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PREVENTIVE ENDODONTICS IN PRIMARY AND YOUNG PERMANENT TEETH USING BIODENTINE – A CASE SERIES

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Abstract:

Pulpitis often requires endodontic treatment, but options like pulpotomy with calcium-silicate cements offer promising alternatives. In a 9-year-old with irreversible pulpitis in a mandibular molar, complete coronal pulpotomy with Biodentine were applied. After 6 months of follow-up, the patient remained symptom-free, with no signs of inflammation or infection in the treated tooth. Another case of pulpotomy done in young permanent anterior teeth with 12 month follow up which showed progressive root development and another case of primary teeth is also illustrated in this case series which describes the clinical effectiveness of Biodenine in vital pulp procedures.
Keywords: Biodentine , Pulpotomy , Calcium-Silicate cement , Preventive Endodontics

INTRODUCTION

Preserving pulp vitality is crucial for tooth survival. Preventive Endodontics aims to protect pulp, avoiding endodontic treatment. It includes crown, pulp, and root protection. Crown protection involves fluoridation, diet control, and prophylaxis. Pulp protection uses liners during cavity prep. Pulp conservation includes pulp capping or pulpotomy. Root conservation involves root canal treatment to prevent tooth loss.

In order to preserve the vitality of the teeth and maturogenesis in young permanent teeth, the restorative material should exhibit the properties of biocompatibility, vascularisation and the property of regeneration.(1) Calcium hydroxide was the initial choice for pulp capping. Odontoblasts form a dentinal bridge in about 3 months with mild inflammation in response to calcium hydroxide. (2) However, calcium hydroxide exhibited partial dissolution, resulting in tunnels within the dentinal bridge, leading to microleakage and the risk of internal resorption. Undifferentiated mesenchymal cells present could differentiate into odontoclasts, contributing to treatment failure.(3) Mineral Trioxide Aggregate (MTA) emerged in the 1990s as an alternative to Calcium hydroxide for pulp capping and root end filling. Comprised of tricalcium silicate and dicalcium silicate, MTA prompts the formation of a reparative dentin complex within 2 months when used for pulp capping, without inducing pulp inflammation.(4) To overcome these drawbacks, researchers have come up with a newer material named Biodentine which is biomimetic for dentin with a compressive strength of 300 MPa which is equal to the dentin.(5) MTA serves in direct pulp capping, root end filling, and dentin replacement. Biodentine, similar but with advantages like shorter setting time and strong adhesion, helps prevent microleakage. (5)

