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

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silicates (MTA (Tulsa Dental)) and Bioaggregate (DiaDent) 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).

All three forms of 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, biocompatible and bioactive when set and provides an excellent seal over time. However, it has some drawbacks.

The initial setting time is at least 3 hours. It requires mixing (resulting in considerable waste), it is not easy to manipulate and is hard to handle. Clinically, both gray and white MTA stain dentin, presumably due to the heavy metal content of the materials or the inclusion of blood pigment while setting (Fig. 1)(9,10).

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 Endosequence® BC Sealer™ (BC sealer), Endosequence® Root Repair Material Paste™ (BC RRMP Paste Syringable) and Endosequence® Root Repair Material Putty™ (BC RRMP Putty) (Brasselet, USA Dental LLC, Savannah, GA).

Recently, these materials have also been made available outside North America as Totalfill® BC Sealer™, Totalfill® BC RRMP Paste and Totalfill® BC RRMP Putty.

All three forms of bioceramic are similar in chemical composition (calcium silicates, zinc oxide, tantalum oxide, calcium phosphate monohydrate and fillers), have excellent mechanical and biological properties and good handling properties. They are hydrophilic, insoluble, radiopaque, aluminum-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, Totalfill® 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 bleeding 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 patient understood that due to the position of the defect that the prognosis was fair. The retreatment was initiated by removal of as much gutta-percha as possible and disinfecting the root canal. Bleeding was seen from the re- sorptive defect. The canal and around the defect were filled with calcium hydroxide and the access sealed with IBMix (Figure 2).

Two weeks later the patient presented asymptomatic. The sinus tract had disappeared and the resorptive defect was free of active bleeding. The root canal was completed and calcium hydroxide and the access sealed with IBMix (Figure 2).

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 in the remaining tooth (Figure 3)

At the six month and fifteen month follow-up the patient was asymptomatic. Probing was normal and sinus tract was not present. Bony 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 resorption defect and the root 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
Irrigation dynamics in root canal therapy

By Prof. Anil Kishen, Canada

Irrigation dynamics deals with the pattern of irrigant flow, penetration, exchange and the forces produced within the root canal system.

Current modes of endodontic irrigation include the traditional syringe needle and syringe-based irrigation. Due to the current developments in irrigant delivery systems, new irrigation methods are being used in clinical practice.

We refer to the importance of irrigation dynamics associated with various irrigation techniques. Endodontic irrigants are liquid antimicrobials used to disinfect the root canal system, and irrigate within the root canal system.

Irrigant exchange in the root canal system is a key prerequisite for achieving optimum chemical efficacy of the irrigants.

When the needle is removed, the ability of chelating agents to dissolve pulp tissue or sodium hypochlorite to inactivate endotoxins, and to disolve tissue remnants and the smear layer is crucial.

A series of vortices of flowing irrigant are created between two immiscible fluids, those in the root canal and those being extruded.

The lateral movement of ultrasonic tip produces high-velocity travelling coronal to the ultrasonic tip position, and this in turn increases the volume of irrigant delivered. Thus, the irrigation system provides an indication of the mechanical debridement efficacy.

Irrigation penetration follows the angle of needle insertion and extrusion. It is dependent on the angle of irrigation, as well as the length of needle insertion.

The type of needle used has a significant effect on the flow pattern of irrigant and penetration. A needle with side-vented tip will allow the flow of irrigant up to the working length (WL) and interaction of irrigant with the root canal wall, it is mandatory to understand the irrigation dynamics associated with various irrigation techniques.

Irrigation methods are categorised as closed-ended, side-vented, and open-ended needles. In the case of closed-ended needles, a higher maximum shear stress is generated near their tips, on the wall facing the needle outlet.

The lateral movement of ultrasonic tip opposes each other and a stable equilibrium is required during irrigation. Ideally, it reduces the volume of irrigant delivered, without compromising therapeutic benefits.

The type of needle has a significant effect on the flow rate and penetration. The lateral movement of ultrasonic tip is observed with the highest turbulence intensity travelling coronal to the ultrasonic tip position.

The lateral movements of the irrigant displayed by this method has important implications with respect to its ability to permit better interaction between the irrigant and the root canal wall, and to potentially enhance the interaction of irrigants with intra-canal biofilms.

Conclusions

The requirements of irrigant penetration, irrigation volume, irrigation time, and minimum risk of apical extrusion oppose each other and a stable equilibrium is required during irrigation. Ideally, it reduces the volume of irrigant delivered, without compromising therapeutic benefits.

In the case of a closed-ended needle, the first step would be to place the needle within the root canal system. The second step is to ensure adequate irrigant refreshment in the root canal system.

The ultrasonically assisted irrigation (d) showed the highest magnitude of velocity, constant to at least 3 mm coronal to the tip placement.

The ultrasonically assisted irrigation (d) showed high levels of stress over the greatest area of the canal wall.
FKG Dentaire: Advocating for more conservative and successful endodontic treatment

By FKG

DUBAI, UAE: Cutting edge endo instruments and continuous investments in research and development has resulted in booming FKG Dentaire’s sales globally. Thinking of the box, willing to create a new paradigm for conservative dentistry and focusing on the interests of both the patient and the dentist has led to the latest launch of FKG’s latest endodontic files: XP-endo Finisher and BT-Apisafe.

FKG is famous for top quality products which includes various international certifications. The Dubai Center started its 2016 activities by receiving practitioners from the Gulf region and as part of its commitment to the Root Canal Treatment and focusing on the interests of both the patient and the dentist, FKG has decided to upgrade its Dubai Center. In addition to an increased number of work stations, partnerships have been established with other leading endodontic manufacturers as Global Microscope, Rki, as well as several other world renowned dental companies.

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FKG Dubai Training Center opens to Eastern European and Greek clients

By Dental Tribune MEA/CAP/Press

DUBAI, UAE: FKG Dentaire Middle East, Africa and India Office Manager & Sales Assistant welcomed 30 Endodontists from all over Europe, Balkans and Scandinavia together with distributors Multidental-Med (Poland) and Dental Expert (Greece).

In order to help practitioners optimise their skills and utilise these new technologies developed by its engineers and top endodontists, FKG Dentaire has set up several Training Centers around the globe. The first one opened in Dubai (UAE) in 2015, as well as the one in Oslo (Norway) in partnership with Dr. Gilberto Bebi (Endo’Inn), followed by La Chaux-de-Fonds (Switzerland) in 2014. The latest training center was inaugurated last year in Mexico (Tutores Dentales). In 2016, following the success of the training center in Dubai and the desire to increase its teaching capacity, FKG Dentaire has decided to upgrade its Dubai Center. In addition to an increased number of work stations, partnerships have been established with other leading endodontic manufacturers as Global Microscope, Rki, as well as several other world renowned dental companies.

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