Septodont

Case Studies Collection

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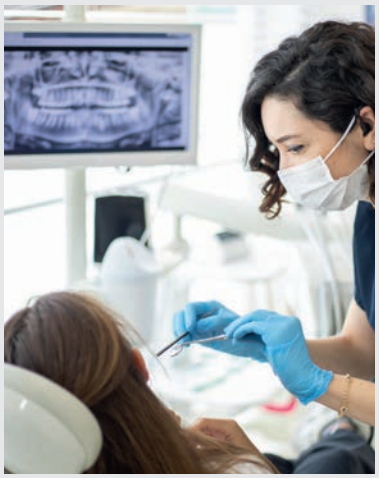
Editorial



Septodont created the *"Septodont Case Studies Collection"* - a series of case reports - in 2012 to share with you their experience and the benefits of using these innovations in daily practice.
Over the past years, authors from more than 15 countries have generously contributed to the success of our magazine that is now distributed on the 5 continents.

Each new issue of the Case Studies Collection is the opportunity to discover new clinical challenges and their treatment solutions. The 24th issue features 3 cases for Biodentine™ and Biodentine™ XP, a case for R.T.R.+ Membrane and a collection of 3 cases for BioRoot™ RCS.

- Biodentine™, the first biocompatible and bioactive dentin replacement material. Biodentine™ uniqueness not only lies in its innovative bioactive and "pulp-protective" chemistry, but also in its universal application, both in the crown and in the root.
- R.T.R.+ Membrane is a unique resorbable synthetic membrane designed to improve post-extraction procedures. It is the first resorbable membrane composed of 100% vegetal-based polymer, making it effective and easy to handle. With a resorption time of 4 to 6 months and a bilayer structure, R.T.R.+ Membrane is highly effective within an appropriate time frame for bone regeneration.
- BioRoot™ RCS is the paradigm for endodontic obturations. Its outstanding sealing properties combined with anti-microbial and bioactive properties allow to get a high seal of the endodontium without having to use complex warm gutta techniques.

The cases are written by the practitioners, the products' application in every case is under the responsibility of the author. Septodont reminds that every product has an official indication, available in the product's information notice.

Content

Direct pulp capping with Biodentine™ XP, a bioactive material

Dr. Marco Calabrese, DDS

Introduction

Biodentine™ (Septodont; Saint-Maur-des-Fossés, France) is a bioactive cement which can be used in direct contact with vital pulp tissue to promote the formation of reparative dentin. In this case, we use the new Biodentine™ XP for direct pulp capping after iatrogenic pulp exposure in a 25-year-old male patient.

When Biodentine™ is used in direct contact with the vital pulp, the aim is to stimulate the formation of reactive reparative dentin (tertiary dentin). The following clinical case report illustrates the use of Biodentine™ for direct pulp capping.

Case Report

A male patient, 25 years old, came to our dental office for a routine check-up two years after the previous one. Bitewing films and intraoral examination showed an asymptomatic mesial deep carious lesion on tooth 37 ***(Fig. 1)***.

The patient reported no spontaneous symptoms. The tooth tested positive on CO2 snow sensitivity and negative on percussion.
After local anesthesia was administered, a rubber dam was put in place. During cavity preparation, the carious dentin was completely excavated and the pulp chamber was exposed iatrogenically. A communication of 1 mm was established ***(Fig. 2)***.

The pulp tissue showed slight bleeding and it was therefore decided to proceed with direct pulp capping. The bleeding was controlled by pressing a sterile cotton pellet soaked in a limewater solution (a saturated solution of calcium hydroxide) onto the exposed pulp ***(Fig. 3)***.

After hemostasis was achieved, a sterile cotton pellet soaked in 5% sodium hypochlorite (NaOCl) solution was applied to clean and disinfect the cavity. After placing a sectional matrix ***(Fig. 4)***, the cavity was bio bulk-filled with Biodentine™ XP ***(Fig. 5)***.

A micro-brush was used to flatten the material and ensure a good fit to the cavity walls ***(Fig. 6)***.

Approximately 12 minutes after mixing, when the Biodentine™ XP had set, the permanent enamel restoration was performed. After acid etching of the enamel margins, a universal dentin adhesive was applied. An “open sandwich” class II restoration was performed using a resin composite material ***(Fig. 7)***.

The final radiograph of the vital pulp therapy procedure showed the different layers of materials used, and correct marginal adaptation can be seen ***(Fig. 8)***.

At the follow-up visit, seven days after direct pulp capping, the patient reported some increased cold and warm sensitivity. After 40 days, the tooth tested positive on CO2 snow sensitivity and negative on percussion. The patient reported no spontaneous symptoms. The response to electric pulp testing was within a normal value range.

After 3 months the X-ray shows no signs of periapical lesion ***(Fig. 9)*** and the patient reports no symptoms.

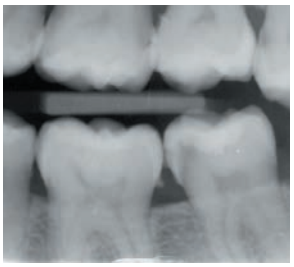


Fig. 1

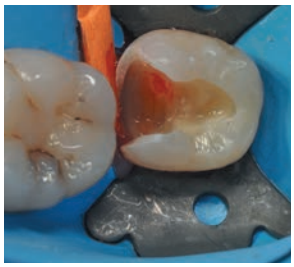


Fig. 2

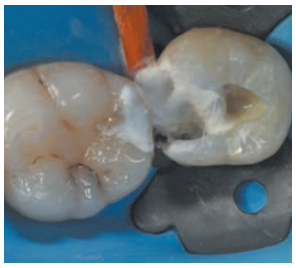


Fig. 3

Fig. 4

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Fig. 6

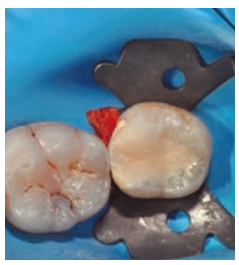

Fig. 7

Fig. 8

Fig. 9

Discussion

Among the many materials that can be used for vital pulp therapy procedures, Biodentine™ is an excellent dentine substitute thanks to its mechanical properties. As extensively documented in the literature, Biodentine™ shows bioactivity and biocompatibility. The direct contact with the vital pulp tissue reduces inflammation and protects the pulp from bacterial infection.(1) The release of calcium and hydroxyl ions promotes dentinogenesis, and a dentine bridge is formed in the area of contact with the pulp.(2,3)

Biodentine™ has good marginal sealing properties and a good, spontaneous adhesion to the dentin, with a mineral-infiltrated zone developing. It has dentine-like radiopacity ***(Fig. 8)*** and is insoluble when coming into contact with oral fluids. Thanks to this property, it is possible to carry out "open sandwich" class II restorations (like the one detailed in this case report) and bulk restorations, the latter of which must be covered by a composite no later than six months after placement.(4)

From preparation to dispensing, the entire procedure is very simple thanks to the new experience of Biodentine™ XP. The Biodentine™ mixer guarantees easy, perfect mixing, and the gun and the adjustable nozzle allow Biodentine™ XP to be applied directly into the cavity for a much more comfortable patient experience.

