

Septodont Case Studies

No. 25 - April 2024

Collection



- Bio-Bulk Fill treatment of deep caries
- Direct pulp capping with the Bio-Bulk Fill technique

Biodentine™

**ACTIVE
BIOSILICATE
TECHNOLOGY**

BioRoot™

- Hydraulic calcium silicate-based sealer in specialist practice
- Obturation protocol for general practice





***ACTIVE
BIOSILICATE
TECHNOLOGY***

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Editorial

The Septodont Case Studies Collection is a series of case reports created to showcase the effective utilisation of our products in various scenarios, from the simply challenging to the most complex clinical situations.

Over the years, authors from more than 15 countries have generously contributed to the success of our magazine, which is now distributed on five continents.

Each new issue of the Case Studies Collection is an opportunity to discover new clinical challenges and their treatment solutions. The 25th issue focuses on Septodont's proprietary **Active BioSilicate (ABS) Technology™**.

This ABS Technology™ platform is the result of **10+ years** of research, innovation, and clinical collaboration. Founded on the vision of repairing and regenerating the dentine-pulp complex, it helped pioneer the shift away from “drill and fill” dentistry.

Giving us control of the manufacturing process from start to finish, ABS Technology™ allows us to create pure, bioactive, and biocompatible tricalcium silicate. This raw material sparked the development of several breakthrough products, saving millions of teeth worldwide:

- Biodentine™ is both a pulp therapeutic and a restorative material, in a single product. It is a dentine substitute suited for restoring a deep cavity using the “Bio-Bulk Fill” procedure, from the pulp to the tooth surface.
- BioRoot™ is the next-generation bioactive root canal sealer for a successful obturation made easy for everyone.





Here's a glimpse into our journey in the words of our R&D Director:

It took 12 years to initiate a research consortium and take the idea of ABS Technology™ to the lab bench, to the factory and, finally, to the dental chair. The journey was filled with ups and downs, great successes and unexpected failures, and countless new solutions and improvements. A new production setting was designed to be able to synthesise tricalcium silicate at an industrial scale while meeting the quality grade required of medical devices.

ABS Technology™ landed far beyond our expectations with Biodentine™, a new class of bioactive dentine substitute. Biodentine™ demonstrated all the features we initially anticipated: fast setting, high mechanical strength, dimensional stability (thanks to the resin-free formulation), high pH and strong sealing capability. However, on top of these benefits, Biodentine™ also demonstrated high biocompatibility and bioactivity that led to amazingly favourable human tissue interactions like pulp healing and dentine bridge formation, as well as excellent long-term stability.

Over the years, Biodentine™ has continued to demonstrate outstanding benefits, both in the crown and in the root, inspiring the dental research community and leading to over 1200 international peer-reviewed publications to date. It has become a gold standard for minimally invasive dentistry, limiting damage to the natural tissues in deep carious lesions, and has become a natural favourite treatment candidate for recent vital pulp therapy approaches.

ABS Technology™ also entered the root canal obturation category with BioRoot™ RCS, a biocompatible and bioactive root canal sealer that provides a tight seal, no shrinkage and high purity. ABS Technology™ is a unique and promising technology platform that continues to go from strength to strength. As the BioBrothers family grows alongside ABS Technology™, we look forward to realising its enormous potential as an innovative and reliable companion in the evolution of dentistry.”



Discover the perspective of clinician Dr. Amre Atmeh, Assistant Professor in Endodontics at the Hamdan Bin Mohammed College of Dental Medicine, Dubai, UAE

Over the years, a variety of restorative materials have been introduced in the quest for the ideal material. This has created a dynamic interplay between research and clinical practice. In this context, ABS Technology™ has brought us closer to the ideal material that we require in our clinics. The technology uses high-purity tricalcium silicate, which comprises the main constituent of Biodentine™ and BioRoot™. Such formulation plays an important role in dictating the properties of these materials during clinical handling and after application. Faster hydration and setting, higher calcium release, and higher stability all contribute to the clinical performance of these materials, hence the treatment outcome. Along with its role as a coronal restorative material, Biodentine™ exhibits interactive relations with the dental and pulpal tissues, adding a “therapeutic” aspect to this role. Produced using the same ABS Technology™, BioRoot™ root canal sealer demonstrates the same combination of therapeutic properties mediated through the release of calcium hydroxide.

Case Studies Collection 25 features two cases with Biodentine™ XP and two cases with BioRoot™ RCS. The cases are authored by the practitioners, who are responsible for the decision to apply the products in the manner described therein. Septodont reminds readers that the official indication of each product is available in their respective instructions for use.



Bio-Bulk fill treatment of deep caries



Michal Ganowicz,
DDS, PhD

 **For how long have you been using Biodentine™?**

I have been using Biodentine™ for 5 years.

 **Why do you use the Bio-Bulk Fill procedure with Biodentine™? What are the main advantages for you?**

The most important thing is the positive effect of Biodentine™ on pulp healing. For me, it is a tool to prevent root canal treatment.

 **When do you use the Bio-Bulk Fill procedure?**

I use the Bio-Bulk Fill procedure with Biodentine™ most often for direct and indirect pulp capping. Occasionally I also use it to treat cementum caries and to seal perforations in root canals.

