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State-of-the-art on MIH. Part. 1 Definition and aepidemiology

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Abstract

MIH: Definition and aepidemiology

Molar incisor hypomineralization (MIH) is one of the most pressing issues in paediatric dentistry. It is a qualitative enamel defect of systemic origin that affects at least one first permanent molar and can also be associated with permanent incisors. However, the same defects have also been observed on primary molars and other permanent teeth. Hypomineralised enamel has less distinct prisms edges and crystals and the interprismatic space is more marked.

Children with MIH undergo dental treatment nearly 10 times more than unaffected children. Preventive treatment following the diagnosis of MIH should take into account patient's age and collaboration, patient's caries risk, type and extension of demarcated lesions and hypersensitivity. Risk assessment and early diagnosis are key factors to an effective and conservative treatment.

KEYWORDS Enamel defects, Molar incisor hypomineralization, Opacities.

Introduction

Molar incisor hypomineralization (MIH) is one of the most pressing issues in paediatric dentistry.

MIH was defined in 2001 to describe a systemic condition as a qualitative enamel defect of systemic origin that affects at least one first permanent molar and can also be associated with permanent incisors (Fig. 1, 2) [Weerheijm et al., 2001]. The same demarcated defects that are present on molars and incisors with MIH have also been observed on other teeth such as primary molars (Fig. 3) and permanent teeth (Fig. 4). There is an association between hypomineralised second primary molars (HSPMs), and HSPM can be considered a predictor for MIH (Fig. 5) [Elfrink, 2015].

FIG. 1 Demarcated opacities at upper left central incisors.

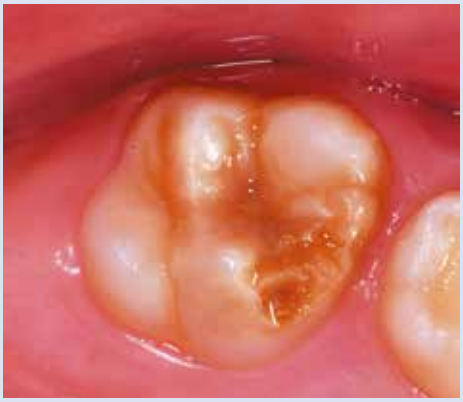

FIG. 2 First permanent molar.

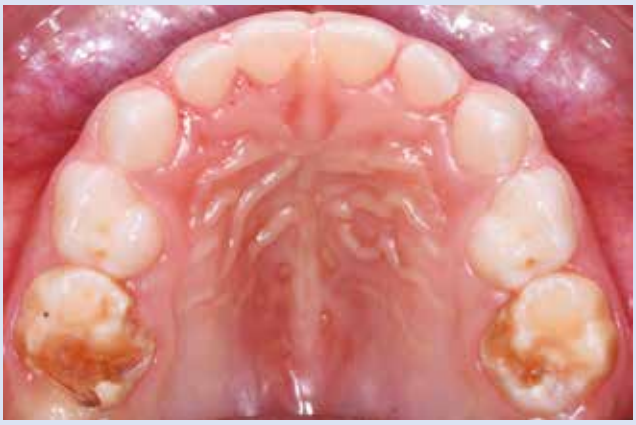

FIG. 3 Upper second primary molars with post-eruptive enamel breakdown at the MIH lesion.

FIG. 4 Tip of permanent canine with opacity.

MIH is considered a worldwide clinical problem with a global prevalence of 14.2%, ranging from 0.5% to 40.2% according to different studies [Balmer et al., 2005; Kusku et al., 2008]. Several factors including different sample sizes, diagnostic criteria, age groups and environmental factors may explain these variations [Zhao et al., 2018].

The aetiology of MIH is still not fully understood, however, a link of cause-effect between antibiotics, ear-nose-throat diseases during the first years of life and MIH lesions has been identified [Giuca et al., 2018]. It was also observed that acute and chronic childhood illness, conditions of birth and neonatal period were weakly associated with MIH, while dioxins showed a moderate level of association [Crombie et al., 2009].

Similarly to other well-known genetic anomalies of the dentition, such as dentinogenesis imperfecta [Campanella et al., 2018], MIH has been recently proposed to be a genetic condition rather than an idiopathic condition [Alaluusua, 2010; Elhennawy et al., 2019; Vieira and Kup, 2016].

Although the aetiology of MIH is still unclear, a combination of different factors that may affect ameloblasts during enamel formation has been proposed. The mineralisation of the first permanent molars usually starts at birth or just before or shortly after birth and it is fully completed at 4–5 years of age [Caruso et al., 2016]; anomalies that occur during the maturation stage can determine the onset of hypomineralisation.

Clinical presentation of MIH

The hypomineralised enamel has less distinct prism edges and crystals and the interprismatic space is more marked, therefore MIH enamel is more porous than the normal sound enamel [Fagrell et al., 2010].

