Molar incisor hypomineralisation: clinical management of the young patient

Précis

Molar incisor hypomineralisation, identified in recent years, is a relatively common dental finding. This article reviews its presentation and clinical management.

Abstract

Molar incisor hypomineralisation (MIH) is a common developmental condition resulting in enamel defects in first permanent molars and permanent incisors. It presents at eruption of these teeth. Early diagnosis is essential since rapid breakdown of tooth structure may occur, giving rise to acute symptoms and complicated treatment. The purpose of this article is to review MIH and illustrate its clinical management in young children.

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Introduction

Molar incisor hypomineralistion (MIH) was introduced as a definitive clinical entity by Weerheijm in 2001.[1] She defined MIH as hypomineralisation of systemic origin affecting one, two, three or all first permanent molars (FPMs) and the permanent incisors. Enamel defects can range from mild opacities, white or yellow in colour, to severe enamel involvement, which breaks down rapidly shortly after eruption.[1,2,3]

The severity of MIH may vary greatly. Some opacities, which appear mild, may have significant subsurface porosity leading to surface disintegration after eruption. This post-eruptive breakdown may manifest itself quickly once the affected tooth is under occlusal load.[1] Variability also exists in relation to the affected teeth. One to four molars may be affected and with varying degrees of severity. It may be asymmetrical but should an FPM be severely affected the contralateral molar is more likely to be affected.[2] Permanent incisor involvement is also variable. Frequently, the incisors are not affected and when involved, the severity of the hypomineralisation is usually less than that of the affected molars. Affected incisors rarely exhibit post-eruptive breakdown, and this is likely to be due to lack of occlusal loading on these teeth.[2,4]

Little data exists on the prevalence of MIH. In Europe, reported prevalence ranges from 2.4 to 25%.[5,6] MIH prevalence can be high in otherwise low caries populations.[7] The aetiology of MIH is unknown. Given the degree of enamel disruption that may present, an underlying prolonged systemic upset of ameloblast function is a likely explanation. Thus, a range of causative factors known to disrupt enamel formation, including environmental toxins, prematurity, asthma, exposure to dioxin, prenatal, perinatal and neonatal medical problems, respiratory diseases, low birth weight, disturbances of calcium/phosphate metabolism, otitis media and febrile childhood diseases have been considered in MIH.[1–5]

Problems specific to MIH in a young child

MIH presents with the eruption of the FPMs and permanent incisors. Therefore, at age six to eight years significant dental treatment may be required, which can prove a challenge in such a young age group. Hypersensitivity is a common complication of MIH, making oral hygiene and eating difficult, while further compromising the defective teeth.

FIGURES 1a and 1b: *Clinical occlusal views of 'mildly' affected FPMs in a child aged seven years with MIH. Preventive fissure sealants are in place. Note that these molars must be kept under regular review. Any further post-eruptive enamel breakdown is best treated with a composite restoration.*

FIGURES 2a, 2b and 2c: *Pre-operative, preparation and postoperative clinical occlusal views illustrating the placement of a composite resin restoration in a 'moderately' affected maxillary FPM in a child aged eight years with MIH.*

FIGURES 3a and 3b: *Clinical occlusal views of failed composite restorations in two cases of hypopmineralised FPMs. As with fissure sealants, composite restorations must be reviewed regularly due to the ongoing risk of enamel breakdown in MIH.*

Hypersensitivity may also complicate the clinical management of MIH. When present, profound analgesia will be essential for all procedures. Therefore, even non-invasive preventive clinical procedures such as fissure sealants may pose significant discomfort for these young children, increasing their anxiety and causing behaviour management problems.

The rapid post-eruptive enamel breakdown that may arise in MIH poses another clinical problem for this group of children. By the time the affected molar is fully erupted, preventive measures may no longer suffice and a more extensive restoration is needed. Should the degree of severity warrant a more radical solution to care, an endodontic or orthodontic opinion should be sought. A combined team approach to treatment planning will maximise options and ensure the best treatment outcome. Incisor involvement may give rise to aesthetic problems, which again require early intervention to deal with unsightly defects or opacities.

Optimal treatment should be established on a case-dependent basis. The child's compliance, severity of hypomineralisation, occlusion, extent of treatment required, financial cost, investment of time, and the long-term prognosis of the teeth are just some of the many factors that may determine the appropriate treatment option.

