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I studied Dentistry at the Universidad Alfonso X el Sabio, Madrid, Spain, and I obtained my PhD in Biomedical Sciences at the Università Politecnica delle Marche, Ancona, Italy. I am currently a research fellow at the latter 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, quality results to improve all possible therapies for our patients.

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# Restoring deep caries in 1 & 2 sessions with Biodentine™ XP in Bio-Bulk Fill

### 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.

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# Summary


### Introduction
This clinical case concerns a 21-year-old patient who presented with an old, leaking composite restoration on the second upper molar and a deep carious lesion on the third molar. Indirect pulp capping with Biodentine™ XP was performed on both teeth with the Bio-Bulk Fill procedure before final composite restoration.

### Methods
The second molar was fully restored in a single session, with the final composite restoration being applied after Biodentine™ XP had set. A two-step approach was chosen for the third molar to allow sufficient time to assess the biological response before proceeding with the final composite restoration. Biodentine™ XP acted as provisional enamel restoration between the two sessions.

### Discussion
This clinical case highlights the significant advantages of using Biodentine™ XP in restorative dentistry, particularly for managing deep carious lesions while preserving pulp vitality.

In the first application on the second molar, Biodentine™ XP was used in Bio-Bulk Fill for indirect pulp capping followed by immediate composite restoration, ensuring an effective biological seal and minimising bacterial contamination. Indeed, Biodentine™ XP's bioactive properties promote dentine remineralisation and provide a protective barrier against bacterial infiltration.

The second application on the third molar involved a two-step approach, initially placing Biodentine™ XP as a provisional enamel substitute to evaluate the effectiveness of the pulp capping before proceeding with the final composite restoration. The favourable pulp response observed at the 3-month follow-up confirmed Biodentine™ XP's efficacy in preserving pulp vitality.

### Conclusion
Biodentine™ XP provides a versatile and effective solution for managing deep carious lesions while preserving pulp vitality. Its bioactive and antibacterial properties make it particularly useful for both direct and indirect pulp capping. Additionally, Biodentine™ XP can serve as a temporary enamel restoration for up to six months, offering flexibility in clinical workflows. Once fully set, it can be incorporated into the final restoration as a permanent dentine substitute, serving as a stable build-up material for direct restorations. These characteristics make Biodentine™ XP a reliable and efficient material for restorative procedures aiming to preserve pulp vitality and maintain the structural integrity of the tooth.


# Introduction

Maintaining pulp vitality is a fundamental goal in restorative dentistry, particularly in young patients where deep caries lesions can progress rapidly. In these cases, indirect pulp capping represents a valuable approach to preserving the pulp while preventing further structural compromise.

The use of bioactive materials is particularly beneficial in this context due to their antibacterial properties, biocompatibility, and ability to induce dentine remineralisation. These characteristics help reduce bacterial load, create a favourable environment for pulp healing, and enhance the long-term success of the restoration by providing a stable interface between the pulp and restorative material. Their sealing capacity further minimises the risk of bacterial infiltration, which is crucial for preserving pulp vitality in cases of deep carious lesions.

This clinical case highlights two different applications of Biodentine™ XP in managing deep caries in a young patient:

**1st application**: On the second molar, Biodentine™ XP was used for indirect pulp capping, immediately followed by a composite restoration

in the same session. This approach ensured an effective biological seal, protecting the pulp and allowing for the immediate functional restoration of the tooth.

**2nd application**: On the third molar, where a deep carious lesion was present, Biodentine™ XP was initially placed as a provisional restoration to evaluate the effectiveness of the pulp capping therapy and monitor the maintenance of pulpal vitality. Given the extent of the lesion and the higher risk of pulpal involvement, a two-step approach was chosen to allow sufficient time to assess the biological response before proceeding with the final restoration. During the second appointment, after confirming a favourable pulp response and ruling out the need for endodontic intervention, Biodentine™ XP was retained as the definitive pulp capping material, ensuring long-term protection before completing the final restoration.

# Case report

## Clinical signs and symptoms

A 21-year-old patient presented to the clinic with cold sensitivity in the upper right quadrant. The intraoral clinical examination revealed an old, leaking composite restoration on the second upper molar and dental caries on the third molar *(Fig. 1)*. X-ray evaluation confirmed a deep carious lesion in the third molar and the presence of a compromised composite restoration on the second molar.

## Procedure and treatement

Proper application of the rubber dam and verification of complete isolation are essential before opening the cavity to prevent further contamination, particularly in direct or indirect pulp capping procedures *(Fig. 2)*.

