

A conservative approach to rehabilitate a molar-incisor hypomineralization case

Uma abordagem conservadora para reabilitar um caso de hipomineralização molar-incisivo

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ABSTRACT

Molar incisor hypomineralization is an increasingly common condition in our population. This condition can have great impact on the esthetics, function, and well-being of the child. This paper reports a case of a young patient diagnosed with this condition affecting all the first permanent molars and lower incisors, particularly teeth 31 and 41. The molars were treated with direct resin restorations with cusp coating and the incisors aesthetic was restored with different techniques such as bleaching with sodium hypochlorite, micro-abrasion and resin restorations. This treatment plan aimed to restore the proper teeth function, treat the already existing hypersensitivity and aligic complains and to improve the aesthetic of the anterior sector. The presented case shows a conservative approach to deal with the molar incisor hypomineralization condition with satisfactory results after 1-year follow-up.

Indexing terms: Bleaching agents. Enamel microabrasion. Pediatric dentistry. Tooth demineralization.

RESUMO

A hipomineralização incisivo-molar (HIM) é uma condição cada vez mais comum na nossa população. Esta condição pode ter um grande impacto na estética, função e bem-estar da criança. Este artigo relata um caso de um paciente jovem diagnosticado com esta condição afetando todos os primeiros molares permanentes e incisivos inferiores, principalmente os dentes 31 e 41. Os molares foram tratados com restaurações diretas em resina composta com recobrimento de cúspides e a estética dos incisivos foi restabelecida com diferentes técnicas, como branqueamento com hipoclorito de sódio, micro-abrasão e restaurações de resina composta. Este plano de tratamento teve como objetivo restaurar a função dos dentes, tratar a hipersensibilidade e as queixas alérgicas já existentes e melhorar a estética do sector anterior. O caso apresentado mostra uma abordagem conservadora para lidar com casos de hipomineralização incisivo-molar com resultados satisfatórios após 1 ano de acompanhamento.

Termos de indexação: Clareadores. Microabrasão do esmalte. Odontopediatria. Desmineralização do dente.

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INTRODUCTION

Molar incisor hypomineralization (MIH) is the term used to describe a special pattern of Dental Developmental Defects [1]. The term was first proposed by Weerheijm et al. that defined MIH as being “hypomineralisation of systemic origin of 1-4 permanent first molars, frequently associated with affected incisors” [2]. It was only in 2000, at the European Academy of Paediatric Dentistry (EAPD) Congress in Bergen, that this was stated as Molar-Incisor Hypomineralization (MIH) and a nomenclature was suggested, given the existing clinical similarity [3]. Enamel defects may appear as a change in tooth color, such as white, yellow, or brownish opacities. The enamel structure is also affected with grooves and depressions on the tooth surface [4]. Affected teeth tend to accumulate more severe defects over time due to the post-eruptive breakdown of the hypomineralized enamel [5].

These severe defects that occur in the enamel structure are due to a disturbance in the calcification phase of dental development, since there is an insufficient deposition of minerals that leads to an incomplete removal of proteins in the enamel matrix [6].

MIH is a very common condition in many populations around the world, however, reports of prevalence of this defect show a very high variability (2.4 - 40.2%). Many treatment options have been described for the clinical management of MIH affected teeth, such as composite resin or glass ionomer cement restorations, as well as steel crowns, and in more severe cases the extraction of these teeth followed by orthodontics, if necessary [7]. Other therapeutic approaches have been described to minimize aesthetic concerns arising from changes in dental structures in anterior teeth, such as whitening of the affected teeth, microabrasion or restorative techniques [8]. The decision on which treatment is most appropriate depends on several factors, such as the severity of the lesions, patient's dental age and social context, and expectations of the child and parents [9].

CASE REPORT

A 9-year-old male patient came to Egas Moniz University Clinic (Egas Moniz, Health Sciences Institute) referred from an external office. In this consultation, MIH was diagnosed, affecting all the first permanent molars and lower incisors, particularly teeth 31 and 41 (figure 1). Patient major complaints were localized pain when chewing and hypersensitivity



Figure 1. Initial intra-oral photographs.

to cold. In all the first permanent molars, in addition to the color change, there was already loss of tooth structure on the occlusal surface, but the cervical margins remained intact and no carious lesions were found. The lower incisors showed yellow-brown well demarcated opacities on the vestibular surface, particularly teeth 31 and 41 with about 2/3 of the surface covered. In the radiographic examination (figure 2), there were no cavities detected, however, it was already possible to observe loss of dental structure due to post eruptive breakdown in all first permanent molars.



Figure 2. Initial orthopantomography.

Rehabilitation of the permanent molars

For the rehabilitation of the permanent molars it was planned to perform direct restorations with cusp coating using composite resin on all affected molars, to restore function, decrease algic complaints and prevent tooth decay. Before the restoration procedure, the most marked brown opacities were removed with a diamond bur. Prior to etching, we used NaOCl 5.25% for 15 seconds to remove the excess protein content from the hypomineralized enamel in order to improve bonding strength. After the deproteinization process, all first molars were etched for 20 seconds and restored using Scotchbond™ Universal adhesive and Filteck™ Z250 A3 and A3,5 resin under isolation with rubber dam (figure 3).

