Non-surgical repair of a cervical resorptive defect utilizing a fast set self curing bioceramic root repair material

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Abstract:
This paper describes the conservative treatment of a cervical root resorption defect with premixed bioceramic putty. The patient presented with a sinus tract associated with a cervical resorptive defect. Usually these lesions are treated with an external approach that results in destruction of the marginal attachment. After disinfection, a new pre-mixed bioceramic material that does not discolor was used internally to seal the defect. Follow-up shows that the sinus tract is not present and that there is bone fill in adjacent to the bioceramic material. Clinically the tooth has maintained its natural color.

Key words:
Cervical root resorption, treatment, repair, pre-mixed bioceramic

Introduction:
Bioceramics are ceramic materials specifically designed for use in medicine and dentistry. They include alumina and zirconia, bioactive glass, coatings and composites, hydroxyapatite and resorbable calcium phosphates, and radiotherapy glasses (1-5). Bioceramics are widely used for orthopedic applications (joint or tissue replacement), for coatings to improve the biocompatibility of metal implants, and can function as resorbable lattices that provide a framework that is eventually dissolved as the body rebuilds tissue (4). There are numerous bioceramics currently in use in dentistry and medicine. Alumina and zirconia are bioinert ceramics used in prosthetics. Bioactive glass and glass ceramics are available for use in dentistry under various trade names. In addition porous ceramics such as calcium-phosphate based materials have been used for filling bone defects. Also some calcium phosphate cements are being studied as bone graft replacements.

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"Biologic adaptation of emerging technologies maximises teeth preservation and treatment results."
silicates (MTA (Tulsa Dental)) and Bioaggregate (DialDent) have been used in dentistry as root repair materials and for apical root filling materials.

Properties of Endodontic Bioceramic Materials

Endodontic bioceramics are not sensitive to moisture and blood contamination and therefore are not technique sensitive (5). They are dimensionally stable and expand slightly on setting, making them one of the best setting materials in dentistry (5). When set they are hard allowing full compaction of a final restoration and are insoluble over time ensuring the superior long-term seal. The pH when setting is above 12 due to the hydration reaction forming calcium hydroxide and later dissociation into calcium and hydroxyl ions (6). Therefore when unset the material has antibacterial properties. When fully set it is bio-compatible and even bioactive. When bioceramic materials come in contact with tissue fluids, they release calcium hydroxide that can interact with phosphates in the tissue fluids to form hydroxyapatite. Few clinicians realize that original MTA is a classical bioceramic material with the addition of some heavy metals. MTA is one of the most extensively researched materials in the dental field (7,8). It has the properties of all bioceramics i.e. high pH when unset, bio-compatible and bioactive when set and provides an excellent seal over time. However, it has some disadvantages. The initial setting time is at least 3 hours. It requires mixing (resulting in considerable waste), it is not easy to manipulate, and it is hard to remove. Clinically, both gray and white MTA stain dentin, presumably due to the heavy metal content of the material or the inclusion of blood pigment while setting (Fig. 1, 2, 10).

Finally, MTA is hard to apply in narrow canals, making the material poorly suited for use as a sealer. Efforts have been made to overcome these shortcomings with new compositions of MTA or with additives. However, these formulations affect MTA’s physical and mechanical characteristics.

2nd Generation Bioceramics: Endodontic Pre-Mixed Bioceramics

These products are available in North America as Endosphere® BC Sealer™ (BC sealer), Endosphere® Root Repair Material Paste™ (BC RRM Paste Syringable) and Endosphere® Root Repair Material Putty™ (BC RRM Putty) (Brascor, USA Dental LLC, Savannah, GA). Recently, these materials have also been made available outside North America as Totalfil® BC Sealer™, Totalfil® BC RRM Paste and Totalfil® BC RRM Putty. All three forms of bioceramics are similar in chemical composition (calcium silicates, zirconium oxide, tantalum oxide, calcium phosphate monohydrate and fillers), have excellent mechanical and biological properties and good handling properties. They are hydrophilic, insoluble, radiopaque, aluminium-free, high pH, and require moisture to set and harden. The working time is more than 50 minutes, and the setting time is 4 hours in normal conditions, depending on the amount of moisture available.

In addition, Totalfil® Fast Set Putty™ has recently been introduced into the market that has all the properties of the original putty but has a faster setting time (approximately 20 minutes). Studies on Endodontic Pre-Mixed Bioceramic materials to date, more than 50 studies have been performed on pre-mixed Endodontic Bioceramic materials. The vast majority of these studies have shown that the properties conform to those expected of a bioceramic material and are similar to MTA.

Case Report

A 29 year old Caucasian female presented pointing to Tooth 11 complaining that her tooth was mobile and pus was present in her gum. Her medical history was non-contributory. Her dental history was that she had had root treatment on the Tooth 11 years previously. The tooth had become discolored about 4 years previously and bleaching with hydrogen peroxide performed.

Clinical and radiographic examination revealed a sinus tract that traced to a resorptive defect in the cervical area of the tooth (Figure 1). With the patients input and consent a treatment plan was devised to perform a retreatment on Tooth 11 and then surgically remove the resorptive defect. The tooth was sectioned and the canal and sinus tract were filled with calcium hydroxide and the access sealed with IBM (Figure 2).

Two weeks later the patient presented asymptomatic. The sinus tract had disappeared and the resorptive defect was free of active bleeding. The retreatment was continued and calcium hydroxide placed into the root canal. Since the resorptive defect was dry and accessible, it was decided to fill the resorptive defect with BC putty from an internal approach (Figure 5).

When the patient returned in another two weeks the sinus tract was still not present, the bioceramic was fully set and appeared to be sealing well. The root canal was completed using the access cavity sealed with a bonded resin (Figure 4).

At the six month and fifteen month follow-up the patient was asymptomatic. Probing was normal and sinus tract was not present. Bone fill in of the resorptive defect was seen (Figure 5).

Discussion

Cervical root resorption is extremely difficult to treat. In most cases, it requires treatment from an external approach because it is so difficult to get a good seal between the external surface where the resorptive tissue originates and the inner resorptive defect. The external approach is usually very destructive to the attachment apparatus and sometimes actually shortens the life of the tooth.

The bioceramic putty is easy to manipulate and was able to flow into the defect when it was free of blood. The material uses the body fluids to set and its slight expansion on setting provides an excellent seal.

The superior seal and bio-active nature of the bioceramic material explains the bone fill into the resorptive defect against the BC material.

References

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