

## A Minimally Invasive Esthetic Approach for Teeth with Molar Incisor Hypomineralization: a Clinical Case Report

*Uma Abordagem Estética Minimamente Invasiva para Dentes com Hipomineralização Molar Incisivo: Relato de Caso Clínico*

*Un Abordaje Estético Mínimamente Invasivo para Dientes con Hipomineralización de Incisivos Molares: Reporte de Caso Clínico*

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### Abstract

Molar incisor hypomineralization (MIH) is a qualitative defect of enamel, clinically characterized by white or yellow/brownish demarcated opacities that affect permanent molars, often associated with permanent incisors. The etiology is multifactorial, including systemic and genetic/epigenetic factors. Defects of anterior teeth can negatively impact children since they might present lower self-esteem and socialization problems. Purpose: To describe a minimally invasive treatment for anterior teeth affected by molar incisor hypomineralization, performed with direct composite resin restoration and a universal adhesive system. Case Report: An 8-year-old patient sought dental care with complaints about her dental appearance, reporting suffering from school bullying. She presented a white-yellowish opacity on the maxillary right central incisor. After a clinical examination, she was diagnosed with molar incisor hypomineralization. To improve dental esthetics, a direct composite resin restoration was proposed. The enamel surface was prepared and etched with 35% phosphoric acid etchant solution for 15 seconds before applying the universal adhesive system. Two different shades of the composite were used for layering the material to disguise the defect without extensive removal of the dental structure. The result was satisfactory as it was possible to mask the opacity, reestablish enamel thickness, and improve the patient's quality of life. Conclusion: Conservative restorations comprising a universal adhesive system seem to bring desirable esthetic results for anterior teeth with molar incisor hypomineralization.

**Descriptors:** Demineralization; Composite Resins; Adhesives; Esthetics.

### Resumo

A hipomineralização molar incisivo (HMI) é um defeito qualitativo do esmalte, caracterizado clinicamente por opacidades demarcadas de branco ou amarelo/acastanhado que acometem molares permanentes, muitas vezes associadas a incisivos permanentes. A etiologia é multifatorial, incluindo fatores sistêmicos e genéticos/epigenéticos. Os defeitos dos dentes anteriores podem impactar negativamente as crianças, pois podem apresentar baixa autoestima e problemas de socialização. Objetivo: Descrever um tratamento minimamente invasivo para dentes anteriores afetados por hipomineralização molar incisivo, realizado com restauração direta de resina composta e sistema adesivo universal. Relato de Caso: Paciente de 8 anos de idade procurou atendimento odontológico com queixas sobre sua aparência dentária, relatando sofrer bullying escolar. Apresentava opacidade branco-amarelada no incisivo central superior direito. Após um exame clínico, ela foi diagnosticada com hipomineralização molar incisivo. Para melhorar a estética dental, uma restauração direta de resina composta foi proposta. A superfície do esmalte foi preparada e condicionada com solução de ácido fosfórico a 35% por 15 segundos antes da aplicação do sistema adesivo universal. Duas tonalidades diferentes do compósito foram usadas para estratificar o material para disfarçar o defeito sem remoção extensa da estrutura dentária. O resultado foi satisfatório, pois foi possível mascarar a opacidade, restabelecer a espessura do esmalte e melhorar a qualidade de vida do paciente. Conclusão: Restaurações conservadoras com sistema adesivo universal parecem trazer resultados estéticos desejáveis para dentes anteriores com hipomineralização molar incisivo.

**Descritores:** Desmineralização; Resinas Compostas; Adesivos; Estética.

### Resumen

La hipomineralización incisivo molar (MIH) es un defecto cualitativo del esmalte, clinicamente caracterizado por opacidades demarcadas de color blanco o amarillo/marrón que afectan a los molares permanentes, a menudo asociados con los incisivos permanentes. La etiología es multifactorial, incluyendo factores sistémicos y genéticos/epigenéticos. Los defectos de los dientes anteriores pueden impactar negativamente a los niños ya que pueden presentar problemas de baja autoestima y socialización. Propósito: Describir un tratamiento mínimamente invasivo para dientes anteriores afectados por hipomineralización de incisivos molares, realizado con restauración directa de resina composta y un sistema adhesivo universal. Caso Clínico: Paciente de 8 años de edad que acude a atención odontológica con quejas sobre su apariencia dental, refiriendo sufrir acoso escolar. Presentaba una opacidad blanco-amarillenta en el incisivo central superior derecho. Después de un examen clínico, se le diagnosticó hipomineralización de incisivos molares. Para mejorar la estética dental se propuso una restauración directa con resina compuesta. La superficie del esmalte se preparó y grabó con una solución grabadora de ácido fosfórico al 35 % durante 15 segundos antes de aplicar el sistema adhesivo universal. Se usaron dos tonos diferentes del composite para estratificar el material para disimular el defecto sin una remoción extensa de la estructura dental. El resultado fue satisfactorio ya que se logró enmascarar la opacidad, restablecer el espesor del esmalte y mejorar la calidad de vida del paciente. Conclusión: Las restauraciones conservadoras que comprenden un sistema adhesivo universal parecen brindar resultados estéticos deseables para los dientes anteriores con hipomineralización incisivo molar.

