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**Dr. Anil K Tomer**  
Professor and Head of Department,  
Department of Conservative  
Dentistry and Endodontics, Divya  
Jyoti College of Dental Sciences  
and Research, Modinagar, Uttar  
Pradesh, India

**Dr. Panna Mangat**  
Professor Department of  
Conservative Dentistry and  
Endodontics, Divya Jyoti College of  
Dental Sciences and Research,  
Modinagar, Uttar Pradesh, India

**Dr. Artika Gupta**  
Post Graduate Student,  
Department of Conservative  
Dentistry and Endodontics, Divya  
Jyoti College of Dental Sciences  
and Research, Modinagar, Uttar  
Pradesh, India

**Dr. Anila Krishna Saxena**  
Post Graduate Student,  
Department of Conservative  
Dentistry and Endodontics, Divya  
Jyoti College of Dental Sciences  
and Research, Modinagar, Uttar  
Pradesh, India

**Dr. Sushma Kumari**  
Post Graduate Student,  
Department of Conservative  
Dentistry and Endodontics Divya  
Jyoti College of Dental Sciences  
and Research Modinagar, Uttar  
Pradesh, India

**Dr. Pudu Tirupathi**  
Post Graduate Student  
Department of Conservative  
Dentistry and Endodontics Divya  
Jyoti College of Dental Sciences  
and Research Modinagar, Uttar  
Pradesh, India

#### Correspondence

**Dr. Anil K Tomer**  
Professor and Head of Department,  
Department of Conservative  
Dentistry and Endodontics, Divya  
Jyoti College of Dental Sciences  
and Research, Modinagar, Uttar  
Pradesh, India

## Periapical healing after direct pulp capping with bioactive material Biodentine: A case report

**Dr. Anil K Tomer, Dr. Panna Mangat, Dr. Artika Gupta, Dr. Anila Krishna Saxena, Dr. Sushma Kumari and Dr. Pudu Tirupathi**

#### Abstract

This case report describes the Direct pulp capping (DPC) of deep carious lesion in mandibular left first permanent molar. A 19 year old female patient reported to the department of conservative dentistry and endodontics, had sensitivity to cold beverages and mild pain on chewing. Clinical examination revealed extensive coronal caries extending to pulp. Tooth was mature and no radiographic pathological finding was found i.e absence of radiolucency in the periapical region and absence of periodontal ligament space thickening. Pulp sensitivity was confirmed by thermal pulp test and Electric pulp test (EPT). Diagnosis of reversible pulpitis was made. Treatment included caries removal under rubber dam isolation, capping of exposure site with Biodentine and sealing with permanent restoration, At 3months, 6 months and 1 year follow up tooth was functional and had normal response to cold test and did not have sensitivity to percussion.

**Keywords:** dental caries, dental pulp, biocompatible materials

#### Introduction

The exposed vital pulp which is unaffected possesses an inherent capacity for healing through cell reorganization and bridge formation when a proper biologic seal is provided and maintained against leakage of oral contaminations <sup>[1]</sup>. vital pulp therapy is the treatment initiated on an exposed pulp to repair and maintain the pulp vitality. The aim of vital pulp therapy is to treat reversible pulpal injuries in both primary and permanent teeth. Vital pulp tissue contributes to the production of secondary dentin, peritubular dentin and reparative dentin in response to biologic and pathologic stimuli. It includes Indirect Pulp Capping, Direct Pulp Capping and pulpotomies <sup>[2]</sup>.

Direct Pulp Capping (DPC) is the procedure in which a material is placed directly over the exposed pulp tissue, which help in promoting healing of pulp and generate reparative dentin. Several agents have been used for DPC; among them, calcium hydroxide (CH) and mineral trioxide aggregate (MTA) were most commonly used. Nowadays, a new calcium silicate based materials have been developed to improve some of the drawbacks of MTA and calcium hydroxide (CH). Biodentine is a calcium silicate based restorative material used for repair of perforations, resorption specification and root end fillings. It has a positive effect on vital pulp cells and stimulates tertiary dentin formation. In direct contact with vital pulp tissue, it promotes growth, proliferation and differentiation of stem cells regenerating and consequently the formation of reparative dentin. Because of its lower cytotoxicity and the higher bio-inductive ability, Biodentine may be considered as an ideal material for dentin-pulp complex regeneration <sup>[1]</sup>.

#### Case report

A 19 year old patient reported with history of sensitivity to cold and pain lasting for shorter duration of time in left mandibular region. Patient chief complaint was pain on taking cold beverages. Clinically, tooth exhibited deep dental caries. Tooth was not tender to percussion and no mobility was detected. Thermal tests (Cold test) elicited positive response. Radiographic examination demonstrated a mature tooth with deep caries extending towards pulp with no widening of the periodontal ligament space and no periapical radiolucency. Diagnosis of Reversible Pulpitis was made.

