

Restoration of molars affected by molar-incisor hypomineralization using the occlusal replica technique

Restauração de molares afetados pela Hipomineralização Molar-Incisivo utilizando a técnica da réplica oclusal

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ABSTRACT

The aim of this study was to report the clinical case of an 8-year-old male patient seen at the Pediatric Dentistry outpatient clinic at the Universidade Federal do Paraná, Brazil, diagnosed with molar-incisor hypomineralization (MIH) after presenting with pain in teeth 16, 36, and 46, which had extensive atypical cavities and opacities on the adjacent enamel. A diagnostic wax-up of affected teeth was performed for manufacture of silicone occlusal matrix. Encapsulated high-viscosity glass ionomer cement was handled and inserted into the occlusal matrix which was fitted onto the teeth by slight finger pressure. After setting time, excess of material was removed, and occlusion was checked. A flowable resin coating material was applied, and the restorations were finished. Six months later, the restorations performed for treatment of the severe MIH lesions proved to be efficient, lowering the sensitivity reported by the patient, reshaping the teeth, improving their function, and refining dental esthetics.

Indexing terms: Dental enamel. Glass ionomer cements. Case reports.

RESUMO

O objetivo deste estudo foi relatar um caso clínico de um paciente com diagnóstico de Hipomineralização de Molares e Incisivos (HMI). Paciente do sexo masculino, de 8 anos de idade, compareceu à clínica de Odontopediatria da Universidade Federal do Paraná com queixa de dor nos dentes 16, 36 e 46 - os quais apresentavam extensas cavitações atípicas com opacidades no esmalte adjacente. O encerramento diagnóstico dos dentes afetados foi realizado para a confecção das matrizes oclusais de silicone. Cimento ionômero de vidro de alta viscosidade encapsulado foi manipulado e inserido na matriz oclusal, a qual foi encaixada sobre os dentes, exercendo-se leve pressão digital. Após a presa do material os excessos foram removidos e a oclusão foi checada. Aplicou-se uma camada de resina fluida de cobertura e as restaurações foram finalizadas. Após seis meses, as restaurações realizadas para tratar as lesões severas de

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HMI mostraram-se eficazes, reduzindo a sensibilidade relatada pelo paciente, além de reestabelecerem a anatomia, função e estética dentária.

Termos de indexação: Esmalte dentário. Cimentos de ionômeros de vidro. Relatos de caso.

INTRODUCTION

Restoration of teeth affected by molar-incisor hypomineralization (MIH) poses a great clinical challenge, and the restorative material should therefore be chosen carefully [1].

Composite resins have better physical properties than other direct restorative materials, provide better esthetic outcomes, and have high wear resistance [2]. However, owing to the smaller mineral content and higher organic material level of hypomineralized enamel when compared with a healthy substrate, the bond strength to adhesive materials is smaller, as phosphoric acid etching increases its porosity, predisposing to cohesive failure [3].

Given the better bond strength of the restorative material to the tooth substrate, glass ionomer cement (GIC) is a good alternative for restoration of molars affected by MIH, once they can be chemically bonded to tooth structures [1]. Consistency and limited working time are the major limitations of these materials, not allowing proper reshaping of tooth anatomy and maintenance of tooth function, in addition to low mechanical strength, which reduces the longevity of restorations [2]. Nevertheless, high-viscosity GICs (HVGICs) presents mechanical and esthetic properties better than conventional GICs [4].

The occlusal replica technique consists in duplicating the occlusal surface anatomy using impression of a tooth with intact superficial enamel or of a tooth wax-up. The impression is then used to transfer the surface details to the restorative material [5]. This procedure allows the reestablishment of the anatomical characteristics of the tooth surface, reduction in the working time, and minimal occlusal adjustment [6].

The restoration of molars affected by MIH with HVGIC associated with the use of an occlusal matrix facilitates the restoration of lost tooth structures [7], allow overcoming the GIC limitations, offering promising alternatives for the restoration of MIH-affected teeth. Accordingly, the present case report describes a restorative technique for MIH-affected teeth using HVGIC and a previously fabricated transparent silicone guide based on the wax-up of the missing structure of the affected teeth.

