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LETTER TO THE EDITOR
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Minimally invasive conservative dentistry using Biodentine

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Dear editor:

Preserving the vitality of the dental pulp is essential to ensure the long-term survival of dental organs. The goal of preservation is to promote the formation of tertiary dentin so that the tooth continues to function as a complete unit (1). Over the years, dental manufacturers have developed materials designed to maintain the function and vitality of teeth. Calcium hydroxide and mineral trioxide aggregate (MTA) were long considered the materials of choice for pulp preservation; however, certain disadvantages —such as adhesion problems during setting time, the difficult handling of the dentinal surface, material resorption, price, among others— led to the search for new materials offering ideal properties to protect the integrity of dental tissues (2). In this context, in 2010, the Septodont company introduced a new biomaterial known as Biodentine.

Biodentine is a dental biomaterial that acts as a dentin substitute (2). It is mainly composed of highly purified tricalcium silicate, zirconium oxide (a radiopacifier), calcium carbonate (a filler), calcium chloride (a setting accelerator), a water-reducing hydrosoluble polymer, and water (3). This material has demonstrated good biocompatibility, sealing capacity, and marginal adaptation through micromechanical adhesion that allows it to bond to the underlying dentin. Moreover, it has compressive strength (100 MPa) similar to that of dentin, as well as adequate microhardness (51 VHN), solubility, radiopacity, low microleakage, and antibacterial and antifungal effects (2, 4).

In the literature, various clinical applications of Biodentine have been reported, including direct pulp capping, in which a protective dressing is applied directly over the exposed pulp to maintain its vitality through tertiary dentin formation (1). Laurent et al. (5) demonstrated that this material promotes the formation of osteodentin mineralization foci by modulating TGF-β1 secretion by pulp cells. Thus, together with its sealing capacity, it increases the success of pulp capping by preventing bacterial microleakage, creating a microenvironment conducive to reparative dentin formation (2). Biodentine is applied directly onto dentin without prior etching or bonding, as it adheres through the physical growth of calcium silicate crystals within

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the dentinal tubules, forming an interface that enables the formation of an apatite layer, which provides an ideal substrate for the colonization of stem cells and odontoblasts supporting new tissue generation (6).

In cases of pulp exposure in permanent teeth with immature roots, according to the study by Katge & Patil (7), which evaluated the clinical performance of Biodentine and MTA in direct pulp capping of permanent molars in patients aged 7-9 years over one year of follow-up, both materials achieved a 100% success rate based on clinical and radiographic parameters. Likewise, high success rates have been reported for the use of Biodentine as a capping material in vital permanent teeth with mature roots. Linu et al. (8), in an 18-month follow-up period, reported success rates of 84.6% for MTA and 92.3% for Biodentine. According to the radiographic findings of that study, visible dentin bridge formation was observed in 69.2% and 61.5% of cases treated with MTA and Biodentine, respectively.

To ensure the clinical success of pulp capping, a definitive restoration must be properly fabricated that establishes proper adhesion between the restorative material and the tooth, as well as between the restorative and capping materials. Biodentine markedly reduces microleakage at the tooth-restoration interface by optimizing secondary barriers beneath the surface seal (1). Additionally, this material has a relatively short setting time (approximately 12 minutes), allowing for the placement of composite resin increments shortly afterward. However, the quality of adhesive bonding between both materials determines the long-term success of the restoration. The use of both etch-and-rinse and self-etch adhesives in combination with Biodentine has been reported, although it remains uncertain which performs better. In the study cited by Meraji & Camilleri (9), which analyzed the clinical performance of a two-step etch-and-rinse adhesive (ExciTE® F, Ivoclar®, Schaan, Liechtenstein) and a one-step self-etch adhesive (AdheSE® One F, Ivoclar®, Schaan, Liechtenstein) combined with Biodentine, scanning electron microscopy and elemental mapping showed slightly better performance for the former, as both materials remained compacted together, whereas the self-etch adhesive showed separation at the Biodentine/adhesive interface.

Other clinical applications of Biodentine are related to pulpotomies, for which encouraging success rates have been reported. Bakhtiar et al. (10) compared the clinical performance of Biodentine, MTA, and TheraCal in partial pulpotomies, observing painful symptoms during the first week in patients treated with TheraCal—associated with an inflammatory response to resin components (11)—whereas those treated with Biodentine and MTA experienced no pain or sensitivity to cold, heat, or touch. Moreover, complete dentin bridge formation was observed in teeth treated with Biodentine; in addition, Biodentine has been reported for use in cases of resorption defects, vertical root fractures, pulp space obturation, periapical lesions, apexification, class II restorations, furcation lesions, dental reimplantation, and pulp necrosis (2).

It is concluded that Biodentine is a promising biomaterial in the field of conservative and minimally invasive dentistry, as its physical, chemical, and biocompatibility properties allow it to be bioactive with dental tissues. Reported studies indicate that it is a first-choice material compared with others such as MTA and TheraCal for pulp capping and partial pulpotomy procedures; however, further long-term studies are needed to assess its use in regenerative endodontic procedures.

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