Septodont

Case Studies Collection

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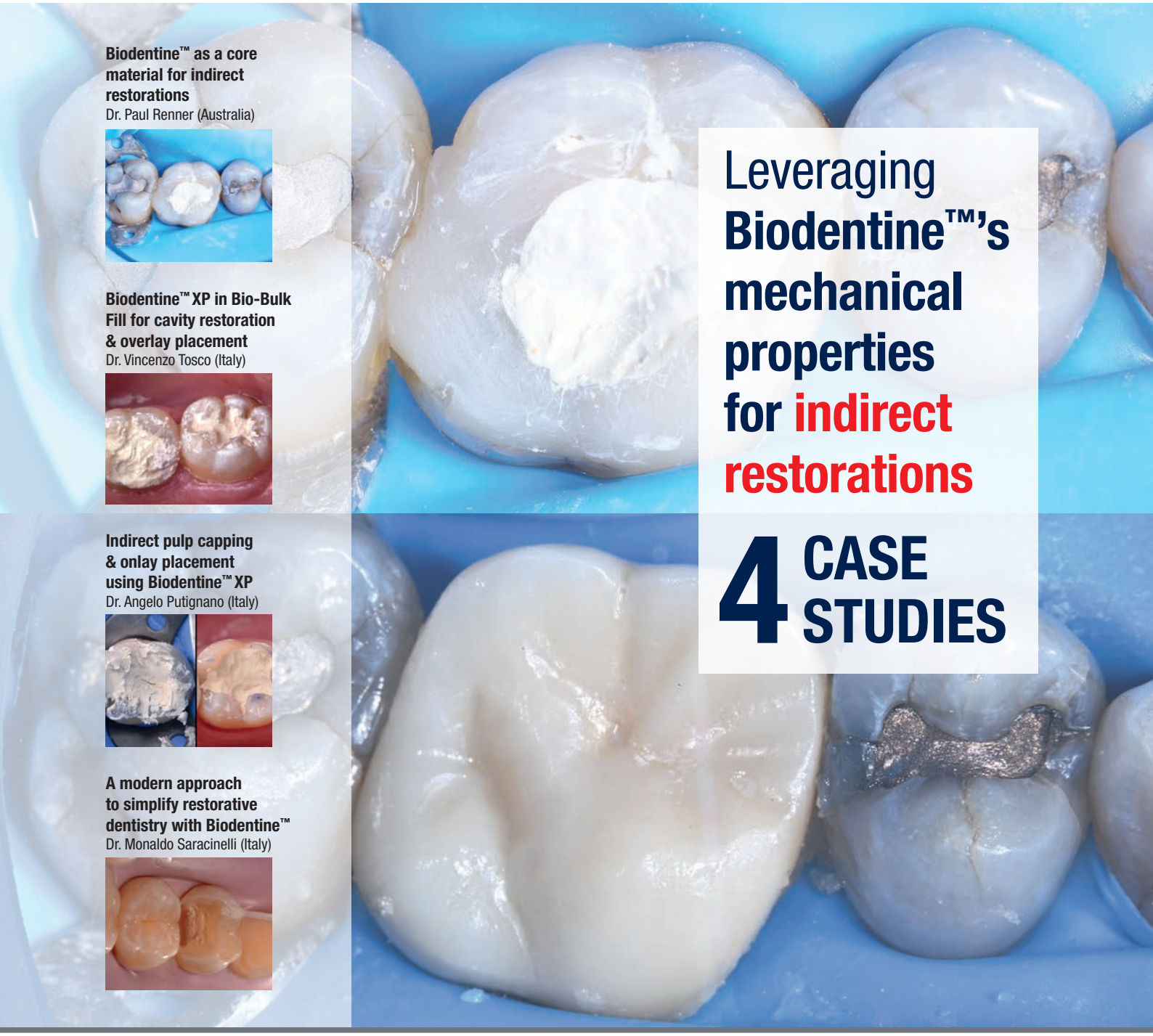
Exclusive edition

Biodentine™ as a core material for indirect restorations
Dr. Paul Renner (Australia)

Biodentine™ XP in Bio-Bulk Fill for cavity restoration & overlay placement
Dr. Vincenzo Tosco (Italy)

Indirect pulp capping & onlay placement using Biodentine™ XP
Dr. Angelo Putignano (Italy)

A modern approach to simplify restorative dentistry with Biodentine™
Dr. Monaldo Saracinelli (Italy)



Leveraging Biodentine™'s mechanical properties for indirect restorations

4 CASE STUDIES

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Editorial

Since 2012, Septodont has published the *"Septodont Case Studies Collection"* — a series of clinical case reports written by dental practitioners. This initiative was launched to share real-world experiences and highlight the benefits of incorporating our innovations into everyday dental practice.

Over the years, contributors from more than 15 countries have helped make this publication a global success, now available to readers around the world.

In this 28th issue, we present four clinical cases focused on deep cavity restorations using the Bio-Bulk Fill technique [1] with Biodentine™ or Biodentine™ XP combined with indirect restorations.

Thanks to its excellent physico-mechanical properties, close to natural dentine, Biodentine™ has proven to be an ideal core material for use under indirect restorations in Vital Pulp Therapy.

Its high compressive strength, strong sealing properties, and superior bioactivity make it an optimal material for the restoration of deep cavities with the Bio-Bulk Fill procedure — even in cases involving symptomatic cracked teeth.

The strength of Biodentine™ eliminates the need for an additional core material during the final restoration. The entire cavity can be filled with Biodentine™, which will serve as a permanent dentine substitute beneath the final indirect restoration, in one or two-session procedures.

Dive into the following case studies and discover how to fully leverage the properties of Biodentine™ and Biodentine™ XP in your daily deep cavity restorations using the Bio-Bulk Fill technique.

Dr M. Paul Renner

Content

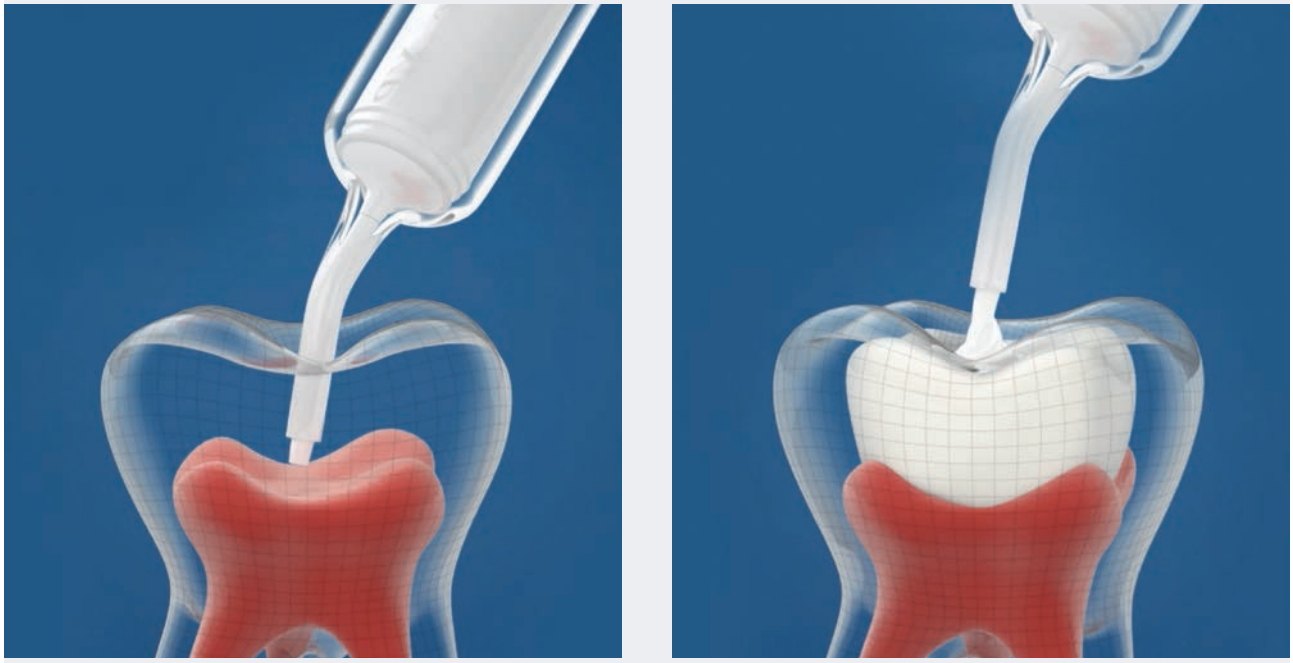
In this review focused on Biodentine™ and Biodentine™ XP in Bio-Bulk Fill procedure combined with a final indirect restoration, you will find the following clinical cases:

Biodentine™ XP

Is THE unique material suited for

Bio-Bulk Fill procedure[1-3]

Fill **the entire cavity** with only Biodentine™ XP
from the pulp to the tooth surface[4]



Final enamel restoration to be performed

- in the same session
  or
- in the second session, which can be performed **between 2 weeks and 6 months later**.