Conclusion

A new biological approach to pulp capping has become possible thanks to bio-ceramic materials like Biodentine™ XP due to their bioactive and biocompatible nature. Biodentine™ XP greatly simplifies this procedure thanks to more thorough and predictable mixing. The injection system allows easier filling of the cavity without the danger of leaving voids in the restoration.

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NEW

Biodentine™ XP

Your NEW dentine restoration system

All Biodentine's science with the eXPerience you expect

- All-in-one cartridge
- Direct placement
- Choice of volume

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Deep restoration with Biodentine™: from the pulp floor to top of the cavity

Dr. Pedro Alexandre

Introduction

Carious lesions in the root region are a major challenge in daily clinical practice. In addition being difficult to detect (diagnosis is often a radiographic finding), they are also very challenging due to their proximity to the pulp tissue and the difficulty of access for restorative procedures.

Biodentine™ is a calcium silicate-based material that has, among its main properties, bioactivity, compressive strength, and short setting time. These qualities make it possible to use Biodentine™ as a one-step filler in the case of conservative treatments of the pulp, with or without exposure.[1,2,3]

Unlike MTA, the indications of which are more focused on endodontics, Biodentine™ has demonstrated proven results in pulp regeneration.[4] When compared to glass ionomers, Biodentine™ is more resistant and bioactive.[3] The latter characteristic is not found in GICs, which are not indicated for placement directly on the pulp without another material as a liner or base, such as calcium hydroxide or MTA.[5,6,7,8,9] Moreover, Biodentine™ does not cause discoloration of tooth structure like MTA does.(10) Thus, it is an excellent option for cases of deep cavities, even those with direct pulp involvement. This article aims to show some of the characteristics and indications of Biodentine™ through a clinical case report.

Case Report

A 77-year-old Caucasian patient presented to the dental clinic after five years without dental care. The clinical findings showed significant bone loss, chronic periodontitis, and loss of some teeth that stabilized the occlusion. The patient reported cold sensitivity in tooth #46, especially when ingesting liquids.

Periapical X-ray confirmed the findings of the clinical examination and root caries was also detected in the distal root of tooth #46, which answered positively to the sensitivity test ***(Fig.1-2)***.

The treatment plan began with a focus on returning the patient to adequate periodontal health. In a subsequent session, with improved condition of the periodontium, the restoration of tooth #46 was performed. Under block anesthesia of right inferior alveolar nerve and rubber dam isolation, the amalgam restoration was completely removed and access to the caries cavity obtained ***(Fig. 3-5)***. Despite the proximity to the pulp tissue, no exposure occurred, and the class II cavity was fully restored with Biodentine™ ***(Fig. 6-8)***.

At two months' follow-up, no symptoms were reported, no periapical lesion was observed radiographically, and the clinical examination showed normal vitality ***(Fig. 9-10)***. Thus, it was decided to perform the definitive restoration, leaving Biodentine™ as the definitive base.

The Biodentine™ material was partially removed and a resin composite filling placed over it ***(Fig. 11)***. Selective etching of enamel was done, followed by the application of an adhesive system (Palfique Bond®, Tokuyama) ***(Fig. 12-13)***. After light-curing, the matrix system (SeptoMatrix, Septodont) was set and a large matrix with a soft ring was used for a better contour and proximal contact point ***(Fig. 14)***. The restoration was started in the distal portion, changing the class II cavity into a class I cavity ***(Fig. 15)***. Finally, the occlusal face was completed using Palfique LX5® (Tokuyama) composite ***(Fig. 16)***. After light-curing, glycerin gel was applied to allow better photo-activation of the surface layer. The restoration was then finished and polished, before removing the rubber dam and checking occlusion ***(Fig. 17)***.

Fig. 1: Initial clinical situation.

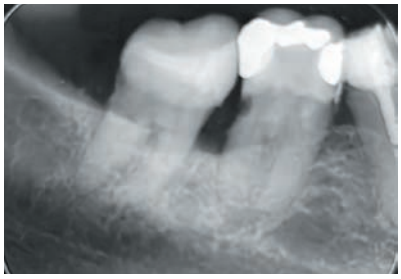

Fig. 2: Initial X-ray.

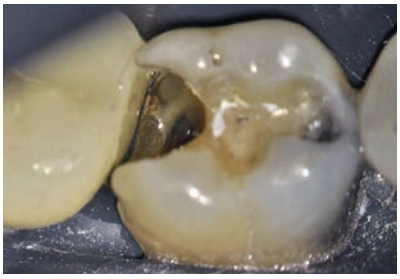

Fig. 3: Class II cavity prepared.

Fig. 4: Septomatrix in position.

Fig. 5: Cavity deep.

Fig. 6: Biodentine™ applied in a Bio Bulk-Fill approach.

Fig. 7: Clinical situation after 12 minutes and the removal of the matrix.

Fig. 8: Clinical situation after the removal of the rubber dam.

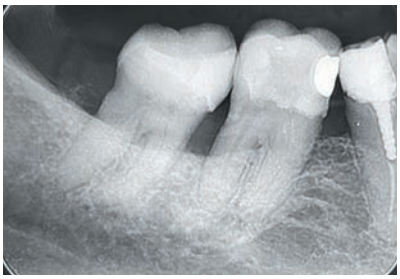

Fig. 9: Follow-up X-ray 2 months postoperatively.

Fig. 10: Biodentine™ restoration after 2 months.

Fig. 11: Removal of the external part of Biodentine™.

Fig. 12: Selective etching of enamel.

Fig. 13: Adhesive application.

Fig. 14: Placement of a matrix system (Septomatrix, Septodont).

Fig. 15: Reconstruction of the distal wall with composite.

Fig. 16: Immediate finished restoration.

Fig. 17: Clinical situation after finishing and polishing.

Important observations

Firstly, it was decided not to remove the amalgam restoration on the mesial face because, although the amalgam corrosion had stained the tooth structure, the restoration did not harm the health of the tooth. It was felt that removal could cause more aggravation to the pulp tissue and consequent loss of pulp vitality.

With regard to the periodontium, the subgingival treatment had the desired effect within two months. The occlusal adjustment allowed for a decrease in the mobility of two teeth that had previously displayed increased mobility due to vertical bone loss.

Discussion

Caries lesions close to the pulp are a challenge to both diagnose and access in our daily practice, as demonstrated in our reported case. Indirect pulp capping is a procedure that aims to preserve pulp vitality by avoiding endodontic treatment.[5,6] Different materials have been used for indirect pulp capping over the years. Pastes based on calcium hydroxide, glass ionomer, and MTA are presented in several studies as options for this treatment.[5,6,7,8] However, the more effective materials in terms of bioactivity (MTA) do not have enough resistance to fill the entire cavity like Biodentine™, which can be used as a single material to bulk-fill a cavity from pulp to crown for up to six months. In the present case, Biodentine™ remained for a period of two months, which was enough time for the signs and symptoms to resolve and a definitive restoration to be placed.

Conclusion

Biodentine™ is an excellent option for restoring teeth with deep cavities, with or without pulp exposure. Important properties such as bioactivity, resistance, and short setting time, in addition to excellent plasticity, allow Biodentine™ to be easily placed in more challenging cases of difficult access and close pulp proximity, as reported in this clinical case.

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Co-Author of Dental Materials Book Series - ABENO.
Speaker at Congress.

