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

By Ilya Mer, Russia and Martin Trope, USA

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 bio inert ceramics used in prosthodontics. 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 based materials have been used for filling bone defects.

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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 biocompatible 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, biocompatible 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 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)(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 Endos- queue® BC Sealer (9,10) (BC sealer), Endosqueue® Root Re- pair Material Paste™ (BC RRP Paste Syringable) and Endos- queue® Root Repair Material Putty™ (BC RRP Putty) (Bras- sefer, USA Dental LLC, Savannah, GA). Recently, these materials have also been made available outside North America as Totalfil® BC Sealer™, Totalfil® BC RRP Paste and Totalfil® BC RRP Putty.

All three forms of bioceramics are similar in chemical composition (calcium silicates, zirconium oxide, tantalum oxide, calcium phosphate monobasic 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 90 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 in- troduced 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 pres- ent 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 discoloured about 4 years previously and bleaching with hydrogen per- oxide performed.

Clinical and radiographic ex- amination 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 retreat- ment on Tooth 11 and then surgi- cally remove the resorptive defect. The patient understood that due to the position of the defect that the prognosis was fair.

The retreatment was initi- ated 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 the defect were filled with cal- cium hydroxide and the access sealed with IRM (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 ap- proach (Figure 3).

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 sixth and fifteenth 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 ex- tremely difficult to treat. In most cases, it requires treat- ment from an external approach because it is so difficult to get a good seal between the external surface where the re- sorptive tissue originates and the inner resorptive defect. The external approach is usu- ally very destructive to the at- tachment apparatus and some- times 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-ac- tive nature of the bioceramic material explains the bone fill into the resorptive defect against the BC material.

References

(2) V.A. Dubok. BIOCERAMICS: TUESDAY, TODAY, TO- MORROW, Powel Metallurgy and Metal Ceramics, Vol 59, Nos 7,8, 9, 1019-1027.

Contact Information

Rya M. BERIS
Private Practice, Russia ryam.beris@gmail.com
Martin TROPE RIS, DMD
Clinical Professor, USA martintrupe@gmail.com
Irrigation dynamics in root canal therapy

By Prof. Anil Kishen, Canada

Irrigation dynamics deals with the flow, penetration, exchange and the forces produced within the root canal system. Current modes of endodontic irrigation include the traditional syringe-based irrigation, ultrasonic, sonic/ultrasonically assisted irrigation, negative-pressure irrigation or sonic/ultrasonic irrigation. Since the nature of irrigation influences 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.

Endodontic irrigants are liquid antimicrobials used to disinfect and condition the root canal system. The process of delivery of endodontic irrigants within the root canal is called irrigation. The overall objectives of root canal irrigation are to remove debris, to inactivate endotoxins, and to dissolve tissue remnants and the smear layer, and to condition the root canal walls as well as to allow the flow of irrigant entailing the transportation of chemical species through the root canals, in order to detach biofilms and debris and to control the root canal geometry. While the chemical effectiveness will be influenced by the concentration of the antimicrobial and the duration of action, the physical effectiveness will depend upon the ability of irrigation to generate optimum streaming forces within the entire root canal system.

The final efficiency of endodontic disinfection will depend upon both their chemical and physical effectiveness.[5] It is important to realise that even the most dependent irrigants have no use if it cannot penetrate the apical portion of the root canal. Thus, the goal of irrigation is to place the needle within 1 mm short of the WL to ensure adequate irrigant exchange and high wall shear stress, which reduces the risk of extrusion.

In the case of a closed-ended needle, placement should be within 1 mm short of the WL, so that optimum irrigation can be achieved. The apical negative-pressure irrigation did not generate marked wall shear stress values, but allowed the flow of irrigant consistently up to the WL. It was the safest mode of irrigation when used close to the WL.

The passive ultrasonically assisted irrigation generated the highest wall shear stress. The use of combined methods is necessary to control the issues of vapour venting and to circumvent the limitations of one method is recommended.

Editorial note: A list of references is available from the publisher.