Summary

Introduction

A vital pulp produces dentine, nourishes the hard tissues, conducts stimuli and participates in the immune response. A tooth with a vital pulp is always better than a non-vital one. Therefore, practising dentists should spare the hard tissues of the tooth and the pulp at all costs and use materials and methods that minimise the need for intervention.

Methods

In a tooth treated with zinc oxide with eugenol for deep caries, a Bio-Bulk Fill filling was placed using Biodentine™ as a dentine substitute and composite. The final filling, which was carried out in two stages, fulfilled its purpose as a method of preventing pulp necrosis while also acting as a permanent filling.

Discussion

The methods of choice should be those that can postpone the need for root canal treatment

and preserve tooth structure and pulp vitality. Indirect pulp capping with Biodentine™ fulfils these criteria, as Biodentine™ has a positive effect on the condition of the pulp, promotes remineralisation and dentine restoration, and acts as a restorative material. Biodentine™, covered with a 1.5-2 mm layer of composite, eliminates the problem of abrasion and the aesthetics of the filling, while retaining the positive properties of the bioactive cement. The best option is to treat the tooth in two stages: at the first visit, fill the entire cavity with Biodentine™; at the second visit, after two weeks, cover the Biodentine™ with composite.

Conclusion

The Bio-Bulk Fill method with Biodentine™ works well in the treatment of deep caries. Biodentine™ as a dentine substitute, combined with an outer layer of universal composite, works perfectly as an aesthetic permanent filling.

Introduction

The current method of choice for treating tooth decay is to prepare the cavity and fill it with composite material. Properly performed, composite fillings effectively restore tooth function, and their effectiveness has been proven in millions of cases. However, this treatment is essentially prosthetic. Every filling, even the smallest, is a prosthetic. At the same time, we know that healthy enamel,

dentine and pulp are precious. A vital pulp produces dentine, nourishes the hard tissues, conducts stimuli and participates in the immune response. A tooth with a vital pulp is always better than a non-vital one. Therefore, practising dentists should spare the hard tissues of the tooth and the pulp at all costs and use materials and methods that minimise the need for intervention.

Case report

Clinical signs and symptoms

The patient presented with hypersensitivity of tooth 16. The tooth had been treated two months previously for a deep MOD cavity with a zinc oxide-eugenol paste. Due to the poor mechanical properties of such a temporary filling, parts of the dentine were exposed, hence the hypersensitivity symptoms. Tap test was negative. The response to cold stimuli was normal.

Diagnosis

Deep caries, uncomplicated.

Procedure and treatment

After anaesthesia and application of a rubber dam, the cavity was prepared. The dentine was left demineralised on pulp chamber walls of the cavity. A minimum of 2 mm of hard tooth tissue was left fully prepared and hard around the cavity margin to ensure tightness of the future restoration. The proximal walls were restored with A3 universal composite after etching and

using a universal bonding system at the cavity margin. The rest of the cavity was filled with Biodentine™ up to the occlusal surface. After 12 minutes of initial setting of the Biodentine™, the rubber dam was removed and the patient was sent home. The next appointment was scheduled for two weeks.

Between visits, the patient had no toothache and the sensitivity diminished. The sensitivity to cold was still normal. Therefore, a rubber dam was placed and 1.5 mm of the outer layer of Biodentine™ was removed. In this case, it was not necessary to anaesthetise the tooth. After selective enamel etching with a universal bonding system, the cavity was filled with one layer of A3 universal composite, prepared and polished.

Follow up

One year after the last visit, the patient has no sensitivity and the tooth responds correctly to stimuli.



Fig. 01: Tooth 16 with MOD cavity and deep caries. Two months after treatment with zinc oxide with eugenol.



Fig. 02: Tooth after preparation.



Fig. 03: Restoration of the proximal walls with composite material.



Fig. 04: Filling of the rest of the cavity with Biodentine™.



Fig. 05: Temporary long-term restoration with Biodentine™.



Fig. 06: Tooth after two weeks. A rubber dam was fitted.



Fig. 07: Tooth after removal of 1.5 mm Biodentine™.



Fig. 08: Selective enamel etching.



Fig. 09: Tooth after application of the universal bonding system.



Fig. 10: Tooth after application of a single layer of A3B universal composite.



Fig. 11: Glycerine-mediated polymerisation of a composite.



Fig. 12: Filling after initial preparation and polishing.



Fig. 13: Bio-Bulk Fill.

Discussion

Untreated caries eventually leads to destruction of the hard tissues of the tooth, inflammation and even pulp necrosis. Therefore, the methods of choice should be those that can postpone the need for root canal treatment and preserve tooth structure and pulp vitality. Indirect pulp capping with Biodentine™ fulfils these criteria, as Biodentine™ has a positive effect on the condition of the pulp, promotes remineralisation and dentine restoration, and acts as a restorative material. In addition, according to the author's clinical experience and the observations of other authors, Biodentine™ works well in direct pulp capping in cases of irreversible pulpitis.

