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
ACTIVA BioACTIVE-RESTORATIVE and ACTIVA BioACTIVE-BASE/LINER have been shown to exhibit bioactive properties based on this kef definition. ACTIVA BioACTIVE products are the first dental resins with a bioactive ionic resin matrix. They have a shock-absorbing, rubberised resin component and reactive ionomer resin fillers that mimic the physical and chemical properties of natural teeth. These bioactive materials actively participate in the cycles of ion exchange that regulate the natural chemistry of the teeth and saliva and contribute to the maintenance of tooth structure and oral health. ACTIVA has the strength, aesthetics and physical properties of resin composites and is more bioactive than glass ionomer cements. ACTIVA heals teeth against micr-akage and its continuous release of calcium, phosphate and fluoride ions provide patients with long-term benefits.

The final treatment after approximately 11 months (Fig. 11) consisted of clearing the canal with the XP-endodontic Finisher and EDTA and 2% chlorhexidine s-lution. The restoration area was plugged with a collagen sponge (Anteriora) 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 (Lyce, blanco, Hahnenkratt) was immediately placed, following which the pulp chamber was filled with ACTIVA. After 20 seconds, the restoration was light-cured from three dif-ferent directions for 20 seconds each. The final result can be seen on a ra-diograph from 13 February 2008 (Fig. 12). Complete bone healing adjacent to the restoration area was observed (Fig. 12). While the radiograph shows the fibre post, the collagen sponge and ACTIVA BioACTIVE CEMENT do not possess sufficient radiopacity to be seen on a radiograph.

Case 3
A 63-year-old female patient pre-sented for dental treatment. A pano-ramic radiograph (Fig. 9) 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 premolar area. Her medical history did not present any contra-indications to dental treatment. When the patient was informed that teeth #43 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 wear-ing a removable partial denture. The thus consented to a treatment that offered no guarantee of success. Clinical examination showed third-stage caries and pus in the gin-gival pocket. A radiograph showed a three-wall infra-bony pocket (Fig. 10A) reaching the apex of the root.

The diagnosis was periapical peri-dontitis with purulent exudate and root caries on the apex of the root. The treatment consisted of endodontic and periodontal treatment after a panora-mic radiograph revealed a positive polymerase chain reaction (PET test, PET Plus, MIP Pharma) was per-formed.

Endodontic treatment was per-formed on 2 July 2004 with a Hfyluxe file of size 25.04 (COTENET) and the SAF System. The pus was evacuated from the root canal and the canal was flushed with 5.25% NaOCl and met
In his private practice and provided his favourite products that he uses and desirable, and 
Dr. Vera, what is your background endodontists.

I did my postdoctoral programme 

Dr Jorge Vera five quickfire questions

after finishing my DDS in Mexico, 

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Dental Tribune International asked

by Dental Tribune International

Dr. Jorge Vera, what is your background in dentistry

After finishing my DDS in Mexico, I did several postgraduate programme in endodontics at Tufts University School of Dental Medicine in Boston in the US, from 1991 to 1993, helping to teach in the undergraduate clinic and doing many research projects under a great team consisting of Dr. Joseph Tenca, Robert White and Melvin Goldman. Once I got my certificate, I returned to practising and teaching in Mexico.

What are your three favourite things about endodontics? 

Initially I like the challenge of properly diagnosing and treating carious and dental pain, and, of course, relieving the affected patients. And then being able to treat symptomatic and previously endodontically treated teeth with retreatment techniques using CBCT, 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 other.

Which endo products couldn’t you do without and why? 

I would not be able to work without a microscope and ultrasonic tips because they change the approach to removinginstrumentations like calcifications and previously placed materials from the root canal system in a conservative way. Also, the use of rotary/rotating instruments is essential in my everyday practice— their evolution is making root canal preparation easier while maintaining more dentine—and, finally, the use of hydraulic calcium silicate/ bioactive cements and CBCT for many cases.

What inspires you in your day-to-day work? 

Being able to bring new techniques, devices and materials into my prac-
tice 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.

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, to always bring basic science into everyday practice because therein lies the foundation of our profession, so that whatever we use on patients helps both them and us, to study every single day, to revise old notes from school and to read the journals. Finally, it is advisa-
ble to take new courses every year.

Thank you very much for the interview.

Dr. Antonio Chaniotsis, Greece

He currently serves as an active member of the Hellenic Society of Endodontology and the Academy of Microscope Enhanced Dentistry and is a certified member of the European Society of Endodontists.

Endo Micro Surgical Retreatment (Management of Endodontic Failure)

Day 1 – By the end of the course delegates will understand: 

- Outcomes of endodontic microsurgery vs. traditional apicectomy.
- The science behind effective local anesthesia in endodontic microsurgery.
- The use of a dental operating microscope in endodontic microsurgery.
- Flap design and tissue handling to improve post-surgical healing.
- How to effectively prepare an ostectomy.
- Correct methods of ultrasonic root-end preparation and how to identify anatomical markers.
- Which equipment is appropriate for use in microsurgical techniques.
- How to effectively prepare and maintain the surgical area.

Day 2 – By the end of the course delegates will have:

- Been calibrated to a dental operating microscope.
- Have identified cases where surgical intervention is appropriate.
- Have raised a flap with microsurgical instruments.
- Created an ostectomy and identified anatomical markers.
- Performed root end resection and retrograde preparation of the root canal space.
- Performed microsurgical suturing.
- Developed a post-operative care strategy to minimize complications and improve healing.

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Course Objectives:

- DAY 1 - Delegates will be able to:
  - Remove gutta-percha obturations from root canals.
  - Remove Caries based obstructions from the root canals.
  - Remove paste obturations and remove fiber posts.
  - Have the opportunity to use most of the current technology used during retreatment procedures.

- DAY 2 - Delegates will be able to:
  - Bypass the apical foramen.
  - Understand all the preventive measures to avoid complications during endodontic instrumentation.
  - Repair a pulp floor perforation.
  - Obtain an internal root canal filling.
  - Perform apical plugs with biocompatible materials.

Endo Non-surgical and Surgical Retreatment (Management of Endodontic Failure)

Day 1 – By the end of the course delegates will learn:

- The importance of endodontic microsurgery
- The science behind effective local anesthesia in endodontic microsurgery
- The use of a dental operating microscope in endodontic microsurgery
- Flap design and tissue handling to improve post-surgical healing
- How to effectively prepare an ostectomy
- Correct methods of ultrasonic root-end preparation and how to identify anatomical markers
- Which equipment is appropriate for use in microsurgical techniques
- How to effectively prepare and maintain the surgical area

Day 2 – By the end of the course delegates will have:

- Been calibrated to a dental operating microscope
- Have identified cases where surgical intervention is appropriate
- Have raised a flap with microsurgical instruments
- Created an ostectomy and identified anatomical markers
- Performed root end resection and retrograde preparation of the root canal space
- Performed microsurgical suturing
- Developed a post-operative care strategy to minimize complications and improve healing

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