(1) Apply Biodentine XP from the pulp to the tooth surface. Final enamel restoration to be performed between 2 weeks and 6 months. Internal Septodont's document provided from Biodentine Expert Board - 11th September 2023.
(2) Internal R&D document RDRADEVPA00DM_283 - Biodentine™ Bio-Bulk Fill statement. 2022
(3) Internal Septodont's document provided from Biodentine Expert Board - 11th September 2023.
(4) Koubi G, Colon P, Franquin JC, Hartmann A, Richard G, Faure MO, Lambert G. Clinical evaluation of the performance and safety of a new dentine substitute, Biodentine, in the restoration of posterior teeth - a prospective study. Clin Oral Investig. 2013 Jan;17(1):243-9. doi: 10.1007/s00784-012-0701-9

Biodentine™ in Bio-Bulk Fill procedure as a core material for indirect restoration

Dr. M. Paul Renner

How long have you been using Biodentine™?

I switched from MTA to Biodentine™ five years ago.

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

Firstly, if I have sufficient time at the appointment I can wait for the Biodentine™ to fully set (12 minutes) and then complete the permanent restoration without fear of damaging the Biodentine™. Secondly, in what is usually the case, if I have insufficient time to wait for the set and then complete the restoration, I can simply fill the cavity completely with Biodentine™, wait for the complete set (12 minutes), discharge the patient, and then reappoint them at a later date to cut back the Biodentine™ and cover it with the final restoration. I often use this latter technique to allow time to assess Biodentine™'s effect on the pulp tissue, whether it be a pulpotomy, deep cavity or symptomatic crack, before committing to the final restoration, especially if an indirect restoration is planned.

Summary

Introduction
Teeth with cracks that exhibit symptoms of moderate to severe pulpitis have historically been treated by pulpectomy, root canal treatment and then restoration with full-coverage indirect restoration. With the success of pulpotomies using calcium silicate cements, many of these teeth have been able to retain their vitality and arguably increase their longevity.

Methods
A full pulpotomy was performed on tooth 26 using Biodentine™ with the Bio-Bulk Fill technique, with a permanent dentin restoration and interim enamel restoration to allow time to assess the success of the vital pulp therapy. The Biodentine™ then acted as a core for the indirect restoration.

Discussion
Numerous studies have demonstrated that the success rate of partial and full pulpotomies ranges from 75-100%.[2,3] It has been advocated as the preferred option for treating teeth with symptoms once described as irreversible pulpitis.[4,5]

While there is little published data on the use of pulpotomy in cracked teeth, my own professional experience has shown this to be a viable treatment option for these symptomatic teeth.

Conclusion
Full pulpotomy and restoration with an indirect full-coverage restoration is a viable treatment option for cracked teeth with symptoms of moderate to severe pulpitis.

Introduction

Symptomatic teeth that are found to have cracks are one of the more difficult situations for which to plan treatment. Many articles have been published regarding these teeth and unfortunately, there has been no consensus on the best course of treatment. In my experience, it is best to treat these teeth conservatively as this allows for further treatment options if the conservative treatment fails.

Case report

Clinical signs and symptoms
In 2018, a 59-year-old patient presented with vague pain in the upper left region. He had difficulty locating which tooth was painful, but he reported that he thought it was one of the last two teeth (tooth 26 or 27).

No teeth were tender to percussion. Tooth 26 reacted strongly to cold testing while the other teeth reacted normally. Tooth 26 tested positive to biting on damp gauze but the sensation did not linger. Both tooth 27 and 25 were negative

to the bite test. The composite resin restoration in tooth 26 was removed under rubber dam and crack lines could be seen under the restoration *(Fig. 1)*, with the most obvious running from the lingual to the centre of the tooth, and another from the mesio-buccal to the centre. A number of other minor cracks were visible, including one that ran under the buccal cusps *(Fig. 1)*.

These crack lines were discussed with the patient and he was given the option of either restoring the tooth with direct composite resin or with a full-coverage indirect restoration. The patient chose to have the tooth restored with a direct composite resin and so this was performed at this appointment. The patient returned annually for examination and reported the tooth was asymptomatic.

In 2024, the patient presented again with pain in tooth 26. He reported the tooth was very sensitive to cold, with the pain lasting several minutes. He also reported that the tooth had ached spontaneously at times. On examination, the tooth reacted very strongly to cold, which lasted for almost one minute. The tooth was also slightly tender to percussion. The composite resin restoration appeared sound *(Fig. 2)*. A PA radiograph *(Fig. 3)* revealed no PARL, but the pulp chamber was reduced in size when compared to a previous bite-wing radiograph.

Diagnosis

Given the tooth's previous history of visible cracks running into the tooth and the current symptoms of moderate to severe pulpitis, a decision was made after discussion with the patient to enter the pulp chamber to assess the condition of the pulp and the depth of the cracks. The plan was to either perform a full pulpotomy or, if no viable pulp tissue was present, extirpate the pulp.

Procedure and treatment

Using local anaesthetic and rubber dam isolation, access was obtained through the composite resin restoration. While the cracks were visible, they appeared similar to the image from 2018 *(Fig. 4)*. The roof of the pulp chamber was removed and vital tissue was found, which did not appear to be heavily inflamed *(Fig. 5)*. A pulp stone was also present *(Fig. 6)*. Removing this revealed bleeding pulp tissue at the opening of the root canals. A cotton pellet soaked in NaOCl

Fig. 1 - Cracks in 2018.

Fig. 2 - Pre-op composite resin restoration, 2024.

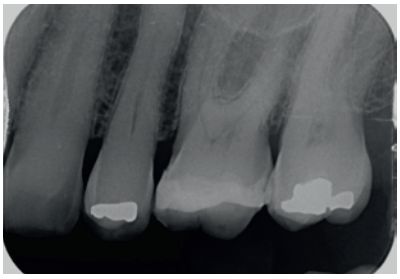


Fig. 3 - PA radiograph.

Fig. 4 - Initial access showing existing cracks.

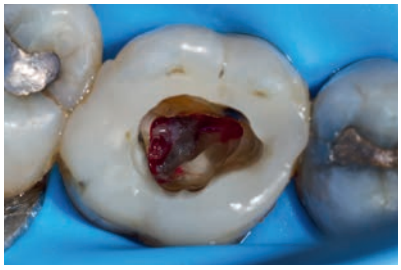


Fig. 5 - Initial exposure of the pulp chamber showing slight bleeding and pulp stone.

Fig. 6 - Pulp stone removed.

was placed on the pulp tissue at the opening of the root canal and after five minutes the bleeding had ceased ***(Figs. 7 and 8)***.

As the plan was to restore the tooth with a full-coverage indirect restoration, the entire pulp cavity was filled with Biodentine™ with the Bio-Bulk Fill technique. ***(Fig. 9)***.

The patient returned after twelve weeks and reported that the tooth had been asymptomatic ***(Fig. 10)***. At this appointment, a preparation for a ¾ crown was performed ***(Fig. 11)***. The Biodentine™ was left in situ, cut back and used as a core for the restoration. A PVS impression was recorded, and a BIS-Acrylic temporary crown cemented with provisional cement ***(Fig. 12)***.

Three weeks later, a monolithic zirconia crown ***(Fig. 13)*** was bonded onto the tooth ***(Fig. 14)***. The tooth will be monitored and a review radiograph taken after six months.

Fig. 7 - Buccal root openings with vital tissue after bleeding has stopped.

Fig. 8 - Palatal root opening with vital tissue after bleeding has stopped.

Fig. 9 - Cavity filled with Biodentine™.

Fig. 10 - Tooth at 12-week review.

Fig. 11 - 3/4 crown preparation.

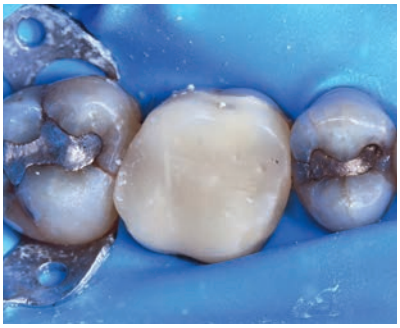


Fig. 12 - Acrylic provision crown prior to delivery of the final restoration.

