

CLINICAL REPORT



Digital restoration of molar hypomineralization in a child: a case report with a 24-month follow-up

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ABSTRACT

Molar Incisor Hypomineralization (MIH) is a developmental enamel defect that offers various treatment options. However, determining the most appropriate approach can be challenging, particularly when dealing with pediatric patients. In this study, we present the case of a 10-year-old male patient with severe MIH who complained of sensitivity while chewing and brushing his teeth. The treatment focused on the lower left first permanent molar, which showed significant coronal destruction. A digital workflow was employed to fabricate a polymethylmethacrylate crown. This chosen protocol demonstrated its efficacy by reducing sensitivity, improving mastication, and ensuring good patient cooperation throughout the 24-month follow-up period. Digital dentistry holds promise as a valuable tool in treating posterior teeth with extensive coronal damage caused by MIH. It simplifies the management of a child's behavior, preserves tooth structure, and results in more durable restorations. Additionally, the use of an affordable, low-cost polymethylmethacrylate-based restorative material provided satisfactory results.

KEY WORDS:

Dental enamel hypomineralization; Computer-aided design; Onlays, pediatric dentistry.

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INTRODUCTION

Molar incisor hypomineralization (MIH) is an enamel quality defect that asymmetrically affects one to four of the first permanent molars and may also involve the incisors. Clinically, it manifests as a demarcated opacity with color changes ranging from white/cream to yellow/brown, with a risk of post-eruptive fractures due to masticatory efforts⁽¹⁾. MIH is associated with hypersensitivity, difficulty obtaining adequate anesthesia, atypical carious lesions, reduction in resin bond strength, and successive replacement of restorations^(2,3).

The management of molars and incisors affected by MIH poses a challenge, but various intervention options are available. Patient cooperation, the stage of tooth development, and the severity of the defect are clinical factors to be considered when making treatment decisions. There is documented support for the use of resin-based fissure sealants, preformed metal crowns, direct composite resin restorations, and laboratory-made restorations. However, no singular technique for addressing molars affected by MIH appears to exhibit superiority⁽²⁾. With technological advances in the digital workflow of computer-aided design and computer-aided manufacturing (CAD/CAM), the treatment of MIH has potentially gained an ally. Through the use of computer-aided milling (CAM), crowns can be fabricated from various materials, including accessible options such as polymethylmethacrylate (PMMA), with greater precision and accuracy⁽⁴⁾, thereby achieving satisfactory treatment results.

The aim of the present clinical case was to demonstrate a restorative procedure utilizing a digital intraoral scanner (IOS) workflow, CAD/CAM fabrication, and a polymethylmethacrylate (PMMA) crown in a child with severe mandibular first permanent molar impairment due to MIH. The case involves extensive coronal destruction, loss of vertical dimension, and hypersensitivity.

CLINICAL CASE

This study followed the case report guidelines (CARE).

The 10-year-old male patient was accompanied by his mother to the Specialized Pediatric Dentistry Clinic. The guardian signed the consent form and the patient agreed to the treatment. The main complaint was great sensitivity while eating and brushing his teeth. The guardian denied that the child was under current medical treatment, but reported a history

of respiratory disease. The initial panoramic radiograph (Figure 1) was analyzed, and it was noted that at the time of the examination, the child was in the first transitional period of mixed dentition, with erupted first molars and permanent central incisors in the upper and lower dental arches.

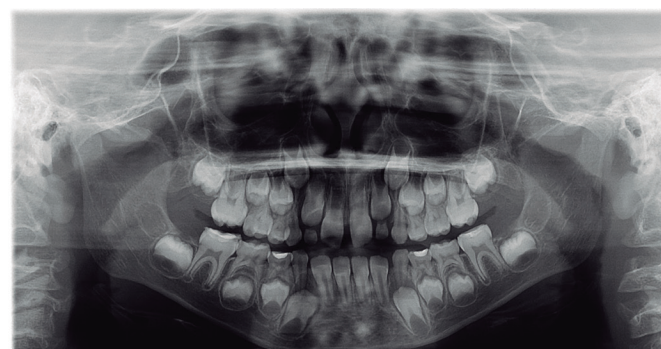


Figure 1. Initial panoramic radiograph. Patient in mixed dentition phase, first transitional period.

