Bioceramic cement in the treatment of Molar Incisor Hypomineralization (MIH) in paediatric dentistry: A case report

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Introduction

Molar Incisor Hypomineralization (MIH) has become one of the most pressing issues in pediatric dentistry. MIH is a qualitative defect of unknown etiology in enamel development, presenting as demarcated opacities of variable extent and severity (Fig. 1, Tooth #8).[1] In 2003, the European Academy of Paediatric Dentistry defined MIH as a systemic condition and qualitative enamel defect of systemic origin that affects at least one first permanent molar (Fig. 2-3), which can also be associated with permanent incisors.[1] However, recent studies have shown it can affect second permanent molars, permanent canines, bicuspids, and second primary molars.[1,2,3,4,5] Hypomineralized second primary molars (HSPMs) can be considered a predictor for MIH in permanent teeth.[4]

Prevalence and distribution

MIH is considered a worldwide clinical problem with a global prevalence of 14.2%, ranging from 0.5% to 40.2%.(6) Worldwide, 25% of children have MIH.[2] Lopes has shown that MIH has, in general, a prevalence of 13.5%; 36.3% of MIH teeth are moderately to severely affected; and MIH is present in 3.6% of second primary molars.[7]

Distribution of MIH was seen more in males at age nine years old, with molars affected more than incisors. The mandible was affected more than the maxilla and the right side was affected more than the left side.[8]

Etiology

Though the etiology of MIH is still not fully understood, a combination of several factors which create MIH enamel formation seem to occur at the maturation stage of enamel formation. The mineralization of the first permanent molars usually starts just before or at birth and is fully completed at four to five years of age.[9]

Acute and chronic childhood illness, certain adverse birth events, and conditions during the neonatal period were weakly associated with MIH, while dioxins showed a moderate level of association.[10] Additionally, there may be a link between the use of antibiotics, as well as ear-nose-throat infections.[11]

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Figure 1

Figure 2

Figure 3

Clinical presentation

MIH can present as a lesion with clear borders which can be white, yellow, or brown. An interesting feature of MIH is the asymmetry of the defects. One molar or incisor can be severely affected while the contralateral tooth may be clinically sound.[8]

The enamel in MIH teeth is different than normal enamel. The hypomineralized enamel has less distinct prism edges and crystals, with larger interprismatic spaces. Thus, MIH enamel is more porous than normal, sound enamel.[12]

This porous enamel is easily damaged enamel and may be subject to rapid wear and post-eruptive enamel breakdown (PEB), particularly in stress-bearing areas due to the forces of mastication. Caries risk is also elevated in porous enamel, particularly in the posterior teeth, where rapid extensive caries can be so severe as to require extraction. Exposed dentin can accelerate the development of carious lesions.[1] Dentin hypersensitivity, poor esthetics, anxiety, and tooth loss can also occur.[1,13,14,15]

Children with MIH often complain of intense dental thermal sensitivity, especially to cold, due to chronic pulp inflammation under the hypomineralized area.[16] Consequently, these patients are at greater risk of caries from poor oral hygiene due to avoiding toothbrushing, which is associated with tooth sensitivity.

Treatment challenges in MIH

Restorative treatment for MIH teeth is challenging for both the patient and the dentist. The subclinical inflammation of pulpal cells and the altered porous enamel structure make bonding less reliable, leading to defective restorations, frequent loss of restorations, and frequent retreatments.

Treatment is further complicated by thermal sensitivity and the difficulty of achieving adequate local anesthesia in MIH-affected teeth. Procedures can be more uncomfortable and painful for children as a result, leading to an increased prevalence of behavioral management problems, lack of cooperation, and dental anxiety and fear.[13]

Successful management of MIH

A risk assessment and early diagnosis are the key factors for an effective, successful, and conservative MIH treatment.[17] The choice of appropriate treatment depends on the extent of MIH. Long-term restorative treatment for hypomineralized teeth requires up to ten times more treatment and retreatment than teeth without MIH.[18] Treatment can range from prophylactic strategies to highly complex restorative procedures.[15]

The best approach to treating MIH patients should be an individualized treatment plan according to the needs of the patient, using minimally invasive dentistry (MID) techniques[19]. MID is defined as a philosophy of minimal intervention for the placement and replacement of restorations. The objective is tissue preservation, achieved by performing treatment with as little loss of tissue and damage to adjacent tissue as possible.[20]

This article will demonstrate how Biodentine™ can be used as a minimally invasive technique for immediate and long-term pain relief to achieve a successful MIH restoration with the least amount of stress and anxiety for the patient.

Figure 4: Initial clinical situation.