Fig. 13 - Monolithic zirconia 3/4 crown.

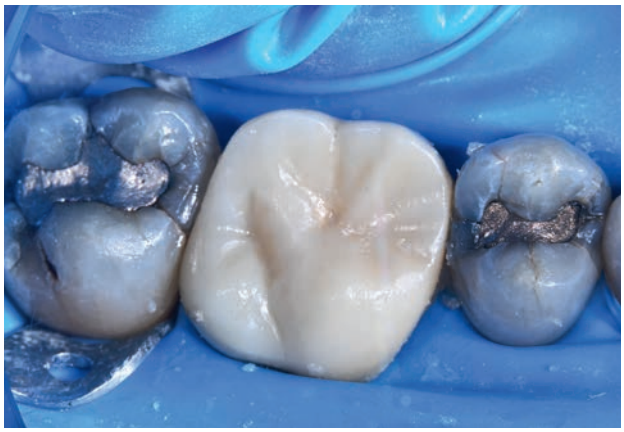


Fig. 14 - Zirconia 3/4 crown bonded.

Discussion

This case highlights a number of elements of pulpotomies in teeth with cracks. Firstly, many teeth with deep cracks have a long-standing mild pulpitis, to which the pulp has responded by producing reparative dentine that often appears in the form of a pulp calcification. The operator must be careful when performing vital pulp therapy on these teeth as it is often difficult to differentiate the pulp calcification from the floor of the pulp chamber. Any pulp calcifications must be removed before assessing the condition of the radicular pulp tissue.

Secondly, in teeth with pulp symptoms resulting from cracks, it is best to perform a coronal pulpotomy. This allows the floor of the pulp chamber to be examined for any extension of the crack across the floor, which would greatly reduce the prognosis for the tooth.

Conclusion

The ability to use Biodentine™ in the Bio-Bulk Fill technique has a number of advantages in cases like the above.

The initial vital pulp therapy appointment can be shortened by completely filling the cavity and using the Biodentine™ as a permanent dentin replacement and an interim enamel replacement. The fact that the material can be left for up to six months allows time to assess the success of the procedure before committing to the final indirect restoration. The strength of Biodentine™ means there is no requirement to place a separate core material.

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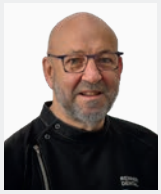
Acknowledgements

I would like to thank my dental assistants, Ms Ellen Gordon and Ms Julie Schefe, for their assistance with the procedures and photography.



Author:

Dr. M. Paul Renner

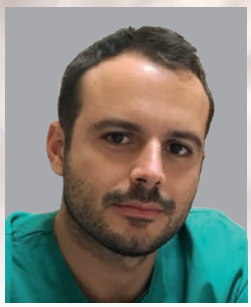
Paul graduated from the University of Queensland with a BDSc in 1981. He has worked in general practice since, first in government service and then in his private practice in Dalby, Queensland from 1991 onwards.

For the last 15 years, Paul has been employed as a part-time clinical supervisor at the University of Queensland, supervising final year students. Additionally, he currently holds the title of Associate Lecturer at the university.

Paul has been active in the Australian Dental Association Queensland, where he served as president for two terms and was awarded lifetime membership.

Since starting to treat symptomatic carious teeth using vital pulp therapy eight years ago, it has become an increasingly important part of Paul's practice. Due to the inability of many patients to afford root canal therapy and restoration with an indirect restoration, Paul has been able to save many teeth from extraction using this approach. Apart from vital pulp therapy, his other areas of interest are the diagnosis and treatment of cracked teeth and dental photography.

Biodentine™ XP in Bio-Bulk Fill for cavity restoration & overlay placement



Dr. Vincenzo Tosco

How long have you been using Biodentine™ ?

I have been using Biodentine™ in my clinical practice for an extended period of six to seven years. I switched to Biodentine™ XP this year.

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

The Bio-Bulk Fill technique enables clinicians to simplify direct posterior restorations, including both direct and indirect pulp capping, through the use 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 in a single visit.

In which cases do you use the Bio-Bulk Fill procedure?

I use the Bio-Bulk Fill procedure 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 concerns a patient who presented with two cavities on their left lower second and third molars. The back wall of the second molar was cracked because of a deep cavity, while the third molar had a cavity on the chewing surface. Biodentine™ XP was used on the two molars for both direct and indirect restoration with the placement of an overlay.

Methods
An indirect pulp capping was performed for both teeth with Biodentine™ XP in two visits, using the Bio-Bulk Fill procedure for both a direct and an indirect restoration.

Discussion
Biodentine™ XP is confirmed by clinical studies to be biocompatible with strong dentine-like mechanical properties. It doesn't require surface conditioning and can be shaped like natural dentine. Its unique properties make it suitable for replacing damaged or lost dentine, providing indirect pulpal protection beyond direct pulp capping. Biodentine™ XP can be bonded with various adhesives before placing composite resins, making it versatile for both direct and indirect restorations.

Conclusion
Recognised as a dentine substitute for its comparable physical and mechanical properties, Biodentine™ XP can be used to fill deep cavities with the Bio-Bulk Fill technique. In direct restoration, combining Biodentine™ in Bio-Bulk Fill with the StyleItaliano Essential Lines technique streamlines procedures and reduces time. For indirect restorations, Biodentine™ XP facilitates precise tooth preparation while maintaining a protective seal, safeguarding the dental pulp.

Introduction

The scientific community, supported by both in vitro and in vivo clinical studies, confirms that Biodentine™ XP is biocompatible, possesses strong dentine-like mechanical properties, and is safe for use in restorative dentistry. Additionally, Biodentine™ XP does not require surface conditioning and can be easily cut and shaped like natural dentine. Its unique properties allow it to serve as a permanent bulk substitute for natural dentine, capable of replacing entire sections of damaged or lost dentine. This makes it suitable for indirect pulpal protection, extending beyond direct pulp capping alone. The surface of Biodentine™ XP can be bonded with various adhesives, similar to natural dentine, prior to the final placement of composite resins. This clinical case demonstrates the application of Biodentine™ XP in both direct and indirect restorations.

Case report

Clinical signs and symptoms

A new patient presented at an urgent appointment with a broken tooth and sensitivity to cold. During the examination, we found that the left lower second molar had an old filling that was partly broken, and the back wall of the tooth was cracked because of a deep cavity. The third molar also had a cavity on the chewing surface ***(Fig. 1)***.

Procedure and treatment

After applying a rubber dam, the cavities were cleaned and prepared. Biodentine™ XP was then used as a bulk material to fill both cavities up to the occlusal surface and serve as temporary enamel substitute ***(Fig. 2)***. Once the material was properly placed into the cavities, the AutoMatrix and rubber dam were removed, and the integrity of the Biodentine™ XP seal on the teeth was verified.

Typically, once the material has set ***(Fig. 3)***, preparation can proceed immediately because it can be shaped and prepared without affecting its integrity. However, in this instance, to evaluate the preservation of the second molar's pulp vitality, the patient was scheduled for a follow-up appointment in two weeks.

The patient returned for a follow-up appointment after one month. At the second visit, the second molar showed wear of the material at the lingual margin ***(Fig. 4)***. However, this issue did not impact the treatment's success because the affected margin will be cleaned and prepared for creating an overlay.

The tooth maintained its pulp vitality, responding positively to vitality testing. Consequently, in the same session, a direct restoration was performed on the third molar, and preparation for the indirect restoration on the second molar was completed.

Once the rubber dam was applied, the LM Gingiva instrument was used to gently displace and push the dam apically from the lingual margin to facilitate proper preparation of the second molar ***(Fig. 5)***. This tool allowed unrestricted movement with the turbine, essential for precise work. Using an additional clamp would have hindered the preparation process.

Fig. 1 - Cavities in the molars.

Fig. 2 - Cavities filled with Biodentine™ XP.

Fig. 3 - Biodentine™ XP fillings after setting.

Fig. 4 - Biodentine™ XP after one month.

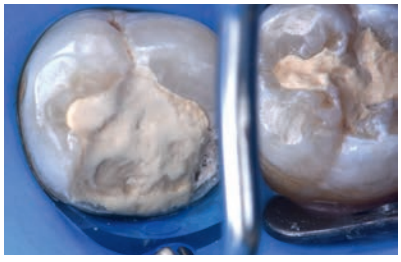


Fig. 5 - Rubber dam isolation.

