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Hypomineralization of Molar Incisors: A Challenge for the Pedodontist (About a Clinical Case)

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Abstract

Molar incisor hypomineralisation (MIH) is defined as the developmentally-derived dental defect that involves hypomineralisation of 1 to 4 permanent first molars (FPM), frequently associated with similarly affected permanent incisors. Clinically, this hypomineralised enamel damage of varying degrees, ranging from opacity to significant losses of substance with difficulty of management. The present work aims to show through a clinical case presenting a moderate MIH with an unusual localization and an asymmetric involvement, the step-by-step diagnostic approach and therapeutic management. Our therapeutic approach has been based on reducing tooth sensitivity, restoring aesthetics and protecting molars with preformed pedodontics crowns to avoid the risk of recurrence and repetitive procedures.

Subject Areas

Dentistry

Keywords

Hypomineralization of Incisor Molars, Enamel Mineralization Defects, Therapy

1. Introduction

Described as early as the 1970s to this day, it is not always identified by the general practitioner [1].

Molar incisor hypomineralization (MIH) is defined as a systemic hypomineralization of qualitative character that directly affects the enamel and dentin of

the first molars, with or without the involvement of the incisors. Less frequently, MIH-like defects have been reported in permanent canines, premolars, and primary second molars [2] [3] [4]. As a result of an altered (or disturbed) matrix production, secretion, arrangement, crystal formation, or matrix resorption, a compromised enamel structure may be observed [5].

High prevalence rates of MIH and its clinical implications are significant for both patients and clinicians. A wide variety in defect prevalence (2.4% - 40.2%) is reported. It seems to differ with regions and various birth cohorts. Some of the recent prevalence studies are tabulated [6] [7].

The etiology of MIH remains unknown. Some systemic factors such as fever, childhood diseases, and respiratory problems that occur during the prenatal, perinatal, and postnatal periods have been associated with MIH [8]. Given this association and the variability in global prevalence and clinical manifestations, the etiology of MIH is currently considered multifactorial and associated with a genetic component [9]. The ameloblast is a cell particularly sensitive to any local or systemic alterations, especially during the mineralization phase of amelogenesis [10]. Therefore, the magnitude of the defects will depend on the timing, duration, and severity of the exposures to risk factor/s, the stage of tooth enamel formation, and the genetic susceptibility of the individual [9].

Clinically, the hypomineralized enamel can be so porous, or resemble discolored chalk or old Dutch cheese [11] [12].

However, its management requires a real strategy to deal with several pitfalls related to hypomineralization: hypersensitivity, rapid development of caries, difficulties during anesthesia, or recurrent failure of restorations, all leading to more limited cooperation of the child [13], which is a real challenge for the pedodontist.

There are multiple treatment options for teeth affected by MIH, including preventive, desensitizing, and remineralizing products, calcium and vitamin supplements, resin infiltration, fissure sealants, enamel microabrasion, direct or indirect restorations, extractions, and orthodontic alignment [14] [15].

The choice and indication for treatment depends on severity, patient age, socioeconomic factors and treatment expectations [15] [16].

In our article, we will detail the treatment of this pathology in our 10-year-old patient from a low socio-economic family who presented with a moderate MIH.

2. Presentation of the Clinical Case

A 10 years old male patient, who had suffered from severe asthma for the first 4 years of life, and whose reason for consultation was the unsightly appearance of the upper central incisors and hypersensitivity.

The exobuccal examination was unremarkable.

During the endobuccal examination, we noted the presence of:

A loss of substance at the level of the 11, 21 with an irregular and yellowish surface

Asymmetrical involvement: Well-defined yellowish opacities in the third in-

cisal of the 31 and 32, 33, and enamel defects with a creamy-white appearance on the 41, 42, 43 with a smooth and hard surface (Figure 1).

The occlusal surfaces of the 4 permanent molars show brownish opacities with soft, porous enamel and irregular, sharp boundaries (Figure 2). This patient also has caries on 75.

Indeed, it is the dyschromia of the incisors that pushed the parents to bring their child back to the consultation, since it appeared more, and plays a very important role in the aesthetics, although the molars are more affected but given their posterior location, makes them less visible and therefore more neglected.

3. Radiographic examination

On retroalveolar radiographs, coronal radiolucency was noted reaching the middle third of the dentin at the level of the 4 permanent molars and a loss of substance reaching the outer third of the dentin at the incisal level of the 11 and 21 (Figure 3).