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Biodentine™ in the Treatment of Molar Incisor Hypomineralization (MIH) in Pediatric Dentistry: A Case Report

Dr. Lance Kisby

Introduction

Molar Incisor Hypomineralization (MIH) has become one of the most pressing issues in pediatric dentistry. MIH is a qualitative defect of unknown etiology in enamel development, presenting as demarcated opacities of variable extent and severity ***(Fig. 1, Tooth #8)***.[1] In 2003, the European Academy of Paediatric Dentistry defined MIH as a systemic condition and qualitative enamel defect of systemic origin that affects at least one first permanent molar ***(Fig. 2-3)***, which can also be associated with permanent incisors.[1] However, recent studies have shown it can affect second permanent molars, permanent canines, bicuspids, and second primary molars.[1,2,3,4,5] Hypomineralized second primary molars (HSPMs) can be considered a predictor for MIH in permanent teeth.[4]

Fig. 1

Fig. 2

Fig. 3

Prevalence and distribution

MIH is considered a worldwide clinical problem with a global prevalence of 14.2%, ranging from 0.5% to 40.2%.(6) Worldwide, 25% of children have MIH.[2] Lopes has shown that MIH has, in general, a prevalence of 13.5%; 36.3% of MIH teeth are moderately to severely affected; and MIH is present in 3.6% of second primary molars.[7]

Distribution of MIH was seen more in males at age nine years old, with molars affected more than incisors. The mandible was affected more than the maxilla and the right side was affected more than the left side.[8]

Etiology

Though the etiology of MIH is still not fully understood, a combination of several factors which create MIH enamel formation seem to occur at the maturation stage of enamel formation. The mineralization of the first permanent molars usually starts just before or at birth and is fully completed at four to five years of age.[9]

Acute and chronic childhood illness, certain adverse birth events, and conditions during the neonatal period were weakly associated with MIH, while dioxins showed a moderate level of association.[10] Additionally, there may be a link between the use of antibiotics, as well as ear-nose-throat infections.[11]

Clinical presentation

MIH can present as a lesion with clear borders which can be white, yellow, or brown. An interesting feature of MIH is the asymmetry of the defects. One molar or incisor can be severely affected while the contralateral tooth may be clinically sound.[8]

The enamel in MIH teeth is different than normal enamel. The hypomineralized enamel has less distinct prism edges and crystals, with larger interprismatic spaces. Thus, MIH enamel is more porous than normal, sound enamel.[12]

This porous enamel is easily damaged enamel and may be subject to rapid wear and post-eruptive enamel breakdown (PEB), particularly in stress-bearing areas due to the forces of mastication. Caries risk is also elevated in porous enamel, particularly in the posterior teeth, where rapid extensive caries can be so severe as to require extraction. Exposed dentin can accelerate the development of carious lesions.[1] Dentin hypersensitivity, poor esthetics, anxiety, and tooth loss can also occur.[1,13,14,15]

Children with MIH often complain of intense dental thermal sensitivity, especially to cold, due to chronic pulp inflammation under the hypomineralized area.[16] Consequently, these patients are at greater risk of caries from poor oral hygiene due to avoiding toothbrushing, which is associated with tooth sensitivity.

Treatment challenges in MIH

Restorative treatment for MIH teeth is challenging for both the patient and the dentist. The subclinical inflammation of pulpal cells and the altered porous enamel structure make bonding less reliable, leading to defective restorations, frequent loss of restorations, and frequent retreatments.

Treatment is further complicated by thermal sensitivity and the difficulty of achieving adequate local anesthesia in MIH-affected teeth. Procedures can be more uncomfortable and painful for children as a result, leading to an increased prevalence of behavioral management problems, lack of cooperation, and dental anxiety and fear.[13]

Successful management of MIH

A risk assessment and early diagnosis are the key factors for an effective, successful, and conservative MIH treatment.[17] The choice of appropriate treatment depends on the extent of MIH. Long-term restorative treatment for hypomineralized teeth requires up to ten times more treatment and retreatment than teeth without MIH.[18] Treatment can range from prophylactic strategies to highly complex restorative procedures.[15]

The best approach to treating MIH patients should be an individualized treatment plan according to the needs of the patient, using minimally invasive dentistry (MID) techniques [19]. MID is defined as a philosophy of minimal intervention for the placement and replacement of restorations. The objective is tissue preservation, achieved by performing treatment with as little loss of tissue and damage to adjacent tissue as possible.[20]

This article will demonstrate how Biodentine™ can be used as a minimally invasive technique for immediate and long-term pain relief to achieve a successful MIH restoration with the least amount of stress and anxiety for the patient.

Case report

Fig. 4: Initial clinical situation.

Fig. 5: Clinical situation after soft dentine removed.

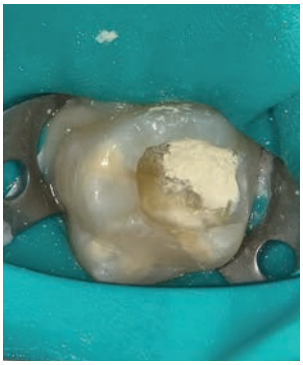

Fig. 6: Biodentine™ placed at mesial-buccal pulp horn area.

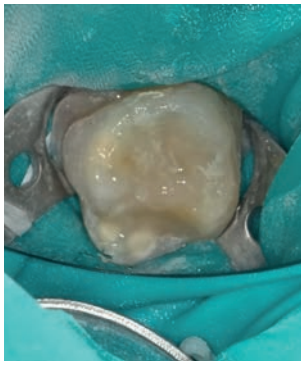

Fig. 7: Clinical situation after composite placed.

This is a case of an eight-year-old male who presented with his parent for an emergency visit complaining of pain to cold stimuli, such as water and ice cream, for over four months. The parent related that the patient had already seen four dentists who were unable to achieve adequate local anesthesia. Pain was not experienced in any other teeth.

Figure 4 shows tooth #3 with not only a large, well-demarcated loss of enamel on the occlusal surface, but also brown spots on other areas of the occlusal and other surfaces. The tooth was sensitive to air blast. A diagnosis of MIH was made based on the history of pain to cold stimuli; no other thermal issues; severe enamel and dentin breakdown on the occlusal (post-eruptive breakdown); and multiple surfaces with brown-yellow areas.

The plan was to provide relief and comfort, and to restore the function of tooth #3. This was first achieved with local anesthesia for the rubber dam clamp. A rubber dam was placed, before removing a thin layer of slightly soft dentin and any poor enamel to reach clean, bondable enamel and dentin ***(Fig. 5)***.

Because this is a newly erupted permanent tooth and the lesion is close to the mesial-buccal pulp horn, the largest of the pulp horns, it was decided to do an Indirect Pulp Capping (IPC) with Biodentine™, a tricalcium silicate cement. Biodentine™ has been shown to have better results as an IPC than other materials.[21] This is due to its high pH of 12 and the release of calcium and silicon ions, which stimulates mineralization and creates a "mineral infiltration zone" along the dentin-cement interface, thus creating a superior sealing property compared to other materials. Biodentine™ shows superior microhardness due to the continued crystallization of calcium silicate hydrate gel, which reduces porosity, increases hardness with time, and increases compressive strength.[22,23,24]

Biodentine™ was mixed, placed, and condensed in the area of the mesial-buccal pulp horn ***(Fig. 6)***. After Biodentine™ had set, excess material was removed. The area was then treated with a selective etch technique of 38% phosphoric acid on enamel only and rinsed with water for 10 seconds. A Premio Bond self-etch adhesive was then placed on the dentin for five seconds, air-dried, and light-cured. Sculpt (GC America) shade A2 was placed in 1-2 mm incremental layers and light-cured at each layer. Once completed, the composite was shaped, contoured, and smoothed. Anatomy was placed and G Coat, an unfilled resin, was placed over the composite and light-cured ***(Fig. 7)***.