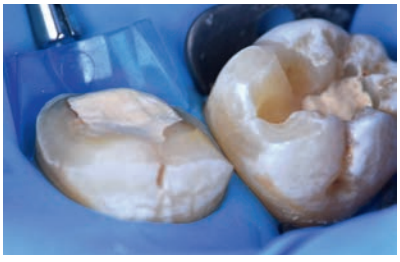


Fig. 6 - Cavity preparation.

The preparation followed the principles of the StyleItaliano philosophy, which includes features like the absence of interproximal boxes, rounded edges, and cusps inclined towards the axial wall. This approach helps to distribute occlusal forces within the tooth, reducing the risk of tooth fracture and aiding in the cementation of the overlay.

During the preparation, the hardness of Biodentine™ XP allowed for precise cutting and shaping without compromising its seal or integrity. In the third molar, a Class I cavity was prepared while preserving Biodentine™ XP in the deepest part of the cavity, up to 1.5 mm from the occlusal surface ***(Fig. 6)***.

After 20 seconds of selective enamel etching ***(Fig. 7)***, a bonding agent (Scotchbond Universal Plus) was applied to the third molar ***(Fig. 8)***. After that, air-blowing was performed for 20 seconds.

The LM-Arte Posterior Misura tool facilitated the assessment of sufficient space for the final enamel layer ***(Fig. 9)***.

A single mass of body shade composite was directly applied to the third molar to complete the restoration ***(Fig. 10)***.

The composite was adapted by removing excess material. It was then possible to shape the occlusal morphology according to the Espresso Posterior Technique concept ***(Fig. 11)***.

After shaping the occlusal morphology according to the Espresso Posterior Technique, essential lines were drawn and characterisations were added to finalise the restoration ***(Fig. 12)***.

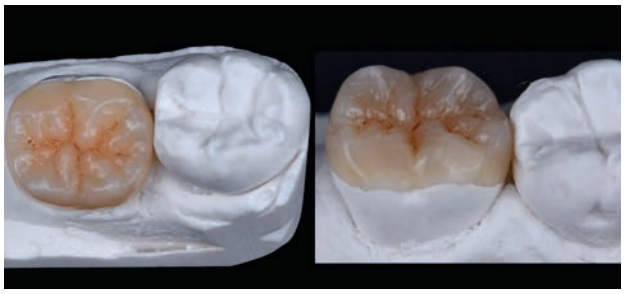


Fig. 13 - Overlay on model.

After completing the temporary restoration, an impression was taken to fabricate the overlay for the second molar ***(Fig. 13)***. Subsequently, the patient was scheduled for another appointment to cement the overlay.

On cementation day, after applying the rubber dam, the temporary restoration was removed, and the tooth surface was cleaned using sandblasting ***(Fig. 14)***. It was observed that Biodentine™ XP remained intact.

To begin cementation, the enamel margin was etched with 37% orthophosphoric acid for 20 seconds ***(Fig. 15)***.

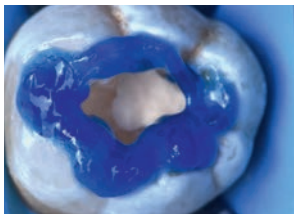


Fig. 7 - Selective enamel etching of third molar.

Fig. 8 - Cavity brushing with bonding agent.

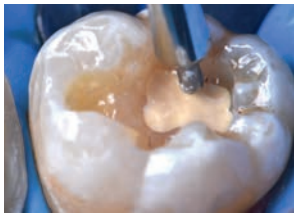


Fig. 9 - Measurement of cavity depth.

Fig. 10 - Injection of bulk composite.

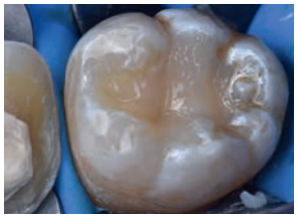


Fig. 11 - View of the raw composite after enamel restoration.

Fig. 12 - View of the occlusal modelling.

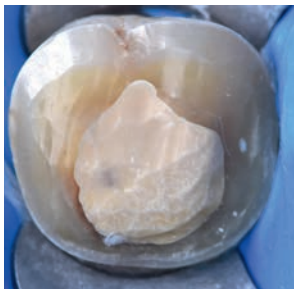


Fig. 14 - View of tooth before overlay cementation.

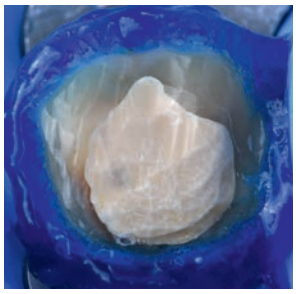


Fig. 15 - Etching of enamel margins.

The proper enamel etching appears uniform and frosty. This etching pattern ensures optimal bonding for the cementation process ***(Fig. 16)***.

A bonding agent (Scotchbond Universal Plus) was applied evenly across the surface ***(Fig. 17)***. It is noteworthy that Biodentine™ XP remained stable without any deterioration during the adhesive application, as evidenced by the clean brush. After air-blowing, the adhesive was then cured.

The overlay was cemented into place ***(Fig. 18-19)***. The LM-Arte Condensa tool helped stabilise and secure the overlay while removing excess cement.

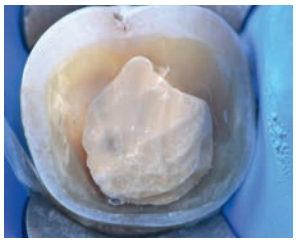


Fig. 16 - View of the enamel after etching.

Fig. 17 - Bonding preparation.

The Step Luting technique, as detailed in our published work, was employed to aid in the removal of excess cement using the LM-Art Eccesso tool. After removal, all margins were inspected to ensure they were clean and that there were no gaps in the tooth-restoration interface.

After removing the rubber dam, all margins of the restoration were finished and polished. Subsequently, the occlusion was checked to ensure proper alignment and function ***(Fig. 20)***.

Radiographs were taken before and after the restorations ***(Fig. 21)***. The pulp vitality was maintained and no periapical lesions were observed.

Follow-Up

The final appearance of the two restorations was satisfactory and radiographic images at the three-month follow-up appointment showed no issues ***(Fig. 22).***

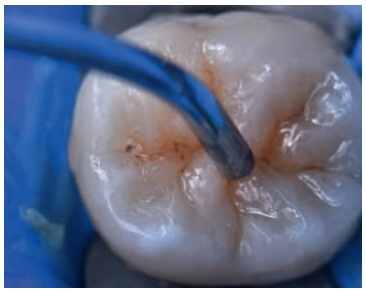


Fig. 18 - Cementing the overlay.

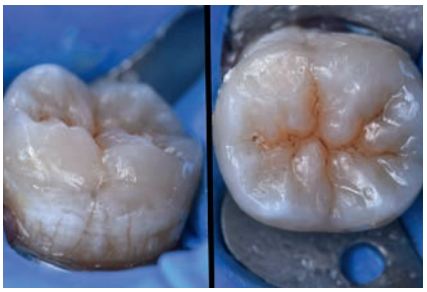


Fig. 19 - View of the tooth after cementing the overlay.

Fig. 20 - View of the teeth after both direct and indirect restoration.

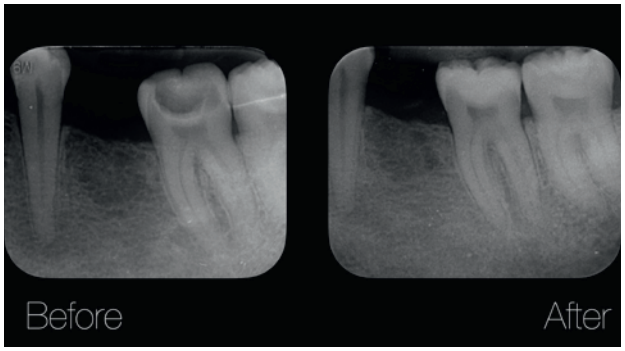


Fig. 21 - X-ray photographs of the teeth before and after restoration.

Fig. 22 - Photographic and X-ray view of the teeth at the three-month follow-up.

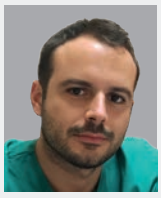
Discussion

The use of Biodentine™ as a bulk fill for both the second and third molars using the Bio-Bulk Fill technique provided a dependable temporary enamel substitute, maintaining the integrity of the restorations between visits. Biodentine™'s ability to preserve its seal and stability during the preparation and cementation of the overlay is particularly noteworthy, highlighting its suitability for both direct and indirect restorations.

The versatility and durability of Biodentine™ were evident in this case. Despite some wear at the lingual margin of the second molar, the material's overall performance remained uncompromised, allowing for successful preparation and cementation of the final indirect restoration while preserving pulp vitality, as confirmed by the three-month follow-up photographs.