CASE REPORT

An 8-year-old male patient was seen at the Pediatric Dentistry outpatient clinic at the Universidade Federal do Paraná, Brazil. Informed consent was obtained from the patient's parents. During history taking, the patient complained about pain on chewing and tooth sensitivity to cold drinks. On clinical examination, the patient was diagnosed with MIH, according to the European Academy of Paediatric Dentistry criteria (EAPD) [8]. Permanent first molars (PFMs) 16, 36, and 46 had extensive demarcated brown opacities associated with atypical cavities and exposed dentin with active carious lesion (figure 1a-b). Tooth 26 had demarcated opacity without post-eruptive enamel breakdown, whereas incisors had no opacities (Figure 1c).

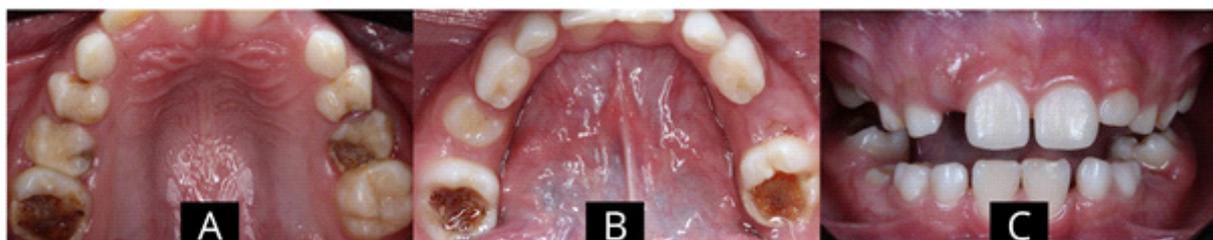


Figure 1. Initial clinical aspects of teeth: A) 16, B) 36 and 46 presenting extensive demarcated brown opacities associated with atypical cavities and exposed dentin with active carious lesion; C) Incisors presenting no opacities.

Chemically activated HVGIC (Equia Forte, GC America, USA) was chosen for the restoration of teeth 16, 36 and 46. First, the upper and lower arches were molded with addition silicone (Silagum, DMG, Germany). After that, in the laboratory phase, a diagnostic wax-up of the affected teeth was performed for the manufacture of occlusal guides. An impression of the wax-up was obtained using a transparent addition silicone (Elite Transparent, Zhermack, Italy), adapting the occlusal matrix technique [7]. The addition silicone was applied evenly onto the wax-up using a dental material dispenser, and after setting time - 15 seconds - the impression was removed (figure 2).

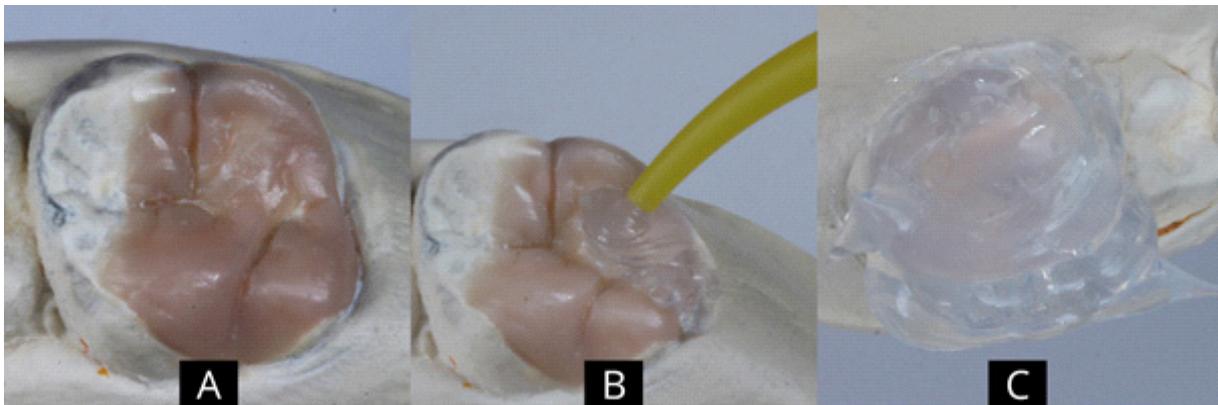


Figure 2. A) Diagnostic wax-up of tooth 16 affected by molar-incisor hypomineralization; B) Silicone occlusal guide con-fection and C) Final aspect of silicone occlusal guide.