After removing the previous composite restoration and cleaning the carious lesion in the third molar, a deep cavity close to the pulp was observed *(Fig. 3)*. In both cases, it was decided to apply Biodentine™ XP using the Bio-Bulk Fill technique for indirect pulp capping to promote dentine repair, provide a protective barrier, and preserve the tooth's vitality.

With the cavities prepared and cleaned *(Fig. 4)*, Biodentine™ XP was applied directly in contact with the deepest area of the cavity.

A Class I cavity is more aggressive in removing all damaged tissue compared to a Class II cavity and can cause more sensitivity. To assess the maintenance of pulpal vitality in the third molar, which was the most compromised, Biodentine™ XP was applied using the Bio-Bulk Fill technique,

**Fig. 01 -** Second and third upper molar with deep carious lesions.

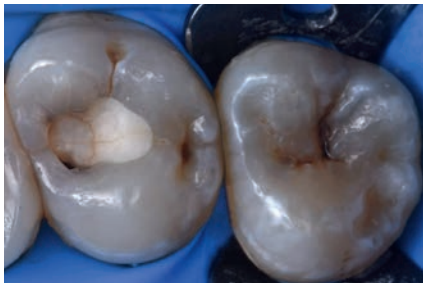

**Fig. 02 -** Rubber dam isolation before cavity preparation.

**Fig. 03 -** Cavities after caries removal.

**Fig. 04 -** Cleaned cavities.

completely filling the cavity up to the occlusal surface as a temporary enamel restoration ***(Fig. 5)***. This approach allows for postponing the definitive restoration while ensuring proper sealing of the cavity to prevent contamination. Additionally, it enables the assessment of pulpal vitality preservation and determines whether endodontic treatment is required if vitality is not maintained.

In contrast, for the second molar, completing the Class II restoration was a priority. Thus, Biodentine™ XP was placed, left to set, and then covered with composite to achieve the final restoration.

Once the material had set, the enamel on the second molar was selectively etched with orthophosphoric acid for 20 seconds ***(Fig. 6)***.

The image shows the typical appearance of properly etched enamel ***(Fig. 7)***. Additionally, it can be observed that during the acid rinsing phase, the hardened Biodentine™ did not dissolve and remained intact. Then, two layers of a next-generation universal adhesive were applied to the entire cavity surface. After air-blowing, the adhesive was light-cured.

The mesial wall was reconstructed using a bulk-fill composite, followed by the application of a thin layer of flowable at the base of the cavity ***(Fig. 8)***.

The restoration on the second molar was then completed using the same bulk-fill composite that was used for the mesial wall. The StyleItaliano Essential Lines technique for occlusal morphology modelling was used to finalise the Class II restoration ***(Fig. 9)***.

The occlusion was checked after removing the rubber dam, and the composite restoration was polished ***(Fig. 10)***.

The patient returned after one month to complete the restoration ***(Fig. 11)***. The cold sensitivity had disappeared and both teeth responded positively to the vitality test. Therefore, a direct composite restoration was carried out on the third molar.

A Class I cavity was prepared by partially removing Biodentine™ XP, leaving it in the deepest part of the cavity only as a permanent dentine substitute ***(Fig. 12)***. Complete removal is not necessary, as the bioactive material is used as a filling material. It is recommended to leave at least 2 mm of