Conclusion

Biodentine™ XP offers diverse applications. Recognised as a dentine substitute for its comparable physical and mechanical properties, it can be used in bulk to fill deep cavities up to 1.5 mm from the occlusal surface for single-session restoration, following the Bio-Bulk Fill protocol. In direct restoration, combining Biodentine™ XP in Bio-Bulk Fill for cavity filling with the Essential Lines technique for occlusal surface modelling streamlines procedures and reduces time. For indirect restorations, once Biodentine™ XP has set, it facilitates precise tooth preparation while maintaining a protective seal, safeguarding the dental pulp.



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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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Biodentine™ XP

The unique

Pulp therapeutic **&** Restorative material

- One-step cavity filling [1]
- Adapted to your practice, in 1 or 2 sessions [1]
- Final enamel restoration to be performed within 6 months [2]

1. Internal Septodont's document provided from Biodentine Expert Board - 11th September 2023.
2. Koubi et al. Clinical evaluation of the performance and safety of a new dentine substitute, Biodentine™, in the restoration of posterior teeth - a prospective study. Clin Oral Investig. 2013.

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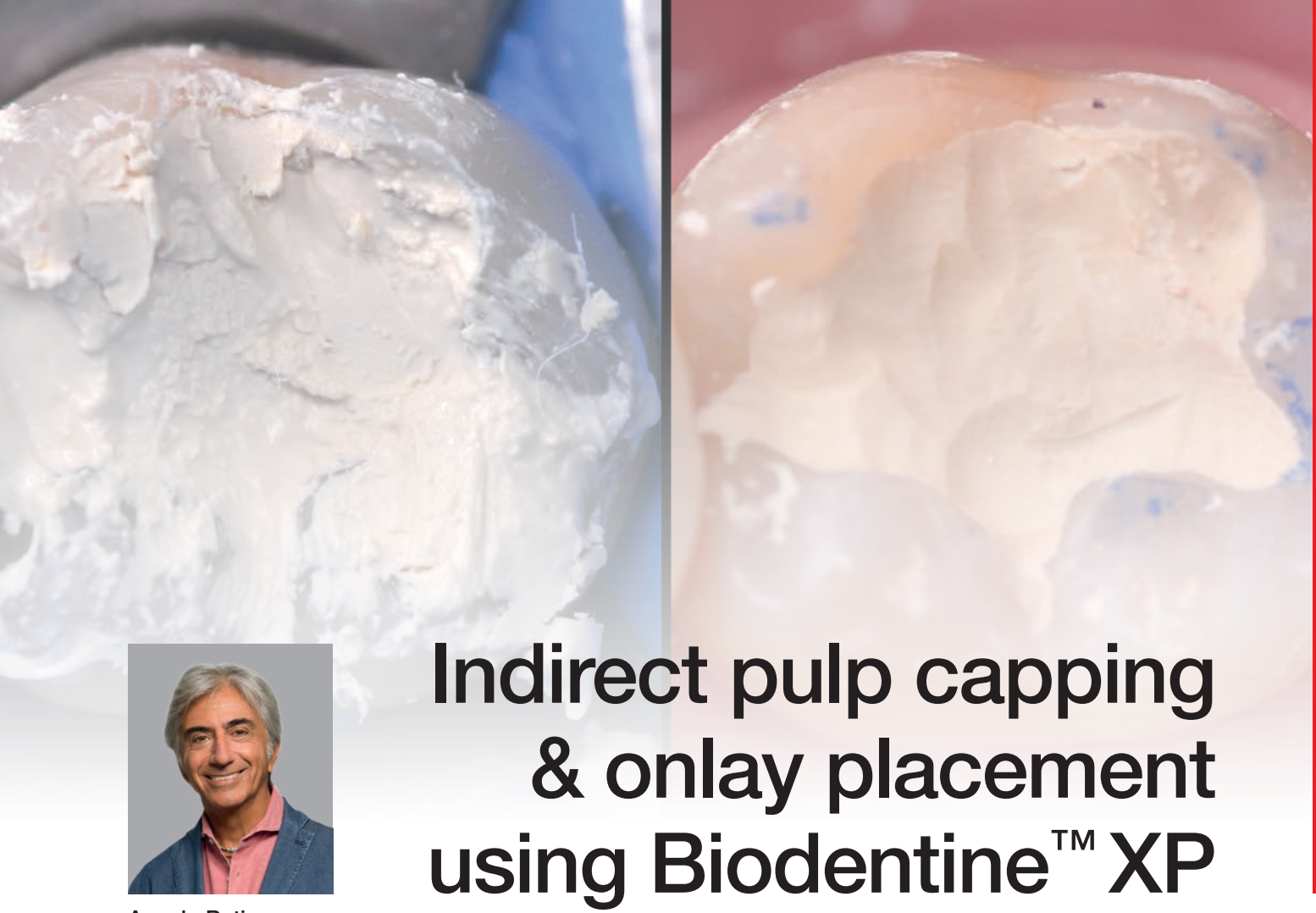

Angelo Putignano
MD, DDS

Indirect pulp capping & onlay placement using Biodentine™ XP

How long have you been using Biodentine™?

I have been using Biodentine™ for several years in my clinical practice as I appreciate its versatility and effectiveness in various restorative procedures. With the introduction of Biodentine™ XP, I transitioned to this new product thanks to its more user-friendly application method.

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

The main advantage of the Bio-Bulk Fill technique is the ability to integrate Biodentine™ XP with adhesive techniques, allowing for the completion of a definitive restoration in a single session. This approach simplifies posterior restorations while ensuring pulp protection and long-term stability, making the treatment more efficient and predictable.

In which cases do you use the Bio-Bulk Fill procedure?

I use the Bio-Bulk Fill procedure in both deep cavities without pulp exposure and in cases of pulp exposure. Having a bioactive material that can support pulp vitality is essential in these situations, as it promotes tissue healing and ensures a more predictable clinical outcome.

Summary

Introduction
A young patient presented to the clinic with an old, infiltrated composite restoration, which seemed to hide dental caries extending deep into the tooth, close to the pulp chamber.

Methods
An indirect pulp capping was performed on the lower first molar using Biodentine™ XP (Septodont, Saint-Maur-des-Fossés, France) with the Bio-Bulk Fill technique, first as a provisional enamel restoration to assess the success of the indirect pulp capping, and later as a permanent dentine substitute for the build-up of the final indirect restoration.

Discussion
Biodentine™ XP is favoured for maintaining pulpal vitality due to its strong adhesion to dentine and composite, ensuring an excellent seal. Its setting time and use as a bulk material (Bio-Bulk Fill) enhance its versatility in restorative procedures.

Conclusion
Biodentine™ XP is effective for direct and indirect pulp capping, serving as a provisional enamel restoration while assessing pulp vitality. If performed in two sessions, final restoration should be completed within six months to avoid fracture and wear. Hardened Biodentine™ XP can be reliably used for building up indirect restorations.

Introduction

The literature indicates that Biodentine™ XP is a preferred material for maintaining pulpal vitality. Its properties allow clinicians to achieve strong adhesion to various substrates (dentine and composite), ensuring an excellent seal for the restoration. The material's setting time and ability to be used with the Bio-Bulk Fill technique enhance its versatility in many restorative procedures. This clinical case demonstrates a two-appointment process using Biodentine™ XP, first as a provisional enamel restoration to assess the success of an indirect pulp capping, and later as a permanent dentine substitute for the build-up of the final indirect restoration.

Case report

Clinical signs and symptoms
A 25-year-old patient presented to the clinic with sensitivity in the lower first molar. Upon intraoral examination, an old, infiltrated composite restoration was observed. An X-ray confirmed the presence of dental caries beneath the composite, extending close to the pulp chamber. After removing the old composite restoration and thoroughly cleaning and preparing the cavity, a deep cavity was revealed ***(Fig.1)***.

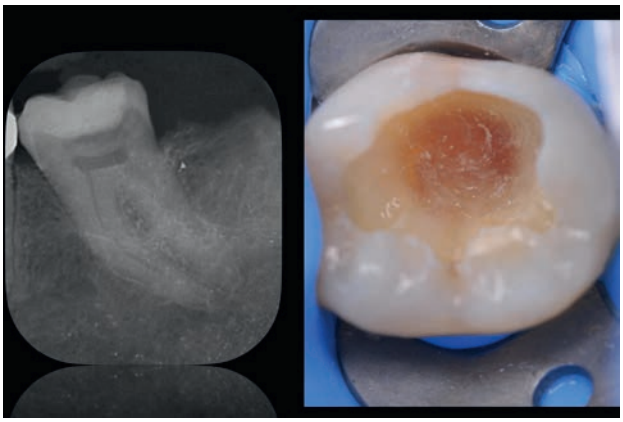

Fig. 1 - Radiographic and photographic image of the affected tooth.

