

Biodentine™ as direct pulp capping material in teeth with mature apices.

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Introduction

Awareness of the importance of preserving the vitality of the pulpo-dentinal complex has resulted in conservative management of pulpal pathologies becoming more and more popular over time; this is due in part to current advances in regard to protocols and appropriate materials for vital pulp therapy procedures, and the economic factors that influence decision-making in many countries and lead many patients to opt for premature tooth extraction because of the costs involved in root canal treatment and subsequent restoration (1, 2).

Pulp tissue may become exposed to the oral environment, whether due to dental caries, or mechanically as a result of restorative or prosthetic procedures. One treatment option for pulp exposure is the application of conservative vital pulp therapy procedures, which may include direct pulp capping, indirect pulp capping if the tissue is not fully exposed, and partial or total pulpotomy; this permits the preservation of the vitality of the tooth, its

nociceptive functions, and the defense system of the body itself. Thanks to the abovementioned items, among others, it has been shown that longer survival time is achieved in teeth without root canal treatment when compared with endodontically treated teeth (1, 3-5).

Included amongst the materials used to perform pulp therapy procedures are bio-ceramic cements; these biocompatible materials are divided into three basic groups: 1. High strength bio-inert cements; 2. Bioactive cements, which form chemical bonds with mineralized tissue; and 3. Biodegradable materials that participate actively in the body's metabolic processes (6). Multiple bioceramic materials are currently available on the market; the most well known of these materials are MTA and Biodentine™, both of which belong to the bioactive cements group. Biodentine™ is a dentin substitute and dentinogenesis promoter with the following properties: alkaline pH, biocompatibility, antibacterial action, release

of calcium and hydroxyl ions, radiodensity similar to dentin, setting time of approximately 12 minutes, insolubility, outstanding sealing properties, and causes no tooth discoloration (7-11); this last property makes it the material of choice when treatments need to be performed involving the coronal and cervical areas whether of anterior or posterior teeth.

At the dental undergraduate clinics of the Faculty of Dentistry of the Mariano Gálvez University of Guatemala and at the Argueta-Orellana private dental clinic, 20 direct pulp-capping procedures were performed on teeth with mature apices clinically diagnosed with reversible pulpitis and with no history of spontaneous pain; all pulp exposures were performed mechanically via the removal of caries (*Fig. 1*) in patients between 16 and 45 years of age. All procedures were performed by the same operator (an endodontist with over eight years' clinical experience), following the same protocol in each case. Clinical and radiographic examinations were performed on each of the patients at 3, 6 and 12 months post-treatment; after 12 months' monitoring, a high percentage of the cases presented radiographic evidence of dentin bridge formation (*Fig. 2*). Below we present a clinical case intended to show the pulp-capping protocol applied for all patients.



Fig. 1

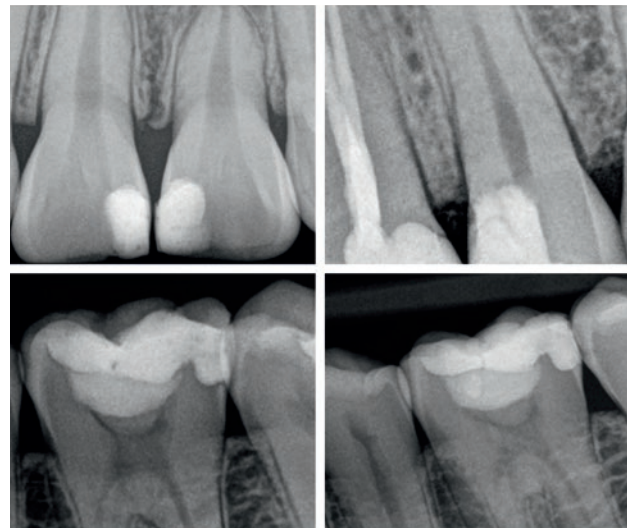


Fig. 2

Clinical case

Patient, 22 years of age, visits the dental clinic presenting short-duration elicited pain in tooth no. 19 (*Fig. 3 and 4*); having established a diagnosis of reversible pulpitis, we proceeded to caries removal under absolute isolation (*Fig. 5*) producing a slight pulpal exposure with no hemorrhaging; this type of exposure may go unnoticed if a correct assessment of the preparation floor is not performed with an endodontic explorer (*Fig. 6*). In the cases where hemorrhage did occur, it was stopped by the application of sustained pressure for 10 seconds with a cotton swab moistened with sterile saline solution; in this particular case

this step did not need to be performed, so the cavity was disinfected with sodium hypochlorite 2.5%, and Biodentine™ was placed to serve as a direct pulp-capping material (*Fig. 7*) using the "MAP System" dental materials micro-aplicator. Approximately 75% of the cavity was filled with Biodentine™ (*Fig. 8*); Cavit-G was then placed over this to serve as a provisional restorative material, and seven days after the procedure the patient was evaluated to confirm that he was completely asymptomatic and that the tooth was responding normally to sensitivity tests so that we could proceed to final restoration (*Fig. 9 and 10*).