After filling the entire cavity with Biodentine™ and waiting 12 minutes, we can send the patient home. Unfortunately, Biodentine™ is not suitable as a permanent filling due to its abrasiveness and colour. According to the manufacturer's recommendations, it can be used as a long-term temporary filling for up to

six months. However, if we use the Bio-Bulk Fill method and cover Biodentine™ with a 1.5-2 mm layer of composite, we eliminate the problem of abrasion and the aesthetics of the filling, while retaining the positive properties of the bioactive cement. In this case, the Biodentine™ acts as a dentine substitute and the composite as an enamel substitute. Together they can function as a permanent restoration for many years.

In theory, we can cover Biodentine™ with composite 12 minutes after application. However, it is better to wait at least two weeks for the material to fully cure if possible. After this time, it will have a micro-hardness like natural dentine. After this time, a stronger bond between the bonding system and its surface is also achieved. Another consideration is the ability to control the vitality of the pulp over time. This will be particularly important in the case of direct pulp capping in a state of irreversible pulpitis.

Conclusion

The Bio-Bulk Fill method with Biodentine™ works well in the treatment of deep caries. The application of bioactive cement to demineralised dentine preserves as much hard tissue as possible and significantly reduces the risk of pulp necrosis.

Biodentine™ as a dentine substitute, combined with an outer layer of universal composite, works perfectly as an aesthetic permanent filling.



Author:

Michal Ganowicz DDS, PhD

I am a specialist in conservative dentistry and endodontics with 20 years of experience working in Warsaw, Poland.

My daily practice involves treating complex issues such as occlusion and temporomandibular joint disorders.

I am particularly passionate about using composite materials and employing biological treatment methods. I fully endorse the power of adhesion and the regenerative abilities of the pulp.

During my lectures and workshops, I advocate for simplified dental treatment procedures as I firmly believe they are the optimal choice for both dentists and patients alike.

NEW

Biodentine™ XP

Your NEW dentine restoration system

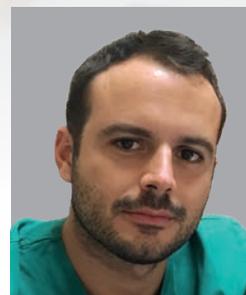
All Biodentine's science
with the e**XP**erience
you expect



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



Direct Pulp Capping with the Bio-Bulk Fill Technique



Vincenzo Tosco
DDS, PhD

How long have you been using Biodentine™?

In my clinical practice, I have employed Biodentine™ for an extended period of six to seven years. With the introduction of Biodentine™ XP to the market, I switched to using this new product this year.

Why do you use the Bio-Bulk Fill procedure with Biodentine™? What are the main advantages for you?

This technique enables clinicians to simplify direct posterior restorations, including both direct and indirect pulp capping, through the utilisation of a bioactive material such as Biodentine™ XP, as a dentine substitute. Indeed, the placement of a protective barrier over exposed or unexposed pulp induces the formation of a dentinal bridge and maintains its vitality and function. The combination of Biodentine™ XP and a resin-based composite for cavity filling ensures a safe outcome, preserving pulp vitality within a single visit.

When/in which cases do you use the Bio-Bulk Fill procedure?

I use it mainly in very deep cavities as a protective base, or for vital pulp therapy, both for indirect and direct pulp capping.

Summary

Introduction

This clinical case demonstrates the basic concepts of the Bio-Bulk Fill approach, using Biodentine™ XP material as a dentine replacement, to perform the restoration of a deep cavity lesion.

Grace, 32 years old, presented with a hole in her tooth, but did not report feeling any pain. The tooth was positive in the vitality test and negative in the percussion test. Clinical examination revealed a cavity without exposure of the pulp, and the radiological examination revealed no periodontal lesions.

Methods

After preparing the cavity with high- and low-speed burs and a vanadium excavator, direct pulp capping was performed using Biodentine™ XP. After allowing the material

to harden for 15 minutes, the lesion was transformed from a class II to a class I cavity. A bulk-fill composite was applied with the Essential Lines modelling technique to complete the direct restoration.

Discussion

The characteristics of Biodentine™ XP allow the practitioner to obtain a seal and form a barrier that induces a pulp response, therefore maintaining the vitality of the pulp. Furthermore, Biodentine™ XP presents good results in terms of bond strength, allowing the restoration to be completed in a single session.

Conclusion

After a six-month follow-up, no radiographic signs of periodontal issues were observed, confirming the maintained vitality of the treated tooth.

Introduction

In restorative dentistry, managing carious exposure in deep lesions is a common occurrence, especially in cases with no or mild symptoms. Various treatment options exist, including minimally invasive approaches to vital pulp treatment, such as direct pulp capping.

Direct pulp capping, when conducted after a careful diagnosis, is generally an effective clinical procedure for treating teeth with deep decay and exposed pulp. Calcium silicate-based materials, called bioceramics, are commonly applied in direct contact with the pulp. These materials play a crucial role in eliciting a pulp response and promoting the formation of a reparative bridge of hard tissues, thereby preserving pulp vitality. Additionally, new bioceramics can serve as a dentine substitute

and have excellent bonding capacity with resin-based composites, allowing for a one-step cavity filling with satisfactory adaptation to the cavity. This way, the procedure is simplified and the chair time required to complete the restoration is reduced.