Procedure and treatment

Given the depth and proximity to the pulp, Biodentine™ XP was applied in Bio-Bulk Fill for indirect pulp capping to assess the tooth's vitality and reduce sensitivity over time. Biodentine™ XP was applied by filling the entire cavity as a temporary restoration. The excess material was removed, and the remaining material was carefully adapted to the cavity margin using a micro-brush ***(Fig. 2)***.

Once the material was adjusted, sufficient time was allowed for it to harden before removing the rubber dam and checking and adjusting the occlusion as necessary ***(Fig. 3)***.

The patient returned to the clinic after seven months to finish the treatment (due to work commitments, the patient was unable to return within the six-month period instructed by the manufacturer for final restoration). The tooth element showed a buccal cusp fracture and the filling material had deteriorated externally ***(Fig. 4)***.

An indirect restoration (onlay) was prepared. Biodentine™ XP was incorporated into the preparation as build-up, thus leaving the material in situ.

Once the restoration was prepared, the impression was taken. Figure 5 shows how Biodentine™ XP remained in place even after the impression removal, thus indicating the presence of a proper interaction between the material and the dentine substrate ***(Fig. 5)***.

When the onlay was ready, the temporary cover was removed, and the preparation surface was cleaned prior to the cementation of the indirect restoration ***(Fig. 6)***.

Next, the surface was sandblasted using AcquaCare (Velopex International, London, UK) to thoroughly clean the substrates, including Biodentine™ XP ***(Fig. 7)***. The material remained intact and was subsequently conditioned for the adhesive procedure.

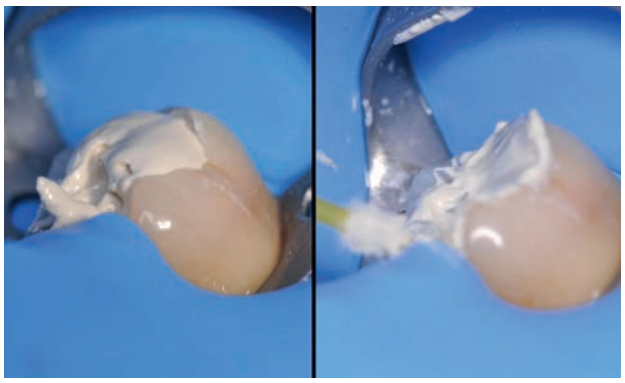

Fig. 2 - Application of Biodentine™ XP.

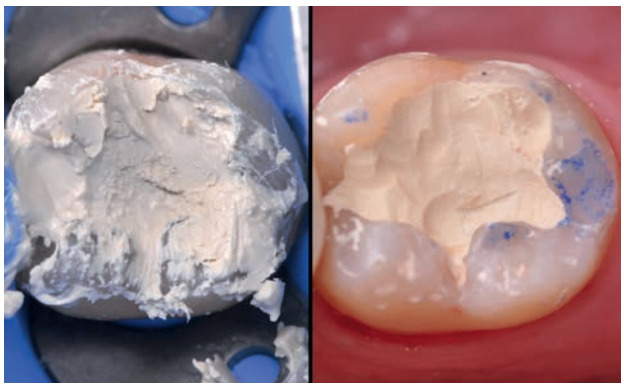

Fig. 3 - Adjustment of the material.

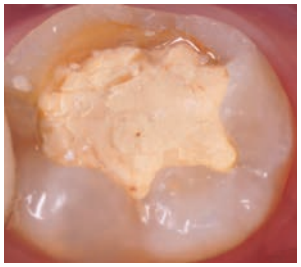

Fig. 4 - View of the temporary enamel restoration with Biodentine™ XP after seven months.

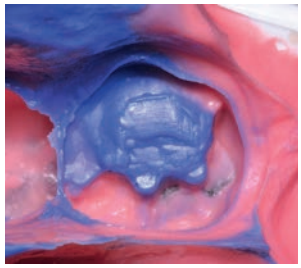

Fig. 5 - Impression of the tooth.

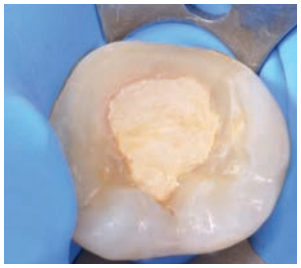

Fig. 6 - Removal of the temporary restoration.

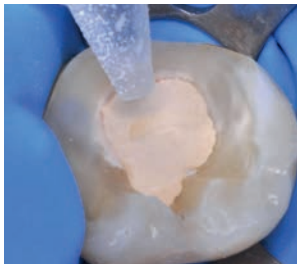

Fig. 7 - Sandblasting of the tooth surface, including Biodentine™ XP.

Selective enamel etching was performed for 20 seconds using orthophosphoric acid ***(Fig. 8)***.

Two layers of the Scotchbond Universal Plus adhesive system (3M, Maplewood, Minnesota, USA) were applied over the entire surface ***(Fig. 9)***, and then air-blowing was performed before polymerisation.

Finally, the onlay was cemented on the tooth surface ***(Fig. 10)***.

The final result one week after cementation showed that the indirect restoration fit well with a proper seal, as confirmed by radiographic evaluation ***(Fig. 11)***. The position of Biodentine™ XP was also intact. No lesions were detected, dental vitality was preserved, and the patient's sensitivity had resolved.

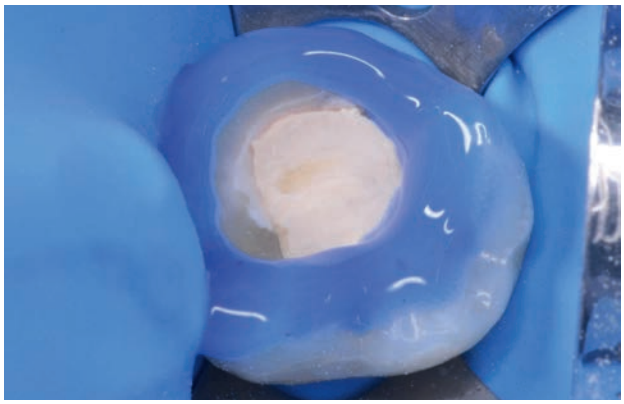

Fig. 8 - Selective enamel etching.

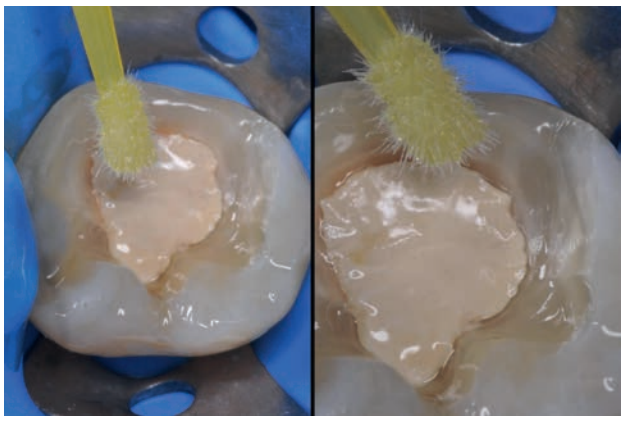

Fig. 9 - Application of the adhesive.

Discussion

The use of Biodentine™ XP as an indirect pulp capping material proved effective in maintaining tooth vitality and reducing sensitivity over time. Its strong mechanical properties and dimensional stability ensured a stable temporary enamel restoration, which is particularly important when final restoration in a single session is not feasible.

During the follow-up visit, despite the delay of treatment, the durability and continued effectiveness of Biodentine™ XP were evident. Incorporating Biodentine™ XP into the build-up for the onlay preparation further validated its compatibility and interaction with the dentine substrate. The successful cementation of the onlay and the intact position of Biodentine™ XP, as confirmed by radiographic evaluation, underscore the material's reliability for indirect restorations.

Fig. 10 - Final situation after onlay cementation.