The patient presented hypersensitivity, thus anesthesia was performed in order to reduce the patient's discomfort during the procedure. After anesthesia and complete isolation of the operating field, the caries-affected dentinal tissue was removed selectively, i.e., the softened tissue was removed from teeth 16, 36, and 46 with a dental excavator following the current principles of minimum intervention dentistry [9] (figure 3a). The hypomineralized enamel was also removed selective using a dental excavator to remove the hypomineralized tissue with opaque appearance, which crumbles on contact with the instruments until more resistant enamel is obtained [3]. For higher restoration durability, the enamel margins were prepared with a truncated cone diamond bur (4138, KG Sorensen, Brazil) (Figure 3b). The enamel and dentin were then conditioned with 10% polyacrylic acid (Cavity Conditioner, GC America, USA) for 10 seconds (figure 3c), rinsed, and dried for 5 seconds at 10 cm from the tooth element.

Encapsulated GIC was handled using amalgamator and inserted into the silicone guide, which was fitted onto the teeth by slight finger pressure (figure 3d). The silicone guide remained adapted to the teeth for 2 minutes - setting time of Equia Forte [10]. After setting time, excess material was removed with a scalpel blade (figure 3e) and occlusion was checked with an articulating paper (Bausch, 200 μ m, Germany) (figure 3f).

After occlusion adjustment, a flowable resin coating material (Equia Forte Coat, GC America, USA) was applied and light-cured for 20 seconds and the restorations were finished (figure 4). Six months later, the restorations were clinically satisfactory, with good marginal fit and integrity, showing no wear and/or discoloration. Also, the patient did not complain about tooth sensitivity or painful symptoms.

DISCUSSION

GIC has been recommended as permanent restorative material, and it is therefore a good alternative for the restoration of MIH-affected teeth [1], as it chemically bonds to the tooth structures, aids with remineralization, reduces