During the clinical examination, white/yellowish opacities were observed in the upper incisors and permanent upper first molars, and yellow/brown opacities with loss of structure were noted in the lower permanent first molars, characterizing MIH with a loss of the vertical dimension of occlusion (Figure 2).

Dental treatment began with prophylaxis using pumice, water, and application of 5% fluoride varnish (Duraphat®) in an attempt to desensitize, but without success. At the next appointment, the decision was made to seal the cavities in the first permanent mandibular molars with encapsulated glass ionomer cement (Riva Light Cure®). Due to significant coronal destruction and masticatory force, the restorative material fractured and was lost.

Due to the large loss of tooth structure in the lower left permanent



Figure 2. Left lateral photograph showing loss of vertical dimension in the lower left first molar.

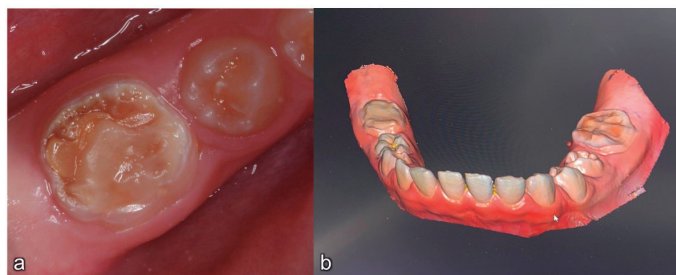


Figure 3. Occlusal view of the lower left permanent first molar showing the great loss of tooth structure (a). Scanning with digital flow of the lower dental arch (b).

first molar (Figure 3a), which made it impossible to efficiently seal the cavity with glass ionomer cement, we decided to perform a rehabilitative treatment by scanning with digital flow (Scanner 3 Shape® device) (Figure 3b) and subsequently construct a crown in polymethylmethacrylate (PMMA) to achieve greater resistance and retention of the restorative material due to the functional requirements of occlusion.

Prior to the prosthetic preparation of the referred tooth, the pterygomandibular anesthesia technique was performed with lidocaine 2% anesthetic salt and epinephrine 1:100,000 vasoconstrictor (DFL®) using a long needle (Terumo). Due to the hypersensitivity reported by the patient, this approach was supplemented with an infiltrative anesthesia technique using articaine 4% anesthetic salt and vasoconstrictive epinephrine 1:100,000 (DFL®) using a long needle (Terumo).

Grinding was performed only around the tooth to be prepared with minimal intervention and maximum preservation of tooth structure (Figure 4a). The hypomineralized enamel that would be in contact with the edges of the restoration was removed using a high-speed candle bur (DC18090J) to improve adhesion of the future crown (Figure 4b). Next, a phosphoric acid etch (Condac 37% - FGM®) was applied around the tooth for 20 seconds, followed by application of Single Bond Universal® (3M) adhesive (Figure 4c) with swabbing for 20 seconds, followed by light curing (Valo Cordless Grand 3200 - Ultradent) for 20 seconds. The polymethylmethacrylate (PMMA) crown was cemented with Dual Allcem resin cement (FGM®) (Figure 4d).

Immediately after cementation, the occlusion was checked, excess cement was removed from the interproximal region using dental floss and the final result of the restorative procedure was obtained (Figures 5a and 5b). The treatment was performed in two sessions on the same day.

At the 12-month follow-up, there was minimal wear of the polymethylmethacrylate (PMMA) crown and good hygiene (Figure 6a). The patient reported decreased pain with chewing and cold liquids and no pain with hygiene. The periapical control radiograph showed intact enamel structure, complete root development, normal periodontal ligament, and normal-appearing bone structure (Figure 6b). At the 24-month evaluation, a slight “wear-through” stain was observed in the mesial portion of the central groove (Figure 7a). However, this did not affect the patient's comfort or chewing function. It's important to note that polymethylmethacrylate (PMMA) is a provisional material, and although satisfactory clinical and radiographic results were achieved over the 24 months (Figure 7a and Figure 7b), the restoration will be replaced with a definitive material after the development of permanent occlusion. For the lower right first permanent molar, the child's caregivers opted for a