The patient returned two weeks later for a follow-up, during which the parent related that the patient had instantaneous relief after the treatment and has not had any thermal sensitivity to tooth #3 since. The parent added that he can now drink cold water and eat ice cream.

Conclusion

MIH is a qualitative defect in enamel. It creates treatment challenges including pain to cold stimuli and problems achieving adequate local anesthesia, which contribute to subsequent behavioral issues and anxiety. In this case, Biodentine™ used as an indirect pulp capping represented a conservative treatment adhering to Minimally Invasive Dentistry guidelines, chosen for many positive properties that included thermal insulation and ease of restoring with a composite.

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He is Board Certified in Pediatric Dentistry since 1983.
He has multiple publications.
He is a Fellow of the American Academy of Pediatric Dentistry for a Master of the Academy of General Dentistry
He created two Pediatric Dental Residencies, one in Danville, PA and the second in Wilmington, DE, and was Program director of both.
He is currently the staff Pediatric Dentist at the Lac du Flambeau Band of Lake Superior Chippewa Indians in Lac du Flambeau, WI with the IHS.
Dr. Kisby has over 47 years of clinical and teaching experience bringing new and exciting techniques and insights to those dentists and staff who treat children.

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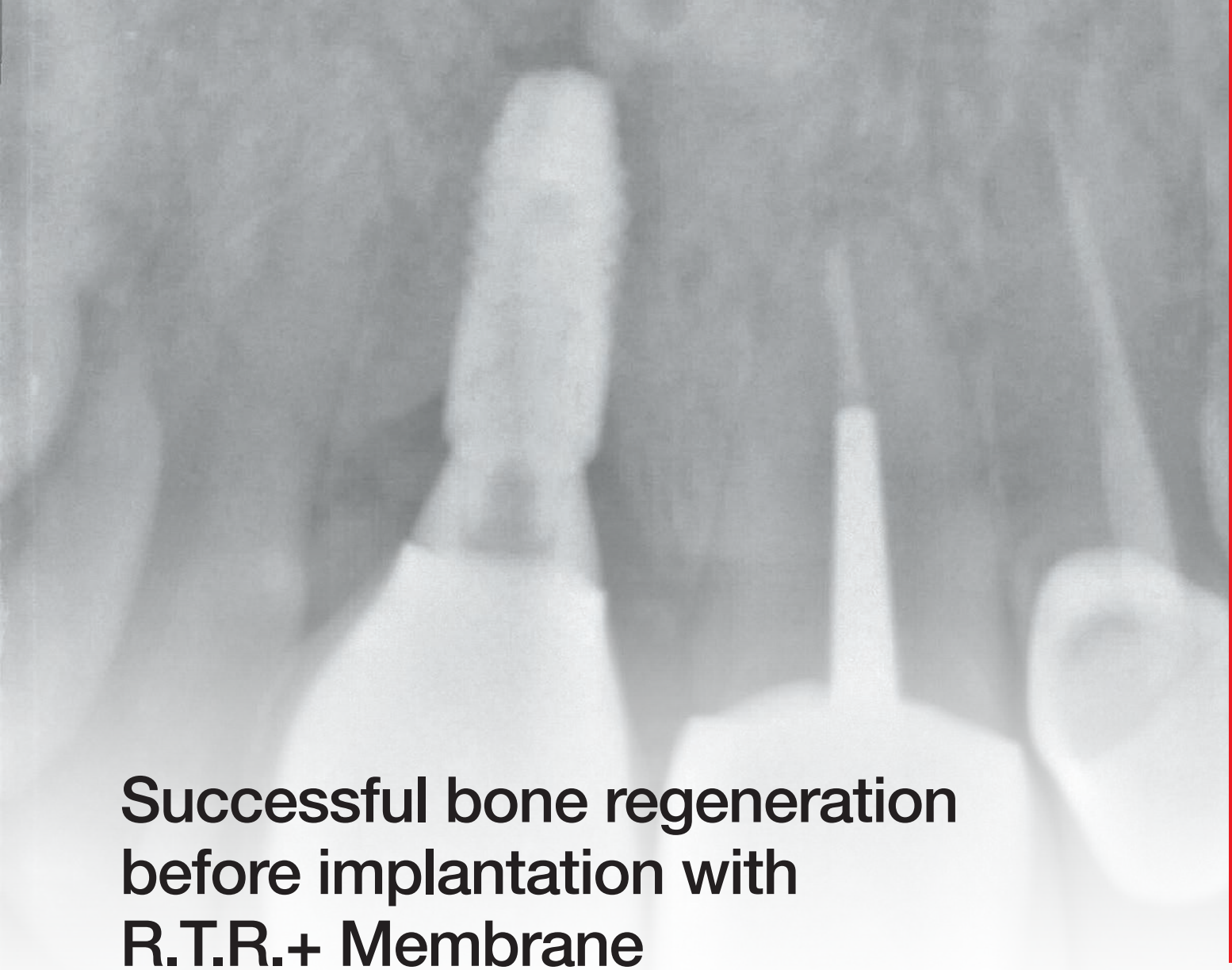

Successful bone regeneration before implantation with R.T.R.+ Membrane

Dr. A. Hoornaert [D.D.S - P.H.D]

Summary

Introduction: Replacing a compromised front tooth is always a challenge, requiring a thorough knowledge of periodontal tissue preservation and regeneration techniques at the implant site.

Clinical Case: A 45-year-old male patient presented with pain and mobility on tooth 11. On inspection, tooth 11 was sensitive to horizontal and vertical percussion and presented an increase in mobility. An extraction was performed with a concomitant bone regeneration using R.T.R.+ Membrane and B.D.X (Bovine Derived Xenograft).

Discussion: Many other procedures could have been used, but the simplicity of handling of the membrane, its resistance to exposure, and its ability to guide healing meant that the bone volume for the placement of an implant could be obtained while maintaining the ideal gingival volume and texture.

Conclusion: The use of a synthetic membrane such as R.T.R.+ Membrane improves the effectiveness of GBR for class 3 bone defects as defined in the Benic system of classification.

Introduction

When a tooth in the maxillary anterior region is compromised and needs to be replaced by an implant, we are faced with a complex challenge.[1] In all cases, we know that esthetic objectives are difficult to achieve due to existing bone deficits or alveolar resorption following avulsion. Further, the vast range of reconstructive techniques available leaves practitioners with a wide choice of materials and equipment.