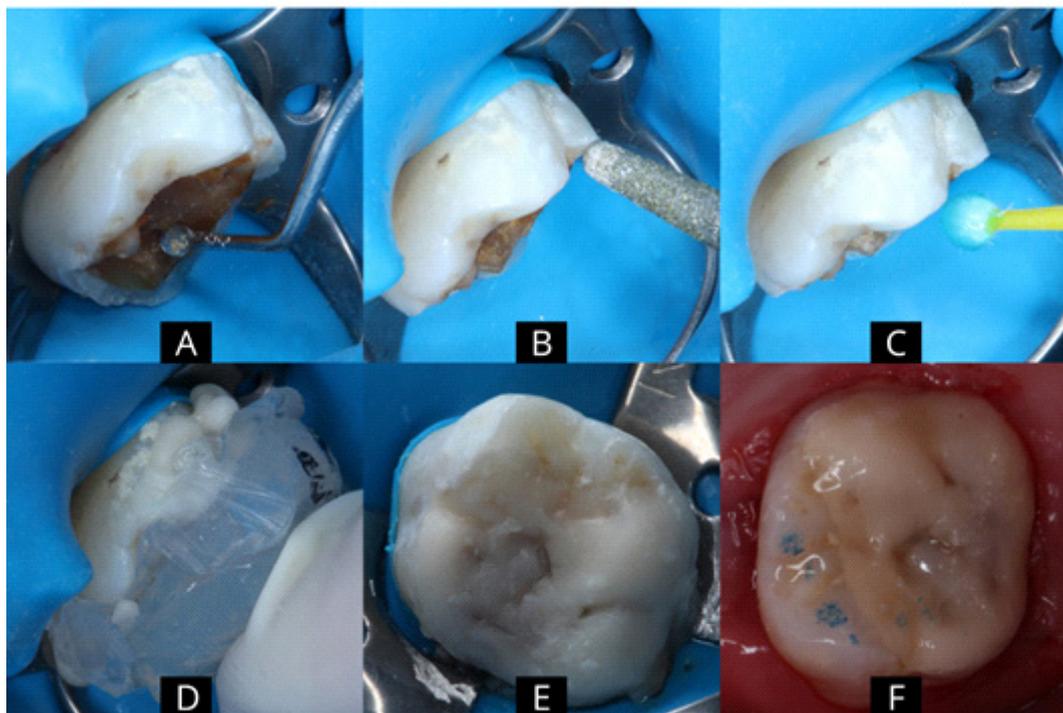


Figure 3. A) Select removal of caries-affected dentinal tissue; B) Preparation of enamel margins; C) Enamel and dentin condition with 10% polyacrylic acid; D) Silicone occlusal guide filled with high-viscosity glass ionomer cement positioned on the tooth 16; E) Aspect of restoration after removing the excess material; F) Clinical aspect of restoration after occlusion adjustment.



Figure 4. Final clinical aspects of teeth: A) 16, B) 36 and 46.

sensitivity, has a linear thermal expansion coefficient similar to that of the tooth, and is more resistant to moisture [11,12]. Previous studies have described success rates between 78.8% [13] and 98.3% [14] for GIC restorations of MIH-affected teeth after 12 months. Recently, Durmus et al. [15] evaluated the clinical survival of HVGI to restore teeth affected by MIH and obtained a success rate of 87.5% after 24 months.

Chemically activated HVGIC was chosen for the present case for combining the properties of high-viscosity cements and the advantages of flowable resin coating (Equia Forte Coat, GC America, USA). High-viscosity cements contain smaller particles in higher amounts compared with conventional GICs, and they also have higher density and surface hardness [16]. On the other hand, flowable resin coating protects the GIC in its initial setting phase, reduces its porosity, and increases its wear resistance [17].

The advantages of occlusal matrices include easy reproducibility of the tooth anatomy, satisfactory esthetic outcomes, and reduced necessity for occlusion adjustments [18]. Moreover, it allows a quicker clinical procedure, reducing chair time, and minimizing behavioral problems, since extended dental treatment length is associated with higher levels of behavioral problems in children [19]. The use of occlusal matrices in MIH patients has been recently described in a case-report study, with satisfactory outcomes in an 18-month follow-up period [7]. The authors considered the patients hypersensitivity when choosing this technique and hypothesized that the HVGC restoration covering of the hypomineralized surface was able to reinforce the porous and fragile enamel owing to a distinct zone of interaction between the material and enamel [7]. In the present case report, we also considered the patients hypersensitivity, however, unlike the previous study, our patient had not received previous treatment. In addition, we chose to carry out the complete isolation of the operating field, while Mendonça et al. [7] opted for the relative isolation.

Cavity preparation was performed by selectively removing the hypomineralized caries-affected tissue and enamel. The minimal intervention dentistry principle, aimed at lifelong maintenance of tooth functions [20], was followed. In cases of cavitated carious lesions that require restorative treatment, it is recommended that the healthy tissue be preserved so that the tooth will be amenable to remineralization, with removal of the caries-affected tissue only as preparation for durable restorations and maintenance of pulp health [13]. Considering that children with MIH-affected teeth increasingly require restorative treatments on a regular basis when compared with those without MIH-affected teeth [21], selective removal of the hypomineralized enamel, removing only opacities located in unsupported enamel or associated to carious lesion, is also recommended so that the dental tissue can be preserved [3,13,14].

The patient was followed up for only six months, which can be considered a limitation of this study. However, it was observed that the approach described herein offers some advantages concerning children's behavior inasmuch as local anesthesia may be not necessary in cases of patients that do not present hypersensitivity, allowing the use of relative isolation, and minimizing any associated discomfort and reducing chair time.

CONCLUSION

The approach proposed in this report, consisting of the use of HVGCs and of a silicone guide, proved feasible for a quicker and more effective reconstruction of MIH-affected teeth.

Collaborators

AG Nagata substantial contribution in carrying out the treatment reported in this case, writing the manuscript and revision; GF Souza substantial contribution during the writing the manuscript and revision; KD Santos substantial contribution in carrying out the treatment reported in this case and draft the manuscript; JF SOUZA substantial contribution in the conception of the work, revising the manuscript critically for important intellectual content.

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