Novel applications of a bioactive resin in perforations, root resorption and endodontic-periodontic lesions

By Dr Marta Maciak, Poland

During the last decade, a considerable amount of attention has been directed towards the development of so-called bioactive materials. To understand this phenomenon better and to avoid misinterpretation, a condensed review of the literature and an assessment of various definitions need to be considered.

There are already several commercially available dental materials that can be defined as bioactive: for instance, any fluoride-releasing material, calcium silicate- and calcium aluminate-based cements, and calcium-based or calcium-containing materials. Biomaterial scientists in the field of implantology have adopted the word “bioactive” to mean materials that are bound to each other through a biomineralised interface. There appears to be confusion within the dental profession, including among scientists, clinicians and industry persons, to what extent biomineralisation can be achieved with dental materials and which materials can be appropriately termed “bioactive” or “biomineralising.”

Bioactivity has been defined and can be interpreted in various ways. A broad definition that has several meanings is the following: a material that is able to have a biological effect or a material that is biologically active and forms a bond between the tissue and the material. In the field of tissue engineering, the term “bioactivity” is related to the cellular effects induced by the release of biologically active substances and ions from the biomaterial, for example from bioactive glasses both in soft- and hard-tissue engineering applications. In addition, its activity has been demonstrated in pulp capping experiments in non-human primates.

Thus, in medicine, bioactivity covers all interaction of materials with living cells and tissue, including the effects of pharmaceuticals. In biomaterial science, with bioceramics and bioactive glasses, bioactivity of a material usually denotes that the material is capable of forming hydroxyapatite minerals on its surface in vitro and in vivo.

The following theoretical question should be asked: can a material that releases ions for biomineralisation be considered bioactive or is the substrate on which the biomineralisation occurs bioactive? Thus, bioactivity of dental materials relates to their potential to induce specific and...
intentional mineral attachment to the dentine substrate. Another definition has been presented in an article by Lööf et al.: “Bioactivity is described as follows: ‘A bioactive material is one that forms a surface property that provides a biological function or effect’. This definition is based on the concept that a bioactive material can interact with the surrounding tissue to improve its properties.”

Case 1
A 28-year-old female patient was referred and presented with pain of tooth 46. The referral letter stated that endodontic treatment was needed and the peroration had been closed with MTA. The patient was in considerable pain when eating and when closing her mouth. The medical history did not present any contraindications to dental treatment.

The clinical examination showed a temporary filling in tooth 46. A radiograph taken on 20 October 2015 showed extrusion of MTA into the furcation, as well as a bony defect (Fig. 5). Perforation of the floor of the pulp chamber was diagnosed.

Upon removal of the temporary filling, a large amount of purulent exudate filled the pulp chamber and was evacuated. After the MTA had been removed, the furcation was flushed with metronidazole (liquid), Polymax (2%) and 2% chlorhexidine (Cerkamed). The borders of the perforation were refreshed with a carbide bur, and then the pulp chamber was etched with 37% orthophosphoric acid for 10 seconds, followed by a thorough rinse. Through the perforation, a collagen sponge (ANTEMA, Moltensi Dental) was applied to support the ACTIVA BioACTIVE-BASE/LINER and to prevent the underlying bone defect. The sponge was not visible on the radiograph. The canal orifices were protected with cotton pellets and the entire pulp chamber was treated with a dentine bonding agent (DentTASTIC UNO, Pulpdent), which was light cured, and then covered with ACTIVA BioACTIVE-BASE/LINER, covering the floor of the pulp chamber (Fig. 2).

The tooth was closed with GIZ glass ionomer (Ide Dental) as a temporary filling. The patient was pain-free within two days. A follow-up radiograph taken on 3 November 2015 (4 days postoperatively) showed the beginning of the healing of the bone in the furcation area (Fig. 3).

Case 2
A 63-year-old female patient presented for dental treatment. A panoramic radiograph (Fig. 5) revealed a heavily restored dentition with single crowns, a three-unit bridge and multiple missing teeth in both arches. She complained of pain in the mandibular right premolar area. Her medical history did not present any contraindications to dental treatment.

When the patient was informed that teeth 45 and 46 would have to be extracted, she objected and asked if anything could be done to save it, even if only on a temporary basis, as she was reluctant to commit to wearing a removable partial denture. The tooth was treated with a root canal filling, shown in the clinical examination of the root canal filling, and the pulp chamber was filled with ACTIVA BioACTIVE-BASE/LINER. A fibre post (Cytec blanco, Hahnenkratt) was immediately placed, followed which the pulp chamber was filled with ACTIVA BioACTIVE-BASE/LINER and ACTIVA BioACTIVE CEMENT do not possess sufficient radiopacity to be seen on a radiograph.

Case 3
A 38-year-old female patient presented for endodontic treatment. The diagnosis was periapical peri-odontitis with purulent exudate and root caries on the mesial aspect. The case was referred and presented with pain of tooth 46. The referral letter stated that endodontic treatment was needed and the peroration had been closed with MTA. The patient was in considerable pain when eating and when closing her mouth. The medical history did not present any contraindications to dental treatment.