After explaining the treatment, written consent was taken from the patient.



**Fig 1:** Pre-Operative X-ray

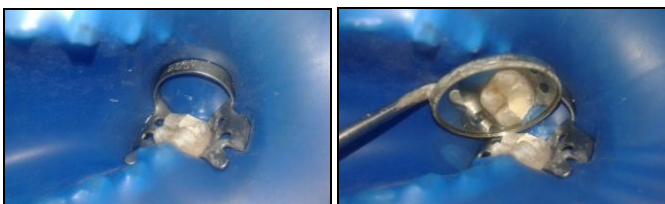
Local anaesthesia was administered and rubber dam isolation was done. Cavity preparation was initiated and carious dentin was completely excavated and tooth was cleaned. During the process, pulp cavity got exposed at one site.



**Fig 2:** Pulp exposed during caries excavation

2.5 % sodium hypochlorite (NaOCl) for 5 minutes was used for achieving the hemostasis and for cleaning and disinfecting the cavity.

After achieving the hemostasis, Biodentine was mixed according to manufacture instructions and applied over the exposed site. The entire cavity was filled with Biodentine.



**Fig 3:** Placement of Biodentine over the exposed site



**Fig 4:** After Biodentine placement

After 7 days, patient reported some increased cold and warm sensitivity of the tooth, but no other subjective symptoms. Biodentine filling was reduced and composite material was used as permanent restoration

After 3 months, symptoms reported earlier had completely

disappeared. Tooth was clinically normal and tested positive for sensitivity and negative for percussion.



**Fig 5:** After 3 months no periapical pathology found.

Follow up at 6 month tooth was clinically normal and radiographically showed no evidence of periapical pathology.



**Fig 6:** 6-month follow up x-ray



**Fig 7:** 1- year follow up

### Discussion

Schroder *et al* explained that the primary aim of a pulp capping material is to induce a specific hard tissue formation by pulp cells that seal the exposure site and maintain the pulp vitality. Direct pulp capping is used not only for accidental exposures of healthy pulps but also for pulps challenged by caries. Dammaschke showed clinically, that Biodentine is able to maintain pulp vitality after direct pulp capping. It is a calcium silicate cement that have the ability to release calcium and hydroxyl ions and form hydroxyapatite crystals on the surface.

Pradelle-Plasse *et al*. explained some advantages of Biodentine over calcium hydroxide as former is mechanically stronger, less soluble, and produces tighter seals, so it overcome the three major drawbacks of calcium hydroxide i.e. material resorption, mechanical instability and microleakage .

Shayegan, *et al*. showed that Biodentine has bioactive properties, encouraging hard tissue regeneration with no signs of moderate or severe pulp inflammation response. They also noted that the material had the ability to maintain a good

marginal integrity due to the formation of hydroxyapatite crystals at the surface, which enhances the sealing ability. Due to its superior sealing potential, it decreases the risk of micro leakage.

Laurent et al showed that, upon application on the exposed pulp, Biodentine had the potential to significantly increase TGF $\beta$ -1 secretion from pulp cells. TGF $\beta$ -1 induces differentiation of progenitor cells into odonto blast-like. These cells secrete restorative type of dentin matrix. Biodentine had the potential to stimulate angiogenesis and the formation of mineralized areas.

As compared to other materials, Biodentine handling is easy and require less time for setting.

Selecting the right pulp capping material is primordial, but some factors also play important role in the success of direct pulp capping i.e. tooth must be asymptomatic, bleeding from the exposure site must be controlled and microbial contamination should be avoided.

Bleeding from the exposed pulp for longer than 5 and up to 10 min is used as a threshold for reversible versus irreversible pulpitis classification.<sup>[2]</sup> in our study, pulp capping agent was placed only after achieving complete hemostasis with 2.5% NaOCl.

Furthermore, in a study by Koubi, *et al*, Biodentine was used as a posterior restoration and revealed favorable surface properties such as good marginal adaptation up to 6 months. For this reason, the manufacturer recommends filling the entire cavity with Biodentine in the first application and to reduce it to a base/dentin substitute level in a second visit one week to 6 months later before final restoration.

The direct pulp capping is an excellent alternative to endodontic treatment. We choose the Biodentine as capping material because of its high qualities.

## Conclusion

Biodentine is a promising product, which has the tendency to maintain the vitality of the pulp because of its bioactive and antibacterial properties. So, it might be a suitable biomaterial in direct pulp capping of permanent teeth.

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