The Benic and Hamerlé classification system offers indications according to the number of missing bone walls and the horizontal and vertical deficit of the crest.[2] However, despite advances in imaging, it is not always easy to predict the extent of the deficit and the technique to be used on the day of extraction, especially since soft tissue regeneration must also be considered in the anterior sector. In cases where the situation appears favorable, immediate extraction and implantation with guided bone regeneration during implantation is an attractive option, but when the tooth has been chronically infected for some time, alveolar preservation can help to preserve the required bone volume and the correct positioning of the keratinized soft tissues.

Case report

Clinical signs and symptoms

A 45-year-old non-smoking patient presented with chewing pain on tooth 11. He reported having had the impression of a slightly mobile tooth for some time. He recounted that his two central incisors had been pulpless and crowned for some twenty years following a sports accident.

Diagnosis

Clinical examination revealed pain on axial and lateral percussion, as well as mobility level two on the Muhlemann scale. Retroalveolar radiology showed a radiolucent image at the apex of tooth 11, indicative of a chronic apical infection that has been evolving despite an attempted apical resection with retrofilling a few years before ***(Fig. 1, 2)***.

In this context, given the poor intrinsic condition of this tooth due to the treatments already carried out, the option of an extraction with the placement of an implant and the creation

Fig. 1

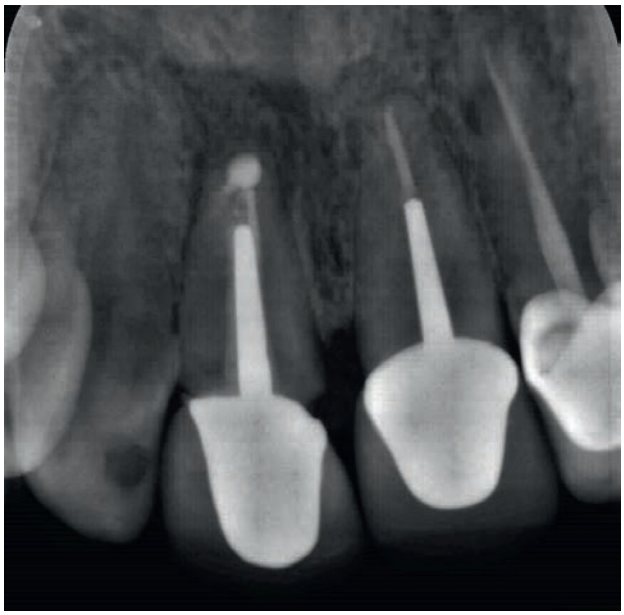

Fig. 2

of a screw-retained crown to replace it was proposed, with the initial intention of carrying out an early implantation.

Procedure and treatment

An impression was taken beforehand to provide a transitional removable fixture prior to extraction. On the day of extraction, during curettage of the alveolus, a vestibular and apical alveolar bone defect was found, and a flap was lifted to visualize the extent of the defect ***(Fig. 3)***. There was no longer any vestibular wall, nor was there an alveolar ceiling.

Guided bone regeneration was performed with B.D.X (0.25-1mm) and synthetic R.T.R.+ Membrane 15x25mm (Septodont; Saint-Maur-des-Fossés, France) ***(Fig. 4)***. The postoperative control radiograph showed the alveolus filled to the top of the ridge ***(Fig. 5)***.

A circular punch of gingiva taken from the tuberosity area was sutured to the gingiva bordering the alveolus to cover the membrane with a non-absorbable 4.0 diameter thread ***(Fig. 6)***.

Stitches were removed after two weeks ***(Fig. 7)*** and the wound was observed to be healing by primary intention. The punch was almost completely resorbed, leaving the membrane slightly exposed ***(Fig. 8)***. At eight weeks, the epithelium covered the entire alveolus, and the tissue was healthy and non-inflammatory ***(Fig. 9)***.

Fig. 3

Fig. 4

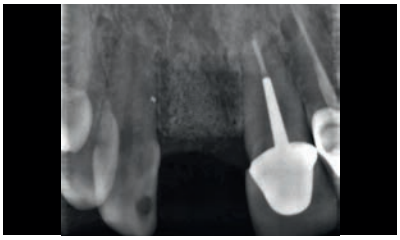

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

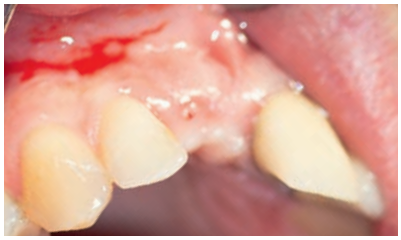

Fig. 10

Fig. 11

Fig. 12

Fig. 13

Fig. 14

At twenty-six weeks, implant surgery was commenced. The full-thickness flap showed a regular ridge of sufficient volume to allow placement of a 3.6-diameter bone level implant ***(Fig. 10, 11, 12)***.

After two months of osseointegration, a provisional crown was fabricated. After the soft tissues had matured, the regular crown was placed ***(Fig. 13, 14, 15)***.

Follow-up

The patient was seen regularly, and the results were maintained from an esthetic and functional point of view, as shown by images taken six years later ***(Fig. 16, 17)***.

Fig. 15

Fig. 16

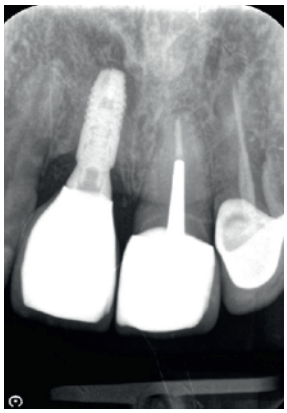

Fig. 17

Discussion

Replacing a maxillary incisor with an implant-supported prosthesis is always a challenge. The conditions for obtaining esthetic similarity with the corresponding tooth, along with functional and esthetic integration at periodontal level, are difficult to achieve in terms of both hard tissue volume and soft tissue quality.

In the present case, the bone defect is borderline between class 3 and 4, as described by Benic et al. The question then arises of whether to perform guided bone regeneration on the day of extraction, or to defer the procedure to achieve soft tissue closure before performing bone augmentation. The advantage of performing the procedure on the same day as the extraction is that it saves time and allows the procedure to be performed without displacing the soft-tissue contour, although it does require the use of a membrane that can ensure the barrier effect while remaining partially exposed. This is the advantage of the synthetic membrane used, since, as can be seen from the images of the various stages, the gingival contour has been preserved from extraction to the final prosthesis, even after six years of follow-up.[3,4]

An autologous apposition graft would probably have provided superior bone gain, but would also have required different soft tissue remodeling, since generally the flap traction required to cover the graft volume would alter the gingival zenith in the palatal position.

Conclusion

The ease of use and resistance to exposure of R.T.R.+ Membrane have made it possible to successfully apply a simple tissue regeneration technique in a difficult clinical context.