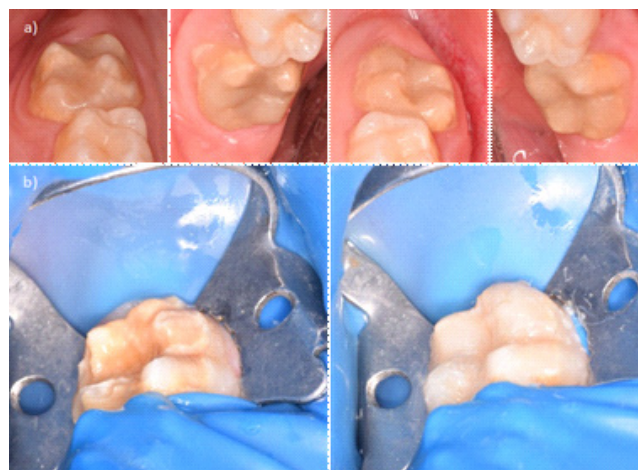


Figure 3. A) All first molars were restored using Scotchbond™ Universal adhesive and Filteck™ Z250 resin; B) Tooth 36 before and after direct restoration with cusp coating.

Rehabilitation of the permanent incisors:

To improve and to standardize the aesthetics of the anterior sector we used different techniques depending on the depth of enamel lesions such as bleaching, microabrasion and sealing with restorative materials (figure 4).



Figure 4. A) Initial view of the 6th sextant; B) after etch-bleach and seal technique; C) after micro-abrasion technique; D) after sealing teeth 32 and 42 and restoration of teeth 31 and 41.

First of all, we used a bleaching protocol with sodium hypochlorite described by Wright [10] in the enamel lesions observed in the lower permanent incisors in order to whiten the more superficial lesions.

The teeth were sanitized with pumice powder using a polishing brush to remove any plaque and any discoloration of the extrinsic surface. Absolute isolation was performed with rubber dam. To allow better penetration of the bleaching agent, acid etching to the enamel surface was done with 37% orthophosphoric acid for 60 seconds.

Sodium hypochlorite (5.25%) was then applied to the entire surface of the tooth using a cotton applicator. The bleaching agent was continuously reapplied to the tooth as it evaporated. At the end of this process it was decided to make a new cycle by doing a new acid conditioning for 60 seconds, followed by rinsing with water and reapplying the bleaching agent.

The treated teeth must be sealed after achieving the optimal whitening result, to prevent organic material from reentering the porous and hypomineralized enamel. However, as some of the lesions were deeper than expected, prior to sealing the teeth 31 and 41 we performed a microabrasion protocol, polishing these teeth with a prophylactic brush using a paste with 37% orthophosphoric acid gel associated with extra fine grain pumice in equal proportions. The final stage was sealing the treated teeth after washing and drying the teeth to remove any bleaching and microabrasion agent. A further acid etching of the teeth was performed for 30 seconds with 37% orthophosphoric acid followed by a flowable resin Filtek™ Supreme XTE white shade to seal teeth 32 and 42 after the bleaching protocol. On teeth 31 and 41 we had to use a restorative approach using Enamel Plus HFO (UD2) and Enamel Plus HRI (EF3) resin to restore the vestibular surface after the microabrasion of the deeper lesions.

Follow-up

After 1-year follow-up (figure 5), the molars presented restorations with good adaptation, no fractures or infiltrations and absence of painful symptomatology.

The permanent lower incisors also showed good results after 1-year follow-up (figure 6), with great aesthetic improvement and good color stability.



Figure 5. 1-year follow up intra-oral photographs.



Figure 6. A) Initial view of the 6th sextant; B) final result; C) 1-year follow-up.

DISCUSSION

In affected permanent molars, the goals of treatment are to prevent the development of dental caries, to help prevent or reduce loss of enamel, restore shape, restore function and solve cosmetic problems. In more severe cases, another concern should be considered, like the hypersensitivity associated with hypomineralized enamel [11].

Currently, there are no standard treatments that can be recommended for all teeth affected by MIH. According to the best guideline of clinical practice and evaluation of relevant literature, composite resins are a viable option as a long-term restorative material for teeth affected by MIH [5,9].

Souza et al. [12] evaluated the success of composite resin restorations and reported a success rate of 73% when restorations were performed with a self-etch adhesive and 59% when performed with a total-etch adhesive at 12 months. At 18 months, the success rate dropped to 68.4% when restorations were performed with a self-etch adhesive and 54.6% when performed with a total-etch adhesive.

The low success rates presented in the study of Souza et al. [12] may be due to the hypomineralization of the affected teeth, which can compromise the adhesion of the resin to the dental surface [13].

Another study comparing the success rates between restorations using the self-etch and total-etch adhesives in sound enamel did not show significant differences between these two systems [14].

