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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'm pleased to show the results of research work to provide predictable, repeatable, and quality results to improve all possible therapies for our patients.



## Indirect Pulp Capping: Bio-Bulk Fill Technique and Bulk&Go

### 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 technique for indirect pulp protection, using Biodentine™ XP material as a dentine replacement, to perform the restoration of a deep caries lesion.

Federica, aged 37 years old, presented with mild sensitivity in her lower left molars. Clinical examination revealed a carious lesion on the first molar and an old filtered composite restoration without occlusal morphology. The tooth was positive on vitality testing and negative on percussion testing. Radiographic examination revealed no periodontal lesions.

### Methods

The two cavities were prepared with high- and low-speed burs and a vanadium excavator. The indirect pulp capping was then performed on the second molar using Biodentine™ XP, filling the cavity up to 1.5mm from the occlusal margin. After allowing the material to harden for 15 minutes, the class II cavity was transformed into a class I cavity, and the adhesive procedures were performed. Next, a body shade composite was applied with the Essential Lines modelling technique to complete the direct restoration. Finally, the first molar restoration was performed using the Bulk&Go procedure combined with Essential Lines technique.

### Discussion

Biodentine™ is a well-studied tricalcium silicate-based material that has demonstrated biocompatibility and bioactivity *in vitro* and *in vivo*. Pre-clinical investigations have revealed its mechanisms of interaction with dental hard tissues. Biodentine™ is shown to create a protective seal that prevents bacterial infiltration, thereby safeguarding the dental pulp. It achieves this through micro-mechanical retention by infiltrating dentinal tubules and by inducing tertiary dentine synthesis, which enhances pulp protection. Biodentine™ also reduces the expression and function of pain receptors, leading to the absence of postoperative pain and hypersensitivity. Additionally, when applied to odontoblastic cells, it decreases pro-inflammatory secretion, thereby reducing inflammation. These findings highlight the beneficial effects of Biodentine™ on dental hard and soft tissues, emphasising its potential for use in dental procedures.

### Conclusion

The scientific community, supported by *in vitro* and *in vivo* clinical studies/reports, demonstrates that Biodentine™ is biocompatible, has strong mechanical properties, and can be safely applied in restorative dentistry. In addition, Biodentine™ requires no surface conditioning treatment and can be cut and reshaped like natural dentine. Because of its characteristics, it can be used as a bulk substitute for permanent dentine to replace the entire damaged or lost dentine, thus as indirect pulpal protection and not just as a direct pulp capping material. The surface of Biodentine™ can be bonded like natural dentine with various adhesives before the final application of composite resins.

## Introduction

Nowadays, bulk-fill composites (BFCs) are among the resin-based materials most widely used for the restoration of posterior teeth. They can be placed and cured in increments of up to 4–5mm in thickness, eliminating the need for layering, shortening the clinical procedure, and simplifying handling. Furthermore, the introduction of bioceramic materials with high-performance properties as a replacement for dentine makes their application possible for the bulk-filling of deep cavities. This clinical case presents two direct restorations in the posterior sector, one based on the Bulk&Go technique proposed by Style Italiano, and a second based on the Bio-Bulk Fill technique.

The Bulk&Go technique takes full advantage of the favourable chemical–physical characteristics of the high-viscosity BFCs to allow for a one-step procedure. Therefore, providing the cavity that does not exceed a depth of 4mm, its restoration can be performed in a single mass application.

The Bio-Bulk Fill technique is a two-step procedure based on the positioning of a first layer of bioceramic material, which acts as a dentine substitute, instead of BFC. The second cover layer consists of an enamel-like composite, like a Body Shade composite, with low translucency.

## Case report

### Clinical signs and symptoms

The young patient reported mild sensitivity in her left lower molars. Clinical examination revealed a carious lesion on the first molar and an old filtered composite restoration without occlusal morphology. The tooth was positive on vitality testing and negative on percussion testing. Radiographic examination revealed no periodontal lesions.

### Diagnosis

Dental caries was present in both molars, with a carious lesion on the first molar and secondary lesions on the second molar.

### Procedure and treatment

A rubber dam was placed to isolate the two molars to be treated (*Fig. 02*). With the cavities open, the carious lesions were first cleaned with the aid of high-speed burs, and then with manual instruments such as vanadium excavators. When all the infected dentine had been removed, a class I on first molar and a class II on the second one were obtained (*Fig. 03*). For the second molar, a sectional metal matrix was placed with wedge and ring to transform class II in class I (*Fig. 04*).

The closure of the matrix on the preparation margin of the cavity was checked and a proper contact point verified (*Fig. 05*).