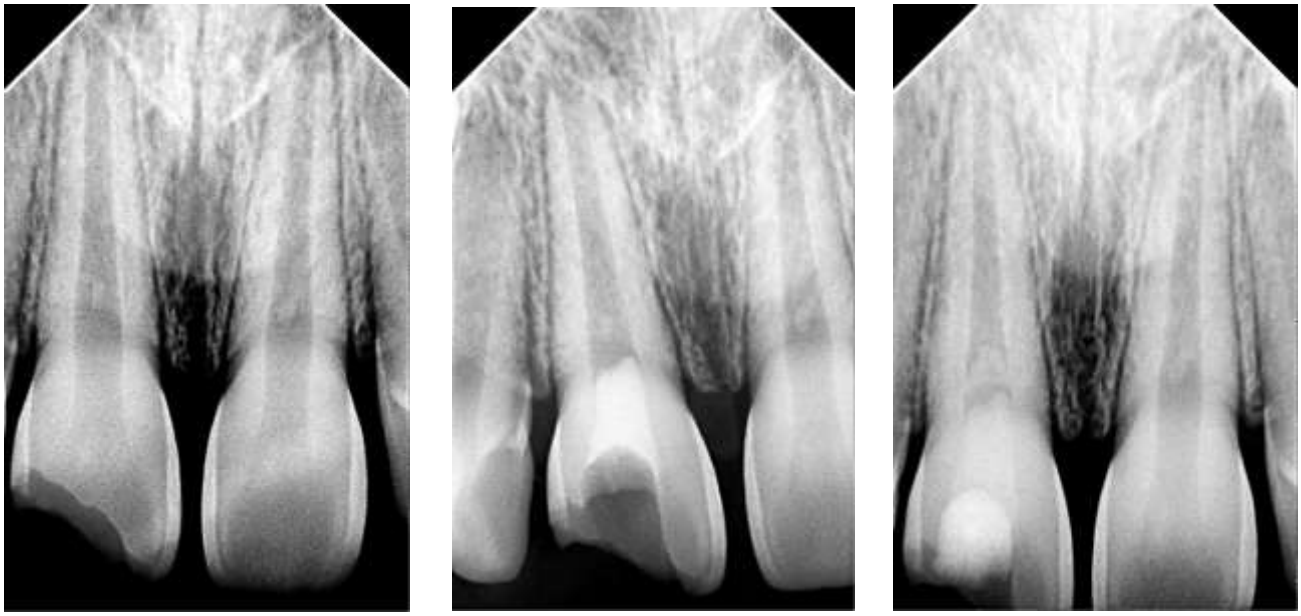
Case report

A 9-year-old female patient presented with a chief complaint of broken front teeth three days prior. Clinical examination revealed an Ellis class II fracture in tooth 11, with a history of sensitivity to hot and cold foods. No extraoral swelling or sinus discharge was observed. Electric pulp testing showed a late response in tooth 11 compared to the contralateral healthy tooth 21. Radiographically, there was radiolucency involving enamel, dentin, and approximating pulp, with normal lamina dura and periodontal ligament space and no periapical radiolucency. Reversible pulpitis was diagnosed in the involved tooth.

Rubber dam isolation was performed, and using a spoon excavator, dentin was removed, revealing a pinpoint exposure. Bleeding could not be controlled initially, necessitating anesthesia with 2% lignocaine with 1:200,000 adrenaline. An access cavity was prepared, and a partial pulpotomy was planned. As bleeding persisted after coronal pulp exposure, the tissue was completely excavated using a sharp spoon excavator. The pulp chamber was irrigated with sterile normal saline, and bleeding was arrested with a saline-soaked cotton pellet for 5 minutes. A 3 mm layer of freshly mixed Biodentine was placed in the pulp chamber, followed by a permanent restoration.

The patient was recalled after 24 hours for evaluation of post-operative pain and swelling, after 5 days esthetic composite restoration was done, regular follow up were carried out for 3, 6-month interval to examine any pain, tender on percussion, radiographic examination was done to check any peri apical radiolucency or any kind of internal or external root resorption.

At three and 12 month follow up (Figure I) the teeth showed absence of any periapical radiolucency. The root maturation was seen in the 12th month follow up radiograph, the tooth was fully functional and the patient was symptomatic.