FIGURES 4a and 4b: *Clinical occlusal views of a 'severely' affected maxillary FPM in a child aged eight years with MIH. A stainless steel crown providing complete crown coverage has been used.*

Management of affected first permanent molars in MIH

There is no universal classification for MIH. The hypomineralised areas have been classified by Alaluusua *et al*[5] as mild (colour change: white, yellow or brown), moderate (loss of enamel only) and severe (loss of enamel in associaton with affected dentine).

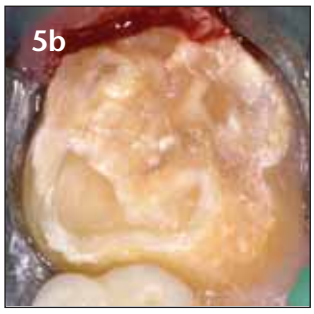
Fissure sealants are the treatment of choice in 'mildly' affected cases, where the enamel appears to be of good quality and clinical and radiographic investigations have confirmed that the molar is caries free (**Figures 1a and 1b**). It is important that even mild cases are checked regularly, at least two to three times annually. Post-eruptive enamel breakdown remains a risk. Should it occur, a composite restoration can be placed in an appropriate and planned timeframe.

In 'moderate' cases, where the enamel/dentine defect is well demarcated and confined to one or two surfaces, composite restoration is the treatment of choice. Using standard etching, bonding and composite packing procedures, composite materials adhere well and show good occlusal wear resistance (**Figures 2a, 2b and 2c**).

Following placement of the composite restoration using good isolation (ideally rubber dam), the remaining pits and grooves should be fissure sealed as an additional preventive measure.

Composite restorations in hypomineralised molars should be reviewed very frequently. Further breakdown of affected enamel can occur at the restoration margins. In this event, another larger composite restoration or a different treatment procedure, e.g., stainless steel crown, will be required.

In 'severe' cases of MIH there is frequently cuspal, with or without pulpal involvement (**Figures 4a to 5b**). The treatment options are either restoration or extraction. A combined endodontic-orthodontic opinion is essential in such cases. Factors such as the occlusion,



FIGURES 5a, 5b and 5c: *Clinical occlusal views of a 'severely' affected mandibular FPM illustrating the preparation and placement of a stainless steel crown. Note the chalky appearance of the enamel, which was friable and easily removed with a steel bur in a slow handpiece.*

FIGURE 6: *Clinical buccal view of two 'severely' affected molars in a child aged eight years with MIH. Note that the correct occlusal height was achieved.*

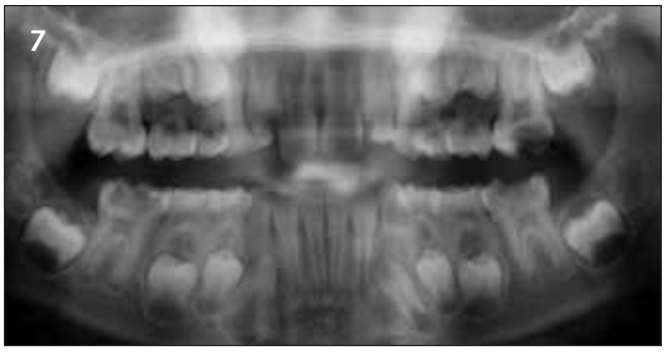


FIGURE 7: *Radiographic OPG view of a child aged eight years with MIH. All four molars are 'severely' affected. Note root development of the second permanent molars. In MIH cases where extraction is under consideration, it is important to check for the presence of the third permanent molars.*

presence or absence of crowding, overall dental development, missing or malformed teeth, and long-term prognosis will determine the decision to retain or extract the affected molars.

Where restoration is the chosen option, full molar crown coverage is the treatment of choice. Preformed stainless steel crowns (3M ESPE) are very successful in restoring hypomineralised molars. In addition to protecting the crown surface of the affected molar, stainless steel crowns eliminate tooth sensitivity and provide immediate protection from any further loss of tooth structure. Preformed stainless steel crowns are easy to fit, can be placed in one visit and do not necessitate any laboratory expense (**Figures 4a to 6**). The 3M ESPE crowns are anatomically contoured and come in a range of six different sizes for each molar. Glass ionomer cement-containing fluoride is the cement of choice. These preformed crowns are comparatively inexpensive and have been shown to last in excess of 10 years. It is advisable to replace them with custom-made crowns when the child reaches their late teenage years and gingival maturation is complete.

