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Chapter 3: An Expert's Protocol for Using Biodentine™ to Manage Cracked Teeth With Severe Pulpitis

*In **Chapter 2: An Expert's Protocol for Using Biodentine™ to Manage Cracked Teeth With Moderate Pulpitis**, Dr Paul Renner shared how he successfully restores cracked teeth with Biodentine™ in cases of moderate pulpal inflammation. In the final instalment of this three-part series, he talks us through how he manages cracked teeth with more severe pulpitis and why Biodentine™ remains his material of choice.*

Why I chose Biodentine™ for this protocol

In Chapter 2, I discussed how the pulp healing qualities of Biodentine™ could help avert the need for pulp exposure in cracked teeth with moderate pulpitis. In cases of severe pulpitis, where pulp exposure is required and the material will be in direct contact with the pulp, these qualities are absolutely vital.

In addition to stimulating the pulp's own healing abilities, Biodentine™ is highly biocompatible with the pulp tissue.[1,2] It's made using proprietary Active Biosilicate Technology™ to guarantee high purity, unlike other calcium silicates that can contain traces of heavy metals, and so it produces no cytotoxic, mutagenic, sensitising, or irritant effects on the exposed pulp.[1-3]

I also favour Biodentine™ in cracked teeth with severe pulpitis because it is imperative that the tooth is strengthened and stabilised to prevent further progression of the crack and even tooth fracture. With its superior microhardness and compressive strength, Biodentine is able to protect the tooth against occlusal forces during the healing stage and beyond.[1,4]

Finally, it can be necessary to place a temporary restoration and provisional crown for up to 24 weeks while monitoring the health of the pulp. Because Biodentine™ can be left in place as a temporary enamel restoration for up to six months, it gives me ample time to assess the pulp response and decide on a definitive course of action.

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* Disclaimer: The clinical cases and all clinical information expressed in this content are solely those of the healthcare professional. The healthcare professional is solely responsible for the scientific and medical positions presented.

The step-by-step protocol for a crack causing severe pulpitis requiring pulp exposure

1. First, assess the vitality of the tooth, explain the proposed treatment and possible complications, and gain informed consent.
2. Anaesthetise and isolate the tooth using a rubber dental dam to maintain a dry, surgically clean field.
3. Identify the crack. This will require removal of any existing restoration.
4. Expose the pulp, amputate the coronal portion, and assess the health of the radicular pulp. The bleeding will have stopped within five minutes (haemostasis) and radicular pulp will appear to be healthy. It is important to perform a full pulpotomy to assess the extent of the crack, especially to determine if it travels across the floor of the pulp chamber as this can indicate a poor long-term prognosis for the tooth.
5. Fill the entire cavity with Biodentine™ using the Bio-Bulk Fill technique. Ensure the tooth is out of occlusion.
6. Review symptoms after 4-6 weeks. If asymptomatic, prepare the tooth for a crown, construct a provisional crown and cement it with a permanent cement. *If the tooth is symptomatic, proceed to pulp extirpation and RCT, using either a provisional crown or stainless steel band as an interim restoration.*
7. Review again in 16-24 weeks. If still asymptomatic, remove the provisional crown, refine the preparation and record an impression to construct a permanent crown. Construct a new provisional crown and cement with provisional cement.
8. Place the final crown.

The protocol in action: A case study

A regular 68-year-old female patient presented in December 2023 for her annual examination and mentioned that she was having occasional sensitivity in the upper right posterior region. The pain was sharp and was usually associated with cold or biting on hard food, but stopped when the stimulus was removed.

A bite-wing radiograph revealed no recurrent caries (Fig. 1). Tooth #16 reacted strongly to cold and was positive to a bite test. Tooth #16 was restored with a large MOD amalgam

in 2001 with no note of a crack recorded then. The patient had a history of cracked cusps and cracked teeth in the past, with #36, #37 and #46 restored with full-coverage indirect restorations previously, and #14 was root-filled and restored with an indirect restoration due to a crack in the unrestored tooth.

Fig. 1: Preoperative bite-wing.

A provisional diagnosis of a cracked tooth/cusp in #16 was recorded and an appointment made to remove the amalgam and investigate the tooth.

In January, the amalgam restoration was removed and cracks were noted running from the distal under the buccal cusps and exiting on the mesial, and running from the disto-lingual toward the centre of the tooth. The buccal cusps were reduced in height and the tooth was restored with direct composite resin overlaying the buccal cusps. The patient was advised that if the tooth remained sensitive, it would be necessary to restore it with an indirect full-coverage restoration.

The patient returned 12 weeks later reporting that the tooth had been sore for several weeks after the restoration, but the pain resolved. Recently, however, the tooth had become painful in response to hot and cold and the pain would remain for some minutes after the stimulus was removed. The tooth was also sore to bite on at times. #16 reacted very strongly to a cold test and was more tender to percussion than the surrounding teeth. A periapical radiograph revealed no periapical radiolucency (Fig. 2).

Fig. 2: Periapical radiograph on return after 12 weeks.

A diagnosis of moderate to severe pulpitis was made and the patient agreed to either pulpotomy or RCT and restoring the tooth with a full coverage indirect restoration. #16 was anaesthetised and isolated. The pulp chamber was accessed occlusally. When the pulp was exposed, profuse bleeding was encountered (Fig. 3).

Fig. 3: Initial exposure.

All the coronal pulp tissue was removed and the floor of the pulp chamber examined. No cracks could be seen and the pulp at the entrance to the canals stopped bleeding quickly and appeared healthy (Fig. 4). The pulp chamber and access cavity were completely filled with Biodentine™ using the Bio-Bulk Fill technique*.

Fig. 4: View of the pulp floor.

After eight weeks, the patient returned for review (Fig. 5). #16 had been symptom-free and a radiograph appeared normal. At this visit, #16 was prepared for a zirconia crown (Fig. 6). No impression was recorded at this visit and a bis-acrylic provisional crown was constructed and cemented with RelyX Unicem (Fig. 7).

Fig. 5: Eight-week review.

Fig. 6: Crown preparation before PVS impression.

Fig. 7: Final restoration after dam removal.

The patient returned after 16 weeks reporting that #16 had been symptom-free. The provisional crown was cut off and the preparation refined. A PVS impression was recorded and sent to the laboratory for construction of a monolithic zirconia crown. A new bis-acrylic provisional crown was cemented with provisional cement. Three weeks later, the zirconia crown was cemented using Fuji Plus.

The crown was reviewed at the patient's annual examination and was symptom-free. A periapical radiograph showed no periapical changes (Fig. 8).

Fig. 8: Review radiograph.

* Fill the entire cavity with only Biodentine™ from the pulp to the tooth surface. Final enamel restoration to be performed in the same session or in the second session which can be performed between 2 weeks and 6 months later.

References

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