Characteristic signs of MIH are tooth hypersensivity as a consequence of the enamel structure, along with with well-defined white-to-yellow/brown large porous demarcated opacities affecting the coronal third of the crown and caused by changes in enamel mineral and protein composition [Giuca et al., 2018].

Enamel anomalies may occur with or without destruction of the enamel by posteruptive breakdown caused by the force of mastication (Fig. 6) [Jälevik and Norén, 2000; Neves et al., 2019]. In addition, teeth are difficult to anesthetise due to the chronic inflammation [Libonati et al., 2018], and they are at increased risk of caries and rapid progression [Paglia et al., 2016].

Besides that, MIH-affected patients exhibit other clinical problems: aesthetic complaint, loss of fillings, need of reinterventions [Giuca et al., 2018], and their quality of life is often compromised [Mulic et al., 2017].

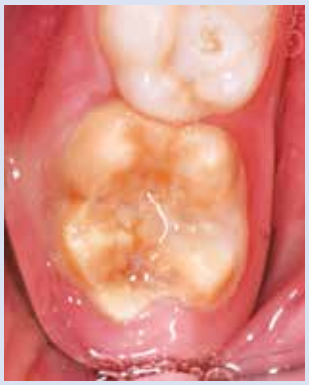

FIG. 5 Hypomineralised second primary molar can be considered a predictor for MIH.

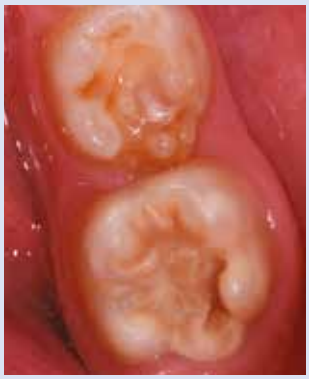

FIG. 6 First permanent molar with severe hypomineralisation and post-eruptive enamel breakdown.

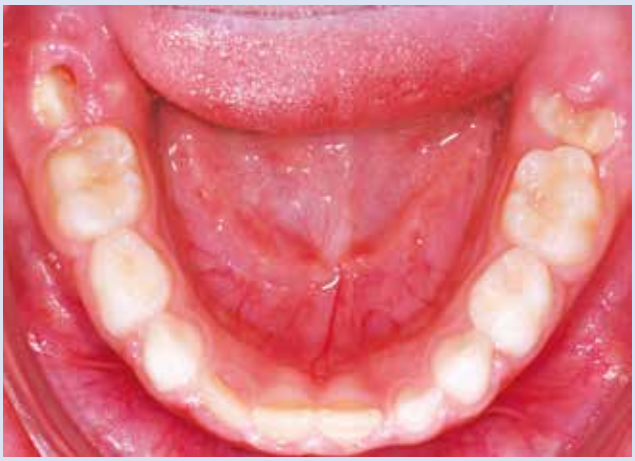

FIG. 7 Early diagnosis is the first step for the management of MIH lesions.

MIH teeth are often affected by dental hypersensitivity and chronic pain [Pasini et al., 2018].

Management of MIH

Children with MIH undergo dental treatment nearly 10 times more than unaffected children [Kotsanos et al., 2005], with subsequential increased prevalence of behavioural management problems and dental fear [Jälevik and Klingberg, 2002], and sudden anxiety episodes during the day may produce a clearly limited ability to cooperate in the dental office.

Preventive treatment following the diagnosis of MIH should be individualised taking into account several factors: patient's age and collaboration, patient's caries risk, type and extension of demarcated lesions and hypersensitivity level.

Risk assessment and early diagnosis are the key factors to an effective and conservative lesion treatment [William et al., 2006], as well as the administration of remineralising products as soon as possible or immediately after diagnosis (Fig. 7).

The management of MIH is challenging as the clinical appearance, and the individual need for treatment varies widely. There is a broad spectrum of treatment modalities available, ranging from prevention of enamel breakdown and caries, management of hypersensitivity or pain, restorative treatments to premature dental extraction [Weerheijm, 2003; Weerheijm et al., 2004; Lygidakis et al., 2010].

The treatment plan should include a short- and long-term approach. Frequent dental check-ups are necessary for a better management of MIH lesions [Libonati et al., 2019] even if it is widely recognised that children and parents collaboration gradually decrease over time. Moreover, differential diagnosis is mandatory to exclude other dental conditions such as amelogenesis imperfecta, enamel hypoplasia, fluorosis and white spots [Giuca et al., 2012; Mast et al., 2013].

Paediatricians and paediatric dentists should cooperate to achieve an early diagnosis and satisfactory treatment results [Paglia, 2018; Glodkowska and Emerich, 2019].

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