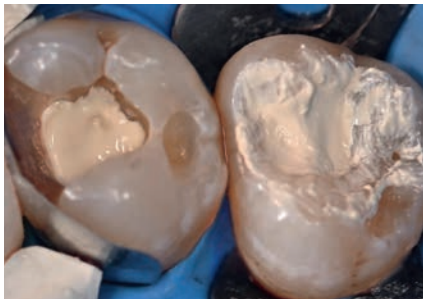

**Fig. 05 -** Placement of Biodentine™ XP in the cavities with the Bio-Bulk Fill technique.

**Fig. 06 -** Selective enamel etching on second molar.

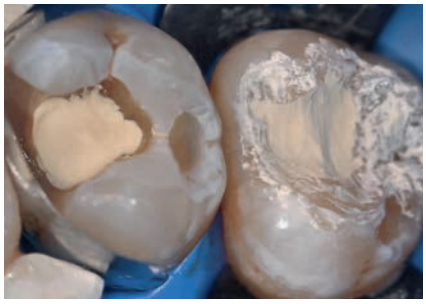

**Fig. 07 -** Enamel after etching.

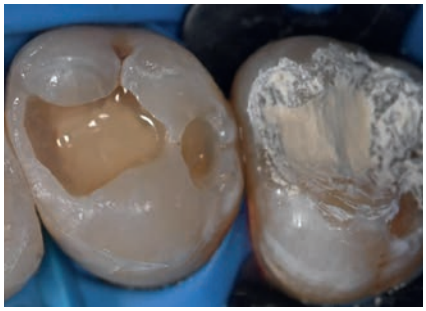

**Fig. 08 -** Application of a bulk flowable after building the mesial wall.

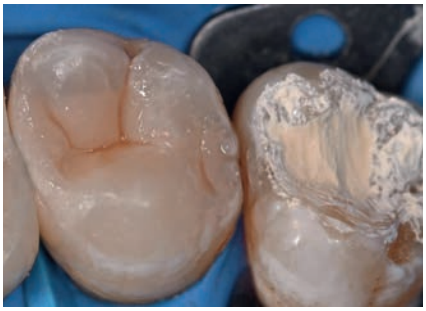

**Fig. 09 -** Final composite restoration on second molar.

**Fig. 10 -** Final view of the restoration after rubber dam removal.

space from Biodentine™ to the occlusal surface to achieve a better aesthetic outcome with the composite restoration.

Selective enamel etching was performed for 20 seconds using orthophosphoric acid ***(Fig. 13)***.

A universal adhesive containing 10-MDPI (3M™ Scotchbond™ Universal Plus Adhesive – Solventum) was then applied to the cavity ***(Fig. 14)***.

A single-shade composite was applied to enhance the aesthetic outcome ***(Fig. 15)***. Since it is less translucent than an enamel shade, it effectively covers Biodentine™, integrating the restoration with the natural tooth.

Finally, as with the second molar, the essential lines were drawn to reproduce the occlusal morphology and characterised with a stain to add depth and a more natural, three-dimensional appearance to the restoration ***(Fig. 15)***.

The rubber dam was then removed and the restoration polished ***(Fig. 16)***, completing the restoration of the two teeth ***(Fig. 17)***.

## Follow up

Radiograph (B) taken at the three-month follow-up showed no radiological signs (***Fig. 18)***. Additionally, the patient reported no sensitivity or pain, indicating the successful maintenance of pulp vitality.

