37 °C at 100% humidity for 5 days to ensure the sealer was set. The samples were embedded in wax on a customized acrylic jig for positioning on CBCT machine.

CBCT EVALUATION

CBCT(NewTom Giano,Imola,Italy) scans of samples were taken with FOV size of 8 × 5 cm ; minimum

slice thickness of 100 micron having x-ray source of 0.5 mm focal spot, 60-90 kV voltage and 1-10 mA current. Images data was transferred to the computer hard drive and was analysed using NNT software (Naples Atlanta Georgia) and Horos software(Bernex Switzerland).



CBCT IMAGES SHOWING FILLING QUALITY OF TWO GROUPS

GroupI:Injectable technique(Endosequence BC Sealer)

GroupII: GP cone technique(BioRoot RCS Sealer)

STATISTICAL ANALYSIS

The results were analyzed with Chi-quadrat test and Fisher’s exact test. All P values lower than 0.05 were considered significant. For statistical analysis, program SPSS Statistics version 20.0 was used.

RESULTS

Injectable technique was found to be insignificantly superior to master gp cone technique(p=0.482).Injectable technique showed less number of voids than the conventional coated GP cone technique.

Table 1: shows the voids percentage, in each group.

GROUP	TECHNIQUE	n	VOIDS %	p-VALUE
GROUP I	INJECTABLE TECHNIQUE	10	0.29	0.482
GROUP II	MASTER GP CONE TECHNIQUE	10	0.83	

DISCUSSION

Three-dimensional obturation of the root canal system is the final objective of non-surgical root canal therapy. Then most commonly used core-filling material is gutta-percha, but it has the disadvantage of being non-adherent to canal walls. It is currently accepted that the major goal of root canal filling is to prevent any interchange between the oral cavity, the root canal system, and the periradicular tissues, providing a barrier to canal infection and re-infection. Sealers are used to attain an impervious seal between the core material and root canal walls. Most of the studies have shown that use of sealer along with core

material results in significantly less voids than when it is not used.

Placement of a sealer into the root canal system should be done in a manner which is predictable and completing covers the dentin walls.¹¹ Accepted means of sealer placement include the use of endodontic files or reamers, lentulospirals, gutta-percha cones, paper points, and recently premixed ,directly injectable sealers.¹² The analysis of the dentin/sealer interface allows the determination of which filling technique could obturate the root canals with less gaps and voids.

In this study, the percentage of voids in root canal filling was evaluated. The root canals were

instrumented with ProTaper Universal System, a widely used rotatory system that allows quick instrumentation, because of its high cutting performance.¹³ The canals were filled using SC technique as it was recommended by the manufactures of the two tested sealers, and the endodontic sealers were placed as; group I -directly injected into the canal space ,and group II-sealer coated master GP cone inserted into the canal. Both the sealer placement techniques were recommended by their respective manufacturers. Researches with the aim of comparing different sealer placement techniques and endodontic sealers usually use single rooted teeth, which do not show many anatomic differences, making it easier to standardize the specimens.¹⁴ The chosen sealers were Endosequence BC Sealer and Bio Root RCS root canal sealers, both of which are nowadays strongly recommended for their excellent physicochemical and biological properties.^{15,16}

Several techniques, such as radiography and transverse root cutting, have been described in the literature for evaluating the quality of the root canal system filling; however, these techniques have limitations. The cross-cut technique may lead to the loss of material during its execution. These techniques also require the destruction of the specimen analysed.¹⁷

CBCCT has the advantages of providing accurate 3-dimensional data and preserving the specimens. Hence in present study high resolution non-destructive 3D imaging modality was used to quantitatively assess voids in root canals .

In the present study the results showed the better performace of injectable sealer placement technique over the conventional GP technique. This nonsignificant superiority of the former technique can be attributed to the fact that in case of injectable technique the sealer is directly injected into the middle third of the canal which after the insertion of master cone gets well adapted to the canal walls as compared to sealer coated GP insertion only.

Within limitations of this study it can be concluded that the percentage of voids in the canals is influenced by the type of sealer placement technique .Both the analysed placement techniques failed to show a consistent adaptation of sealer to the total circumference of the root canal wall.

CONCLUSION

The novel premixed directly injectable sealers(Endosequence BC Sealer) are better and convenient to be used over the conventional sealers(Bioroot RCS) in filling of the root canals.

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