**Descritores:** Desmineralización; Resinas Compuestas; Adhesivos; Estética.

### INTRODUCTION

Molar incisor hypomineralization (MIH) is a dental condition of multifactorial origin, defined as

qualitative defects of enamel that affect at least one permanent molar, frequently correlated with incisors<sup>1</sup>. Similar defects have been noticed on

permanent canines, premolars, and primary second molars<sup>2</sup>. The etiology is multifactorial, associated with systemic, genetic, and/or epigenetic factors<sup>3</sup>, however, more prospective studies are necessary to clarify the causes<sup>4</sup>. Maternal illnesses, exposures in perinatal (i.e., prematurity and cesarean delivery) and postnatal periods (i.e., fever, asthma, bronchitis, urinary tract infection), as well as birth complications, were indicated to be risk factors<sup>3</sup>. Also, a global prevalence of 13.1% (11.8 -14.5%) is estimated<sup>5</sup>.

MIH lesions are characterized by demarcated opacities ranging from white-yellow to yellow-brown, or severely hypomineralized broken enamel<sup>6</sup>. The enamel can break down right after the eruption or due to masticatory forces<sup>6</sup>, creating cavities susceptible to biofilm accumulation, facilitating caries development<sup>2,7</sup>. Furthermore, the patients might present sensitivity to cold, warmth, and mechanical stimuli, such as toothbrushing<sup>6</sup>. Affected teeth present lower hardness values, and the enamel is porous with disorganized prisms, leading to impaired etching properties<sup>8</sup>.

In order to choose the treatment, multiple factors should be considered, including the severity of MIH lesions, presence of sensitivity or post-eruptive breakdown, age, and the psychological impact of dental esthetic on the patient<sup>4</sup>. Preventive procedures such as dietary advice<sup>2</sup> and the use of toothpaste with a fluoride level of at least 1,000 ppm have been recommended<sup>9</sup>. Topical preparation comprising Casein phosphopeptide-amorphous calcium phosphate (CPP-ACP)<sup>10</sup> and fluoride varnish has been suggested to manage sensitivity<sup>11</sup>. Approaches for MIH posterior teeth include fissure sealants<sup>2,12</sup>, composite resin<sup>13</sup> restoration, glass ionomer cement<sup>14</sup> restoration, preformed metal crowns<sup>15</sup>, and even more invasive procedures such as extraction for severely affected molars<sup>2</sup>.

Resin infiltration<sup>16</sup>, microabrasion followed by a remineralizing agent<sup>17</sup>, composite resin restorations<sup>18</sup>, the etch-bleach-seal technique<sup>19</sup>, and external bleaching<sup>4</sup> are some options reported for anterior teeth. Children with MIH can be socially and psychologically affected<sup>20</sup>. Nonetheless, few studies support the management of the defects<sup>4</sup>. Thus, this study aims to provide a conservative approach to improve the appearance of incisors with MIH.

#### CASE REPORT

An 8-year-old female sought dental care with esthetic concerns regarding her maxillary right central incisor. During anamnesis, it was revealed that she suffered from bullying because of the appearance of her tooth. She was in the mixed dentition phase and did not present sensitivity. An intra-oral examination was conducted and white-

yellow opacities on the maxillary right central incisor and mandibular left first molar were observed (Figure 1).



**Figure 1:** Patient's smile before the treatment. A white-yellowish opacity on the right maxillary central incisor can be observed.

After a clinical examination and anamnesis, she was diagnosed with MIH. Considering the patient's age, extension, color, and severity of the opacity, a minimally invasive treatment plan was chosen to manage the defect on the central incisor, comprising superficial wear and a direct composite resin restoration. A spherical diamond bur (no. 1012, KG Sorensen, São Paulo, Brazil) was used to wear the superficial portion of the white-yellow stain in order to enhance the esthetics without increasing the bulk of the tooth (Figures 2-3).