Faced with this clinical picture we evoked the diagnosis of MIH, based on the history, the topography and the characteristics of the involvement, but also on the severity of the involvement according to the chronology of the eruption.

Our therapeutic goals were to eliminate hypersensitivity and pain, control the factors responsible for caries disease, and restore function and aesthetics.

A professional prophylactic cleaning of the dental surfaces to reduce the bacterial load followed by the application of Duraphat fluoride varnish (22,600 ppm F) on the hypomineralized surfaces for 1 min to avoid hypersensitivity and the risk of caries in this area. Advice is given to optimize the conservation of fluoride on the surface of the tooth (do not drink within two hours or eat within four hours).

Conservative care was first applied to the first permanent molars in order to avoid pulpal damage and necrosis: it was decided to cure the hypomineralized tissue in its entirety and to apply a hybrid glass ionomer and preformed pedodontic crowns on the 4 permanent molars (Figure 4), because the adhesion of conventional filling materials is not optimal on hypomineralized and soft enamel, in addition to the extent of the loss of substance. There is therefore a risk

Figure 1. Intra-oral view: A yellowish opacities was noted at the level of the 11, 21 and in the third incisal of the 31 and 32, 33.

Figure 2. Intraoral views: The occlusal surfaces of the 4 permanent molars show brownish opacities with soft, porous enamel and irregular, sharp boundaries.

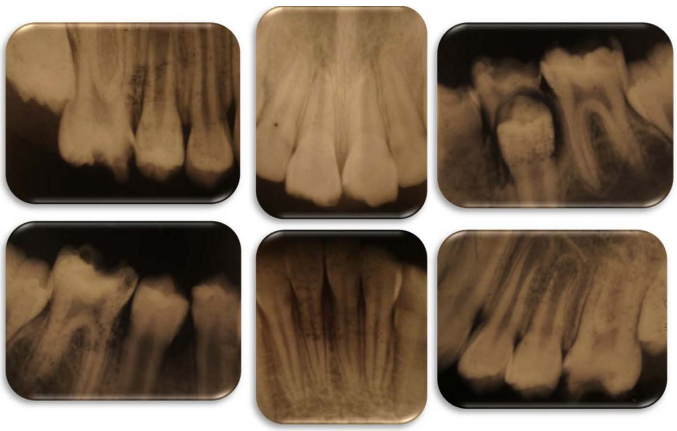

Figure 3. Retroalveolar radiographs: coronal radiolucency was noted reaching the middle third of the dentin at the level of the 4 permanent molars and a loss of substance reaching the outer third of the dentin at the incisal level of the 11 and 21.

Figure 4. Intraoral views: preformed pedodontic crowns on the 4 permanent molars.

of early loss of the filling and refractory caries and therefore of repeated re-interventions which lead to very significant coronal decay.

Finally, aesthetic restoration of the upper central incisors was performed by curettage of all hypomineralized tissues and obturation by the layering technique (**Figure 5**).

For the lower incisors we opted for the micro-abrasion technique.

Clinical and radiographic follow-up sessions were scheduled every 3 months at baseline and then every 6 months after each year.

Figure 5. Intraoral view: aesthetic restoration of the upper central incisors was performed by curettage of all hypomineralized tissues and obturation by the layering technique.

4. Discussion

In our patient, the elements collected through the medical history, the clinical and radiographic examination were in favor of the diagnosis of Hypomineralization of Molar Incisors.

The term "Molar Incisor Hypomineralisation", defined by Weerheijm *et al.* [17] in 2001, was adopted at the 6th annual EAPD meeting in 2003 [18]. Indeed, this

The pathology corresponds to qualitative enamel defects of systemic origin affecting one or more permanent first molars, whether or not associated with lesions of the permanent incisors [19]. Less frequently, MIH-type defects have been reported in permanent canines, premolars and primary second molars [2]. Our patient presented with damage to the first 4 molars, incisors and canines.

At present, the etiology is thought to be multifactorial; however, it is not yet clearly elucidated. Various causes have been suspected, including: [20] [21]

- Premature deliveries, neonatal hypoxia, respiratory diseases;
- Infectious diseases in early childhood: Severe diseases with high fever such as diphtheria, scarlet fever, mumps and measles have an influence on amelogenesis;
- The use of certain antibiotics in the early stages of life;
- The presence of dioxin derivatives in breast milk.