This clinical case demonstrates the basic concepts of the “Bio-Bulk Fill” approach, using Biodentine™ XP as a dentine replacement, to perform the restoration of a deep cavity lesion. Grace, 32 years old, presented with a hole in her tooth, but did not report feeling any pain. The tooth was positive in the vitality test and negative in the percussion test. Clinical examination revealed a cavity without exposure of the pulp, and the radiological examination revealed no periodontal lesions.

Case report

Clinical signs and symptoms

The patient reported no pain. The clinical examination showed a deep carious lesion and the radiological examination showed a D3 lesion according to the American Dental Association Caries Classification System. Pulp vitality was positive and percussion test negative.

Diagnosis

Dental caries. Visible deep lesion with no symptoms.

Procedure and treatment

Direct restoration involving dental caries removal and the application of Biodentine™ XP for direct pulp capping.

The lesion was deep and the pulp was exposed. At this point, a cotton pellet was used to promote formation of the clot. Only after the bleeding had stopped was the direct pulp capping performed, applying Biodentine™ XP inside the cavity directly in contact with the pulp. After 15 minutes, when the material had hardened, the Biodentine™ XP layer was modified with burs and manual instruments in order to distribute the material homogeneously within the cavity.

A sectional matrix was positioned to transform the lesion from a class II to a class I cavity,

and the enamel was selectively etched for 20 seconds. After the application of the universal adhesive system, the mesial wall was built, re-establishing a proper contact point. Upon the removal of the sectional matrix, the class I restoration was completed using only one mass of bulk-fill composite, and the occlusal morphology was obtained following the Essential Lines modelling technique.

After completing the restoration and curing the material, glycerin was applied for 40 seconds for a final oxygen-free curing cycle. After the second premolar was performed, the old restoration of the first premolar was also replaced, again following the Bulk-and-Go and Essential Lines techniques proposed by StyleItaliano.

The check-up x-ray showed different radiopacities of the composite and Biodentine™ XP. After six months of follow-up, no radiographic signs of periodontal lesions were evident. The vitality test was positive and the percussion test negative, a sign of maintained vitality of the treated tooth.

Follow up

No symptoms or radiological lesions were observed at the six-month follow-up.



Fig. 01: Deep proximal cavity.



Fig. 02: Rubber dam isolation.



Fig. 03: Dental caries removal using a vanadium excavator.



Fig. 04: Clean cavity with pulp exposure.



Fig. 05: Injection of Biodentine™.



Fig. 06: Hardening of bioceramic material before restoration.

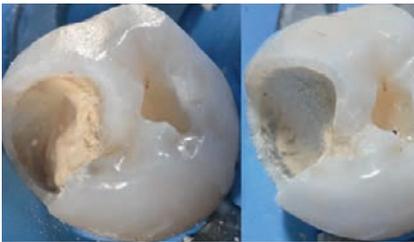


Fig. 07: Shaping of bioceramic lining before restoration.

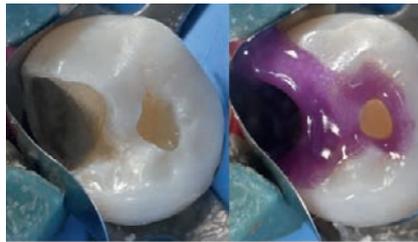


Fig. 08: Selective enamel etching.



Fig. 09: Bonding of class II cavity.



Fig. 10: Mesial wall reconstruction, transforming class II into class I.



Fig. 11: Occlusal modeling of lower premolar.



Fig. 12: Light curing under glycerin gel.



Fig. 13 - Final restoration.



Fig. 14 - Final aspect of lower premolar restoration.



Fig. 16 - Restored lower premolars.



Fig. 15: Before and after cavity restoration.



Fig. 17: X-ray before and after direct pulp capping.

Discussion

Biodentine™ XP plays a crucial role in eliciting a pulp response and promoting the formation of a reparative bridge of hard tissues, thereby preserving pulp vitality. Additionally, it can serve as a dentine substitute, allowing for a one-step cavity filling with satisfactory adaptation to the cavity. Furthermore, the material is easy to

handle and has excellent bonding properties with resin-based composites, allowing the practitioner to complete the restoration in a single session. This way, the procedure is simplified, and the chair time required to complete the restoration is reduced.

Conclusion

This technique allows the clinician to simplify direct posterior restorations, including direct or indirect pulp capping, using a bioactive material like Biodentine™ XP as a dentine substitute. The

combination of Biodentine™ XP and composite for filling the cavity and the Essential Lines modelling technique ensures a safe outcome in one single visit.



Before and after cavity restoration.



Author:
Vincenzo Tosco DDS, PhD

Graduated in Dentistry at the Universidad Alfonso X el Sabio, Madrid, Spain. PhD in Biomedical Sciences at the Università Politecnica delle Marche, Ancona, Italy. Currently, research fellow at the same University under the supervision of Professors Angelo Putignano and Giovanna Orsini.

My main activities concern endodontics, restorative dentistry, and aesthetics. After graduating, I had the opportunity to build on current scientific research with the goal of creating new procedures specifically designed to improve health outcomes. This translational research allowed me to apply simplified techniques and learn about the characteristics of the different materials. During lectures and workshops, I demonstrate the results of research work to provide predictable, repeatable, and quality results to improve all possible therapies for our patients.

