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## Case Report

# Association of in-office and supervised in-office bleaching protocols in Molar Incisor Hypomineralization: A Case Report

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### ARTICLE INFO

#### Article history:

Received 5 May, 2018

Accepted 18 May, 2018

Published 12 June 2018

#### Keywords:

*Molar incisor hypomineralization*

*dental bleaching*

*aesthetics*

### ABSTRACT

Molar incisor hypomineralization (MIH) is defined as a qualitative enamel defect of systemic origin. It is frequently associated with many dental problems which requires a complex treatment, especially when anterior teeth are involved. Currently, dental bleaching is one of the treatments of option to improve the aesthetic conditions for mild/moderate cases, but it can cause side effects on enamel such as mineral lost. To overcome this situation, many remineralizing agents have been incorporated to the formulation of the bleaching gels. The paper presents a case report of a young woman with white opacities on incisors treated with a combined use of two in-office bleaching protocols with gels containing fluoride and potassium nitrate in their composition (Opalescence<sup>®</sup> Boost 40% and Opalescence<sup>®</sup> Quick PF 45% - Ultradent) to minimize the enamel side-effects and to correct the aesthetic defect. To further protect the hypomineralized area, it was proposed to apply a layer of an etch-and-rinse adhesive system (Adper<sup>™</sup> Single Bond 2 – 3M) prior all dental bleaching session. The protocol used in this treatment has shown to be effective to improve aesthetics, according to the patient expectation.

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### Introduction

Molar incisor hypomineralization (MIH) is defined as a qualitative enamel defect of systemic origin and its world prevalence ranges from 3% to 44% [1, 2]. It affects at least one first permanent molar, and it is often associated with alterations in permanent incisorS [3]. Clinically, hypomineralized enamel presents demarcated opacities, ranging from white to brown, according to the severity of the disease [2]. Due to the

high degree of porosity and less resistance, MIH is associated with many dental problems such as post-eruptive breakdown, increased susceptibility to caries and hypersensitivity [3]. Besides the recurrent and more complex treatment required, such factors can cause social and psychological harm for the patients affected, mainly when anterior teeth are involved [3]. Due to that, to restore the aesthetics and facial harmony is of extreme relevance for the patient self-esteem and represent a challenge for the dentistry professional [1].

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Many treatment recommendations have been proposed, but they are general and usually do not correlate all the MIH clinical characteristics with the whole individual's oral health together [4]. Recently, a new standardized assessment criterion was proposed to diagnose MIH, leading into consideration both degree of severity and hypersensitivity [4]. The idea of the international working group who created the MIH-Treatment Need Index (MIH-TNI) is to use it for epidemiological studies on data collection as well as for the assessment of the condition and treatment planning of individual patients [4]. Currently, for mild/moderate cases, microabrasion and/or a composite restoration are the treatments of choice to improve aesthetic conditions [2, 5, 6]. However, the success of microabrasion is limited to the depth and extension of the defected enamel [5,6] and the adhesion of composite resins to hypomineralized tissue is critical due to its micromorphologic characteristics [7]. According to Mastroberardino et al (2012), a conservative approach to improve the condition of teeth affected by mild/moderate MIH would be useful.

Therefore, the aim of this article was to present a case report involving a mild case of MIH using the association of two bleaching protocols: in-office and in-office with dental bleaching tray, protecting the hypomineralized area as the treatment of option, as well as its implications and aesthetic repercussions.

### Case Report

The present paper shows a case report of a 22-year-old young woman who came to the Department of Restorative Dentistry at Piracicaba Dental School (FOP/UNICAMP) to improve the aesthetics of her smile. She was dissatisfied with the white-demarcated opacities in the upper central incisors. Clinical evaluation revealed that the patient was affected by MIH (Figures 1A, 1B and 1C).

Considering her age, a minimally invasive approach was proposed to improve the aesthetic condition of the teeth, instead of conventional restorative treatments. Thus, the proposed treatment was based on a combined approach of two in-office bleaching protocols: the first protocol being carried out with a gel of hydrogen peroxide (40%) applied as the conventional manner and the second one performed with a gel of high concentration of carbamide peroxide (45%) in a custom tray.