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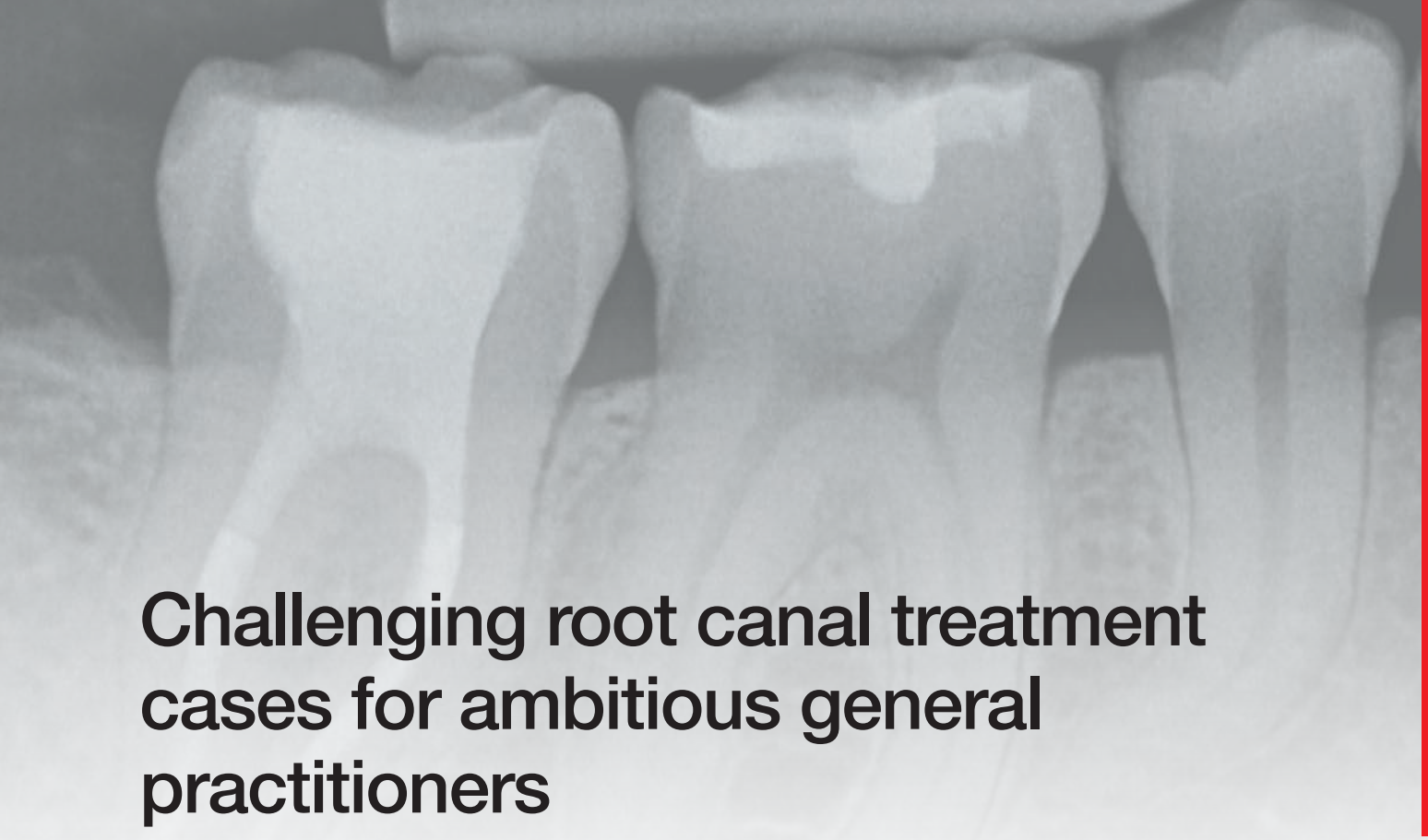

Challenging root canal treatment cases for ambitious general practitioners

Dr. Sascha Herbst, Prof. Dr. Falk Schwendicke

Summary

Introduction: In endodontics, recent advances in material sciences allow for new perspectives when it comes to moderately or highly difficulty cases.

Methods: A bioactive tricalcium silicate-based sealer, BioRoot™ RCS (Septodont; Saint-Maur-des-Fossés, France) was used during single cone obturation in three challenging cases which were followed up for up to 14 months.

Discussion: Bacteria-tight and homogeneous root canal fillings can be achieved in cases with curvatures beyond 30° with BioRoot™ RCS in single-cone technique.

Conclusion: In addition to saving time, BioRoot™ RCS, a bioactive tricalcium silicate-based sealer, provides high chances of success even in challenging cases.

Introduction

The main goal of a root canal treatment is to shape, disinfect, and obturate the root canal system. Cases differ with regards to their complexity and hence require different levels of experience and equipment. Most cases in general practice are classified as having low to moderate difficulty according to the classification of the American Association of Endontists. Due to recent advances in rotary instrumentation, nickel titanium files, and obturation materials, previously unsolvable high-difficulty cases (e.g. those with large curvatures) are increasingly manageable for well-trained and ambitious general dentists.[1]

The single-cone technique was developed in the 1960s for simplifying the obturation of root canals, but effective sealing materials were lacking.[2] In the following decades, several material classes were proposed and investigated for this technique with varying results. In the late 2000s, hydraulic calcium silicate sealers such as BioRoot™ RCS (Septodont, Saint-Maur-des-Fossés, France) were introduced, based on the same technology as hydraulic calcium silicate cements. These bioceramic sealers allowed for proper sealing with the single-cone technique, finally simplifying the obturation process.

Hydraulic calcium silicate materials like BioRoot™ RCS - the first fully synthetic tricalcium silicate sealer - interact positively with the dentine and produce a tag-like structure at the interface, a so-called "mineral infiltration zone" with hydroxyapatite recrystallization.[3] Laboratory studies show good sealing abilities and high biocompatibility of hydraulic calcium silicate sealers.[4] BioRoot™ RCS also overcomes the leaching of trace minerals observed in materials based on Portland cement.[5]

The following cases show different challenges that could be managed by ambitious general dentists utilizing an appropriate protocol. Case 1 shows the management of a curvature >30°, Case 2 the retreatment of an S-shaped curvature with a middle mesial canal, and Case 3 the handling of an extensive apical lesion.

Case reports

Case 1: Large curvature

Clinical signs and symptoms

A 59-year-old female with adjusted hypertension attended the Department for Oral Diagnostics, Digital Health and Health Services Research (Charité - Universitätsmedizin Berlin) with intermittent spontaneous pain at tooth 26. Clinically, the tooth showed no reaction to cold testing, slight tenderness to percussion, and no mobility. The periapical radiograph ***(Fig. 1)*** revealed no apical pathology.

Diagnosis

The clinical findings indicated pulp necrosis with symptomatic apical periodontitis.