**Fig. 11 -** Second and third molar at one-month review.

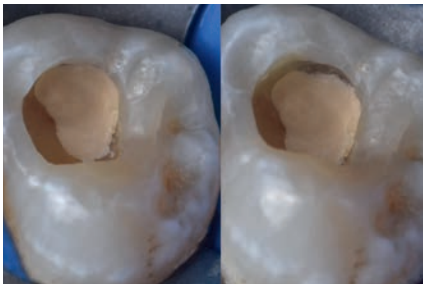

**Fig. 12 -** Biodentine™ XP partially cut back on third molar.

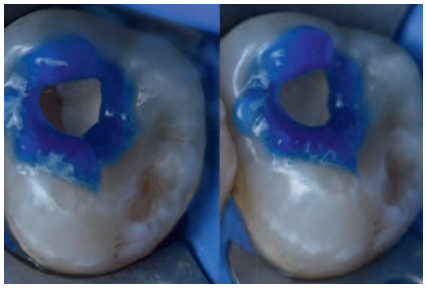

**Fig. 13 -** Selective enamel etching on third molar.

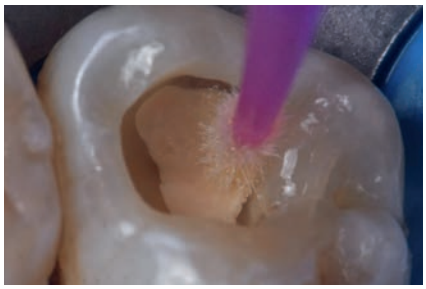

**Fig. 14 -** Application of the 10-MDPI-based adhesive system with a microbrush.


**Fig. 15 -** Final composite application and restoration.

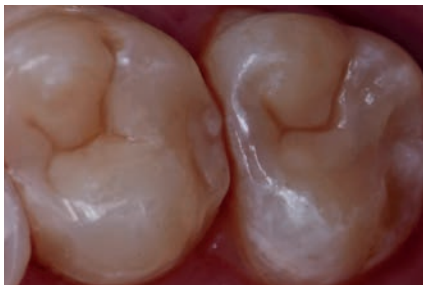

**Fig. 16 -** Second and third molar after restoration.

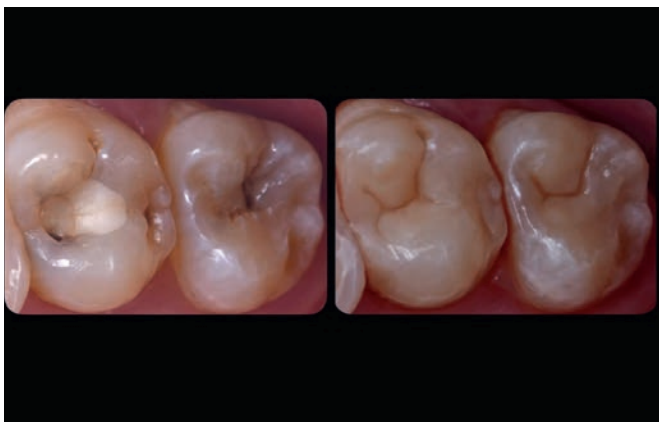

**Fig. 17 -** Initial situation and final result for both restorations.

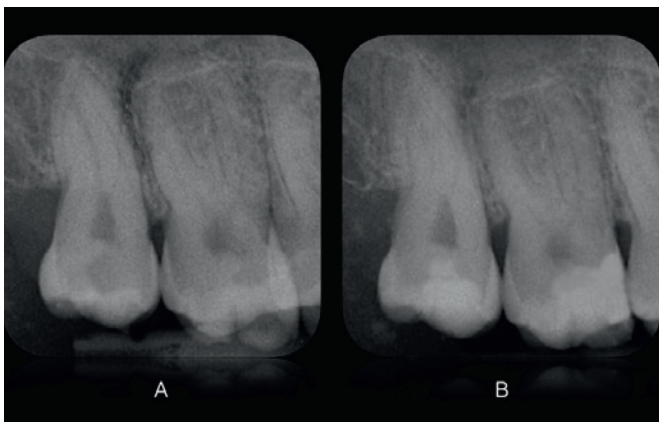


**Fig. 18 -** Radiographic evaluations: (A) Before restoration; (B) At three-month follow-up.

# Discussion

This clinical case underscores the significant advantages of using Biodentine™ XP in restorative dentistry, particularly for managing deep carious lesions while preserving pulp vitality. Biodentine™'s bioactive properties play a crucial role in promoting dentine remineralisation, while its sealing ability provides a protective barrier against bacterial infiltration. These characteristics are essential for maintaining pulp health, especially in young patients with rapidly progressing caries.

In the first application on the second molar, Biodentine™ XP is used for indirect pulp capping followed by immediate composite restoration. This approach ensures an effective biological seal, protecting the pulp and allowing for immediate functional restoration. Biodentine™ XP's ability to set quickly and provide a stable interface between the pulp and the composite restoration is particularly beneficial in such scenarios, as it minimises the risk of bacterial contamination and supports the long-term success of the restoration.

The second application on the third molar involves a two-step approach, where Biodentine™ XP is initially placed using the Bio-Bulk Fill method as a provisional enamel substitute to evaluate the effectiveness of the pulp capping therapy. This method allows sufficient time to assess the biological response before proceeding with the final composite restoration. The favourable pulp response observed at the three-month follow-up confirms the material's efficacy in preserving pulp vitality.

Biodentine™ XP's ability to serve as both a provisional enamel restoration and permanent dentine substitute without the need for total removal further highlights its versatility and effectiveness in clinical workflows.

# Conclusion

Biodentine™ XP, a bioactive dentine substitute, offers a versatile and effective solution for managing deep carious lesions while preserving pulp vitality. Its chemical bonding with dentine, combined with its bioactive and antibacterial properties, makes it particularly useful for both direct and indirect pulp capping. Additionally, its ability to serve as a temporary enamel restoration for up to six months provides flexibility in clinical workflows. Once fully set, Biodentine™ XP can be incorporated into the final restoration as a permanent dentine substitute, eliminating the need for removal and serving as a stable build-up material for direct restorations. Overall, Biodentine™ XP's bioactive and antibacterial properties, combined with its strong mechanical properties, make it a reliable and efficient choice for deep cavity restorative procedures aiming at preserving pulp vitality and maintaining the structural integrity of the tooth.

## References

1. Hardan L, Mancino D, Bourgi R, Alvarado-Orozco A, Rodríguez-Vilchis LE, Flores-Ledesma A, Cuevas-Suárez CE, Lukomska-Szymanska M, Eid A, Danhache ML, et al. Bond Strength of Adhesive Systems to Calcium Silicate-Based Materials: A Systematic Review and Meta-Analysis of In Vitro Studies. Gels2022,8,311.
2. About I. Biodentine: from biochemical and bioactive properties to clinical applications. Giornale Italiano di Endodonzia, 2016;30(2):81-88.
3. Falakaloğlu S, Yeniçeri Özata M, Plotino G. Micro-shear bond strength of different calcium silicate materials to bulk-fill composite. PeerJ. 2023 Mar 29;11:e15183.

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