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RESEARCH ARTICLE

Molar-Incisor Hypomineralization (MIH): An Unusual Case with Literature Review

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ABSTRACT

Background: Enamel defects are known to occur due to depressed activity of the enamel-forming ameloblasts which result in the formation of linearly distributed pits or grooves. These alterations can be found in two different stages: Enamel matrix formation (secretion phase) and enamel mineralization (maturation phase). If an unbalance occurs during the secretion phase, the enamel defect is called hypoplasia. Molar incisor hypomineralization (MIH) is a common developmental condition resulting in enamel defects in first permanent molars (FPM) and permanent incisors. One to four molars, and often also the incisors, could be affected. Since first recognized, the condition has been puzzling and interpreted as a distinct phenomenon unlike other enamel disturbances. Early diagnosis is essential since, rapid breakdown of tooth structure may occur, giving rise to acute symptoms and complicated treatment. The relevance of each event is difficult to establish, as many can happen more than once in early childhood. Also, the literature refers to the first years of life as a critical period for crown formation of FPM and incisors, and therefore more likely at risk for MIH. **Objective:** This article is a literature review for MIH and rare case illustration with Clinical appearance, symptoms and signs, diagnostic criteria associated with MIH. Clinical management of MIH also described in particular molars and hypoplastic incisors. **Conclusion/Result:** A case of a 9 years old male patient reported with severe dental sensibility, masticatory difficulties. Clinical examination revealed severe enamel structural defects affecting all four permanent first molars and opaque stains affecting permanent lateral incisors, which is very rare entity.

Key words: Tooth Demineralization, Diagnosis, management, lateral Incisor,Case Report

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INTRODUCTION

The word molar incisor hypomineralization (MIH) concept was introduced in 2001 which describes the clinical form of enamel hypomineralization of systemic cause disturbing one or more permanent first molars (PFMs) and incisors (Weerheijm *et al*., 2001). The disorder is also known as non-fluoride enamel opacities, idiopathic enamel hypomineralization, internal enamel hypoplasia, enamel opacities, opaque spots , idiopathic enamel opacities and nonendemic mottling of enamel (Allazzam *et al*., 2014).

Clinically, MIH might be identified by the enamel appearance of white, cream, yellow to brownish stains, with a porous "holland-cheese" consistence, always with a well-demarcated boundary between the enamel affected portion and the sound enamel. Being a hypomineralized deficiency, enamel thickness is not altered, however, its resistance to masticatory forces are low when compared to normal enamel, therefore enamel might

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break down after tooth erupting, creating a false idea of hypoplastic enamel, nevertheless, margins of those disintegrated areas are irregular, whereas in hypoplasia, margins defects are smooth (Crombie, 2008).

Furthermore, post eruptive breakdown (PEB) leads affected teeth to elevated susceptibility for carious lesions development, high sensitivity to thermal and mechanical stimuli and poor esthetic appearance, which, according to Scheffel *et al*. (2014), might be a reason for bullying among children (Scheffel, 2014).

Clinical approach for MIH cases is challenging for dental surgeon once these teeth might be highly sensitive, susceptible to fast dental caries development, limited cooperation of a young child, difficult on achieving anesthesia and recurrent episodes of restorations breakdown. Therefore, available treatment approaches for teeth affected by MIH are extensive, ranging from prevention, and restorative to extraction of affected teeth in most severe cases.

Prevalence:

The prevalence rate for MIH is estimated at 2.8% to 25% depending on the study and the geographical region. Some evidence for differing rates of MIH in the mandible and maxilla has been found, but studies do not agree on which location is more common. There also does not appear to be a significant difference in MIH instances between the sexes (Willmott, 2008).Traditionally, there have been more studies from Northern Europe and MIH has appeared to be more common in those countries. However, lately studies have been published from other parts of the world.

Clinical appearance, symptoms and signs associated with MIH:

Clinically, MIH lesions are outsized defined opacities of dissimilar enamel translucency. The imperfect enamel is yellow-brown or white-cream in color. The opacities are typically limited to the incisal or cuspal one third of the clinical crown, rarely involving the cervical one third. The complete enamel surface is characteristically smooth and often hypermineralized resulting in post-eruptive maturation; the subsurface enamel is soft and spongy. The MIH-affected first permanent molars are sometimes oversensitive to stimuli and may be difficult to anesthetize. It is believed that there is subclinical pulpal inflammation due to porosity of the enamel which could lead to hypersensitivity experienced by some individuals. A study comparing the pulps of noncarious hypomineralized first permanent molar to seemingly sound FPM from MIH affected persons, it was determined that the changes were revealing of inflammatory changes. Caries development is very rapid in FPM affected by MIH due to the porous enamel. It is further compounded by the fact that these affected children may avoid brushing because of sensitivity (Weerheijm *et al*., 2003).

MIH Diagnosis:

Any investigation for MIH should be commenced on clean wet teeth and the age of 8 years is optimal, as at this age all permanent first molars and most of the incisors are erupted. In adding, the permanent first molar teeth will be in a fairly good condition without unnecessary post-eruptive breakdown. Judgments associated to individual teeth (all FPM and incisors) should be recorded, serving in the correct diagnosis of the complaint. Diagnostic measures for hypomineralization of FPMs presently available are the modified defect of dental enamel (DDE) index given by Federation Dentaire International in 1992 (Table 1) and the criteria used for diagnosis MIH (Table 2).