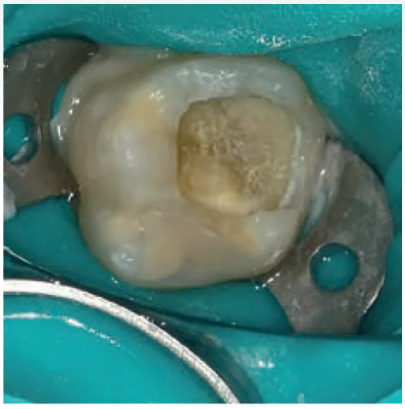

Figure 5: Clinical situation after soft dentine removed.

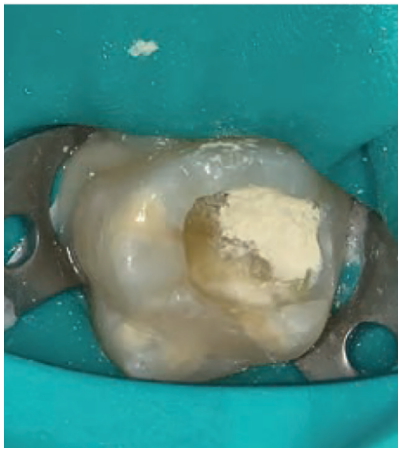

Figure 6: Biodentine™ placed at mesial-buccal pulp horn area.

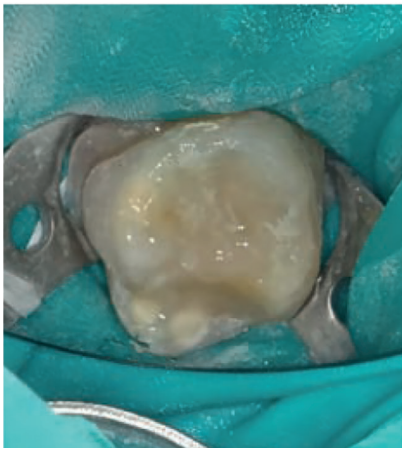

Figure 7: Clinical situation after composite placed.

Case report

This is a case of an eight-year-old male who presented with his parent for an emergency visit complaining of pain to cold stimuli, such as water and ice cream, for over four months. The parent related that the patient had already seen four dentists who were unable to achieve adequate local anesthesia. Pain was not experienced in any other teeth.

Figure 4 shows tooth #3 with not only a large, well-demarcated loss of enamel on the occlusal surface, but also brown spots on other areas of the occlusal and other surfaces. The tooth was sensitive to air blast. A diagnosis of MIH was made based on the history of pain to cold stimuli; no other thermal issues; severe enamel and dentin breakdown on the occlusal (post-eruptive breakdown); and multiple surfaces with brown-yellow areas.

The plan was to provide relief and comfort, and to restore the function of tooth #3. This was first achieved with local anesthesia for the rubber dam clamp. A rubber dam was placed, before removing a thin layer of slightly soft dentin and any poor enamel to reach clean, bondable enamel and dentin (Fig. 5).

Because this is a newly erupted permanent tooth and the lesion is close to the mesial-buccal pulp horn, the largest of the pulp horns, it was decided to do an Indirect Pulp Capping (IPC) with Biodentine™, a tricalcium silicate cement. Biodentine™ has been shown to have better results as an IPC than other materials.[21] This is due to its high pH of 12 and the release of calcium and silicon ions, which stimulates mineralization and creates a "mineral infiltration zone" along the dentin-cement interface, thus creating a superior sealing property compared to other materials. Biodentine™ shows superior microhardness due to the continued crystallization of calcium silicate hydrate gel, which reduces porosity, increases hardness with time, and increases compressive strength.[22,23,24]

Biodentine™ was mixed, placed, and condensed in the area of the mesial-buccal pulp horn (Fig. 6). After Biodentine™ had set, excess material was removed. The area was then treated with a selective etch technique of 38% phosphoric acid on enamel only and rinsed with water for 10 seconds. A Premio Bond self-etch adhesive was then placed on the dentin for five seconds, air-dried, and light-cured. Sculpt (GC America) shade A2 was placed in 1-2 mm incremental layers and light-cured at each layer. Once completed, the composite was shaped, contoured, and smoothed. Anatomy was placed and G Coat, an unfilled resin, was placed over the composite and light-cured (Fig. 7).

The patient returned two weeks later for a follow-up, during which the parent related that the patient had instantaneous relief after the treatment and has not had any thermal sensitivity to tooth #3 since. The parent added that he can now drink cold water and eat ice cream.

Conclusion

MIH is a qualitative defect in enamel. It creates treatment challenges including pain to cold stimuli and problems achieving adequate local anesthesia, which contribute to subsequent behavioral issues and anxiety. In this case, Biodentine™ used as an indirect pulp capping represented a conservative treatment adhering to Minimally Invasive Dentistry guidelines, chosen for many positive properties that included thermal insulation and ease of restoring with a composite.

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