Bonding to hypomineralized enamel can be a great challenge due to its altered physical and chemical characteristics, namely the high amount of protein load present in the hypomineralized enamel [15].

To remove the excess protein content from hypomineralized enamel to improve bonding with dental adhesives, many authors have suggested the use of NaOCl as it is an oxidative solution [16,17].

Another factor to consider is whether the affected enamel is completely removed or not. Removing only the porous enamel is less invasive but can lead to high risk of marginal breakdown due to defective bonding. Removing all defective enamel provides sound enamel for bonding, however, the undesirable side-effect is that excessive tooth tissue is removed [9].

Sönmez and Saat [17] aimed to evaluate the clinical performance of composite resin restorations in MIH affected molars placed into cavities prepared invasively or noninvasively and with or without deproteinization of the affected enamel. They reported that the removal of the whole affected enamel significantly increased the success of the treatment compared with noninvasive techniques without removal of all clinically defective tissue. Furthermore, they also observed that the success rate of the restorations in the group where they used a noninvasive technique and the deproteinization using 5% sodium hypochlorite, was not significantly different than the groups where they removed all the affected enamel and the group without MIH. These findings suggest that in cavities without removal of all hypomineralized enamel, sodium hypochlorite may help in achieving better bond strength while preventing major tissue loss.

As for the lesions visible on the incisors, the range of treatments vary depending on the type and depth of the lesion. Isolated brown or white defects of less than few tenths of millimeter depth can be easily treated with microabrasion. However, deeper enamel defects need a combination of various techniques such as microabrasion, macroabrasion, bleaching, resin restorations, full or partial veneers or a combination of the above [18,19].

Wright [10] developed a bleaching technique called Etch-bleach-seal, which shows good results in the treatment of enamel hypomineralization lesions of incisors affected by molar-incisor hypomineralization.

Bleaching of hypomineralized enamel lesions using 5% sodium hypochlorite has been clinically useful. This technique is simple, inexpensive, fast, safe and non-invasive, which allows the enamel to maintain its structure. It does not require special materials and can be used safely on young permanent teeth [8].

The application of sodium hypochlorite degrades and removes the chromogenic organic material located in the hypomineralized enamel [8,10].

This technique provides a conservative alternative treatment for yellow-brown hypomineralized enamel lesions that have demonstrated good clinical success. The application of conservative treatment techniques should be considered prior to the application of techniques that require substantial removal of enamel for the treatment of enamel discolorations [8].

However, in some cases the bleaching technique alone is not enough to reach a satisfactory result as we found in our case. This technique showed good results in the more superficial lesions but required other approaches in the deeper lesions.

Enamel microabrasion is also a conservative method to consider for removing enamel to improve discoloration limited to the outer layer of the enamel [19]. This method involves mild acid etching in combination with rotary application of an abrasive medium such as pumice [20].

This technique has been suggested for aesthetic improvements using different mixtures and concentrations of hydrochloric acid, phosphoric acid gel, pumice or other particles like silica carbide [19]. We used a mixture of 37% phosphoric acid gel associated with extra fine grain pumice in equal proportions

Even if a restorative approach is necessary, microabrasion should be considered as a first treatment option, as it may reduce the need for enamel wear, thus being a more conservative treatment method [21].

In our case, some of the enamel defects were deeper into the enamel and could not be resolved with microabrasion alone. In these cases a resin composite restoration may be a good complement in order to achieve an optimal aesthetic result like showed by Sundfeld et al. [19].

The presented case shows a conservative approach to deal with the MIH condition, in which we aimed to restore function and aesthetic using simple and efficient techniques. Usually, the recommended treatments for HIM, when affecting dental cusps, may be composite restoration, stainless steel crown or, in cases of markedly severe lesions of MIH, extraction may be considered, however, the need for orthodontic treatment may arise. For all these reasons, we realize that the dentist's decision is not easy, but first of all, one of the questions that must be asked is whether the affected dental structures are for restoration or for extraction. This decision depends on multiple factors such as the child's age, HIM severity, pulp involvement, tooth restorability, presence of third molar germs, cost of treatment, and whether short, medium- or long-term treatment is desired. In this particular case, after clinical and radiological evaluation, the proposed treatment was direct restoration because it was more conservative, since the cervical margins of the teeth in question did not presented hypomineralization and the patient showed acceptable oral hygiene. The use of stainless-steel crowns was not disregarded, but as it was more invasive, we saved that option in case the restorations presented infiltration during the follow-up. The bleaching technique described was able to disguise the yellow-brown stains on the lower permanent incisors but required other approaches in the deeper lesions. After one-year of follow up, the initial complaints disappeared, and the restorations showed no signs of wear and good margin adaptations, thus proving the use of resin restorations on MIH patients as a good conservative alternative to steel crowns.

Collaborators

R TEMUDO, investigation, data curation, writing-original draft. P NEVES, writing-original draft. I VENTURA, project administration. L LOPES, conceptualization, supervision, Writing-review & editing.

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