Firstly, the oral environment stabilization procedures were carried out by means of supragingival scraping using Duflex periodontal cures (SS White, Rio de Janeiro, Rio de Janeiro, Brazil) and dental prophylaxis with pumice paste (SS White, Rio de Janeiro, Rio de Janeiro, Brazil) and water in the proportion of 2:1. In the subsequent session, the initial color of the teeth were recorded using the VITAPAN® Classical visual scale (VitaZahnfabrik, Bad Säckingen, Germany). The upper incisors were presented in color A1, the canines in color A3,5 (Figure D). The lower teeth were presented in color A2 for incisors and A3,5 for canines.

On the beginning of each bleaching session, a gingival barrier (OpalDam® – Ultradent Products, Inc., South Jordan, UTAH, USA) was applied and light cured for 20 s on the gingival contour of all teeth to protect and avoid any mucosa irritation.

As the patient presented areas of hypomineralization, the superficial and subsurface layer of the enamel were protected through the application of a single bottle adhesive system (Adper™ Single Bond 2 – 3M of Brazil, Sumaré, São Paulo, Brazil) light cured for 40 s (Figures 2A and 2B). This practice was performed throughout the treatment, prior to the start of each in-office bleaching session.

For the in-office bleaching technique, the first agent used was the Opalescence® Boost 40% (Ultradent Products, Inc., South Jordan, UTAH, USA) which is the basis of hydrogen peroxide and was prepared according to the manufacturer's specifications. In each session, a desensitizer agent (UltraEZ 3%, Ultradent Products, Inc., South Jordan, UTAH, USA) was applied for 15 min prior the bleaching. After that, two applications of the bleaching agent were performed for 20 min each (Figure 2C). At the end of each session the teeth were washed thoroughly with water and then neutral colorless fluorine gel (2% NaF – New DFL, Jacarepaguá, Rio de Janeiro, Brazil) was applied for 4 min. Two sessions were performed at one-week interval (Figure 2D). During the treatment with the bleaching agent Opalescence® Boost 40%, the patient complained of hypersensitivity. A 15-day period was waited for stabilizing the final smile color.

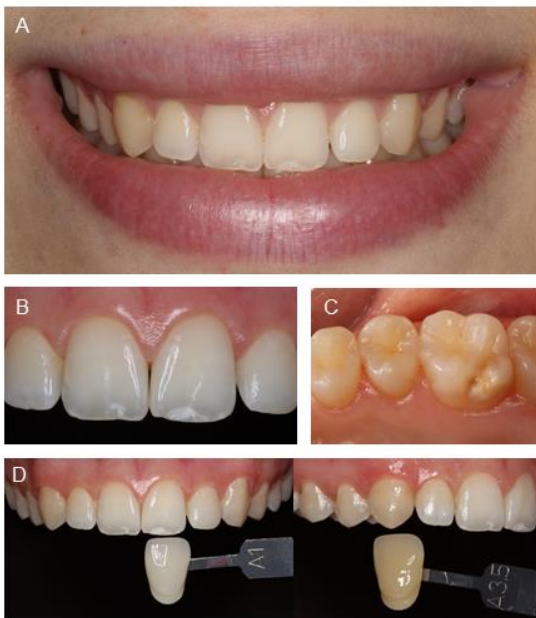
In order to obtain more satisfactory aesthetic results and to reduce the hypersensitivity, when the patient returned to the dental office it was indicated the association a supervised in-office bleaching treatment with 45% carbamide peroxide gel (Opalescence® Quick PF 45% (Ultradent Products, Inc., South Jordan, UTAH, USA), which uses is recommended with personalized bleaching trays.

The moldings of the upper and lower arches were performed with alginate (Hydrogum – Zhermack, Badia Polesine, RO, Italy) to obtain the type III gypsum model. Soon afterwards, acetate trays (Sof-Tray® Classic Sheets, Ultradent Products, Inc., South Jordan, UTAH, USA) were made, which, after being cut and analyzed for their adaptation to the teeth and gingival tissues, a quantity of the gel was placed in the space referring to the center of each tooth to be cleared; the bleaching was performed in the dental office, for the time of 30 min, were made 3 sessions, with interval of 1 week (Figures 3A, 3B, 3C and 3D).