One precaution to be aware of when placing preformed stainless steel crowns on permanent molars is to ensure that they are inserted at the correct occlusal height. This is easily achieved by reducing the excess length of the preformed crowns with a curved scissors, then smoothing the margin with an abrasive stone and crimping with an Adams pliers, before cementing (**Figure 6**).

Another option for the management of 'severe' cases of MIH is extraction. However, this may be the least satisfactory approach. Depending upon the number of molars extensively affected, extraction of all four molars as part of a planned orthodontic treatment plan may be the most practical approach to care. The timing of extraction of FPMs is now less critical with the extensive use and availability of orthodontic fixed appliances. However, in cases where future orthodontic treatment is not an option, Jalevik and Moller[8] have shown that extraction of FPMs in MIH is still a good treatment alternative. Favourable spontaneous space reduction and development of the permanent dentition positioning can be expected without any intervention in most cases, if extractions are done prior to the eruption of the second permanent molars.

Symptomatic molars may pose a difficulty in ensuring that extractions are carried out at the optimum time. In such cases, a glass ionomer material can be used as an interim restoration to resolve symptoms. This provides time to allow the extractions to be carried out at the projected optimal time as in **Figure 7**.

The endodontic option in the treatment of severely affected molars in MIH is a dilemma. The high level of compliance, time, effort, and financial cost in undertaking the endodontic treatment, with the subsequent need for crowning these molars in such young children, needs to be weighed against the long-term prognosis for these heavily restored teeth.

Management of hypomineralised incisors in MIH

Incisor involvement is variable. Not all patients with MIH exhibit enamel opacities on their permanent incisors. However, the prevalence of this feature may exceed 30% in some populations.[9] Treatment of the affected incisors in MIH will be determined by the severity of the condition. Aesthetic considerations are the prime factors in intervention in such cases, as the affected incisors rarely exhibit post-eruptive breakdown since they are not subjected to the heavy occlusal loading sustained by FPMs.

The incisal opaque defects usually extend through the full thickness of

enamel so that acid/pumice micro-abrasion techniques tend to produce little improvement in appearance when used alone.[4] Bleaching may improve yellow brown discolouration but is unlikely to improve the underlying opacity. Unsightly opacities and defects on permanent incisors of young children can be successfully masked using direct composite veneers. Minimal enamel preparation is essential. Use of opaquers helps to preserve tooth structure and provides an improved aesthetic result (**Figures 8a to 9b**). These composite veneers can be modified or replaced with porcelain veneers later if desired, when dental and gingival development is complete.

FIGURES 8a and 8b: *Clinical pre-operative and postoperative views of a child aged nine years with a 'mildly' affected maxillary left central incisor treated with a direct composite veneer.*

FIGURES 9a and 9b: *Clinical pre-operative (nine years) and postoperative (11 years) labial view of a child with a number of incisor opacities. Direct composite veneers were used on the maxillary central incisors and on the mandibular central incisors and right lateral incisor (which was the most discoloured tooth).*

Conclusions

In recent years an increasing number of children are attending their dentist because of molar sensitivity, unsightly appearance of incisors or 'crumbling back teeth', all indicators of MIH. It is important that MIH is diagnosed early. This ensures that appropriate treatment can be provided and in an optimum timeframe. It also ensures that the risk and complications of post-eruptive enamel breakdown are minimised. A comprehensive assessment of the affected teeth, including clinical and radiological investigations, will determine the extent and severity of the condition. Referral for an orthodontic and/or endodontic opinion may be necessary in severe cases of MIH.

Treatment options are case dependent. Affected incisors can be treated successfully with conservative direct composite veneers. Treatment of affected molars may range from preventive fissure sealants, to composite restorations, to preformed stainless steel crowns. Extraction of severely affected molars is a viable option if done as part of a structured orthodontic treatment plan, taking into account the child's overall long-term dental health. Endodontic treatment may be required where retention of the severely affected molar is necessary. In all cases of MIH, it is essential that the young child be reviewed on a regular basis in order to assure their long-term dental health.

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