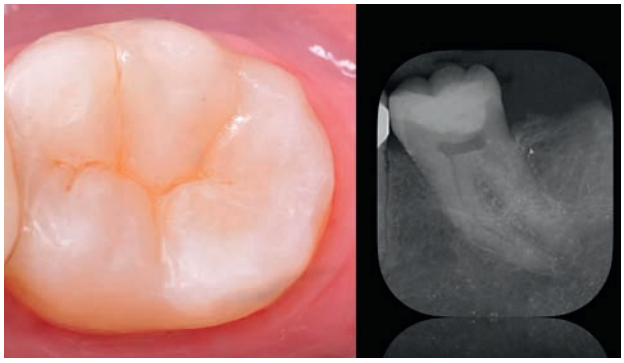

Fig. 11 - Radiographic and photographic image one week after cementation.

Conclusion

In conclusion, clinicians can confidently use Biodentine™ XP with the Bio-Bulk Fill technique, even in treatments requiring two appointments. This material is effective for both direct and indirect pulp capping procedures, serving as a temporary enamel restoration while evaluating pulp vitality outcomes. It is crucial to complete the final restoration within six months, as the material may be prone to fracture and wear if left in the occlusal surface beyond this period. Ultimately, the hardened Biodentine™ XP can be reliably used for building up indirect restorations without concerns about its performance.

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Author:

Angelo Putignano MD, DDS

After completing his M.D., Dr. Angelo Putignano received a postgraduate certificate for Doctor of Dental Surgery at the University of Ancona in Italy. Following this, he became the professor of Restorative Dentistry for Marche Polytechnic University's School of Dentistry. Concurrently, he is the Head of the Operative Dentistry and Endodontics department, and Dean for the School of Dental Hygiene at Marche Polytechnic University.

Being an active member of both the Italian Society of Operative Dentistry and the European Academy of Aesthetic Dentistry, Dr. Putignano has continued to demonstrate excellence within multiple fields of dentistry. He is also the founding member of the Italian Academy of Aesthetic Dentistry.

Dr. Putignano has brought his knowledge to multiple publications, co-authoring such textbooks as "Adhesive Dentistry: The Key to Success" and "Indirect Conservative Restoration of Posterior Teeth". When not lecturing on adhesive and aesthetic restorations or contributing to dental literature, he runs his own private practice limited to restorative dentistry in Ancona, Italy.

A modern approach to simplify restorative dentistry with Biodentine™

Dr. Monaldo Saracinelli

How long have you been using Biodentine™?

II have been using Biodentine™ since the beginning of 2023, with the original capsule format and amalgam vibrator.

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

I prefer to use a one-step technique wherever possible and Biodentine™ can be used alongside self-adhesive flow composites. After waiting for the Biodentine™ setting time of about 15 minutes, the composites can be positioned above the material to protect it and make it waterproof to the subsequent etching steps and adhesive systems.

In which cases do you use the Bio-Bulk Fill procedure?

I use the Bio-Bulk Fill procedure for both deep cavities with and without pulp exposure. A bioactive material that supports pulp vitality is crucial, as it aids tissue healing and ensures predictable clinical outcomes.

Summary

Introduction
The clinical case emphasises a conservative approach to aesthetic restorations using Biodentine™ and a final indirect restoration, aiming to replicate the natural form, colour, and function of teeth while preserving the pulp and delaying invasive treatments.

Methods
A 23-year-old patient presented with a deep, asymptomatic carious cavity in the first upper premolar (1.4). A small pulp exposure was observed after caries removal. A direct pulp capping was performed with Biodentine™, followed by a provisional composite restoration after the 12-minute setting time. At a second session, a composite inlay was placed to finalise the restoration, with Biodentine™ acting as a permanent dentine substitute.

Discussion
This clinical case underscores the advantages of Biodentine™ in restoring deep carious cavities, particularly its role in preserving pulp vitality and promoting sustained dental health. Biodentine™'s biocompatibility and dentine-like properties make it ideal for such restorations. The material's quick setting time enhances workflow efficiency, reducing contamination risks and ensuring a strong seal to prevent bacterial infiltration. Additionally, combining Biodentine™ with adhesive procedures and composite inlays exemplifies a conservative approach that preserves tooth structure. This method results in biologically compatible and aesthetically pleasing restorations.

Conclusion
Tricalcium silicate-based materials, such as Biodentine™, offer biocompatibility, bioactivity, and remineralisation properties, allowing the avoidance of endodontic treatments.

Introduction

The purpose of this article is to highlight an effective and conservative approach to performing aesthetic restorations with Biodentine™ and a final indirect restoration, guided by the principles of replicating the natural form, colour, and function of dentition. The mission is to preserve the pulp and delay more invasive treatments by utilising advanced materials and following precise workflows that shape the strategy.

Preserving tooth structure is crucial for long-term success. Utilising adhesive procedures at both radicular and coronal levels improves prognosis, while materials with physical properties similar to dentine (Biodentine™) and enamel (composite inlay) create biologically compatible restorations.

Therefore, it is essential to achieve an adequate seal by placing the peripheral restoration onto sound dentine and/or enamel, effectively controlling the lesion and inactivating any remaining bacteria.

Case report

Clinical signs and symptoms

In July 2023, Emy, a 23-year-old patient, presented with a deep carious cavity in the first upper premolar (1.4), which was asymptomatic at the time *(Fig. 1)*.

After dam isolation, cleaning, and disinfection of the 1.4 cavity, a small pulp exposure can be observed *(Fig. 2)*.

Procedure and treatement

After the cavity was prepared, it was disinfected for 60 seconds *(Fig. 3)*.

Biodentine™ was prepared before and after mixing it in the amalgam shaker to achieve a smooth and homogenous consistency *(Fig. 4)*.

Biodentine™ was applied to the exposed pulp using a soft brush *(Fig. 5)*. Unlike MTA, you only need to wait 12 minutes before proceeding with the adhesive session.

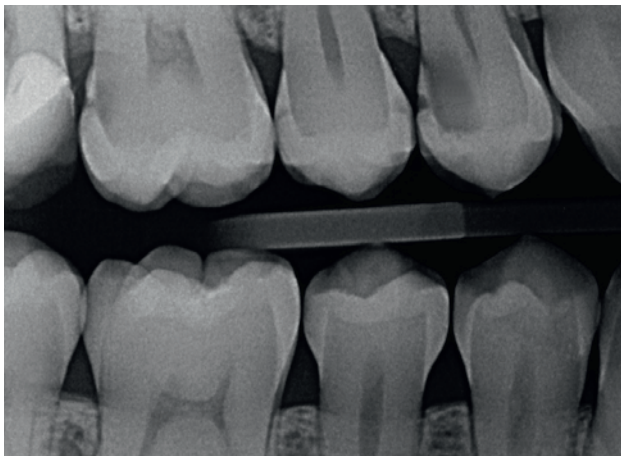

Fig. 01 - Preoperative radiograph.

A 20-second selective enamel etching was performed, followed by the application of a universal adhesive *(Fig. 6)*.

The universal adhesive was light-cured for 40 seconds *(Fig. 7)*.

A flowable composite resin was used for the “build-up” of the restoration *(Fig. 8)*.

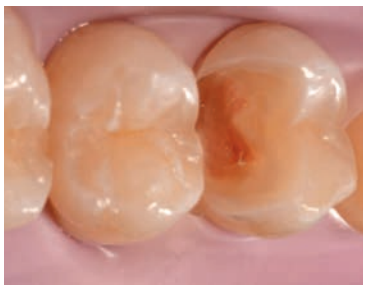

Fig. 02 - Isolation of the tooth.

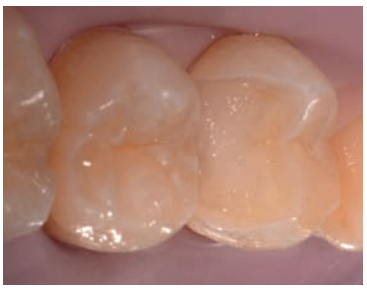

Fig. 03 - Cavity preparation.

Fig. 04 - Preparation of Biodentine™

Fig. 05 - Application of Biodentine™.

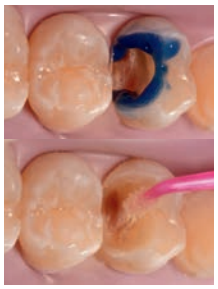

Fig. 06 - Etching and application of the adhesive.

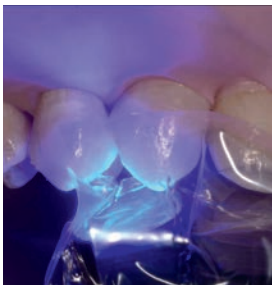

Fig. 07 - Light curing of the adhesive.

Fig. 08 - “Build-up” with composite.

An X-ray was taken to control the build-up after the restoration *(Fig. 9)*.

Due to the violation of the biological width, a minor crown lengthening was performed in the same session immediately after removing the dam *(Fig. 10)*.