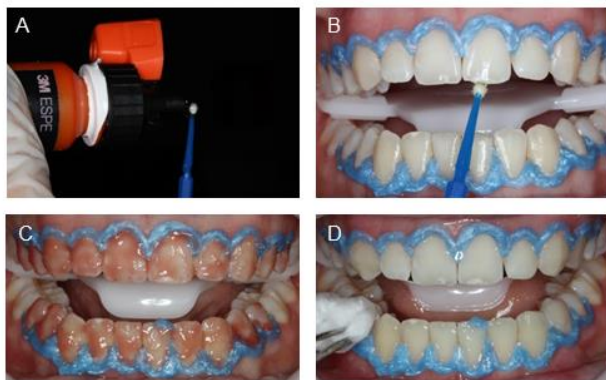
At the end of each session, the bleaching agent was removed with suction and abundant washing. The dental surfaces were then dried and neutral colorless fluorine gel (2% NaF - New DFL, Jacarepaguá, Rio de Janeiro, Brazil) was applied for 4 min.

After the bleaching procedure, a period of 2 weeks of the patient return was waited for evaluation of the final color obtained. The smile was presented with the upper incisors in color B1 and upper canines in color A1 (Figures 3E); the lower incisors in color B1 and the lower canines in color A1.

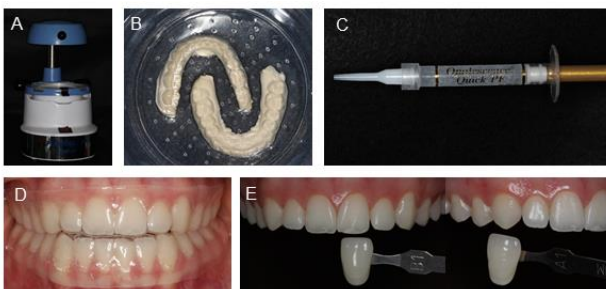
**Figures**



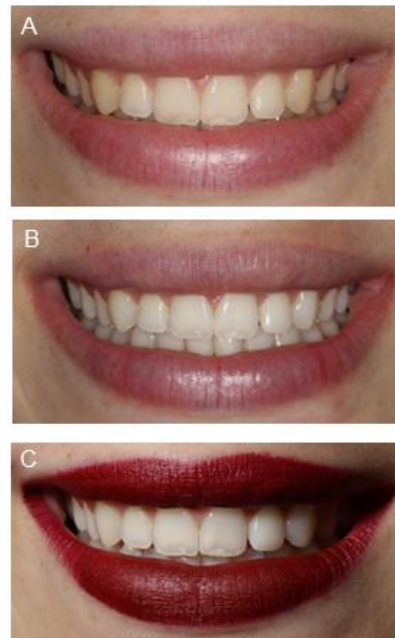
**Figure 1:** A Initial smile picture; B Upper central incisors white-demarcated opacities; C Upper Molar Brown opacity in the occlusal interface; D Initial color of the upper teeth using the VITAPAN® Classical visual scale.



**Figure 2:** A Adper™ Single Bond 2 (3M); B Adhesive system layer application on the hypomineralized areas; C Dental Bleaching Opalescence® Boost 40% (Ultradent Products); D Neutral colorless fluorine gel (2% NaF) application for 4 min.



**Figure 3:** A Vacuum former used to produce individual trays; B Acetate trays confection; C Opalescence® Quick PF 45% (Ultradent Products); D Adaptation of acetate trays; E Final color of the upper teeth using the VITAPAN® Classical visual scale.



**Figure 4:** A Initial smile picture; B and C Final smile picture.

**Discussion**

According to the MIH-Treatment Need Index (MIH-TNI) criteria proposed during the spring meeting of the German Society of Paediatric Dentistry (DGKIZ) in Würzburg (Germany) in 2016, the present case can be classified as a typical MIH-TNI 1 MIH (without hypersensitivity and without defect) [4]. The upper frontal incisors and molar were the mostly involved teeth with demarcated incisal white opacities and a brown opacity involving the occlusal interface, respectively (Figures 1B and 1C). Even though the hypomineralized areas affected less than 1/3 of the teeth, the patient had a high aesthetic need and wanted to reduce the appearance of it on the upper incisors without being submitted to an invasive approach, such as resin restoration. The protocol used in this case report has shown to be effective to improve aesthetics according to the patient expectation.