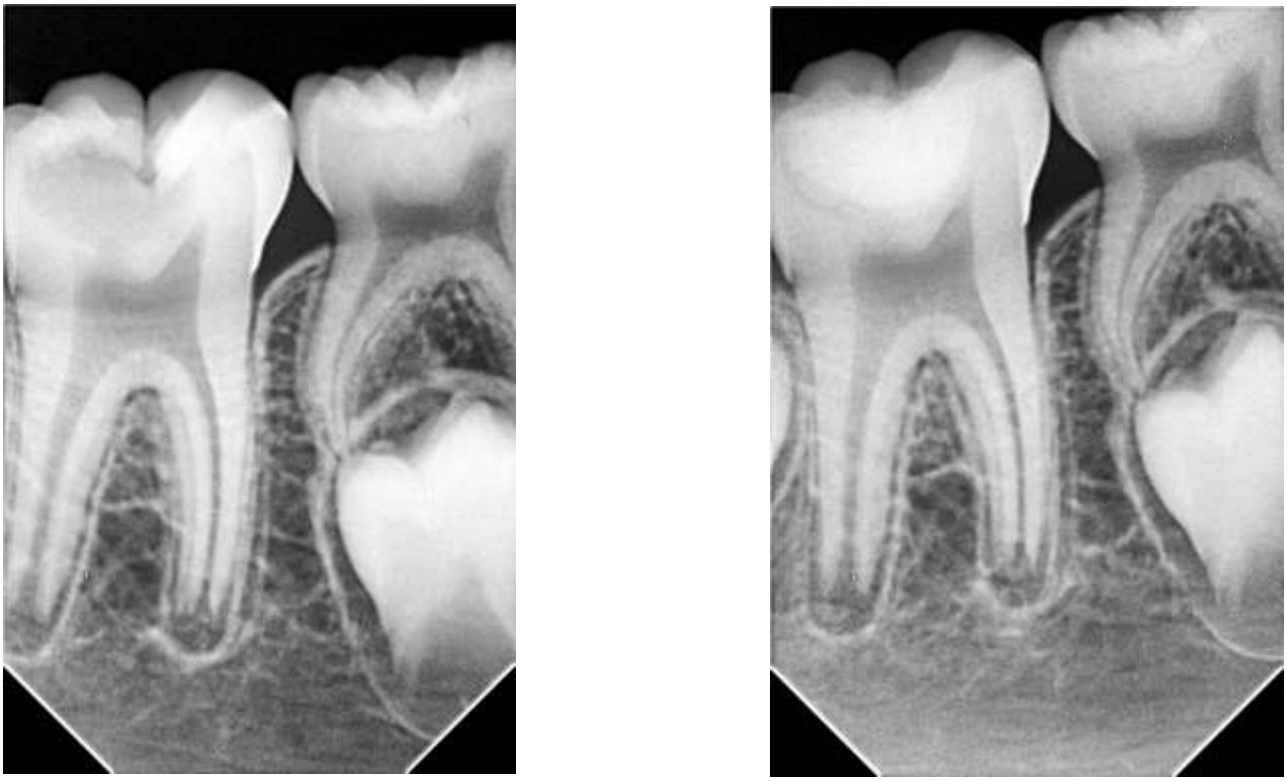


(Figure *Ia: Pre Op Radiograph , Ib – 3 month follow up , Ic – 12th month follow up showing calcific barrier beneth the biodentine and root end closure in the apical 1/3rd of the root.*)

A 8 year old female patient came to the department of Pediatric and preventive dentistry with the chief complaint of pain in her lower back tooth region for the past 5 days. On examination

patient had dental caries in relation to 46. There was no history of swelling or sinus discharge, the pain was aggravated during mastication and relieved during rest. Radiographic examination revealed radiolucency involving enamel, dentine and approximating pulp in relation to 46. After complete clinical and radiographic examination a diagnosis of reversible pulpitis was confirmed. (Figure II)

Local anaesthesia 2 % lignocaine with 1:800000 adrenaline was administered, rubber dam isolation was done, and the carious lesion was removed with the help of high speed airouter handpiece with water as coolant. Once the hard caries was removed a sharp spoon excavator was used to excavate the infected dentine, while removing the infected dentine a pin point exposure of pulp was evident, bleeding of pin point pulp exposure was controlled with the help of moist cotton pellet dipped in normal saline. After the bleeding got arrested the exposed pulp was capped with freshly prepared biodentine for 2mm, then the cavity was restored with type IX GIC.

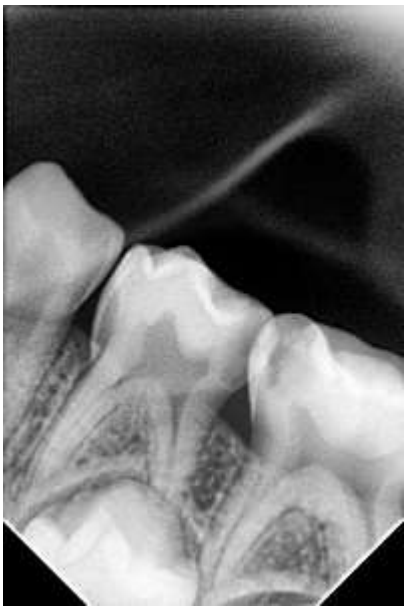


(Figure IIa – Pre op Radiograph IIb-Post operative Radiograph after Biodentine placement)

A 8 year old male patient came to the department of Pediatric and preventive dentistry with the chief complaint of pain in his lower back tooth region for the past 5 days. On examination patient had dental caries in relation to 74. There was no history of swelling or sinus

discharge, the pain was aggravated during mastication and relieved during rest. Radiographic examination revealed radiolucency involving enamel, dentine and approximating pulp in relation to 74. After complete clinical and radiographic examination, a diagnosis of reversible pulpitis was confirmed.