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Dr. Sascha Herbst

Hydraulic calcium silicate-based sealer in specialist practice

| Summary

Introduction

49% of endodontists use bioceramic sealers in specialist practice.

Methods

Single-cone obturation using a bioactive calcium silicate-based sealer (BioRoot™ RCS; Septodont; Saint-Maur-des-Fossés, France) was used in one complex case with follow-up at six months.

Discussion

Apart from time efficiency, the outlined single-cone obturation method employing BioRoot™ RCS enables successful management of intricate root canal procedures.

Conclusion

BioRoot™ RCS offers a streamlined obturation process for endodontic treatments in specialist practice with a favourable healing outcome.

Introduction

Bioceramic sealers have gained significant attention and adoption within the field of endodontics, with approximately 49% of endodontists incorporating these sealers into their practice.¹ Among the various techniques employed, the single-cone method stands out as the second most frequently utilised technique by endodontic specialists.¹

The rising utilisation of bioceramic sealers can be attributed to their recognised biological properties and simplicity in application.^{2,3} These sealers have garnered attention for

their biocompatibility, aiding in reduced tissue irritation and promoting a favourable environment for healing.^{4,5} Additionally, their straightforward application process has contributed to their appeal among endodontic specialists, offering a streamlined approach to effectively seal root canals.¹ Furthermore, the growing interest in bioceramic sealers is supported by the availability of more outcome studies.⁶⁻⁸ These studies have indicated similar treatment outcomes between bioceramic sealers and epoxy resin-based sealers with easier technique.

Case Report

Clinical signs and symptoms

A healthy 23-year-old female sought care at the Department for Oral Diagnostics, Digital Health, and Health Services Research (Charité - Universitätsmedizin Berlin) due to persistent severe pain associated with tooth 47 (sensitivity to percussion and pain during the night).

Diagnosis

Six weeks earlier, tooth 47 had undergone endodontic treatment, but the root canal filling was extended to the middle third in the mesial root canal and was inhomogeneous in the distal root canal (*Fig. 1*). Additionally, a diffuse apical translucency was present at both roots on the preoperative radiograph (*Fig. 1*). Presently, clinical symptoms indicated recurrent symptomatic apical periodontitis with the need for further intervention.

Procedure and treatment

In the first appointment, the root canal filling (*Fig. 2*) was removed using rotary endodontic instruments (HyFlex Remover, Coltène, Altstätten, Switzerland) and the working lengths were confirmed radiographically (*Fig. 3*). A middle mesial root canal could be

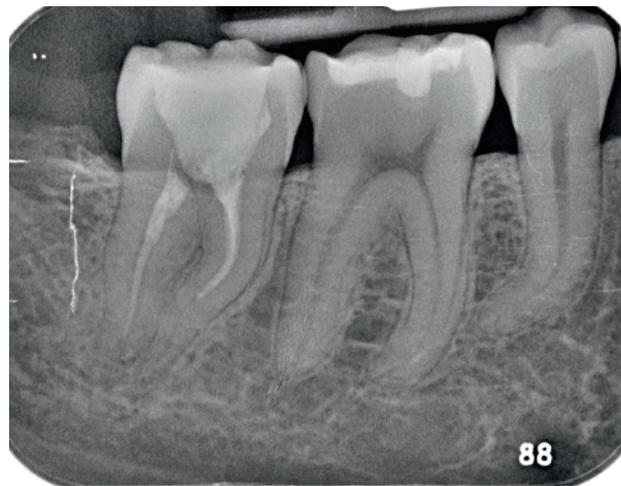


Fig. 01



Fig. 02

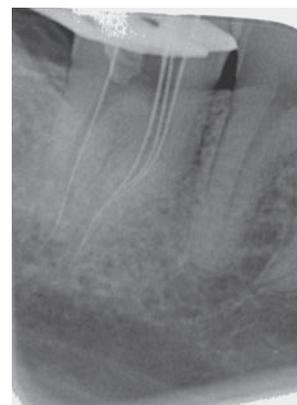


Fig. 03



Fig. 04



Fig. 05



Fig. 06

detected (Fig. 4) and was prepared up to size 25.04. The mesiobuccal and mesiolingual root canals were carefully prepared up to size 40.04 (Fig. 5), and the distal root canal was prepared to size 50.04 (Fig. 6).

Each root canal underwent extensive irrigation using activated 3% sodium hypochlorite (NaOCl) and was subsequently temporarily sealed with a calcium hydroxide intracanal dressing along with glass ionomer cement.

Three weeks later, the patient exhibited no symptoms and the obturation procedure was indicated. The final irrigation protocol involved activated 17% ethylenediaminetetraacetic acid (EDTA) and 3% NaOCl. Prior to filling, all canals were rinsed with 0.9% saline solution and dried using paper points. A bioactive calcium silicate root canal sealer (BioRoot™ RCS, Septodont) was manually mixed with five drops of liquid for 60 seconds on a sterile glass surface. The sealer was delicately applied into the root canals using a gutta-percha point with gentle oscillating motions, following the manufacturer's instructions.