**Figure 2:** Tooth after cavity preparation procedure.



**Figure 3:** Lateral view of the cavity prepared.

Then, according to the manufacturer's recommendations, a 35% phosphoric acid etchant solution (Ultra-Etch, Ultradent Inc) was dispensed for 15 seconds to the enamel surface. Afterward, it was rinsed off with water spray and air-dried. The adhesive (Single Bond Universal, 3M ESPE, St Paul, MN, USA) was applied with a microbrush and rubbed for 20 seconds. Then, it was gently air-dried

for 5 seconds and light-cured using a LED Curing Light Polywave (Valo Cordless, Ultradent Inc) for 10 seconds. Composite resin 2 mm increments (Palfique LX5, Tokuyama Dental), color A2E and A2O were inserted since the opaquest layer (A2O) was first placed to disguise the defect. A2 color was used for the final layer to simulate the enamel. Each layer was light-cured for 20 seconds. Finishing and polishing were performed using flexible polishing discs with aluminum oxide coating (Sof-Lex, 3M ESPE), abrasive rubber discs (Jiffy, Ultradent Inc), and a diamond paste (Diamond Polish, Ultradent Inc). Bleaching treatment was not considered in this case because the patient was comfortable with the color of her teeth (Figures 4-5).



Figure 4: Intra-oral view after restorative treatment.



Figure 5: Post-operative result of composite restoration.

## DISCUSSION

MIH can be confused with other developmental defects, such as fluorosis, amelogenesis imperfecta, and enamel hypoplasia<sup>18</sup>. It can also be mistaken for carious white spot lesions<sup>21</sup>. Thus, clinical examination and anamnesis are essential to distinguish these conditions in order to provide a correct diagnosis and a suitable treatment for the defects.

Opacities in fluorosis are symmetrical<sup>22</sup>, diffuse, and caries-resistant, whereas opacities in MIH are demarcated, asymmetrical, and caries-prone<sup>18</sup>. Moreover, fluorosis is mainly associated with a high fluoride intake period<sup>18</sup>, differing from the etiology of MIH. Defects in MIH are more asymmetrical, affecting one to four permanent first molars, with or without the involvement of the incisors<sup>18</sup>. In amelogenesis imperfecta, there is a generalized involvement of both primary and permanent dentitions<sup>21</sup>, as well as a history of family onset<sup>18</sup>. Whilst the borders of MIH lesions may be

irregular as a result of enamel breakdown<sup>18</sup>, in hypoplasia, which presents reduced enamel thickness<sup>23</sup>, the margins are smooth<sup>18</sup>. Unlike MIH, carious white spot lesions occur in areas of plaque accumulation<sup>24</sup>.

In this case report, the maxillary right central incisor defect was located on the incisal third one-third of the tooth, which is not an area prone to caries development. The enamel was of normal thickness, differentiating it from hypoplasia. Besides that, the patient presented a white-yellow demarcated opacity only on the maxillary central incisor and mandibular left first molar, which were neither diffuse nor symmetrical, being distinguished from amelogenesis imperfecta and fluorosis.

Children with enamel defects of anterior teeth might have a lack of self-confidence and lower social interaction<sup>20</sup>. Some of them avoid smiling<sup>25</sup> and state being subject to unkind remarks by their peers<sup>20</sup>. In the present case, the patient reported being a victim of bullying because of her tooth's appearance, corroborating the negative psychosocial effects on children with MIH and emphasizing the urge to improve their quality of life. Thus, esthetic treatment can positively impact children's confidence and happiness<sup>20</sup>. Hasmun *et al.*<sup>26</sup> (2018) conducted a study that analyzed the oral health-related quality of life in children with MIH who had opacities involving at least one permanent incisor. Multiple minimally invasive treatments were provided to reduce the visibility of the defects, according to their clinical needs. After the treatment, improvements in children's quality of life were indicated.

Currently, no standard treatment for MIH-affected incisors has been established due to the limited number of studies reporting variable success rates<sup>4</sup>. It is important to highlight that children have large pulp chambers, high pulp horns, and immature gingival contour, contra-indicating the use of porcelain veneers<sup>34</sup>, and thereby endorsing minimally invasive approaches. Conservative approaches for anterior include microabrasion, bleaching, resin infiltration, the etch-bleach-seal technique, and conventional restorative options as the most common approach<sup>4</sup>. Some factors should be considered when choosing a treatment plan for anterior teeth, including color, size, and depth of opacity, presence/absence of sensitivity or post-eruptive breakdown, developmental stage, age of the patient, medical history, ability to cooperate and psychological impact of dental appearance on the patient<sup>4</sup>. Microabrasion mechanically removes stains using acidic and abrasive agents on the defective surface<sup>27</sup>, mostly indicated for creamy-whitish defects<sup>21</sup>. Using a remineralizing agent such as Casein phosphopeptide-amorphous calcium fluoride phosphate after microabrasion seems to bring desirable results<sup>17</sup>. However, its effect is



limited to removing the first 100–200 µm of surface enamel, thus, it is inefficient for deeper opacities<sup>28</sup>.

