

# Pulp Capping with Biodentine: Case of Preventive Endodontics

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**Abstract:** *The placement of a protective dressing directly on the exposed pulp is the definition of direct pulp capping whose purpose is to preserve the vitality of the pulp and save the tooth. Most used pulp capping materials are: Calcium hydroxide, MTA and Biodentine. Biodentine is calcium silicate cement that stimulates the formation of tertiary dentin and has an effect on the vital cells of the pulp. It acts on cellular mechanisms as inducers of scarring through the selection, recruitment and differentiation of stem cells. So Biodentine can be considered as a material of choice for the regeneration of dental tissues. Choosing the right capping material is important, but other prognostic factors have an important role in the success of direct pulp capping.*

**Keywords:** Biodentine; Direct Pulp Capping; Pulp Vitality

## 1. Introduction

The dentin-pulp complex has been the subject of numerous studies, which make it possible to understand the response of the tooth to the different care procedures.

Pulp capping, as it has existed for more than 200 years, is defined by the National Council of Teachers of Conservative Dentistry as the technique that consists of "covering the dentine-pulpal tissues with a biomaterial placed in contact with a pulp wound (direct pulp capping).

The procedure of pulp capping involves the use of bioactive endodontic cements. These materials have a common capability that is bioactivity, the bioactivity implies releasing calcium ions, electroconductivity, and production of calcium, of calcium hydroxide, formation of an interfacial layer between the cement and dentinal wall and formation of apatite crystals over the surface of the material in a synthetic tissue fluid environment such as phosphate buffer saline. [1]

## 2. Case Report

A 20-year-old patient reported to the Department of Conservative Dentistry and Endodontics, School of Dentistry of Casablanca, Morocco, has tooth decay and reported discomfort.

**History revealed:** the patient has a deep cavity with physical stimulation.

**Clinical examination:** No history of spontaneous pulpal pain was reported. Status of the pulp and periradicular tissues was carefully evaluated. The clinical examination revealed normal appearance of adjacent gingival tissue and small enamel caries lesion.

**Radiographic examination** reveals a deep caries lesion with no signs of periapical pathology (Figure 1).



**Figure 1:** Pre-operative radiography showing mesial carious lesion on tooth 14

### Diagnosis

The diagnosis of the case was deep caries (category 2, Baume classification)

### In the first appointment:

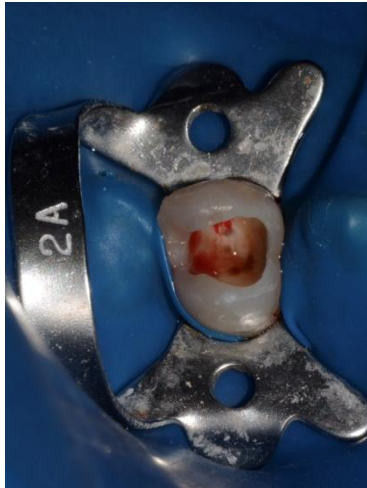
After informing the patient with the procedure, the operative steps were as follows:

- Anesthesia.
- The isolation of the tooth using a rubber dam.
- The eviction of carious tissue: during the removal of infected dentin there was an accidental exposure of the pulp (Figure 2).
- A cotton pellet moistened with 3% NaOCl placed over the exposure for 2 min to obtain adequate hemostasis.
- Hemostasis
- Preparation and installation of the capping material (Biodentine™) placed in the entire cavity and occlusion was checked (Figure 3).
- Immediate postoperative x-ray control (Figure 4).

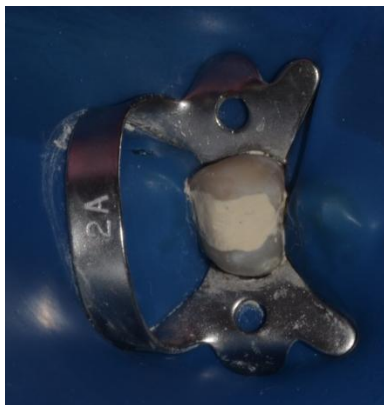
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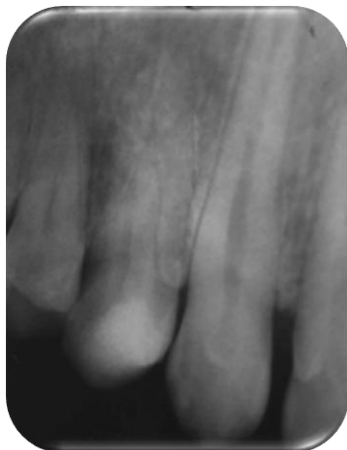
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**Figure 2:** The cavity after evictions of carious tissue and accidental pulp exposure

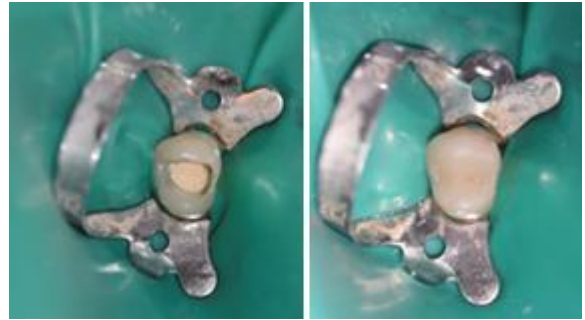


**Figure 3:** Biodentine was prepared, triturated and placed in the entire cavity and occlusion was checked.



**Figure 4:** immediate postoperative x-ray

The second appointment was programmed one week later: only 2mm layer of Biodentine is left and topped with a universal composite resin then finished and polished (Figure 5-6).