Local anaesthesia 2 % lignocaine with 1:800000 adrenaline was administered, rubber dam isolation was done, and the carious lesion was removed with the help of high speed airouter handpiece with water as coolant. Spoon excavator was used to remove the entire coronal pulp and the pulp was filxed with 3.25% Sodium Hypochloride for 30 seconds , the bleeding was completely arrested , and the radicular pulp was sealed with biodentine for 2mm and entrance filling was done with type IX GIC.(Image III)



(Figure IIIa- Pre-Op Radiograph IIIb- 3rd month follow up after biodentine placement ,3c- 12th month follow up)

Discussion:

In recent times, Biodentine, a material primarily composed of calcium silicate, has gained widespread recognition and found application in various therapeutic procedures, such as addressing root perforations, performing apexification, managing resorptions, conducting retrograde fillings, employing pulp capping techniques, and serving as a substitute for dentin. Biodentine undergoes hardening via hydration. Mixing its powder and liquid components for 30 seconds produces a creamy paste. The powder reacts with the liquid, forming a silicate hydrate gel and producing calcium hydroxide (CH) as a byproduct. CH breaks down into

hydroxyl ions (OH-) and calcium ions (Ca+2), elevating pH levels and Ca+2 concentrations.(6)

In Case 1, following trauma three days prior, the inflamed pulp is removed and capped with Biodentine. Subsequent radiographs reveal clear dentinal bridge formation beneath the Biodentine. Reparative dentine is thought to form at a cellular level through differentiation from undifferentiated mesenchymal cells, leading to the creation of new odontoblast-like cells.(7)

Other theories suggested that other cells such as fibroblasts may differentiate to produce the mineralized tissue. Ricucci et al. noted that in direct pulp capping of carious pulp exposures, the defects were repaired by the deposition of an amorphous dystrophic calcified tissue that closely resembled pulp stones rather than dentine.(8)

In Case 2, dental caries caused pain, leading to pulp exposure. Clinical signs like pulp appearance, bleeding color, and hemorrhage control indicated pulp vitality. The pulp seemed vital with resilient texture, bright red bleeding, and rapid hemorrhage control post-amputation, suggesting healthy pulp suitable for preservation. However, there is no consensus regarding the specific time required to control bleeding. On the other hand, Mutluay et al. (9) suggested that the evaluation of pulpal bleeding is subjective and may not reflect the actual pulpal status. Methods aiding in correct diagnosis of the pulp status should be further studied.

Moreover, there is still controversy regarding the type of irrigating solution and haemostatic agent most suitable for vital pulp therapy. NaOCl has been one of the most commonly used disinfectants for root canal treatment for many years; consequently, clinicians have arbitrarily adopted the use of NaOCl for vital pulp therapy. NaOCl readily controls bleeding, while at the same time disinfects the cavity.(4)

In case 3 involving primary teeth with reversible pulpitis, laser pulpotomy with Biodentine as a pulp medicament was employed. Laser was used for disinfection and achieving hemostasis. Biodentine's suitability relies on proper case selection, stringent antiseptic standards, effective isolation under rubber dam, its high sealant capacity and mechanical properties, and adequate marginal seal with adhesive resin composite for immediate tooth restoration. However, careful case selection is crucial as not all teeth are suitable for pulpotomy. Intense bleeding post-exposure may indicate a pulp tissue in a moderate to severe inflammatory stage, rendering pulpotomy unsuitable, as per some authors.(10)

Conclusion:

In conclusion, Biodentine™ might be a suitable biomaterial in preventive endodontics to preserve the vitality of the teeth. However, further clinical studies with longer follow-up periods and larger sample sizes are recommended for further evaluation and assessment.

Acknowledgement:

Nil

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