Asthma is the etiological hypothesis of MIH in our patient. According to Jalevik & Noren [22], ameloblasts are very sensitive to oxygen deficiency. Oxygen deficiency at birth could therefore also be a possible cause of enamel formation disorders [23].

The treatment modalities available for teeth with MIH are broad, ranging from prevention, restoration, to extraction.

The decision about which treatment to use is complex and depends on a number of factors. The most common factors are the severity of the condition, the dental age of the patient, the social environment, and the expectations of the child and parents [24].

It is important and wise to start giving appropriate dietary advice to affected

children and their parents. Toothpaste containing at least 1000 ppm fluoride is recommended [25].

Recently, amorphous casein-calcium phosphate phosphopetide (CPP-ACP), which provides a super-saturated environment of calcium and phosphate on the enamel surface, has been shown to promote remineralization. Although its clinical efficacy is still controversial, its recommendation in the form of toothpaste or sugar-free chewing gum may be beneficial for patients who complain of mild pain to external stimuli [26] [27].

For patients with spontaneous hypersensitivity, professional application of a fluoride varnish (Duraphat 22,600 ppm F) and possibly a 0.4% stannous fluoride gel may be helpful.

In our patient, the difficulties encountered were:

- Dental hypersensitivity that manifests itself to heat, cold, or contact. An application of varnish was the rule;
- Unsightly appearance at the anterior level;
- Anesthetic difficulties and adhesion of restorative materials in the first permanent molars.

Regarding the unaesthetic aspect related to the dyschromia of the lower incisors, we proceed to an amelar micro-abrasion because it constitutes a minimal therapy which aims at eliminating only the stainings of extrinsic or intrinsic origin limited to the superficial layers of the enamel. This technique was effective in our case because the defects were shallow and much localized [28].

In the literature there is controversy regarding the efficacy of conventional materials on teeth affected by MIH:

With regard to amalgam, it is non-adhesive, poorly insulating and predisposes to marginal fractures. Glass-ionomer cements are considered transitional restorations; Fayle advocates restorations with composite resin when the cusps are not affected. These restorations require proper access and optimal isolation. If a watertight surgical site cannot be achieved, it is preferable to place a glass ionomer cement shield as a first step and postpone composite fabrication, or to choose another treatment option [29] [30].

In our case, we decided to restore the first 4 permanent molars with hybrid glass ionomer cement and preformed pedodontic crowns, because the adhesion of conventional filling materials is not optimal on hypomineralized and soft enamel, especially since the loss of substance is significant. There is therefore a risk of early loss of the filling and of secondary caries, and therefore of repeated interventions that lead to very significant coronal decay. In very severe cases, extraction of the first molars followed by orthodontic treatment may be indicated [31].

Preformed pedodontic crowns are recommended when cusps are affected or when pain is intense and disabling. The success rate and longevity is 92% - 94%. They allow the restoration of the contact point as well as the coronal morphology, and maintain the vertical and horizontal dimensions of the arches. In addition, they are relatively easy to make. They will be replaced by ceramic crowns at

the end of growth [32] [33].

Follow-up sessions are important in the management of MIH to intercept complications and monitor the treatments performed as well as root building.

Early management and the right therapeutic decision allowed us to keep the molars.

5. Conclusions

MIH causes significant tissue damage, which is why early detection and management is essential to limit the severity of the damage and maintain the first molars on the arch.

Follow-up sessions are important in the management of MIH, to intercept and monitor the treatments carried out, as well as the root edification.

Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] Weerheijm, K.L., Ja'levik, B. and Alaluusua, S. (2001) Molar-Incisor Hypomineralization. *Caries Research*, **35**, 390-391. https://doi.org/10.1159/000047479

[2] Elfrink, M.E., ten Cate, J.M., Jaddoe, V.W., Hofman, A., Moll, H.A. and Veerkamp, J.S. (2012) Deciduous Molar Hypomineralization and Molar Incisor Hypomineralization. *Journal of Dental Research*, **91**, 551-555. https://doi.org/10.1177/0022034512440450

[3] Negre-Barber, A., Montiel-Company, J.M., Boronat-Catalá, M., Catalá-Pizarro, M. and Almerich-Silla, J.M. (2016) Hypomineralized Second Primary Molars as Predictor of Molar Incisor Hypomineralization. *Scientific Reports*, **25**, Article No. 31929. https://doi.org/10.1038/srep31929