After removal of the temporary filling, the pulp chamber was filled with ACTIVA BioACTIVE-BASE/LINER and ACTIVA BioACTIVE-RESTORATIVE cement (Pulpdent) has been shown to exhibit bioactive properties based on this last definition. ACTIVA BioACTIVE products are the first dental treatment after approximately 11 months (Fig. 7) consisted of cleaning the canal with the XP-endo Finisher and EDTA and 2% chlorhexidine irrigation. The resorption area was plugged with a collagen sponge (Anteria) to provide support for ACTIVA BioACTIVE CEMENT and to prevent it from flowing beyond the root structure. A dentine bonding agent (All Bond Universal, Bisco) was applied to the canal space, but not polymerised, just slightly air-dried, and the root was filled from the apex to the pulp chamber with ACTIVA BioACTIVE-BASE/LINER. A fibre post (Cytec blanco, Hahnenkratt) was immediately placed, followed which the pulp chamber was filled with ACTIVA BioACTIVE-BASE/LINER and ACTIVA BioACTIVE CEMENT do not possess sufficient radiopacity to be seen on a radiograph.

The final treatment after approximately 11 months (Fig. 7) consisted of cleaning the canal with the XP-endo Finisher and EDTA and 2% chlorhexidine irrigation. The resorption area was plugged with a collagen sponge (Anteria) to provide support for ACTIVA BioACTIVE CEMENT and to prevent it from flowing beyond the root structure. A dentine bonding agent (All Bond Universal, Bisco) was applied to the canal space, but not polymerised, just slightly air-dried, and the root was filled from the apex to the pulp chamber with ACTIVA BioACTIVE-BASE/LINER. A fibre post (Cytec blanco, Hahnenkratt) was immediately placed, followed which the pulp chamber was filled with ACTIVA BioACTIVE-BASE/LINER and ACTIVA BioACTIVE CEMENT do not possess sufficient radiopacity to be seen on a radiograph.

The tooth was closed with GIZ glass ionomer (Ide Dental) as a temporary filling. The patient was pain-free within two days. A follow-up radiograph taken on 3 November 2015 (4 days postoperatively) showed the beginning of the healing of the bone in the furcation area (Fig. 3).

Case 2
A 16-year-old patient was referred with root resorption of tooth 21. A Cekt scan and radiograph (Figs. 4 & 5) taken on 30 March 2017 clearly demonstrated the root resorption. Note the temporary filling in the pulp chamber. The patient’s medical history was non-contributory. The diagnosis was maxillary internal and external root resorption.

After removal of the temporary filling, the pulp chamber was filled with ACTIVA BioACTIVE-BASE/LINER and ACTIVA BioACTIVE-RESTORATIVE cement (Pulpdent) has been shown to exhibit bioactive properties based on this last definition. ACTIVA BioACTIVE products are the first dental
After finishing my DDS in Mexico, I didn’t intend to practice endodontics every day. In the interview, Vera also shed some light on what inspires him to practice endodontics and what he would like to share with aspiring endodontists.

Dr. Vera, what is your background in endodontics?

I currently serve as an active member of the Hispanic Society of Endodontology and the Academy of Microscope Enhanced Dentistry and I am a certified member of the European Society of Endodontology. My main interests are aesthetic dentistry, endodontics and prosthodontics.

What is one piece of advice that you would like to share with aspiring endodontists?

To be both open and critical about new techniques and devices arriving on the market; he always brings basic science into everyday practice; to study every single day; to view endodontics as a specialty in conservative dentistry and endodontics from the university’s Department of Restorative Dentistry. From 2004 to 2009, she was an assistant in the periodontal department. In 2009, she received a PhD in medical sciences in dermatology. She is a member of the Polish Dental Association and Polish Endodontic Association. She has authored many publications, and since 2015, she has lectured in Poland and numerous other countries, in addition to presenting practical training in the fields of endodontics and aesthetic dentistry. Her main interests are aesthetic dentistry, endodontics and prosthodontics. She can be contacted at martamaciak2012@gmail.com.

What kind of professional development is essential in your everyday practice—rotary/reciprocating instruments is a conservative way. Also, the use of ultrasonic root-end preparation and how to identify anatomical markers.

What are your three favourite things about endodontics?

Firstly, I like the challenge of properly diagnosing and treating carious and dental pain, and, of course, resolving the affected patients. And then being able to treat symptomatic and previously endodontically treated teeth with retreatment techniques using Cavit, the microscope or endodontic microsurgery, and returning them to functionality. Lastly, the tremendous load of basic science that endodontists must carry requires continuous study to better perform clinically in fields like pharmacology, physiology and others.

What would you do without and why?

I would not be able to work without endodontic microsurgery and devices and materials in my practice about which I have learnt in lectures and courses. Documenting their use and eventually seeing those patients on which they were used, heal and remain functional for a long time. I also enjoy preparing lectures for students and peers on those same topics.

Thank you very much for the interview.
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