

## Modified glass ionomer and orthodontic band: An interim alternative for the treatment of molar incisor hypomineralization. A case report.

Carla Orellana<sup>1</sup> & Vidal Pérez.<sup>1,2</sup>

**Affiliations:** <sup>1</sup>Departamento de Pediatría Estomatológica, Universidad de Talca, Chile. <sup>2</sup>Unidad de Cariología, Universidad de Talca, Chile.

**Corresponding author:** Vidal Pérez. Universidad de Talca, Avda. Lircay s/n, Talca, Chile. Phone: (56-71) 2200 200 E-mail: vperez@utalca.cl

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**Abstract:** Introduction: Molar incisor hypomineralization (MIH) is a developmental condition resulting in defects in the enamel characterized by demarcated opacities mainly affecting first permanent molars and occasionally permanent incisors in 1 of every 6 children worldwide. Affected molars have greater susceptibility to post eruptive breakdown, extensive caries and, in severe cases, are difficult to restore. When the MIH-affected molar presents severe crown destruction, it is necessary to perform an intermediate restoration to preserve the remaining dental structure in order to maintain occlusion, proper hygiene and periodontal health. The case of an 11-year-old patient with severe MIH is reported. The patient had extensive crown destruction by caries in tooth 1.6 without clinical or radiographic signs of pulp pathology. After an initial preventive intervention, enamel without dentin support and carious dentin were removed from tooth 1.6. Subsequently, crown restoration was performed with resin-modified glass ionomer, followed by the cementation of an orthodontic band. After 18 months of follow-up, the patient reported no pain or discomfort. The restoration was preserved intact, maintaining occlusal functionality, pulp and gingival health. Conclusion: The interim treatment, cementing an orthodontic band over a tooth restored with glass ionomer seems to favor retention and compressive strength, keeping the MIH-affected molar asymptomatic for at least 18 months. Further studies evaluating this treatment option in similar clinical situations are recommended.

**Keywords:** Dental caries; dental enamel; modified glass ionomer; molar, restoration.

### INTRODUCTION.

Molar incisor hypomineralization (MIH) is a particular type of developmental dental defect (D3). Clinically it is characterized as demarcated opacities mainly affecting first permanent molars and occasionally permanent incisors in 1 of every 6 children worldwide.<sup>1-3</sup> Unlike the symmetrical appearance of other D3s such as fluorosis and other enamel defects of systemic origin, MIH is characterized by an asymmetric distribution.<sup>1</sup>

The number of affected molars per patient ranges from 1 to 4, and the clinical appearance of opacity varies between molars. In one single mouth it is possible to find a severely affected molar, others with mild lesions and some without any lesions.<sup>4</sup> MIH can be clinically observed in some teeth as opacities with intact enamel surface and, in more severely affected teeth,

as extensive areas of broken enamel.<sup>5</sup>

In the latter, there is an increment in abrasion, erosion and retention of bacterial plaque, increasing the risk of fracture and the development of atypical extensive caries which are difficult to restore.<sup>4,6</sup> In this context, children with MIH may experience increased sensitivity (making it difficult to anesthetize them) and present about 10 times more need for restorative treatment, significantly reducing their quality of life.<sup>7</sup> As the exact cause of this condition has not yet been discovered (making prevention unlikely),<sup>8,9</sup> early diagnosis and effective restorative techniques appear to be the primary clinical goals for the treatment of affected children.

Traditional restorations are not suggested in case of molars with MIH. Amalgam requires excessive removal of dental tissue to obtain adequate mechanical retention, leaving the tooth structurally weak and prone to fracture.<sup>10</sup> Resins also present problems since their adhesion to MIH-affected enamel is inadequate, favoring microfiltration, which may result in failure of the restoration.<sup>10-12</sup> Prefabricated metallic crowns have been suggested in the literature as a more definitive option; however, periodontal problems associated with molars restored with this technique discourage their use as permanent restoration.<sup>10</sup>

In these difficult clinical conditions, glass ionomer seems to be the restorative material of choice for the interim treatment of MIH-affected molars. Due to its favorable adhesive properties to enamel/dentin, it can better preserve the remaining dental structure, allowing the adjustment

of the restoration to the atypical cavities that are usually formed when the affected enamel is removed.<sup>13</sup> However, in extensive restorations, glass ionomer usually fractures, leading to retreatment, thus increasing the occurrence of painful clinical experiences and pulpal damage.<sup>14</sup>

The aim of this study is to report the case of an 11-year-old patient with severe MIH who was treated with resin-modified glass ionomer and orthodontic band, and 18 months of follow-up.

## CASE.

### Patient information

Eleven-year-old patient, female, receiving treatment at the Specialization Program in Pediatric Dentistry at Universidad de Talca.

### Clinical Findings

The intra-oral clinical examination revealed a demarcated opacity with post-eruptive enamel breakdown associated with extensive dental caries in tooth 1.6. In addition, it presented an atypical restoration in tooth 3.6 and a demarcated opacity associated with occlusal caries in tooth 4.6.