Afterwards, customised gutta-percha points were coated with BioRoot™ RCS, placed into the root canals and trimmed at the orifice level using a heat-plugger. The upper portion of the softened gutta-percha was carefully compacted to ensure an appropriate coronal seal. Finally, any excess material was flushed out with water and dried using compressed air (Fig. 7 a,b). Coronal seal was accomplished with OptiBond FL (KaVO Kerr, Brea, USA) and a dual curing core build-up composite (Luxacore Z, DMG, Hamburg, Germany). The adequacy of the procedure was evaluated via a postoperative periapical radiograph (Fig. 8).



Fig. 07a

Fig. 07b

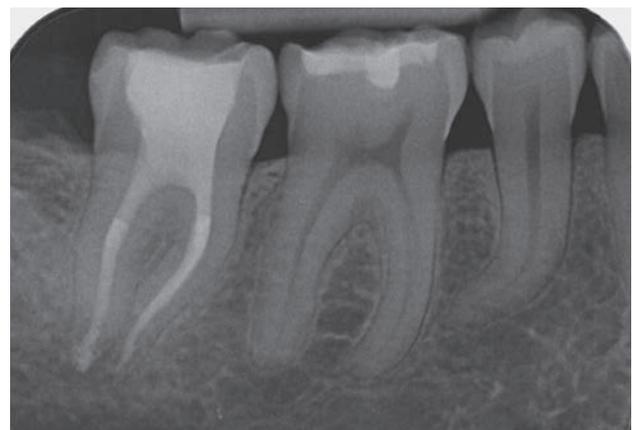


Fig. 08

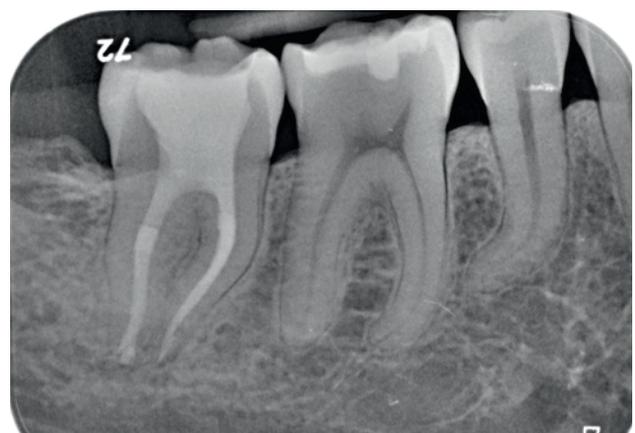


Fig. 09

Follow up

Twelve months later, the patient was still free of any symptoms and the periapical radiograph exhibited healthy apical conditions (Fig. 9).

Discussion

The popularity of BioRoot™ RCS stems from its recognised biological properties and ease of application using techniques such as the single-cone method. Additionally, the growing availability of outcome studies support the efficacy and reliability of bioceramic sealers for root canal treatments.

The present case showed high difficulty, encompassing a middle mesial root canal with an S-shaped anatomy and a large apical foramen at the distal root canal. With deliberate and cautious application in accordance with the manufacturer's recommendation, a proper sealing with single-cone technique using BioRoot™ RCS can be assumed after six months, even in this complex situation.

Conclusion

In summary, bioceramic sealers have gained considerable traction within the endodontic community, with almost half of endodontic specialists incorporating them into their practice.

Single-cone technique using BioRoot™ RCS allows for successful endodontic treatment in specialist practice.



Author:

Dr. Sascha Herbst

Board Certified Endodontist - Deutsche Gesellschaft für Endodontologie und Traumatologie.

Since 2024: Deputy Head of the Department of Conservative Dentistry and Periodontology - University Hospital - Ludwig-Maximilians-University Munich - Munich, Germany.

2020 - 2023: Deputy Head of the Department of Oral Diagnostics, Digital Health and Health Services Research - Center for Dental and Craniofacial Sciences - Charité - Universitätsmedizin Berlin - Berlin, Germany.

2020 - 2023: Co-Head of the Dental Trauma Board Charité - Universitätsmedizin Berlin - Berlin, Germany.

2016 - 2020: Assistant Professor in the Department of Operative and Preventive Dentistry, Center for Dental and Craniofacial Sciences - Charité - Universitätsmedizin - Berlin - Berlin, Germany.

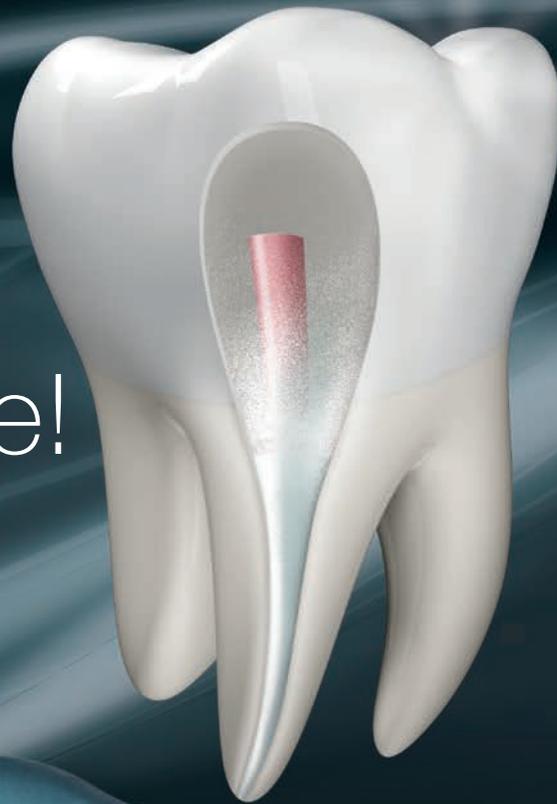
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Dr. Sascha Herbst

Obturation protocol for general practice

| Summary

Introduction

Recent advances in material sciences allow for straightforward obturation protocols in general practice.