Qualitative defects such as hypomineralization are result of alterations that occur during the maturation of the organic matrix on the second phase of amelogenesis [7]. The cause remains unknown, but it has been associated with health problems during pregnancy or early childhood [1]. The result is a tissue with lower mechanical resistance than a normal enamel due to the low calcium and phosphate ions content and partial loss of prismatic pattern that can extend through the full thickness of the enamel [8]. Considering it, the use of bleaching systems composed only by hydrogen or carbamide peroxide on hypomineralized teeth by itself is not recommended. This is due because despite their ability to disintegrate pigmented molecules in tooth structure, the unstable free radicals generated during the oxide-reduction reaction of these agents are also able to decompose both organic and inorganic contents [9-11]. The consequences of this process may worsen the mechanical properties of hypomineralized affected teeth and yet highlight the appearance of MIH opacities [2].

However, many agents have been incorporated to the formulation of the bleaching gels to minimize the side effects of the treatment on enamel [9]. For example, both bleaching agents chosen for this case report, Opalescence® Boost and Opalescence® Quick PF 45%, have in their composition the presence of fluoride and potassium nitrate. Mineral loss that happens during the dental bleaching can be attributed to saturation of the bleaching gel, even though it has a neutral pH [12]. If the gel becomes undersaturated compared to the surface enamel, the ionic balance will lead the enamel surface to lose ions [13]. In this way, in order to prevent mineral loss and maintain the saturation of the bleaching agent at a level similar to the enamel, fluoride addition to bleaching agents may be necessary [13]. Besides that, fluoride is important to minimize or reverse microstructural defects through the enamel adsorption and precipitation of calcium and phosphate present in saliva [12].

Another factor to lead in consideration is that hypersensitivity is a symptom frequently reported by patients with MIH [3,4] and can be worsened during a dental bleaching treatment. For this reason, a bleaching gel with a desensitizing agent incorporated to its formulation should always be considerate. Potassium nitrate can decrease the ability of nerve fibers in the dental pulp to repolarize after an initial depolarization due to pain sensation, reducing the symptom [14]. Both bleaching agents used in this case report present in their composition potassium nitrate. However, after the use of the bleaching agent Opalescence® Boost 40%, which is based of hydrogen peroxide, the patient complained of hypersensitivity. In order to reduce or avoid the symptom, it was chosen the Opalescence® Quick PF 45%, which is based of carbamide peroxide.

It also has been reported that inorganic loss promoted by bleaching agents in enamel may not be limited to the surface but may possibly reach the enamel subsurface as well [15]. To avoid this situation, the present case reported proposed to protect the affected area with an adhesive system prior all bleaching sessions. The Adper™ Single Bond 2 is classified as a two-step etch-and-rinse adhesive system, to change the bonding to enamel surfaces is a durable and reliable clinical procedure with the previous use of phosphoric acid etching [16]. Considering that the acid etching would cause more damage to the hypomineralized tissue, its use on this case report was not supported. However, as MIH-affected teeth has already increased porosity, ranging from 5-25% in comparison to normal enamel [8], it is believed that the adhesive would flows through the enamel microporosities and polymerizes to form interlocked tags that would protect the enamel surface and subsurface against the dental bleaching. Another benefit of the application of an adhesive layer on the hypomineralized area is to prevent to increase its luminosity. It has been shown that enamel changes caused by low concentrations of bleaching peroxides may contribute to the deviation of the light in different indices of refraction, perceived as white [2]. For this reason, affected areas can become over-luminated, which would not be a desirable outcome for MIH patients.

In contrast, when an adhesive system is applied for protecting tissue purposes, such as in case of eroded enamel or dentin, the layer is not resistant to the daily acid challenge and brushing abrasion for a long period of time [17]. However, considering all the benefits exposed above, its use prior every bleaching session is justified. The association of the in-office with the supervised in-office bleaching techniques make possible to protect the affected area prior the gel application, improving

the aesthetic aspect of patients affected by MIH with a simplified modification of the bleaching technique. Even though, to remove the white-demarcated opacity was still visible on the upper incisors at the end of the treatment, the patient was satisfied with the overall esthetic result and the minimally approach used.

## Conclusion

The proposed protocol based on the use of two in-office bleaching techniques, being one of them with the use of bleaching trays, using agents containing fluoride and potassium nitrate in their composition has shown to be effective in teeth with mild enamel white opacities, preventing hypersensitivity and allowing to preserve enamel integrity without recurring to restorative treatment or enamel microabrasion.

## Acknowledgements

Ultradent Products company kindly donated the bleaching gels used in this case report.

## Conflict of interest

The authors state that there were no financial and personal conflicts of interest that could have influenced this work.

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