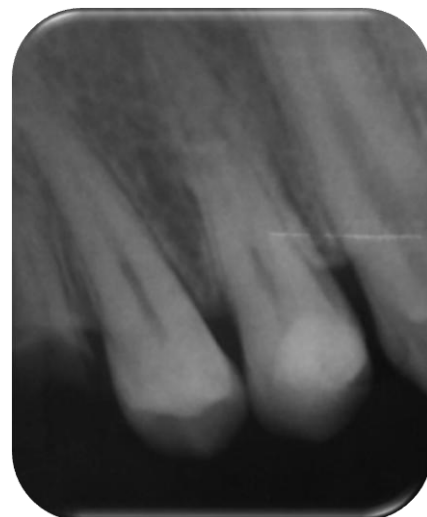
**Figure 5-6:** 1 week later, only 2mm layer of Biodentine is left and topped with a universal composite resin then finished and polished.

**Follow up:** Rx control and vitality tests were conducted at the first week, 6 months and 1 year later (Figure 7-8-9-10).

The tooth was clinically normal and again tested positive for sensitivity and negative for percussion. The recall radiography showed no evidence of periapical pathology showing good response to treatment with Biodentine™.



**Figure 7:** Tooth has been restored and the pulp has been left intact and vital.



**Figure 8:** 1 week follow up x-ray



Figure 9: 6 months follow up x-ray



Figure 10: 12 months follow up x-ray

### 3. Discussion

Pulp integrity of the tooth should be maintained for long term survival, to retain the tooth as functional unit and to withstand heavy masticatory forces. The aim of a direct capping of exposed, vital and painless pulps is to maintain the pulpal health, allowing patients to retain teeth longer and at lower costs than more invasive interventions like root canal treatment.[2] The success of direct pulp capping after such different exposures may differ, with high and low success rates after traumatic and carious exposures, [3]

Another factor influencing the potential prognosis of directly capped pulps might be the capping material.

These materials should have the following ideal properties like:

- Stimulate reparative dentin formation
- Maintain pulpal vitality
- Release fluoride to prevent secondary caries
- Bactericidal or bacteriostatic
- Adhere to dentin
- Adhere to restorative material

- Resist forces during restoration placement and during the life of restoration.
- Sterile
- Radiopaque
- Provide bacterial seal[4]

Conventionally, calcium hydroxide is used, due to its antibacterial effects and dentinogenesis induction. Nevertheless, this material presents some drawbacks: Poor bonding to dentin, resorption and mechanical instability. As a result, it does not prevent microleakage in the long run. Moreover, the newly formed dentin bridges may contain defects and could act as a portal of entry for microorganisms.[5]

Another pulp capping material was recently suggested: mineraltrioxide aggregate (MTA) or direct bonding onto exposed pulp. This aims to seal the exposed area and prevents bacterial leakage more effectively than CH.

MTA is a bioactive, biocompatible, antibacterial material with unique stability and high sealing ability, which stimulates faster dentin bridges formation than calcium hydroxide, leading to pulp healing, and high success rates in clinical procedures.

Despite the advantages of MTA, this material poses some difficulties with manipulation and applicability, requiring proper training and ability. Besides, long setting time, and potential discoloration of dental tissue are important clinical limitations of MTA. [6, 7]

New calcium-silicate-based restorative cement, which is Biodentine can be used as dentin substitute and has similar applications as MTA. It encourages the vital pulp cells and stimulates reparative dentin formation when in direct contact with pulp tissue. The consistency of biodentine is similar to that of phosphate cement. The material can be directly applied in the cavity as bulk dentin substitute without preconditioning.[8]

Biodentine has a specific feature which is its capacity to continue improving in terms of compressive strength with time until reaching a similar range with natural dentine.

Compared to other materials such as MTA, Biodentine handles easily and needs much less time for setting.

In the study by Grech., & al., biodentine showed the highest compressive strength compared to the other tested materials [9]

Concerning the antibacterial effects of biodentine, some studies revealed that Biodentine had a significantly more pronounced antibacterial effect than MTA [10], low cytotoxicity [11], good biocompatibility, bioactivity [12], Easy manipulation, good consistency, and reduced setting time (10–15 min) add to its advantages[13].

Zirconium oxide, a radiopacifier does not cause dentin discoloration [14].

The success of a pulp capping is determined by these factors: Prognostic factors

## 1) Origin of pulp exposure

The success of direct pulp capping after such different exposures may differ, with high and low success rates after traumatic and carious exposures, better prognosis after traumatic exposure: 92% successful [15].