Methods

Single-cone obturation using a bioactive calcium silicate-based sealer (BioRoot™ RCS; Septodont; Saint-Maur-des-Fossés, France) was used in two cases, which were followed up for up to 16 months.

Discussion

Practical benefits include the indication for single-cone obturation, easy post-obturation access to clear the cavity with water, and reduced treatment time and postoperative pain.

Conclusion

BioRoot™ RCS offers high chances of success for endodontic treatments in general practice.

Introduction

The primary objective of a root canal treatment is to shape, disinfect and obturate the root canal system to prevent further infection. Besides clinical effectiveness, treatment duration and the pain experience are important to patients as well.

One of the most significant advancements in endodontics in recent years has been the introduction of hydraulic calcium silicate (bioceramic) materials for obturation, like the fully synthetic tricalcium silicate sealer BioRoot™ RCS. Bioceramic sealers are known for their excellent biocompatibility and bioactivity, which means they can stimulate bone mineralisation, facilitate the repair of periapical tissues, and consequently promote the healing process.⁽¹⁾ Additionally, a recent systematic review and meta-analysis suggests that bioceramic sealers may be associated

with less post-operative pain and discomfort for patients compared to epoxy resin-based sealers, contributing to a better patient experience.⁽²⁾

BioRoot™ RCS allows for effective sealing due to tag-like structures at the dentine interface when employing the cold single-cone technique.⁽³⁾ As a result, this material can be used in the single-cone technique, reducing treatment time compared to the warm-vertical compaction technique.⁽⁴⁾

Taking the above-mentioned aspects into account, BioRoot™ RCS can be an effective material for use in general practice. The following case reports illustrate the effective use of BioRoot™ RCS in daily practice cases which can be effectively solved by general dentists.

Case report 1: Second upper molar with straight roots

Clinical signs and symptoms

A 43-year-old female patient presented to the Department for Oral Diagnostics, Digital Health



Fig. 01

and Health Services Research at Charité - Universitätsmedizin Berlin with moderate pain while chewing in the area of tooth 27. Additionally, the patient reported a partial fracture of the tooth. Clinically, there was no response to cold testing and no mobility, but tenderness to percussion was observed. The periapical radiograph (*Fig. 1*) revealed an extremely deep caries lesion reaching into the inner part of the dentine, but no signs of a periapical lesion were visible.

Diagnosis

The clinical and radiographic findings indicated an extremely deep caries lesion with concomitant pulp necrosis and symptomatic apical periodontitis.

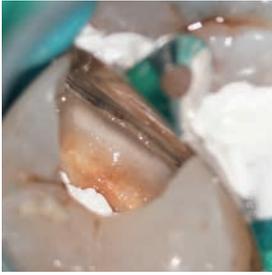


Fig. 02

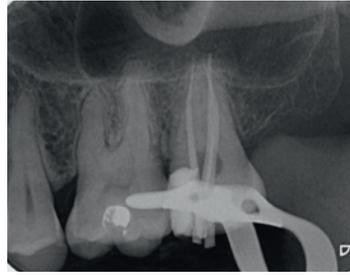


Fig. 03



Fig. 04a



Fig. 04b

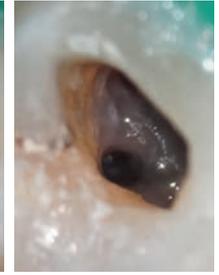


Fig. 04c



Fig. 05a



Fig. 05b



Fig. 05c

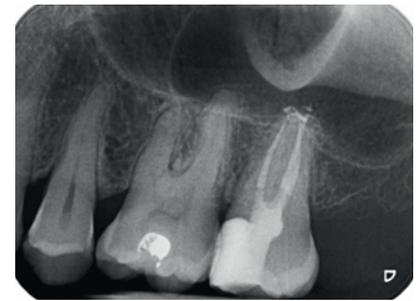


Fig. 06

Procedure and treatment

At the first visit, non-selective caries removal was performed, and a pre-endodontic build-up was placed using a bulk-fill composite (SDR, Dentsply-Sirona, Charlotte, USA) (Fig. 2). Three root canals were successfully located, and the working length was confirmed radiographically (Fig. 3). Subsequently, all root canals were enlarged with HyFlex CM (Coltène, X) up to 40.04. During the preparation, pus exudation was observed from the palatal root canal. All root canals were thoroughly irrigated with 3% sodium hypochlorite (NaOCl) and temporarily sealed with a calcium hydroxide intracanal dressing and glass ionomer cement.