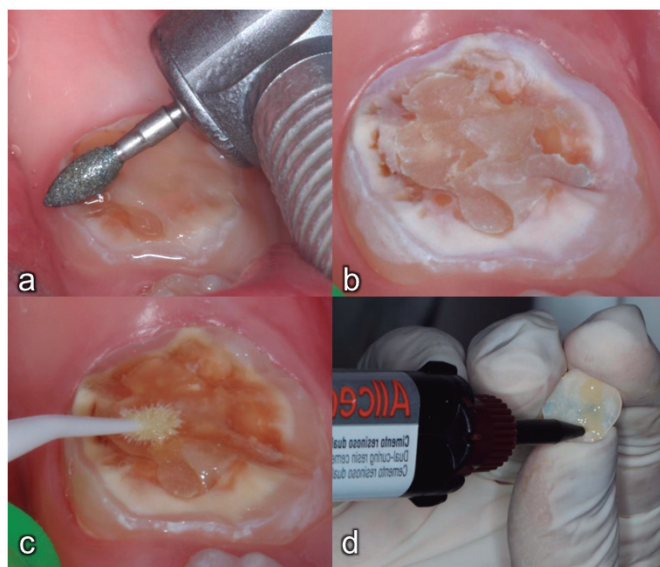


Figure 4. (a): Preparation of the lower left permanent first molar with a candle-shaped drill (a). Finished preparation showing the margins of intact enamel (b). Application of Single Bond Universal® 3M adhesive on the entire tooth surface of the lower left permanent first molar (c). Cementation of the crown in PMMA (d).

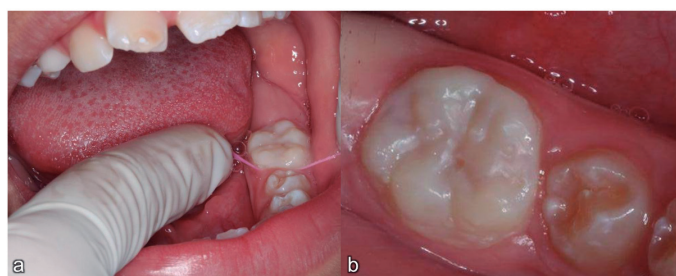


Figure 5. Removal of excess cement in the interproximal region using dental floss (a). Final appearance after cementation of the PMMA crown (b).

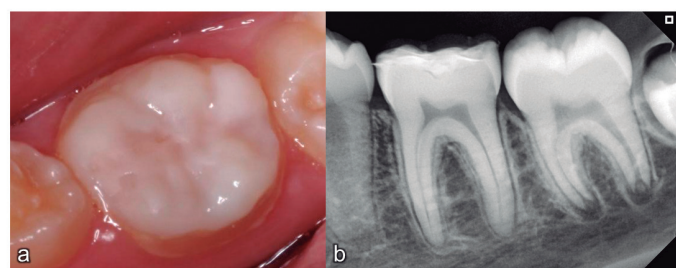


Figure 6. Clinical control at 12-month follow-up. Good adhesion and preserved material are observed (a). Radiographic control at 12-month follow-up with normal bone levels (b).

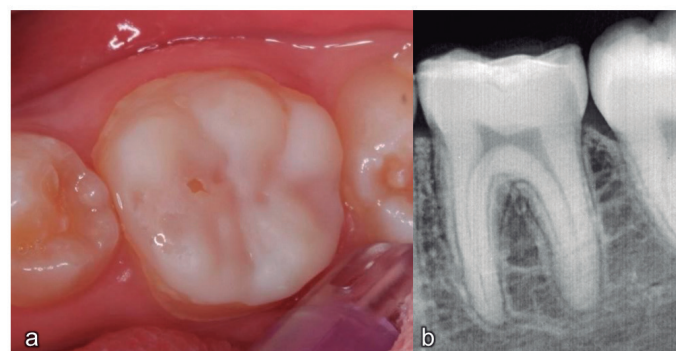


Figure 7. Clinical control at 24-month follow-up. Note “wear-through” spot in the mesial portion of the central groove (a). Radiographic control at 24-month follow-up with normal bone levels (b).

definitive restoration with digital flow in Emax porcelain.