Procedure and treatment

After accessing the pulp chamber, it was observed that the root canals appeared to be reduced in size. The second mesio-buccal canal (Mb2) could be located in close proximity to the first mesio-buccal canal (Mb1). Root canal lengths were confirmed radiographically ***(Fig. 2)*** and glide path preparation was done with a

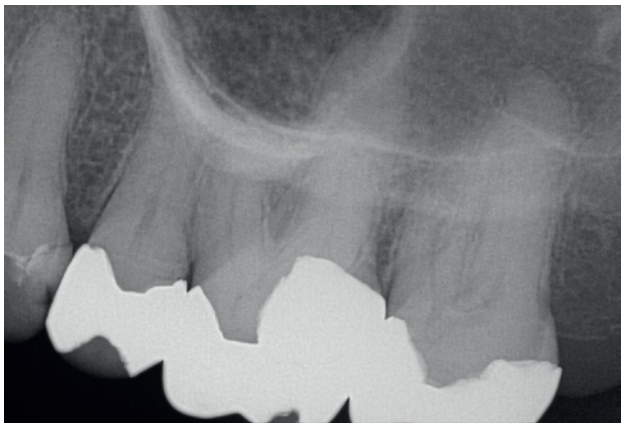

Fig. 1

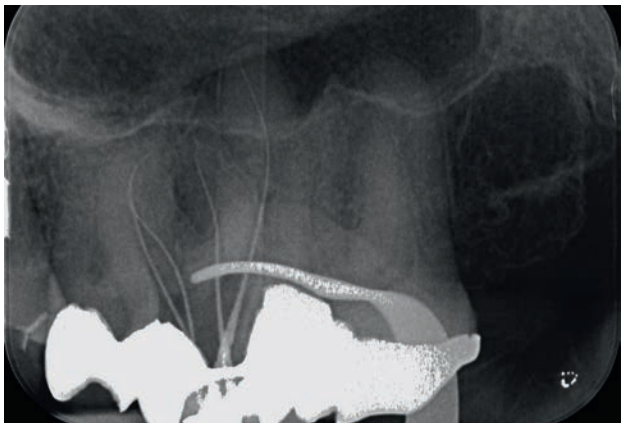

Fig. 2

rotary NiTi instrument (size 15.03). Mb2 merged with Mb1 in the coronal third. All root canals were prepared carefully to size 40.04 ***(Fig. 3a-b)*** in multiple steps and with copious 3% sodium hypochlorite (NaOCl) irrigation.

At the second visit, the patient was free of any symptoms. The temporary calcium hydroxide dressing was removed and the master cone fit verified radiographically ***(Fig. 4)***. Final irrigation was done with activated 17% ethylenediaminetetraacetic acid (EDTA) and 3% NaOCl.

Before obturation, all canals were irrigated with 0.9% saline and dried with paper points. BioRoot™ RCS, a bioactive tricalcium silicate root canal sealer, was hand-mixed with five drops of the liquid for 60 seconds on a sterile glass plate. The sealer was placed in the root canals with a gutta-percha point with shaky movements, in accordance with the manufacturer's recommendations. Afterwards, the fitted gutta-percha points were coated with BioRoot™ RCS, inserted into the root canals, and cut with a heat-plugger at orifice level. The coronal portion of the melted gutta-percha was carefully condensed to obtain a proper coronal seal. Finally, the excess material was flushed out with water and dried with air ***(Fig. 5a-b)***. The root canal filling was evaluated on the postoperative radiograph ***(Fig. 6)***.

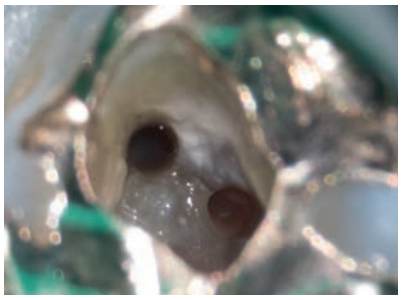

Fig. 3a

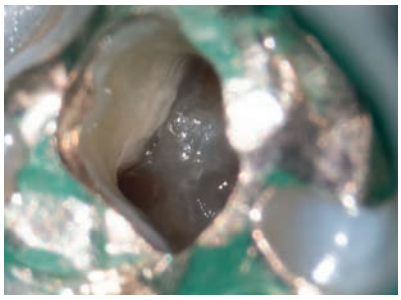

Fig. 3b

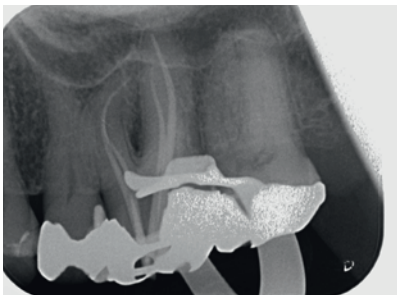

Fig. 4

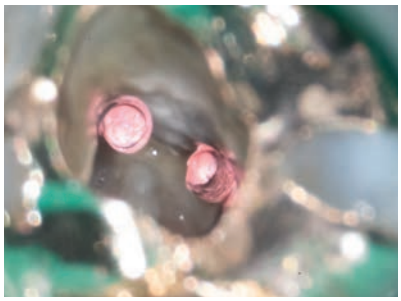

Fig. 5a

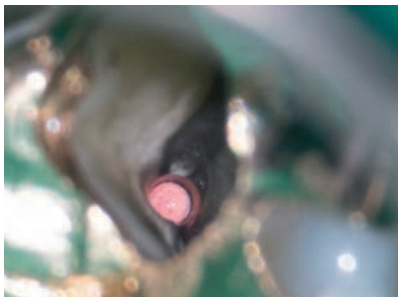

Fig. 5b

Fig. 6

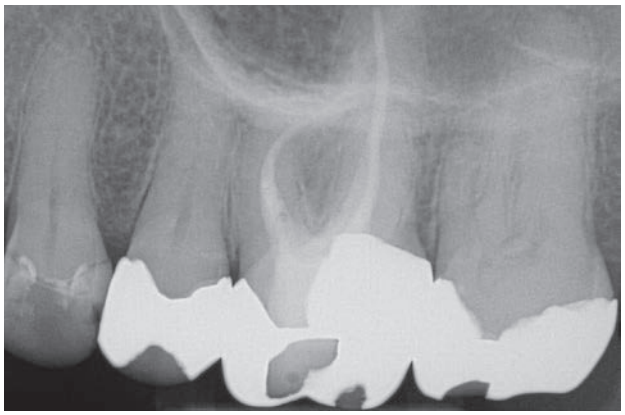

Fig. 7

Follow-up

Fourteen months later, the patient was still free of symptoms and the radiograph showed no signs of pathology ***(Fig. 7)***.

Case 2: Retreatment of an S-shaped anatomy

Clinical signs and symptoms

A healthy 23-year-old female attended our clinic with pain during mastication on tooth 47. The tooth had undergone a root canal treatment one month before and was still sensitive to percussion and palpation. On the periapical radiograph ***(Fig. 8)***, a short obturation in the mesial canals was visible, as well as an inhomogeneous root canal filling in all canals.

Diagnosis

The initial diagnosis was symptomatic post-treatment apical periodontitis. Pre-operatively identified challenges were the S-shape of the mesial root and the presence of a root canal filling.

Procedure and treatment

The old root canal filling could be removed entirely with hand instruments, but the patient felt some pain during instrumentation. Surprisingly, there was still vital pulp tissue present in the distal root ***(Fig. 9)***, so the initial diagnosis was complemented by moderate pulpitis in the distal root. After the removal of the old gutta-percha, a middle mesial canal could be detected ***(Fig. 10)***. The S-shape of the mesial root and the distal root canal were prepared as described in the protocol from Case 1; all mesials confluenced in the middle third of the root and were prepared to size 40.04 ***(Fig. 11, 12)***. Due to the size of the distal root canal, the final shaping was 50.04. All canals were obturated with BioRoot™ RCS, as previously described in Case 1 ***(Fig. 13)***.

Follow-up

After four months, the patient was still free of symptoms.