**Fig. 01** - Initial situation.



**Fig. 02** - Isolation.



**Fig. 03** - Cavities preparation.

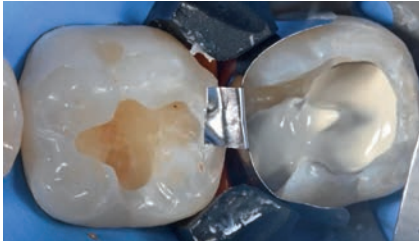


**Fig. 04** - Matrix, wedge and ring placement on the second molar.



**Fig. 05** - Verification of a proper contact point.





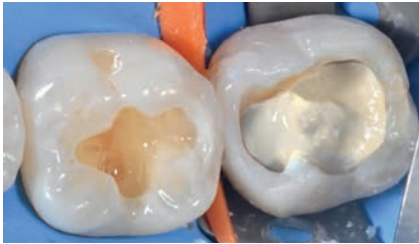
**Fig. 06** - Biodentine™ XP placement.



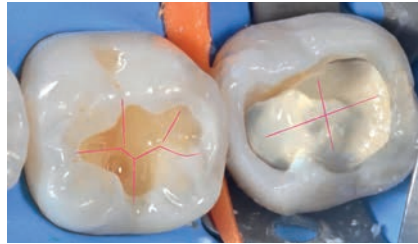
**Fig. 07** - Enamel margin of the cavity preparation.



**Fig. 08** - Selective-etch on enamel.



**Fig. 09** - Restoring the mesial wall of the second molar.



**Fig. 10** - Essential lines technique.



**Fig. 11** - Drawing the lines on the first and the second molars.

After that, the Biodentine™ XP biomaterial was applied inside the cavity in a single mass up to 1.5mm from the occlusal surface, thus leaving space for the final layer of composite enamel.

Once applied, the material was left to harden for 15 minutes before proceeding with the adhesion procedure (*Fig. 06*). The enamel margin of the cavity preparation was kept free in order to build the mesial wall with the composite, transforming class II into class I (*Fig. 07*). Subsequently, the enamel was selectively etched for 20 seconds (*Fig. 08*). The mesial wall of second molar was built, making it possible to restore the two class I cavities (*Fig. 09*).

The Bulk&Go technique was used in the first molar, while in the second molar, the last layer of enamel shade composite was placed using a Body Shade composite to complete the restoration. The Essential Lines technique was applied for modelling (*Fig. 10*). After filling the cavity and condensing the composite, the essential lines were drawn to reproduce the occlusal anatomy of



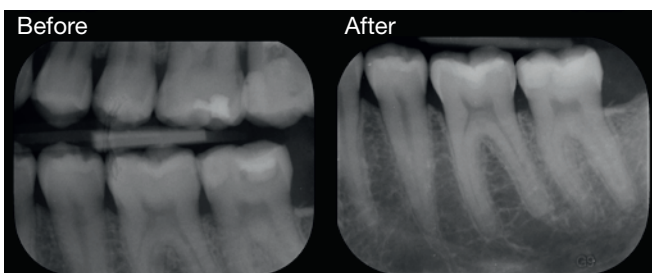
**Fig. 12** - Final situation.

each posterior tooth (*Fig. 11*). The two restorations were then finished and polished (*Fig. 12*).

The control x-ray shows the different radiopacities of the BFC and Biodentine™ XP. Furthermore, the entire cavity was filled and sealed without the presence of gaps or voids within the restorations.

### Follow up

At nine months, no radiographic signs of periodontal lesions were evident, and no symptoms were reported by the patient (*Fig. 13*).



**Fig. 13** - 9 months follow-up.



**Fig. 14** - Before and after.

## Discussion

Biodentine™ has been applied as a bulk restorative material in deep dentine cavities to replace dentine. Biodentine™ is easy to handle, showing good marginal adaptation. When covered with resin-based composite, it is a well-tolerated permanent dentine substitute. Additionally, Biodentine™ can be cut and shaped like the natural dentine. Furthermore, in this case, the patient reported absence of post-operative pain and post-operative sensitivity. This may be due to at least two factors:

- 1) The infiltration of Biodentine™ into the dentine tubules. The precipitation of crystals within the tubules decreases dentine tubule permeability and fluid movement, which may decrease post-operative sensitivity.
- 2) The reduction of odontoblast pain receptor expression and function and the reduction of the secretion of pro-inflammatory cytokines.

## Conclusion

Biodentine™ has multiple applications. Considered a dentine substitute due to its similar physical mechanical characteristics, it can be used to fill the cavity up to 1.5mm from the occlusal surface in bulk mode, following the Bio-Bulk Fill technique.

The combination of Biodentine™ for filling the cavity and the Essential Lines technique for modelling the occlusal surface simplifies and saves time in direct posterior restoration.

## References

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