DISCUSSION

Restoring teeth with MIH in children can be extremely complex due to hypersensitivity, anxiety, difficulty with anesthesia, poor esthetics, carious lesions with rapid progression, and restoration failure^(6,6). The use of IOS brought a new treatment perspective, minimizing the challenge of dealing with the child's uncooperative behavior and allowing for preservation of tooth structure and a restoration with greater longevity⁽⁷⁾. The present case report describes the restorative treatment of a mandibular permanent first molar affected by MIH using a digital workflow with IOS and CAD/CAM fabrication of the polymethylmethacrylate (PMMA) restoration.

Recently, there has been an increase in studies investigating the treatment of teeth affected by MIH. Preformed metal crowns are an alternative for severely compromised molars. However, there may be a short-term increase in periodontal pocket depth⁽⁸⁾. High success rates have been reported with the use of indirect restorations, including composite resin onlays, cast metal onlays, minimally invasive gold, and CAD-CAM restorations. However, there may be variability in margin finishing, with restorations being placed supra, sub, and equigingivally, potentially impacting periodontal tissues in the long term⁽³⁾. Generally, laboratory-made indirect restorations can be considered a better long-term option. Disadvantages such as more invasive preparation, repair difficulty, and higher cost should be considered when deciding to use this technique^(9,10).

The choice of common treatments for MIH, such as provisional restorations, should consider the need for replacement in adolescence or adulthood. Polymethylmethacrylate (PMMA) is used in the formulation of modern provisional materials (milled PMMA and 3D printed materials)⁽¹¹⁾. Its low cost, aesthetics, wear resistance, high polishing capacity, color stability and good marginal fit confirm it as one of the materials for fabricating durable temporaries⁽¹²⁾. However, its mechanical behavior is not impressive, which can lead to cracks and fractures. In addition, polymethylmethacrylate (PMMA) is radiotransparent, susceptible to degradation in contact with water, and has low thermal conductivity, which affects taste perception⁽¹³⁾. The choice of PMMA-based material was aimed at increasing the vertical dimension of the occlusion of the lower left first permanent molar. Although the patient had significant coronal destruction requiring regular follow-up, we achieved successful restorative treatment and good material adherence during the 24-month follow-up. The patient reported improvement in chewing due to reduced pain with eating and drinking cold liquids and no pain with brushing.

In recent years, MIH has become a challenge in dental practice, requiring good treatment planning based on scientific evidence and the use of appropriate materials. We highlight as the main limitation of our

study the use of a provisional material that may lead to failures in the long term. We emphasize the importance of respecting the principles of minimum intervention and maximum preservation of tooth structure during rehabilitative preparations, if necessary. Future studies should describe and standardize guidelines for obtaining more conservative dental preparations for restorations in teeth affected by MIH⁽¹⁴⁾. In the present report, the mandibular permanent second molars exhibited characteristics of enamel defect, indicating a patient who requires follow-up and long-term dental care.

CONCLUSION

Digital dentistry is a promising tool in the treatment of posterior teeth with extensive coronal destruction due to MIH, facilitating the child's behavioral management, preserving tooth structure, and providing more durable restorations. The use of an affordable and inexpensive PMMA-based restorative material showed satisfactory results during the 24-month follow-up period. There were improvements in tooth sensitivity, oral hygiene, and restoration of the patient's occlusion.

CLINICAL SIGNIFICANCE

Molar incisor hypomineralization (MIH) is becoming a common enamel problem in children. Treatment is challenging due to issues with the adhesion of restorative materials, caused by the porosity of the defect, dentin sensitivity, and difficulties in managing behavior. The significance of this case involves the use of digital flow technology and affordable restorative materials to treat posterior teeth affected by MIH. We emphasize that digital flow technology promotes patient cooperation, reduces treatment time, allows for a more conservative and faster tooth preparation, and results in restorations with greater durability, as evidenced by a 24-month follow-up.

ETHICS COMMITTEE

This study was approved by the Research and Bioethics Committee of the São Leopoldo Mandic School of Dentistry (CAAE: 59630922.9.0000.5374) and was conducted in full compliance with the Declaration of Helsinki of the World Medical Association. All respondents voluntarily chose to participate by accepting informed consent. The survey was anonymous, and the information was used for this research only.

CONFLICTS OF INTEREST.

The authors of the manuscript entitled "Digital restoration of molar hypomineralization in a child: a case report with a 24-month follow-up" declare no conflicts of interest.