A wide posterior bite tray and silicone impression were taken immediately after the surgery using Zhermack Hydrorise Heavy & Light Body materials *(Fig. 11)*.

A light-curing, soft single-component temporary restorative material was used *(Fig. 12)*.

At a second session, the composite inlay, fabricated by the lab, was tried in for fit and adjustment *(Fig. 13)*.

The cavity was cleaned and disinfected. Following this, a 20-second selective enamel etching was performed *(Fig. 14)*.

Etching was followed by application of the universal adhesive *(Fig. 15)*.

The inlay was bonded using a transparent composite photo-activated cement *(Fig. 16)*.

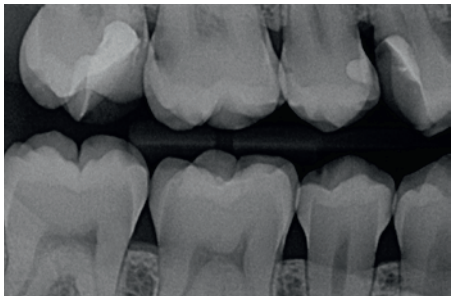

Fig. 09 - Postoperative radiograph of the tooth after composite “build-up”.

Fig. 10 - Crown lengthening.

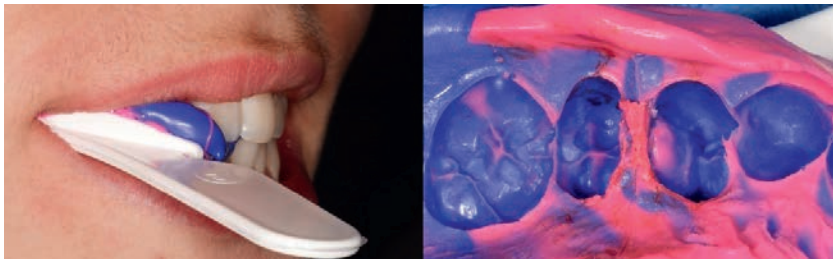

Fig. 11 - Impression of the tooth.

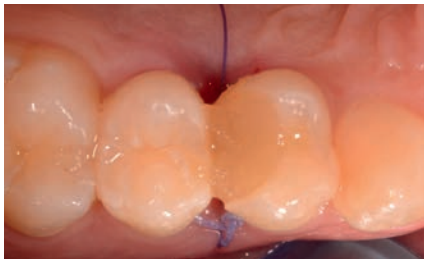

Fig. 12 - Light-curing, soft single-component temporary restorative material.

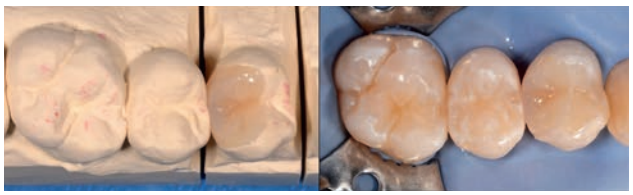

Fig. 13 - Try in and adjustment of the composite inlay.

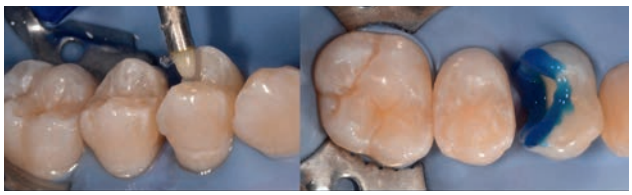

Fig. 14 - Selective enamel etching.

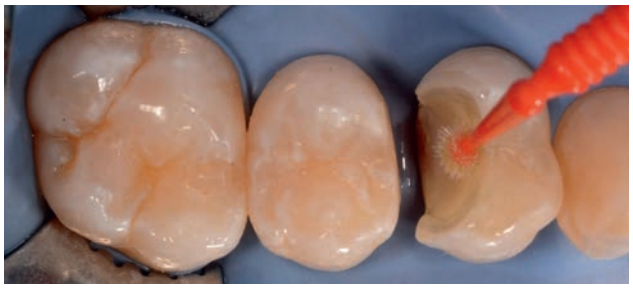

Fig. 15 - Universal adhesive application.

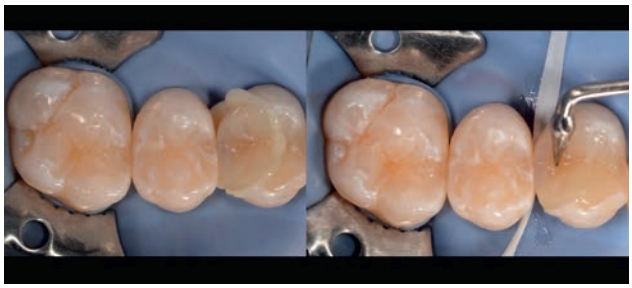

Fig. 16 - Bonding of the inlay.

Each side of the inlay was cured with a 60-second exposure to the curing light *(Fig. 17)*.

Occlusal contacts were checked to ensure proper fit and alignment *(Fig. 18)*.

Immediate post-operative results were evaluated, including the fit and functionality of the restoration *(Fig. 19)*.

Follow up

In 2024, Emy's one-year check-up included an X-ray and a positive vitality test *(Fig. 20-21)*. The vitality test results were positive, confirming the continued health of the tooth.

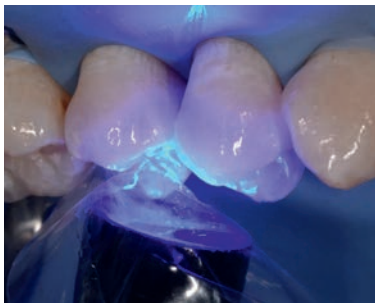

Fig. 17 - 60-second light curing for each side of the composite cement.

Fig. 18 - Occlusal contacts checked.

Fig. 19 - Postoperative view of the restoration.

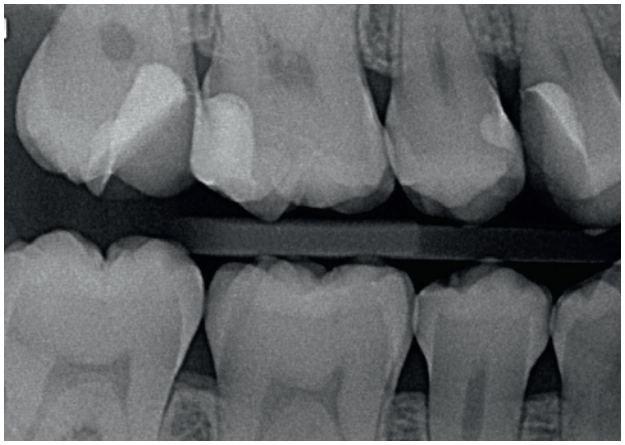

Fig. 20 - Radiographic view of the restoration at one-year follow-up.

Fig. 21 - Photographic view of the restoration at one-year follow-up.

Discussion

This clinical case highlights the significant benefits of using Biodentine™ for the restoration of a deep cavity, emphasising its role in preserving pulp vitality and ensuring sustained dental health.

Biodentine™'s biocompatibility and physical properties are similar to natural dentine, making it an ideal material for such restorations. In this case, the application of Biodentine™ directly to the exposed pulp facilitated its healing, promoting the formation of reparative dentine and maintaining pulp vitality. The quick setting time of Biodentine™ allowed for efficient workflow, minimising the risk of contamination and ensuring a robust seal, which is crucial for preventing bacterial infiltration and subsequent complications.

Moreover, the use of Biodentine™ in conjunction with adhesive procedures and composite inlays demonstrates a conservative approach that

maximises the preservation of tooth structure. The combination of Biodentine™ as permanent dentine substitute and a composite inlay for the final restoration provided a biologically compatible and aesthetically pleasing outcome.

The successful one-year follow-up, with positive vitality tests and radiographic evidence of continued tooth health, underscores the effectiveness of this treatment strategy. This case reinforces the importance of using advanced biomaterials like Biodentine™ to achieve durable and functional restorations while preserving the natural dentition and delaying more invasive treatments.

Conclusion

Tricalcium silicate-based materials offer biocompatibility, bioactivity, and remineralisation properties. So, can endodontic treatments be avoided? YES, provided that the following criteria are met:

1. The lesion must be asymptomatic.
2. Pulp exposure should be iatrogenic or traumatic.
3. Dental dam isolation is essential.
4. Thorough cleaning and disinfection of the cavity are required.
5. Bleeding must be controlled and stopped.
6. Biodentine™ must be applied effectively.
7. The correct adhesive protocol must be followed.

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Notes

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