After ten days, the patient was free of any symptoms. The final irrigation was done with activated 17% ethylenediaminetetraacetic acid (EDTA) and 3% NaOCl. Before obturation, all canals were rinsed with 0.9% saline solution and dried using paper points (Fig. 4a-c). BioRoot™ RCS, which is a bioactive calcium silicate root canal sealer, was manually mixed with five drops of the liquid for a duration of 60 seconds on a sterile glass surface. The sealer was applied into the root canals using a gutta-percha point with gentle, oscillating movements, following the manufacturer's guidelines. Subsequently, the properly

fitted gutta-percha points were coated with BioRoot™ RCS, inserted into the root canals, and trimmed at the orifice level using a heat-plugger. The upper part of the melted gutta-percha was meticulously condensed to ensure a suitable coronal seal. Ultimately, any excess material was flushed out with water and dried using compressed air (Fig. 5a-c). The quality of the root canal filling was assessed through a postoperative periapical radiograph (Fig. 6).

Follow up

16 months later, the root canal treatment was so far successful as the patient was still free of any symptoms and the radiograph showed no signs of an apical lesion (Fig. 7).

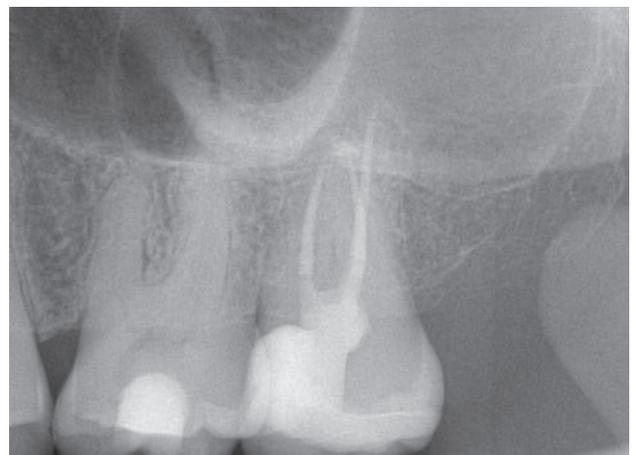


Fig. 07

Case report 2: Lower first molar with straightforward anatomy

Clinical signs and symptoms

A healthy 30-year-old patient visited the clinic with a previously accessed tooth 46. During the first visit, the patient was pain-free, but she described a history of persistent severe pain before beginning root canal treatment. The preoperative radiograph (Fig. 8) shows the access cavity and an apical lesion at the mesial root.

Diagnosis

By amalgamating the patient's information and the preoperative radiograph, the initial diagnosis strongly suggested symptomatic apical periodontitis accompanied by an apical lesion.

Procedure and treatment

The treatment was scheduled for two appointments. At the first visit, the initial access cavity (Fig. 9a, b) was refined and the four root canals were located. Then, all root canals were carefully prepared up to 40.04 (HyFlex CM) under copious irrigation with 3% NaOCl (Fig. 10a-c). The preparation and working length were confirmed by a periapical radiograph (Fig. 11). Calcium hydroxide was placed into the canals, and the cavity was temporarily sealed with glass ionomer cement.



Fig. 08

At the second visit, the patient was still symptom-free and all canals were obturated using BioRoot™ RCS, as previously described in Case 1 (Fig. 12a-c). Finally, the assessment of the root canal filling was conducted using a postoperative periapical radiograph (Fig. 13).

Follow up

At the follow-up visit 12 months later, the patient was pregnant, so a periapical radiograph was not indicated. Nevertheless, the patient remained symptom-free during the observation period.



Fig. 09a

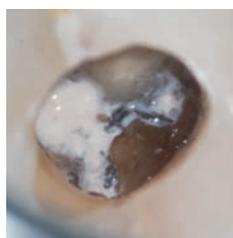


Fig. 09b



Fig. 10a



Fig. 10b

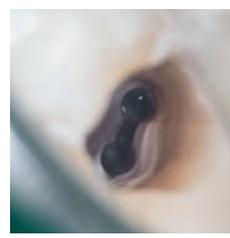


Fig. 10c



Fig. 11



Fig. 12a

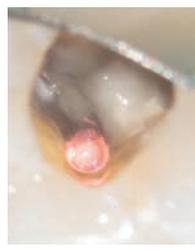


Fig. 12b

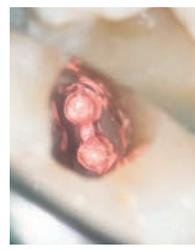


Fig. 12c



Fig. 13

Discussion

In summary, using a bioceramic root canal sealer offers general dentists a range of advantages, including enhanced biocompatibility and bioactivity compared to epoxy resin-based sealers, which display initial cytotoxic effects.⁽⁵⁾ Bioactive sealers, on the other hand, have a favourable impact on immune cells and the inflammatory process.^(1,6) Furthermore, the set material fosters periodontal ligament cell adhesion and aids in the healing process by releasing calcium and silicon ions, along with calcium hydroxide.^(7,8)

From a practical point of view, the composition of BioRoot™ RCS enables straightforward post-obturation cleaning of the access cavity with water. When combined with the single-cone technique, this material can significantly reduce treatment time.

All the factors mentioned can enhance patient outcomes by reducing both treatment time and postoperative pain.^(2,4)

Conclusion

The described single-cone obturation technique using BioRoot™ RCS allows for successful treatment and patient outcomes in general practice.



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