Reference

1. Da Silva FG, de Almeida SB, de Campos PH, Abrantes RM, de Oliveira AVA, Guaré RO, et al. Low-Level laser therapy for management of hypersensitivity in molar-incisor hypomineralization and oral health-related quality of life: case report. *J Clin Pediatr Dent.* 2022;46(2):107-11. doi: 10.17796/1053-4625-46.2.3.
2. Americano GCA, Jacobsen PE, Soviero VM, Haubek D. A systematic review on the association between molar incisor hypomineralization and dental caries. *Int J Pediatr Dent.* 2017; 27(1):11-21. doi: 10.1111/ipd.12233.
3. Somani C, Taylor GD, Garot E, Rouas P, Lygidakis NA, Wong FSL. An update of treatment modalities in children and adolescents with teeth affected by molar incisor hypomineralisation (MIH): a systematic review. *Eur Arch Paediatr Dent.* 2022; 23(1):39-64. doi: 10.1007/s40368-021-00635-0.
4. Stanley M, Paz AG, Miguel I, Coachman C. Fully digital workflow, integrating dental scan, smile design and CAD-CAM: case report. *BMC Oral Health.* 2018;18(1):134. doi: 10.1186/s12903-018-0597-0.
5. Ghanim A, Silva MJ, Elfrink MEC, Lygidakis NA, Mariño RJ, Weerheijm KL, et al. Molar incisor hypomineralisation (MIH) training manual for clinical field surveys and practice. *Eur Arch Paediatr Dent.* 2017;18(4):225-242. doi: 10.1007/s40368-017-0293-9.
6. da Costa-Silva CM, Jeremias F, de Souza JF, Cordeiro Rde C, Santos-Pinto L, Zuanon AC. Molar incisor hypomineralization: prevalence, severity and clinical consequences in Brazilian children. *Int J Paediatr Dent.* 2010 Nov;20(6):426-34. doi: 10.1111/j.1365-263X.2010.01097.x. â©
7. Davidovich E, Dagon S, Tamari I, Etinger M, Mijiritsky E. An innovative treatment approach using digital workflow and CAD-Ca@AM Part 2: The restoration of molar incisor hypomineralization in children. *Int J Environ Res Public Health.* 2020; 26;17(5):1499. doi: 10.3390/ijerph17051499.
8. Koleventi A, Sakellari D, Arapostathis KN, Kotsanos N. Peridodontal impact of preformed metal crowns on permanent molars of children and adolescents: a pilot study. *Pediatr Dent.* 2018;40(2):117-21. PMID: 29663912.
9. Dhareula A, Goyal A, Gauba K, Bhatia S, Kapur A, Bhandari S. A clinical and radiographic investigation comparing the efficacy of cast metal and indirect resin onlays in rehabilitation of permanent first molars affected with severe molar incisor hypomineralisation (MIH): a 36-month randomised controlled clinical trial. *Eur Arch Paediatr Dent.* 2019;20(5):489-500. doi: 10.1007/s40368-019-00430-y.
10. Gaardmand E, Poulsen S, Haubek D. Pilot study of minimally invasive cast adhesive copings for early restoration of hypomineralised first permanent molars with post-eruptive breakdown. *Eur Arch Paediatr Dent.* 2013;14:35-9. doi: 10.1007/s40368-012-0002-7.
11. Balkenhol M, Mautner MC, Ferger P, Wöstmann B. Mechanical properties of provisional crown and bridge materials: chemical-curing versus dual-curing systems. *J Dent.* 2008;36(1):15-20. doi: 10.1016/j.jdent.2007.10.001.
12. Prasad KD, Shetty M, Alva H, Anupama Prasad D. Provisional restorations in prosthodontic rehabilitations-Concepts, materials and techniques. *J Health Allied Sci.* 2012;2:72-7. DOI: 10.1055/s-0040-1703578
13. Totu EE, Cristache CM. Could the old poly (methylmethacrylate) face arising challenges of new advanced technologies for dental prosthesis manufacturing. *Rev Chim.* 2017;68:2102-7. DOI:10.37358/RC.17.9.5832
14. Sundfeld D, da Silva L, Kluppel OJ, Santin GC, de Oliveira R, Pacheco RR, et al. Molar incisor hypomineralization: etiology, clinical aspects, and a restorative treatment: case report. *Oper Dent.* 2020;45(4):343-351. doi: 10.2341/19-138-T.



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