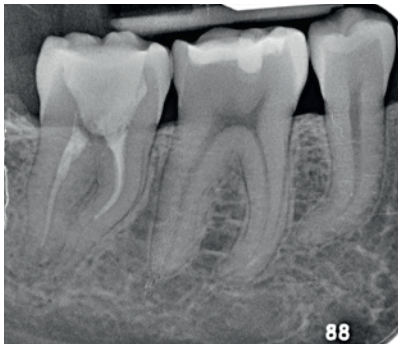

Fig. 8

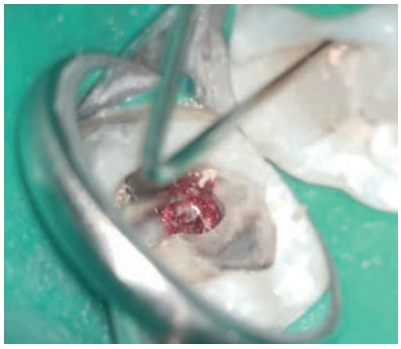

Fig. 9

Fig. 10

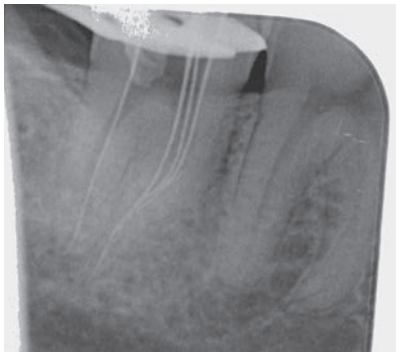

Fig. 11

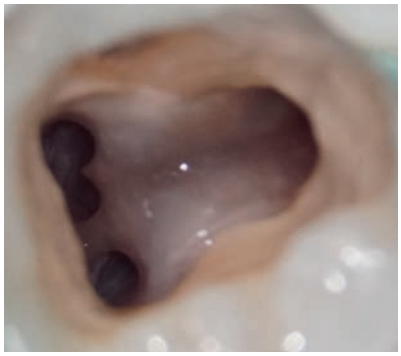

Fig. 12

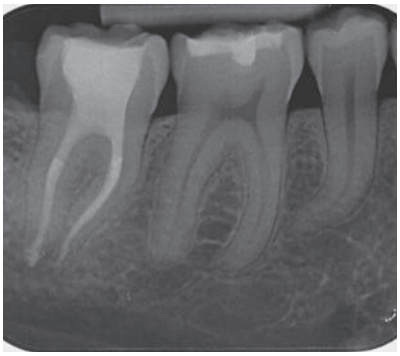

Fig. 13

Case 3: Treatment of an extensive apical lesion

Clinical signs and symptoms

A 55-year-old female attended the clinic with swelling and persistent pain. Clinically, tooth 47 showed no reaction to cold testing. The panoramic view indicated an extended periapical lesion at the same tooth ***(Fig. 14)***.

Diagnosis

The diagnosis was infected pulp necrosis with an accompanying periapical abscess. Due to close proximity of tooth 47 to an impacted wisdom tooth, a cone beam computed tomography (CBCT) was conducted. On the CBCT, we could identify that the periapical lesion of tooth 47 communicated with tooth 48 ***(Fig. 15)***. The goal was therefore to reduce the periapical lesion, preserving tooth 47 and leaving the impacted wisdom tooth in place.

Procedure and treatment

At the first visit, the abscess was incised and tooth 47 was accessed to relieve the patient's symptoms. At the second visit, the patient was free of pain and the root canal treatment of 47 was continued.

After precluding the presence of a middle mesial canal, the mesial canals were prepared to size 40.04 and the distal root canal to 50.04. BioRoot™ RCS was used in single-cone technique for obturation in the same manner described in Case 1 ***(Fig. 16a-c, Fig. 17)***.

Fig. 14

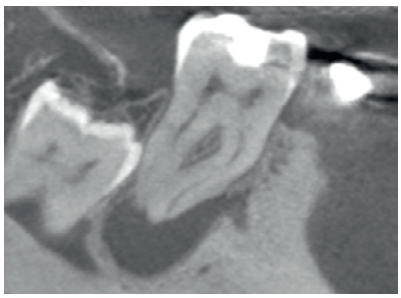

Fig. 15

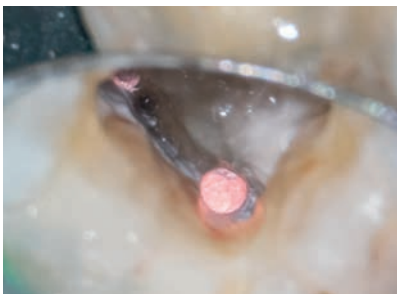

Fig. 16a

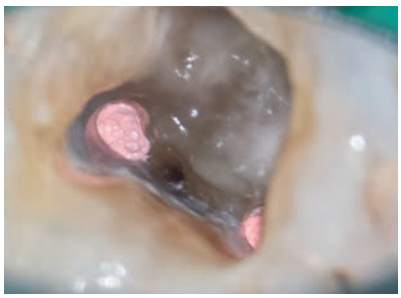

Fig. 16b

Fig. 16c

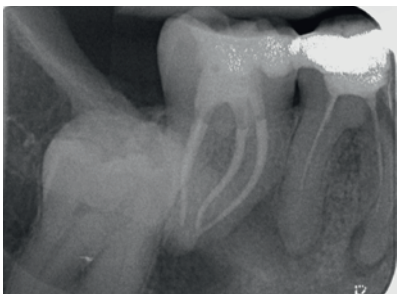

Fig. 17

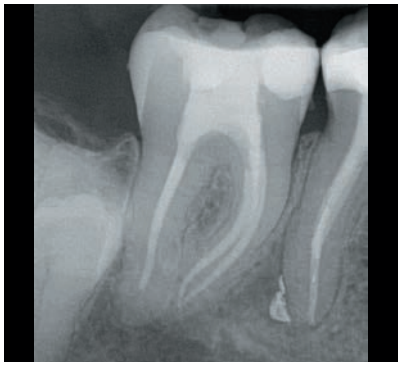

Fig. 18

Follow-up

14 months later, complete healing with periodontal ligament at the apices could be observed on the follow-up radiograph ***(Fig. 18)*** and the patient was still free of symptoms. In the meantime, tooth 46 was selectively retreated.

Discussion

Root canal treatments formerly classified as 'high-difficulty' due to characteristics like curvatures beyond 30° or S-shaped canals can be resolved by ambitious and trained generalists if employing a proper treatment protocol. The treatment protocol described will allow for homogeneous root canal filling in both low- and high-curvature cases, and may be applied in almost every clinical situation except for open or immature apices.

Studies demonstrate that the single-cone technique is time-saving and easy to learn.[2] The time saved during obturation can be invested in careful root canal preparation (Cases 1 and 2) or advanced disinfection procedures (Case 3) instead. Additionally, due to its high proportion of tricalcium silicate (>40%), BioRoot™ RCS offers a particularly high biocompatibility compared to conventional epoxy resin-based sealers, which display initial cytotoxic effects.[6] Bioactive sealers instead promote a positive effect on immune cells[7] and on the inflammatory process[8] Additionally, the set material allows adherence of periodontal ligament cells[9] and supports the healing process through the release of calcium and silicon ions, as well as calcium hydroxide.[10,11]

Conclusion

In addition to saving time, the described single-cone obturation technique using BioRoot™ RCS allows for successful treatment of even challenging root canal cases.

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Notes

Notes

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