Resin infiltration has been suggested<sup>29,30</sup> to mask MIH defects since infiltrant resin can enhance the optical properties of hypomineralized enamel<sup>31</sup>. However, this technique is unpredictable as infiltrant materials do not penetrate hypomineralized enamel consistently<sup>31</sup>. Further research is necessary to improve the reliability of resin infiltrant on MIH-affected teeth<sup>32</sup>. The etch-bleach-seal technique has been recommended to remove yellow-brown stains<sup>19</sup>. The enamel surface is etched with 37% phosphoric acid, bleached with 5% sodium hypochlorite, and covered with a flow sealant<sup>19</sup>. Esthetic results are not guaranteed<sup>19</sup>, since the resin infiltration technique is unreliable<sup>31</sup>. External bleaching with hydrogen peroxide (up to 6%) or carbamide peroxide (10% or 16%) gels used in custom-made trays<sup>4</sup> are options for adolescents<sup>21</sup>. It is not recommended for children due to side effects, including gingival irritation, sensitivity, and enamel surface alterations<sup>2</sup>. Considering that the patient, in this case, was 8 years old, bleaching treatment was not a viable choice.

In this case report, the treatment plan was accomplished using composite resin, considering the patient's age, extension, and color of the defect. The decision was supported by the fact that composite resin provides satisfactory esthetic results due to its capacity to replicate natural tooth structures, mimicking properties such as translucency, opalescence, and fluorescence<sup>33</sup>. Furthermore, composite resin offers satisfactory outcomes and longevity<sup>2</sup>, and it can be used in children and adolescents<sup>34</sup>.

Despite the advantages, restoring MIH-affected teeth is a challenge due to poor adhesion to the dental structure. Hypomineralized enamel differs from sound enamel, since it is porous, with reduced mineral content and inferior mechanical properties, hardness, and elasticity<sup>35</sup>. For that reason, acid etching does not present typical patterns of demineralization, impairing adhesion<sup>36</sup>. Accordingly, some authors have recommended a more invasive approach, with total removal of hypomineralized enamel<sup>37,38</sup>. However, even enamel that seems intact and unaffected by MIH has ultrastructural alterations and different ion composition<sup>36</sup>, so bond strength is compromised even after apparently removing the defective enamel<sup>39</sup>. Deeper opacities may require a more extensive removal; nevertheless, considering the pulp anatomy of immature incisors, the procedure should be as conservative as possible<sup>4</sup>.

Both total-etch and self-etch dental adhesives achieve inferior bonding to hypomineralized compared to sound enamel<sup>40</sup>. Recent systematic reviews have observed no

statistically significant differences in restoration survival when using self-etch or etch-and-rinse adhesives on MIH-affected teeth<sup>37,41,42</sup>. An 18-month study carried out by De Souza *et al.*<sup>37</sup> (2016) reported 68% survival rates for self-etching and 54% for total-etch, which was considered a good clinical survival for hypomineralized young permanent teeth.

In order to enhance the adhesion to MIH-affected teeth, universal adhesives may be an alternative<sup>39</sup>. Besides demineralizing the tooth surface, this type of adhesive has components that infiltrate tooth tissues<sup>43</sup>. They are composed of adhesive functional monomers, such as 10-MDP (methacryloyloxydecyl-dihydrogen-phosphate), which chemically interact with the hydroxyapatite in teeth, improving bonding properties<sup>43</sup>. Universal adhesives enable professionals to choose whether to use the etch-and-rinse or the self-etch approach<sup>39</sup>. Although the self-etch strategy appears to have adequate bonding to dentin, the bond strength to enamel is inferior<sup>44</sup>. The etching step increases the surface area, creating resin tags as the resin monomers can infiltrate into the enamel. Thus, selective etching of enamel before applying the universal adhesive appears to be the best option<sup>44,45</sup>. In the present case, since dentin was not affected, the enamel was etched with phosphoric acid before applying the universal adhesive system.

Thus, considering the evidence above, the universal adhesive was chosen for the case, aiming to overcome the adhesion difficulties of MIH-affected teeth. In addition, an opaque layer was first placed to mask the defect without extensive enamel removal<sup>4,46</sup>. Then, a layer of A2E shade was applied over the opaque one to simulate the enamel and provide a natural-looking result<sup>47</sup>. The minimally invasive approach preserved dental structure, and no sensibility was caused to the patient. The optical properties and thickness of the enamel were successfully replicated.

## CONCLUSION

MIH might be a psychosocial concern to children and cause negative impacts on their quality of life, especially when upper incisors are affected. Thus, esthetic treatment can improve their social-emotional well-being. In children, a conservative approach is preferable to preserve tooth structure and avoid wounding pulpal tissues. When recommended, composite restoration can bring satisfactory outcomes, since it is a minimally invasive treatment yielding esthetic results. Different shades of composites were used to improve the color uniformity of the tooth. The treatment was successful, and both the mother and patient were satisfied with the results.

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### **CONFLICT OF INTERESTS**

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The authors declare no conflict of interest.

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**Received** 04/04/2023

**Accepted** 03/01/2024