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# Sealing Ability of Bioceramic Sealer- Short Review

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## Abstract

Bioceramic based sealers which have been introduced recently in endodontics that contain biocompatible ceramic materials or metal oxides with enhanced sealing ability that are designed particularly for medical and dental applications. These materials have ability to either function as human tissues or to resorb and encourage the regeneration of natural tissues. They can achieve excellent hermetic seal, antibacterial properties, highly hydrophilic, dimensional stable and have good radiopacity, these properties make them good choice in endodontics. The aim of this review is to evaluate the sealing ability and the adaptation of Bioceramic sealer compared to other sealers and when be used with different obturation techniques using Micro-CT. in this short review we found the obturation with Bioceramic sealers has comparable but not superior to other sealers when used as a single cone regarding to the size and distribution of voids. The Bioceramic sealers can give efficient results with smaller size of voids when it used with other obturation techniques other than single cone. However, more researches to compare Bioceramic sealers with different sealers using different obturation techniques.

***Keywords:*** *Bioceramic; Sealing ability; Micro-ct*

## Introduction

The ultimate goal of root canal system obturation is to provide a hermetic seal to prevent the leakage of fluid and antigenic agents to or from the peri-radicular tissue [1,2]. To achieve this goal the root filling composed of a solid core material (gutta-percha) and a sealer which fills the interface between the solid core material and dentine wall [1,3].

There are different types of endodontic sealers available and they are divided into different groups according to their chemical composition such as zinc oxide eugenol, glassionomer, calcium hydroxide, silicon, resin and Bioceramic based sealers which have been introduced recently in endodontics [1,4,5].

The main functions of root canal sealers are sealing off of voids, patent accessory canals and multiple foramina, forming a bond between the core of the filling material and the root canal wall and acting as a lubricant while facilitating the placement of the filling core and entombing any remaining bacteria [6,7]. The ideal root canal sealers should have excellent seal after setting, perfect dimensional stability, Reasonable setting time, adequate adhesion with canal walls and high biocompatibility [8,9].

Bioceramics are biocompatible ceramic materials or metal oxides with enhanced sealing ability that are designed particularly for medical and dental applications. These materials have ability to either function as human tissues or to resorb and encourage the regeneration of natural tissues. Bioceramic materials composed of alumina, zirconia, bioactive glass, glass ceramics, calcium silicates, hydroxyapatite and resorbable calcium phosphates [10-12].

Bioceramic based materials can be classified according to their composition (Calcium silicate based, Calcium phosphates and Mixture of calcium silicates and calcium phosphates) or according to their interaction with the adjacent alive tissues (Bioactive materials and Bioinert materials and Biodegradable) [13-15].

Bioceramic Sealers are biocompatible, they can achieve excellent hermetic seal, antibacterial properties, highly hydrophilic, dimensional stable and have good radiopacity, these properties make them good choice in endodontics [16-19].

A number of bioceramics have been introduced to the market such as EndoCem MTA, EndoCemZr, RetroMTA, Ortho MTA, mechanically mixed MTA, MTA Plus, gray MTA Plus, CimentoEndodôntico, CER, Rapido or fast endodontic cement, MTA caps, nano white MTA, Theracal, Generex A, B, bioactive glass and bioceramic gutta-perch [20].

Microleakage results from voids occurring at the interface of the dentinal wall and root filling material or through voids within the filling material, allowing bacterial penetration and repopulation of microorganisms that making the smaller the number of gap-containing regions, the better the performance of the root filling [21-23]. Therefore the sealing ability and the adaptation of different root canal materials need to be assessed. For this purpose different methods have been used such as; Dye penetration, Bacterial studies, chemical diffusion technique, scanning electron microscope, confocal microscope and three-dimensional (3D) methods such as Micro-computed tomography (CT) [24]. The importance of Micro-CT devise in the researches that evaluating root canal materials sealing ability that is an accurate method, providing 2D and 3D views of the filled root canals without damaging the samples, it can qualitatively observe the adaptation as well as gaps and voids of the obturation and Quantitative data of these parameters are also obtained from the 3D assessment [21,25,26].

In this paper we fuscous on the researches evaluating the Bioceramic endodontic sealers sealing ability compared with other sealers with single cone obturation and when be used alone in different obturation techniques using Micro-CT. Three obturation techniques (single cone, lateral condensation and thermafil) were compared by Berkan C., *et al.* in 2015 [27] regarding to void occurrence in canals filled with bioceramic sealer using Micro-CT, in 2D images There were no significant differences were found with respect to proportions of sections with voids. Regarding to the 3D images were showed the voids present in all levels that were significantly lowest in apical third and highest in coronal third and volume of voids largest with single cone and smallest with thermafil making the bioceramic root canal filling material effectively filled root canals, with similar void characteristics, when used with different obturation techniques.

The bioceramic sealers sealing ability compared with AH Plus sealers using single cone obturation technique by Yan Huang., *et al.* 2018 [28] no significant difference was observed for the volume of closed voids and the surface of closed voids between AH Plus and BC sealers in all 3 sections whereas they were larger in the apical section when the AH Plus sealant was used these results were showed Bioceramic sealers sealer has a similar sealing ability in the entire root canal as the AH Plus sealer and the better sealing effect appeared in the coronal and middle sections than the apical part by using any of the tested sealers. In the same year [21] were evaluate sealing ability of root c round-shaped canals obturated with bioceramic-impregnated gutta percha cone (BCC) or gutta percha (GP), with bioceramic sealer (BCS) or AH Plus sealer using matched single-cone technique and they were found minimal gaps and voids in all groups at less than 1% volumes in all groups and the voids frequently detected in coronal third of the root canals, rather than those in middle and apical third that making the bioceramic-impregnated gutta percha cone (BCC) system was not superior to conventional GP/epoxy resin-based sealer in terms of resistance to leakage and 3D compaction.

## Conclusion

In conclusion with the limitation of this review we find that the obturation with Bioceramic sealers has comparable but not superior to other sealers when used as a single cone regarding to the size and distribution of voids. The Bioceramic sealers can give efficient results with smaller size of voids when it used with other obturation techniques other than single cone. However more researches to compare Bioceramic sealers with different sealers using different obturation techniques.

## Conflict of Interest

The author has no conflict of interest.

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