

Direct pulp capping in immature permanent teeth

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Introduction

Direct pulp capping (DPC) is a procedure that is usually performed on children or young persons with permanent teeth that have open apices and are showing dental lesions close to the pulp tissue. This loss of dental structure can be caused by deep caries, trauma or mineralization defects in the tooth structure.

In these cases, the patient may notice some degree of discomfort to stimuli (primarily the cold or sugary foods), although not showing any signs of spontaneous sensitivity. X-rays usually show lesions close to the pulp without indications of pulpal degeneration, so there is likely to be pulpal exposure if the decayed tissue is completely removed during the operation.

The purpose of direct pulp capping is to stimulate reparative dentin formation which maintains the vitality of the pulp and, as a result, allowing the apex to continue developing. This is achieved by removing any microorganisms

present and ensuring the lesion is properly sealed using a material that is well-tolerated by the dental pulp.

Throughout history, different materials and techniques have been used for direct pulp capping in immature permanent teeth.

Traditionally, calcium hydroxide has been used as a material for pulp capping, due to its effective antibacterial properties. However, there are some long-term disadvantages due to its high solubility and inability to adhere to dentin. Subsequently, etching techniques have been used on the pulp for dentin bonding and sealing it with a permanent filling material, but several studies have shown poor biocompatibility of these resin-based materials with the pulp. (1,2)

The arrival of new bioactive materials has led to an increased success in direct pulp capping. Among them, MTA® and Biodentine™ are well-

known options. MTA has been used since 2000 due to its biocompatibility with the pulp and its insolubility, with numerous studies showing higher percentages of long-term success when using this material than when calcium hydroxide was used. (3)

Biodentine™ was introduced in 2010 and has very similar physical and biological properties to dentin, as it is a biocompatible and bioactive material that induces pulp repair. It has simpler handling properties to MTA, such as a shorter

setting time (12 minutes), and it does not cause dental discoloration because it does not contain bismuth oxide. (4-6)

Currently, there are numerous clinical studies on the effectiveness of Biodentine as a direct pulp-capping material. (7-11)

In our clinical practice, the direct pulp capping procedure consisted of caries removal up to the pulpal chamber, filling in the cavity with Biodentine™ and sealing it with, in our case, a composite resin.

Clinical case report

An 8-year-3-month-old patient visits our surgery for the first time. The clinical examination showed a deep caries lesion in molar 3.6. with clinical signs of reversible pulpitis.

The periapical X-ray confirms the proximity of the lesion to the pulp and the teeth with open apices. The proposed treatment plan was to remove the caries (with a high risk of pulpal exposure) and to protect the remaining healthy pulp for the apical closure to progress naturally. The clinical procedure was as follows:

1. Clinical and X-ray diagnosis. (Fig 1)
2. Local anesthesia is administered, and the tooth is isolated with a rubber dam.
3. The caries lesion is initially cleaned using a high-speed rotary instrument (Komet® 0.10 mm round diamond bur) and then complete caries removal is performed using a slow-speed rotary instrument (Komet® 0.10 mm round tungsten-carbide bur). (Fig. 2)
4. The cavity and the area where the pulp is exposed are cleaned for one minute using a cotton ball moistened with 5% sodium hypochlorite, checking there is no bleeding where the pulp tissue is exposed. (Fig. 3)
5. Biodentine™ is applied to the cavity close to

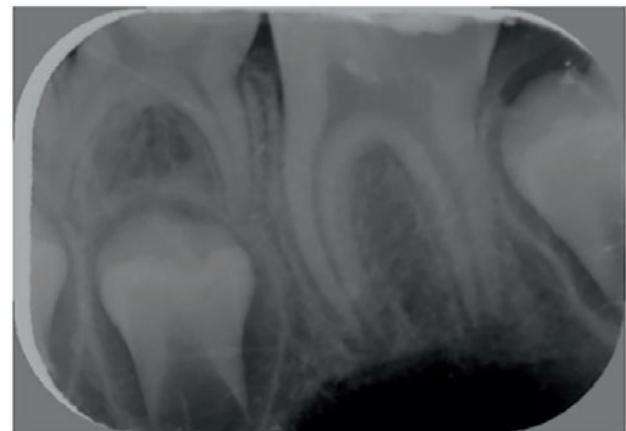


Fig. 1: Pre-operative X-ray showing the radiolucent image indicating caries near the pulp in tooth 3.6 with open apices.



Fig. 2: Clinical view after the caries removal.



Fig. 3: The cavity and exposed pulpal cavity is disinfected using a cotton ball with 5% sodium hypochlorite.



Fig. 4: Appearance after the application of Biodentine™.



Fig. 5: 37% orthophosphoric acid applied to the enamel.



Fig. 6: Cavity filled with a hybrid resin composite.

the pulpal exposure using a plastic instrument according to the manufacturer's instructions. (*Fig. 4*)

6. 12 minutes after mixing the Biodentine™, following the manufacturer's instructions, the etch-and-rinse procedure is carried out using an enamel etchant (Scotchbond™ Etchant 3M™ ESPE™) which is then washed and dried, before an adhesive (Scotchbond™ Universal) is applied, then cured and sealed with a hybrid composite (Filtek Supreme XTE 3M™ ESPE™) using a layering technique. (*Figs. 5 and 6*)
7. The rubber dam is removed, and the bite is checked, and a post-operative X-ray is performed. (*Figs. 7 and 8*)

It is important to inform the patient that they need to return for follow-up appointments to check the apical closure and assess the pulp vitality. If these follow-up appointments, vitality tests and X-rays are not carried out, failure of the treatment due to a pupal necrosis following the treatment could go unnoticed. (*Figs. 9 and 10*)



Fig. 7: Clinical view after the rubber dam is removed.

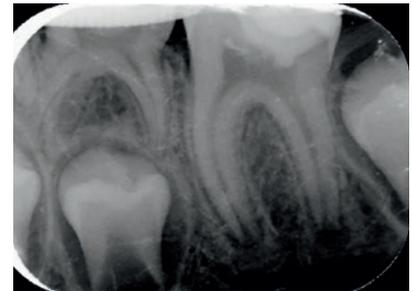


Fig. 8: Post-operative X-ray.



Fig. 9: X-ray at 18-month follow-up appointment showing dentin bridge formation underneath the Biodentine™, as well as apical closure.



Fig. 10: X-ray at 30-month follow-up appointment showing the positive progression of the treatment.

Conclusion

In this clinical case study, the clinical and radiographic findings reveal that Biodentine™ exhibits good clinical and radiographic behavior in direct pulp capping treatment in immature permanent teeth.