[4] Da Cunha Coelho, A., Mata, P., Lino, C., Macho, V., Areias, C., Norton, A. and Augusto, A. (2019) Dental Hypomineralization Treatment: A Systematic Review. *Journal of Esthetic and Restorative Dentistry*, **31**, 26-39. https://doi.org/10.1111/jerd.12420

[5] Elhennawy, K., Manton, D.J., Crombie, F., Zaslansky, P., Radlanski, R.J., Jost-Brinkmann, P.G. and Schwendicke, F. (2017) Structural, Mechanical and Chemical Evaluation of Molar-Incisor Hypomineralization-Affected Enamel: A Systematic Review. *Archives of Oral Biology*, **83**, 272-281. https://doi.org/10.1016/j.archoralbio.2017.08.008

[6] Wright, J.T. (2006) The Molecular Etiologies and Associated Phenotypes of Amelogenesis Imperfecta. *American Journal of Medical Genetics*: *Part A*, **140**, 2547-2555. https://doi.org/10.1002/ajmg.a.31358

[7] Jacobsen, P.E., Haubek, D., Henriksen, T.B., Stergaard, J.R. and Poulsen, S. (2014) Developmental Enamel Defects in Children Born Preterm: A Systematic Review. *European Journal of Oral Sciences*, **122**, 7-14. https://doi.org/10.1111/eos.12094

[8] Fatturi, A.L., Wambier, L.M., Chibinski, A.C., *et al.* (2019) A Systematic Review and Meta-Analysis of Systemic Exposure Associated with Molar Incisor Hypomineralization. *Community Dentistry and Oral Epidemiology*, **47**, 407-415. https://doi.org/10.1111/cdoe.12467

[9] Vieira, A.R. and Kup, E. (2016) On the Etiology of Molar-Incisor Hypomineralization. *Caries Research*, **50**, 166-169. https://doi.org/10.1159/000445128

[10] Robinson, C. (2014) Enamel Maturation: A Brief Background with Implications for Some Enamel Dysplasias. *Frontiers in Physiology*, **5**, Article 388. https://doi.org/10.3389/fphys.2014.00388

[11] Weerheijm, K.L. (2004) Molar Incisor Hypomineralization (MIH): Clinical Presentation, Aetiology and Management. *Dental Update*, **31**, 9-12. https://doi.org/10.12968/denu.2004.31.1.9

[12] Fayle, S.A. (2003) Molar Incisor Hypomineralization: Restorative Management. *European Journal of Paediatric Dentistry*, **9**, 121-126.

[13] Jälevik, B. (2010) Prevalence and Diagnosis of Molar Incisor-Hypomineralization (MIH): A Systematic Review. *European Archives of Paediatric Dentistry*, **11**, 59-64. https://doi.org/10.1007/BF03262714

[14] Jälevik, B. and Klingberg, G.A. (2002) Dental Treatment, Dental Fear and Behavior Management Problems in Children with Severe Enamel Hypomineralization of Their Permanent First Molars. *International Journal of Paediatric Dentistry*, **12**, 24-32. https://doi.org/10.1046/j.0960-7439.2001.00318.x

[15] Lygidakis, N.A., Wong, F., Jälevik, B., Vierrou, A.M., Alaluusua, S. and Espelid, I. (2010) Best Clinical Practice Guidance for Clinicians Dealing with Children Presenting with Molar Incisor Hypomineralization (MIH): An EAPD Policy Document. *European Archives of Paediatric Dentistry*, **11**, 75-81. https://doi.org/10.1007/BF03262716

[16] Weerheijm, K.L., Duggal, M., Mejàre, I., Papagiannoulis, L., Koch, G., Martens, L.C. and Hallonsten, A.-L. (2003) Judgement Criteria for Molar Incisor Hypomineralization (MIH) in Epidemiologic Studies: A Summary of the European Meeting on MIH Held in Athens. *European Journal of Paediatric Dentistry*, **4**, 110-113.

[17] Weerheijm, K.L. (2003) Molar Incisor Hypomineralization (MIH). *European Journal of Paediatric Dentistry*, 4, 115-120.

[18] Steffen, R. and Van Waes, H. (2011) Therapy of Molar Incisor Hypomineralisation under Difficult Circumstances. A Concept for Therapy. *Quintessenz*, **62**, 1613-1623.