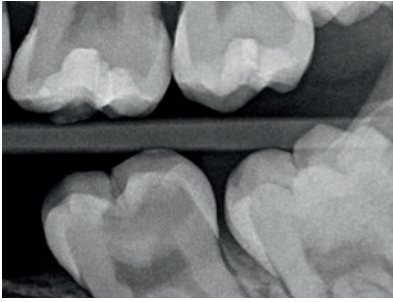


Fig. 3



Fig. 4

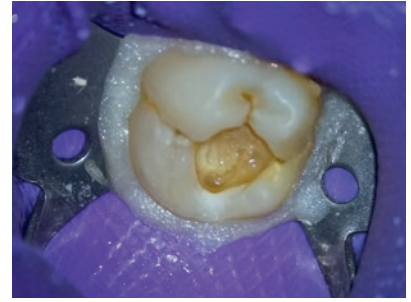


Fig. 5

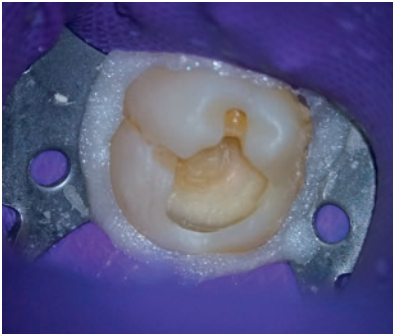


Fig. 6

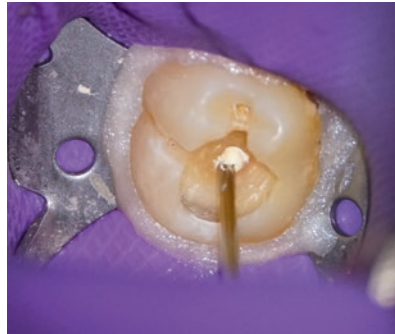


Fig. 7

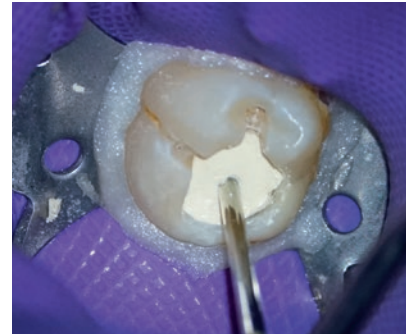


Fig. 8



Fig. 9

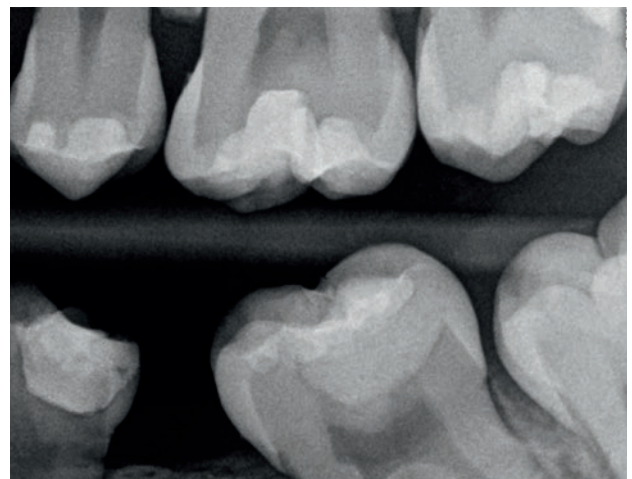


Fig. 10

Follow-up

All patients were re-evaluated at 3, 6 and 12 months after their pulp-capping appointment. In clinical situations such as this, we hope to see radiographic evidence of mineralized tissue formation under the cap between six and nine months post-procedure (12).

All 20 cases were re-examined at 12 months of follow-up, and in all cases the response to

the sensitivity tests was normal; all teeth went on to final restoration in acceptable conditions, and in 14 of the 20 cases (70%) it was possible to clearly observe radiographic evidence of mineralized tissue formation under the pulp capping material; a supplementary examination is planned at 24 months post-procedure for all these cases.

Discussion

From an entirely optimistic perspective, the ultimate goal of any dentist when performing restorative and/or endodontic procedures should be the maintenance of the pulp vitality and functionality of the tooth, with no discomfort for the patient (13).

Obtaining an adequate diagnosis is key to the success of conservative pulpal therapy; an ideal case is one where we have a diagnosis of reversible pulpitis with no history of spontaneous or long-lasting dental pain(14), as it is generally accepted that a history of spontaneous or nocturnal pain is associated with the presence of an irreversible pulp inflammation process(15, 16). In these cases, the success of direct pulp capping may be questionable (17), although some studies have shown that even in

these types of situations vital pulp therapy may achieve a successful outcome (1, 18-20).

In regard to the long-term success of conservative pulp procedures, it is extremely important that the tooth be provided with a definitive final restoration that guarantees an adequate marginal seal, since this last factor, in conjunction with the absence of bacterial contamination during the procedure, is among the most important factors to be taken into consideration in view of preventing subsequent pulp inflammation (21, 22). The reported success rate for vital pulp therapy procedures using bioactive cements is greater than 80% in examinations at up to 10 years (23); this is a very high percentage for a dental procedure in such operational time frames.

Conclusion

Based on the clinical results obtained in the present series of cases and taking into consideration the limitations inherent in the study, we can conclude that direct pulp capping

with Biodentine™ teeth presenting reversible pulpitis is highly effective for the maintenance of pulp vitality.



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