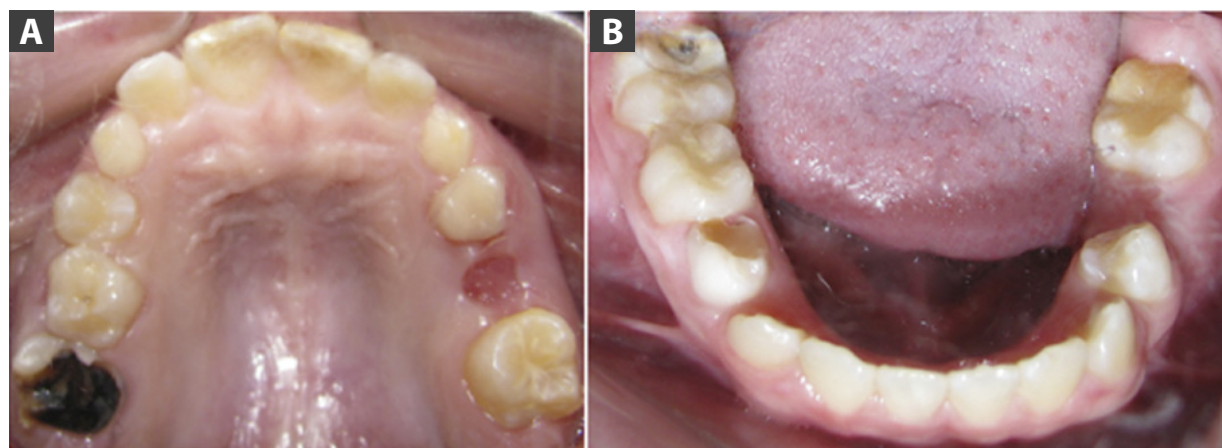
### Diagnostic evaluation

The clinical findings described above correspond to clinical signs consistent with a diagnosis of severe MIH.<sup>4,5</sup> (Figure 1)

### Therapeutic intervention

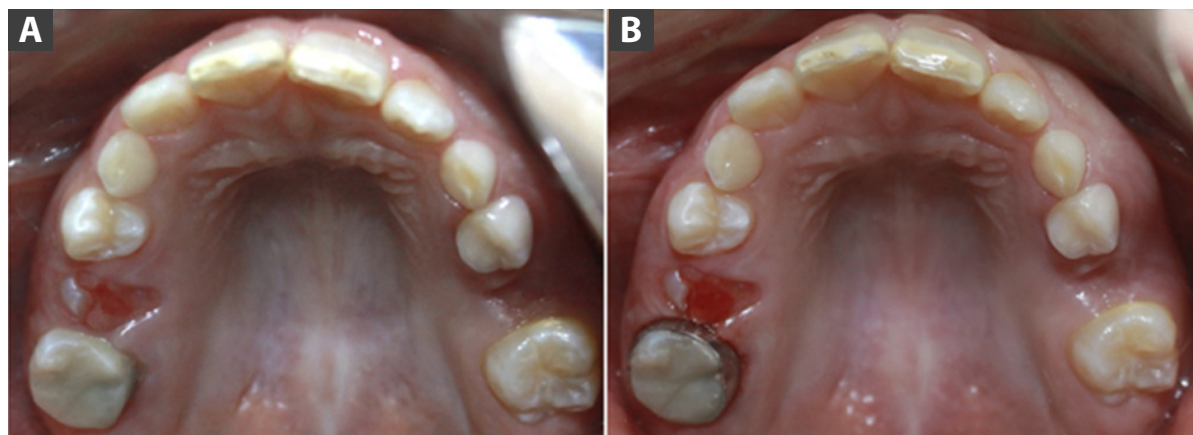
Before signing informed consent, the first stage of treatment consisted of education and prevention sessions

**Figure 1.** Molar with severe MIH shows extensive caries.



**A:** The upper jaw presents tooth 1.6 with severe MIH associated with extensive caries. **B:** In the lower jaw, tooth 3.6 is seen with an extensive restoration with marginal maladjustment and tooth 4.6 with deep occlusal caries.

**Figure 2.** A. Tooth 1.6 affected with severe MIH was restored with resin-modified glass ionomer. B. Orthodontic band was adapted and cemented to the contour of the molar.



**Figure 3.** Molar with MIH treated with glass ionomer restoration and orthodontic band after 6 months of follow-up.



A. Restoration is intact; Glass ionomer without fracture and good marginal sealing. B. Marginal and papillary gum is in good condition in relation to the band. C. X-rays show that the restored molar has no signs of periapical lesions.