Table 1: Modified DDE index

Mild	<30% of the tooth's enamel surface area visibly disrupted (this encompasses the entire range reported in most other studies)
Moderate	31 to 49% of the tooth's enamel surface area visibly disrupted
Severe	>50% of the tooth's enamel surface area visibly disrupted

Table 2: Definitions of the criteria used for diagnosing MIH (Weerheijm *et al*., 2003)

Criteria	Definition
Opacity	A defect involving an alteration in the translucency of the enamel, variable in degree. The defective enamel is of normal thickness with a smooth surface and can be white, yellow or brown in color. The border of the lesions is demarcated.
PEB	A defect that indicated deficiency of the surface after eruption of the tooth. This may be caused by such factors as trauma and attrition
Atypical restoration	Size and shape of restoration do not conform to typical restorative characteristics. In most cases,restorations will be extended to the buccal or the palatinal smooth surface. At the border of the restoration, opacity may be noticed.
Extraction due to MIH	Absence of a molar should be related to the other teeth of the dentition. Absence of a first permanent molar in a sound dentition is suspected to have been an MIH molar.

Case report:

A nine years old male patient reported to the department of pedodontics and preventive dentistry with the chief complain of sensitivity in the teeth and irregular teeth. On asking patient's mother did not relate any non-

nutritive habit by the child, as finger or pacifier or trauma to teeth. Clinical examination revealed subtle opaque hypoplastic stains on all permanent first molars, whereas maxillary lateral incisors showing extensive irregular enamel lesions exposing dentin (Fig 1). FPMs also presented intense pain to mechanical and thermal stimuli. Occlusal radiographic examination also revealed the lesions on FPMs were restricted to enamel (Fig.1, 2).Based on the pattern of hypomineralization presented and radiographic evaluation, as well as on the related history and symptoms, the diagnosis of MIH was determined.

This is one of the rare case where a patient is having MIH in maxillary lateral incisors (Fig 1, 3) only with FPMs without involvement of maxillary central incisors and mandibular incisors which has a very low prevalence(Allazzam *et al*., 2014). Radiographic examination also revealed the lesions on lateral incisors were restricted to enamel, apparently being shallow lesions instead the dentin exposure and intense sensibility (Figure 4).

Fig.1: Maxillary arch showing MIH in FPMs and Lateral Incisors

Fig. 2: Mandibular arch showing MIH in FPMs

Fig. 3: Severe MIH showing in Maxillary FPM and Lateral Incisor

Fig. 4: Radiograph showing Defects in Lateral incisors

Tomo *et al*., (2016) revealed subtle opaque hypoplastic stains which were observed on permanent incisors, whereas on all four FPMs with extensive irregular enamel lesions exposing dentin.

Clinical management of MIH:

MIH's clinical management is thought-provoking due to the sensitivity and fast development of dental caries in affected PFMs, the limited cooperation of a young child, and the frequent marginal breakdown of restorations.

The offered treatment approaches for teeth with MIH are extensive, ranging from prevention, restoration, to extraction. A very useful six-step approach for MIH has been proposed(William *et al*., 2006) (Table 3).The decision on which treatment should be used is complex and is dependent upon on a number of factors. The commonly identified factors are the severity of the condition, the patient's dental age and the child/parent's social background and expectation (Garg *et al*., 2012).

Table 3: A clinical management approach for affected MIH(William *et al*., 2006)

Steps	Recommended procedures
Risk identification	Assess medical history for putative etiological factors
Early diagnosis	Examine at risk molars on radiograph if possible Monitor these teeth during eruption
Remineralization and desensitization	Apply localized topical fluorides
Prevention of dental caries and PEB	Institute through oral hygiene home care program Reduce cariogenicity and erosivity of diet Place pit and fissure sealants
Restorations and extractions	Place intracoronal (resin composite) bonded with self-etching primer adhesive or extracoronal restorations (stainless steel crowns). Consider orthodontic outcomes postextraction
Maintenance	Monitor margins of restorations for PEB Consider full coronal coverage restorations in the long-term

Summary of Treatment Modalities:

For treating hypomineralized first permanent molars:

Prevention and restoration of the hypoplastic teeth, we can use Topical fluoride application, Desensitizing toothpaste, CPP-ACP containing topical fluoride and Glass ionomer cement (GIC) sealants to provide caries protection. For the reduction of surface permeability conventional GIC, resin modified GICs (RMGIC), Composite resin restorations and PMRCs in permanent teeth is restricted to nonstress-bearing areas. We can also do Full coverage restoration with stainless steel crowns (SSCs) which are the treatment choices, Partial and full coverage indirect adhesive or cast crown and onlays.

For Restoration of hypomineralized permanent incisors:

Enamel discoloration often states an esthetic concern for any child with MIH incisors. Modern minimally invasive techniques offer numerous possibilities for treating these lesions. Yellow or brownish yellow defects are of full thickness and may react to bleaching with carbamide peroxide (Fayle,2003)while those that are creamy-yellow or whitish-creamy are less porous and variable in depth (Jalevik and Noren ,2000) and can be treated by microabrasion with 18% hydrochloric acid or 37.5% phosphoric acid and abrasive paste. More noticeable enamel defects might be dealt with by combining the two methods. Conservative treatment methods

should be used as the first line of treatment before more invasive treatment such as resin restorations/veneers or crowns that may create problems, resulting from the large pulp size and immature gingival contours in young incisors (Wray and Welbury,2001).

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