## 2) Size and exhibition site.

The Materials that are used: the potential prognosis of directly capped pulps can be influenced by the capping material:

## 3) Calcium hydroxide / Tricalcium silicate cements: MTA / Biodentine (Gold standard)

**Advantages:****Biodentine:**

Bioactive material / Alternative to MTA

**MTA:**

Faster setting time / Better mechanical properties

Easy handling / Temporary restorations

No colouring / The cost

**Ca(OH)<sub>2</sub>:**

Quality of the Dentin Bridge / Marginal adjustment

Direct bonding to Composite [16, 17].

4-Sealing of the coronary restoration

The success of pulp capping = Sealed coronary restoration

5-Patient's age

10-30ans → 92% success

50-80ans → 70% success [18].

**4. Conclusion**

Biodentine holds promise for clinical dental procedures as a biocompatible and easily handled product with short setting time.

In parallel with this bio-induction, their mechanical properties broaden their indications. The approach of the pulp capping in single visit simplifies and improves the clinical use of Biodentine. The various fundamental and clinical studies confirm the interest of their use.

**Conflicts of Interest:** The authors declare that there are no conflicts of interest regarding the publication of this article.

**References**

- [1] **Parirokh M, Torabinejad M.** Mineral trioxide aggregate: a comprehensive literature review--Part I: chemical, physical, and antibacterial properties. *J Endod.* 2010; 36(1): 16-27.
- [2] **Garrocho-Rangel A, Flores H, Silva-Herzog D, et al.** Efficacy of EMD versus calcium hydroxide in direct pulp capping of primary molars: a randomized controlled clinical trial. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2009; 107: 733-738.
- [3] **Al-Hiyasat AS, Barrieshi-Nusair KM, Al-Omari MA.** The radiographic outcomes of direct pulp-capping procedures performed by dental students. *J Am Dent Assoc* 2006; 137: 1699-1705.

- [4] **Qureshi A, Soujanya S, Nandakumar E, and al.** Recent Advances in Pulp Capping Materials: An Overview. *J Clin Diagn Res.* 2014; 8(1): 316-321.
- [5] **Poggio C, et al.** Biocompatibility of a new pulp capping cement. *Annali di Stomatologia.* 2014; 69-76.
- [6] **Darvell BW, Wu RCT.** MTA an hydraulic silicate cement: review update and setting reaction. *Dent Mater* 2011; 27: 407-422.
- [7] **Camilleri J.** Mineral trioxide aggregate: present and future developments. *Endod Top* 2015 ; 32: 31-46.
- [8] **Mente J, Geletneky B, Ohle M, Koch MJ, Friedrich Ding PG, Wolff D, et al.** Mineral trioxide aggregate or calcium hydroxide direct pulp capping: An analysis of the clinical treatment outcome. *J Endod* 2010; 36: 806-13.
- [9] **Grech L, et al.** Investigation of the physical properties of tricalcium silicate cement-based root-end filling materials. *Dental Materials* 2013; 29(2): 20-8.
- [10] **Deshmukh P, Sahu Y, Jain A, Mishra P, Rahman O, Sharma Sh.** Biodentine: the new bioactive and biocompatible material of choice for direct pulp capping & Pulpotomy in curiously exposed permanent teeth. *International Journal of Applied Dental Sciences* 2018; 4(4): 09-12.
- [11] **Zhou HM, Shen Y, Wang ZJ, Li L, Zheng YF, Häkkinen L, Haapasalo M.** In vitro cytotoxicity evaluation of a novel root repair material. *J Endod* 2013; 39: 478-483.
- [12] **Han L, Okiji T.** Uptake of calcium and silicon released from calcium silicate-based endodontic materials into root canal dentine. *Int Endod J* 2011; 44: 1081-1087.
- [13] **Haapasalo M, Parhar M, Huang X, Wei X, Lin J, Shen Y.** Clinical use of bioceramic materials. *Endod Top* 2015; 32: 97-117.
- [14] **Camilleri J.** Staining potential of neo MTA plus, MTA plus, and biodentine used for pulpotomy procedures. *J Endod* 2015; 41: 1139-1145.
- [15] **Al-Hiyasat AS, Barrieshi-Nusair KM, Al-Omari MA.** The radiographic outcomes of direct pulp-capping procedures performed by dental students. *J Am Dent Assoc* 2006; 137: 1699-1705
- [16] **Nowicka A, Lipski M, Parafiniuk M, Sporniak-Tutak K, Lichota D, Kosierkiewicz A, Kaczmarek W, Buczkowska-Radlińska J.** Response of Human Dental pulp Capped with Biodentine and Mineral Trioxide Aggregate. *JOE* 2013; 39(6) :743-747.
- [17] **Bakhtiar H.** Human pulp responses to partial pulpotomy treatment with theraCal as Compared with Biodentine and ProRoot MTA: A clinical Trial. *J Endod* 2017; 43(11) :1786-1791.
- [18] **Paladino F, et al.** Estimer l'état pulpaire. *Réalités cliniques* 2013; 24(4): 253-264.