[19] Kellerfoff, N. and Lussi, A. (2004) Hypomineralization of Incisor Molars. *Rev Mens Suisse Odontostomatol*, **114**, 250-253.

[20] Weerheijm, K.L. (2004) Molar Incisor Hypomineralization (MIH): Clinical Presentation, Aetiology and Management. *Dental Update*, **31**, 9-12. https://doi.org/10.12968/denu.2004.31.1.9

[21] Maurin, J.C., Bleicher, F. and Magloire, H. (2005) Clinical Consequences of Dioxin Effects on Dental Development. *Archives de Pédiatrie*, **12**, 1636-1640. https://doi.org/10.1016/j.arcped.2005.06.012

[22] Jälevik, B. and Noren, J.G. (2000) Enamel Hypomineralization of Permanent First Molars: A Morphological Study and Survey of Possible Aetiologicalfactors. *International Journal of Paediatric Dentistry*, **10**, 278-289. https://doi.org/10.1046/j.1365-263x.2000.00210.x

[23] Jälevik, B., Noren, J.G., Klingberg, G. and Barregård, L. (2001) Etiologic Factors Influencing the Prevalence of Demarcated Opacities in Permanent First Molars in a Group of Swedish Children. *European Journal of Oral Sciences*, **109**, 230-234. https://doi.org/10.1034/j.1600-0722.2001.00047.x

[24] Kotsanos, N., Kaklamanos, E.G. and Arapostathis, K. (2005) Treatment Management of First Permanent Molars in Children with Molar-Incisor Hypomineralisation. *European Journal of Paediatric Dentistry*, **6**, 179-184.

[25] Willmott, N.S., Bryan, R.A. and Duggal, M.S. (2008) Molar-Incisor-Hypomineralisation: A Literature Review. *European Archives of Paediatric Dentistry*, **9**, 172-179. https://doi.org/10.1007/BF03262633

[26] Shen, P., Cai, F., Nowicki, A., Vincent, J. and Reynolds, E.C. (2001) Remineralisation of Enamel Subsurface Lesions by Sugar-Free Chewing Gum Containing Casein Phosphopeptide-Amorphous Calcium Phosphate. *Journal of Dental Research*, **80**, 2066-2070. https://doi.org/10.1177/00220345010800120801

[27] Azarpazhooh, A. and Limeback, H. (2008) Clinical Efficacy of Casein Derivatives: A Systematicreview of the Literature. *The Journal of the American Dental Association*, **139**, 915-924. https://doi.org/10.14219/jada.archive.2008.0278

[28] Chafaie, A. and Heyraud, S. (2006) Ameloidal Micro-Abrasion, Clinical Aspects. *Clinic*, No. 27, 25-31.

[29] De Souza, J.F., Fragelli, C.B., Jeremias, F., Paschoal, M.A.B., Santos-Pinto, L. and de Cássia, L.C.R. (2017) Eighteen-Month Clinical Performance of Composite Resin Restorations with Two Different Adhesive Systems for Molars Affected by Molar Incisor Hypomineralization. *Clinical Oral Investigations*, **21**, 1725-1733. https://doi.org/10.1007/s00784-016-1968-z

[30] Lygidakis, N.A., Chaliasou, A. and Siounas, G. (2003) Evaluation of Composite Restorations in Hypomineralized Permanent Molars: A Four Year Clinical Study. *European Journal of Paediatric Dentistry*, **4**, 143-148.

[31] Albadri, S., Zaitoun, H., McDonnell, S.T. and Davidson, L.E. (2007) Extraction of First Permanent Molar Teeth: Results from Three Dental Hospitals. *British Dental Journal*, **203**, 408-409. https://doi.org/10.1038/bdj.2007.679

[32] Zagdwon, A.M., Fayle, S.A. and Pollard, M.A. (2003) A Prospective Clinical Trial Comparing Preformed Metal Crowns and Cast Restorations for Defective First Permanent Molars. *European Journal of Paediatric Dentistry*, **4**, 138-142.

[33] Ong, D.C. and Bleakley, J.E. (2010) Compromised First Permanent Molars: An Orthodontic Perspective. *Australian Dental Journal*, **55**, 2-14. https://doi.org/10.1111/j.1834-7819.2009.01176.x