**Figure 4.** Interim molar treatment for MIH-affected molar still successful after 18 months.



A. Restoration preserves the remaining tooth structure, without recurrent caries. B. Gingival health is maintained in relation to the band. C. X-rays show no signs of pulpal pathology.

regarding MIH (for the patient and her guardian) emphasizing the increased risk of caries and the need to control diet and hygiene. The cariogenic risk of the patient was assessed using the Cariogram program adapted to the local reality according to the EpiMaule 2015 study.<sup>15</sup> A high-risk level resulted mainly due to a cariogenic diet and poor oral hygiene.

Oral hygiene instruction (sweeping technique), including flossing once a day and dietary advice, was performed. Fluoride varnish (22500ppm) was applied (Duraphat, Colgate, USA). After the preventive intervention, cariogenicity decreased as well as the consumption frequency of a cariogenic diet, and oral hygiene improved.

The second stage consisted of restoring teeth 3.6 and 4.6

using resin-modified glass ionomer due to its effectiveness in teeth with hypomineralized enamel.<sup>13</sup> The treatment of tooth 1.6 was performed after consultation with an orthodontic specialist. It was decided to retain the tooth due to the radiographic absence of the germ of tooth 1.8. During clinical examination, tooth 1.6 showed no signs or symptoms of pulpal disease. The radiographic examination showed no periapical alterations and, subsequently, the interim treatment reported below was planned.

Following infiltrative anesthesia with 2% lidocaine, and with rubber dam isolation of tooth 1.6, enamel without dentin support was removed with a high-speed round diamond bur (018, Jota, Switzerland), the hypomineralized enamel was partially removed using a low-speed round bur (018, Jota, Switzerland) until the affected tissue showed good resistance.<sup>16</sup> In the carious dentin, selective removal of soft tissue was performed with a carbide round bur (016, Jota, Switzerland).<sup>17,18</sup> The tooth was reconstructed with resin-modified glass ionomer (Vitremer, 3M, USA); occlusion was adjusted and in the following session, an orthodontic band was adapted to the contour and cervico-occlusal height of the molar, which was cemented with glass ionomer cement (Relyx luting, 3M, USA). (Figure 2)

#### Follow-up and results

At the 6 month follow up cariogenic risk was reassessed and found to remain moderate, the importance of diet was reinforced, and oral hygiene as well as the application of biannual fluoride varnish was promoted. Regarding tooth 1.6, the patient reported satisfaction with the treatment with no pain or discomfort associated with the orthodontic band noted. Clinical examination showed that restoration remained intact, with fracture-free glass ionomer and good sealing between restoration and the band. At the periodontal level, marginal gingival and papillary areas were in good condition in relation to the orthodontic band. X-rays of the severely MIH-affected molar showed no signs of pulpal pathology (Figure 3). At the 12-month and 18-month check-ups, similar conditions were observed. (Figure 4)

#### DISCUSSION.

In general terms, D3s are enamel alterations that originate before the tooth erupts. However despite years of research, the exact causes of many D3s, including MIH, have not been established.<sup>5</sup> In fact, the enamel formation stage during

which MIH arises is not currently known and there is no evidence that determines its cause.<sup>19</sup> With prevention as a hard-to-reach goal, the efforts of clinicians and researchers should focus on early diagnosis and restorative treatments that may remain successful over time.

In patients affected with MIH it is advisable to perform a restoration, including intermediate treatments such as the one described in this report, in a single treatment session, assuring durability, in order to significantly reduce the number of dental interventions, such as repeated visits to the dentist, anesthesia, pulp injury, pain and discomfort.<sup>4</sup> This would contribute to provide a comfortable dental experience and favor the prognosis of the affected molar.

One of the most recommended adhesive materials for the intermediate treatment of MIH-affected molars is glass ionomer, mainly because of its favorable chemical adhesion and fluoride release properties.<sup>14</sup> Resin-modified glass ionomer seems to offer better mechanical resistance.<sup>10,13</sup> However its use in extensive restorations in posterior teeth makes them prone to fracture.

The case report presented in this paper is an example of the asymmetrical clinical variability of MIH,<sup>4</sup> *i.e.*, despite the diagnosis of severe MIH, tooth 2.6 was not affected by any demarcated opacity. (Figure 1)

The proposed treatment in this case follows the guidelines reported in the literature for teeth 3.6 and 4.6.<sup>10</sup> However, for tooth 1.6 affected with severe MIH, it proposes the cementation of an orthodontic band over the glass ionomer restoration. (Figure 2)

This therapeutic alternative seems to improve the retention and resistance of glass ionomer to occlusal forces. Although this observation is based on a case report, the proposed treatment alternative proved to be effective after 18 months of follow-up without requiring retreatment. This restorative technique effectively preserved the remaining tooth structure, maintaining functionality (occlusion), oral hygiene and pulp health (Figure 4), while the patient waits for a long-term treatment that could involve a more complex rehabilitation technique such as a crown, or the right moment to remove the tooth and start rehabilitation by installing an implant.<sup>20</sup>

Evaluating the success of this interim treatment in a greater number of molars with severe MIH and other similar clinical situations (such as amelogenesis imperfecta) should be the aim of future research.

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