Conclusion

The requirements of adequate irrigant penetration, irrigant delivery, irrigation safety and minimum risk of apical extrusion oppose each other and a subtle equilibrium is required during irrigation. Ideally, in a canal enlarged to size 50 or 55 and taper 0.04 or 0.06, an open-ended needle should be placed 2 or 3 mm short of the WL to ensure adequate irrigant exchange and high wall shear stress, while reducing the risk of extrusion.

The mechanical debridement efficiency of irrigation has demonstrated maximum when the needle outlet is placed 2 or 3 mm short of the WL, and a subtle equilibrium is required during irrigation (Figs. 1a–d & 2a–d).

Enhancing irrigation dynamics using physical irrigation methods

Fluid dynamics studies on apical negative-pressure irrigation (c), there was a slight increase in the magnitude of negative-pressure irrigation (c) (Fig. 3a), showing the highest magnitude of wall shear stress. The use of combined methods is necessary to control the issues of vapour venting and to circumvent the limitations of one method is recommended.

Editorial note: A list of references is available from the publisher.
FKG Dubai Training Center opens to Eastern European and Greek clients

**By Dental Tribune MEA/CAPPMea**

**Dubai, UAE:** FKG Dentaire Middle East, Africa and India office welcomed 50 Endodontists all the way from Poland and Greece for two days in Dubai. A combination between high level endo-training and leisure as the attendees were invited by Magdalena Uhlmann, FKG Area Sales Manager Eastern Europe, Balkans and Scandinavia together with distributors Multidental-Med (Poland) and Dental Expert (Greece).

The Swiss manufacturer is famous for the development and production of dental products for dentists, endodontists, and laboratories. Founded in from the heart of the watchmaking industry in Switzerland, FKG has a reputation for top quality products which includes various international certifications.

On 15th of January 2016, the regional MEA team led by Alexandre Mulhauser (Middle East, Africa and India Director) and Olivia Mulhauser (MEA and India Office Manager & Sales Assistant) hosted a group of 50 dental professionals from Poland and Greece who were invited to a FKG dedicated and tailor-made event organized by Magdalena Uhlmann as well as Multidental-Med and Dental Expert.

The program of the delegation included two speaker presentations by Dr. Andreas Krokidis who lectured as part of the morning session on “NiTi Sequences selection”, and Dr. Bartosz Cerkaski (Poland) and Dr. Andreas Krokidis (Greece). Partnerships have been created with different continuing education organizations like CAPPIMEA (UAE), Next Level Endodontics (Pr Martin Troke and University of Pennsylvania faculty (USA)) and others to organize specialized trainings to fit to the level of any dentist willing to push his/her knowledge and improve outcomes. The next day to save is the AEEDEC (2-4 February 2016) in Dubai. FKG Dentaire will have a major stand on the Swiss Pavilion (Booth N° 8E10) and has brought top endodontic lecturers to Dubai!

- On February 2nd, Pr Martin Troke will lecture on “Modern Endodontics: Theory to Practice” and will do a three hour Advanced Specialty Course.
- On February 3rd, Pr Martin Troke and Pr Roger Bebeiz will discuss in a joint lecture apical limit, apical enlargement, canal shape and obturation techniques.
- On February 4th, Pr Roger Bebeiz will lecture on “Treating infected root canals and periradicular radiolucent lesions” and will do a three hour Advanced Specialty Course.

Pr Roger Bebeiz.

FKG Dubai: 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 sales globally. Thinking of the box, willing to create a new path towards conservative dentistry and focusing on the interests of both the patient and the dentist has led to the latest launch of new dental companies.

The Dubai Center started its 2016 activities by receiving groups of dentists and endodontists from Greece and Poland trained by Dr Bartosz Cerkaski (Poland) and Dr Andreas Krokidis (Greece).

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Pr Martin Troke.

Contact Information

Alexandre Mulhauser
Middle East, Africa and India Director
alexandre.mulhauser@fgk.ch
+971 52 765 8888

The full group from Greece and Poland.

Boat Trip

Afternoon Session Hands-On course

FKG equipped Training facilities in the FKG Training Center in Dubai

Dr. Andreas Krokidis

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