



Molar Incisor Hypomineralisation (MIH) from the orthodontic point of view

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Abstract

Background: Molar Incisor Hypomineralisation (MIH) is a developmental disorder of the enamel of permanent first molars, frequent during childhood. Management is multidisciplinary and can include the orthodontist's cooperation. **Aim of this review** is to highlight the orthodontic issues in MIH. **Materials and methods:** A systematic review was performed on principal medical databases. **Results:** Orthodontic therapy with extractions could be a valid therapeutic strategy in patients with severe MIH and severely affected FPM. The timing of the extractions is essential to achieve optimal results. All dentists should be aware of orthodontic consequences of extractions when they decide to perform them during management of MIH. **Conclusions:** In MIH some orthodontic issues can occur and an extractive strategy with orthodontic considerations is a valid therapeutic option with a good cost-effectiveness ratio.

Introduction

Molar Incisor Hypomineralisation (MIH) is a developmental disorder of the enamel, characterized by hypomineralisation of systemic origin of 1-4 permanent first molars (PFM), often associated with affected incisors. Clinically, hypomineralisation can be seen as an abnormality in the translucency of the enamel (opacity). The opacities can be of different colours, depending on the severity of the MIH and they may undergo post-eruptive enamel breakdown (PEB) due to soft and porous enamel.²

A prevalence between 3 and 20% is reported in developed countries. The etiology is multifactorial and prenatal, perinatal and postnatal factors such as infections and respiratory diseases are often involved.⁷

The management is commonly multidisciplinary and can require different specialists. It may include several steps: risk identification, early diagnosis, remineralisation and desensitisation, prevention of caries formation and PEB, restorations and extractions with orthodontic assessment and treatment (Fig.1).⁸⁻⁹

Aim of this review is to highlight the orthodontic issues in MIH management and the orthodontist's role

Methods

A systematic review was performed using principal medical databases (Pubmed, Google Scholar, Scopus); used keywords were "MIH management", "MIH", "Orthodontics". After a careful analysis, 18 articles were selected.

Review

Orthodontic treatment: indications and issues

The MIH management can raise some orthodontic issues.⁹⁻¹¹ In children with MIH severely affected FPM, the first clinical consideration is to decide whether to restore or extract. Extraction of FPM affected with MIH may be preferable to attempting complicated restorative management in such young dentition. Although many dentists and patients believe nowadays in a more conservative treatment plan, some thought might still be given for such a radical approach, resulting usually in the extractions of several permanent teeth. Variables affecting this decision include the child's age, orthodontic considerations, presence of other dental anomalies, degree of severity of MIH, pulp involvement, presence of third molar germ(s), restorability of the tooth/teeth and expected long term treatment cost.¹²⁻¹³

Some situations in which the literature suggest extractions as a feasible options are severe hypomineralisation, severe sensitivity or pain, large multi-surface lesions/restorations, difficulty of restoration or history of restorative failure, inability to achieve local anaesthesia, behavior, management problems preventing restorative treatment, apical pathosis, orthodontic space requirements where FPM are heavily restored in the presence of healthy pre-molars, crowding distally in the arch and third permanent molars reasonably positioned, financial considerations precluding other forms of treatment.⁹ A complication of FPM extractions is the potential orthodontic treatment need and subsequent prognosis. Mills said that "first permanent molar extractions double the orthodontic treatment time and halve the prognosis".¹⁴ This is based on the fact that FPM are typically considered the "keystones of dentition"

as said by Angle.¹⁵⁻¹⁶ Despite lacking consistent data in literature, on the basis of case reports, expert opinions and guidelines we can expect to achieve good results following removal of FPM using fixed appliances, although treatment complexity is to a certain degree case-dependent. The FPM is not an orthodontist's first choice for extraction, because following orthodontic treatment may be complicated.¹⁰ Consequently, the decision to extract a FPM should be seriously evaluated and discussed with an orthodontist as early as possible. Any dentist should always consider the orthodontic consequences of the extraction of FPM before doing it. When a FPM removal is performed, it's important to consider the need of balancing (extraction of the contralateral tooth in the same arch) or compensating (extraction of the opposing tooth in the other arch).¹⁰

A correct timing for FPM extraction is essential for the success of treatment and to avoid complex and long treatments.

The dental age of 8.5-9 years is the ideal time for the FPM removal extraction, with the help of a full clinical examination and a panoramic radiograph.¹⁰

Extraction of lower first permanent molars

For mandibular first permanent molars the ideal age for extraction is 8-9 years, when the crown of the mandibular second permanent molar is complete on radiograph or when the bifurcations of its roots are just visible. When the lower FPM removal is performed at the right time the second permanent molar can be expected to erupt into a good contact point relationship with the second premolar where there is crowding present.¹⁰ There may be some spontaneous improvement in crowding further forward in the arch as well as a better chance of a satisfactory eruption of the third permanent molar¹⁰. When there is little or no crowding present, a space will remain and fixed appliance treatment will be required at a later stage to close this.¹⁰

A problem due to the extraction of the lower first permanent molar before the ideal stage, before the development of the bifurcation of the roots of mandibular second permanent molar, is the risk of the lower second premolar drifting distally. This happens when the mandibular premolar is distally inclined, and escapes from the bifurcation of the second primary molar roots. It lacks the guidance given by the mesial root of the lower first permanent molar and it erupts distally into the first permanent molar socket. The crown of the mandibular second premolar may become impacted against the crown of the lower second molar, with a space between the first and

second premolars. To prevent this it has been advised that the lower second primary molar may be extracted at the same time as the first permanent molar, so allowing free eruption of the lower second premolar. Residual space and unfavourable angulations can be corrected at a later stage with the use of fixed appliance therapy.¹⁰

If, however, the extraction of the mandibular FPM is done after its adjacent second permanent molar has erupted the spontaneous forward movement of the lower second permanent molar is reduced. It invariably tips mesially and rolls lingually. This lingual rolling may result in the development of a scissors bite.¹⁰ This is accentuated if the compensating extraction of the opposing maxillary first permanent molar has not been performed with the result of failure of spontaneous space closure, poor angulation, and an unsatisfactory contact point relationship with the second premolar. The continued tipping of the lower second permanent molar, if left untreated, may lead to important periodontal consequences.

With the extraction of the lower FPM an over-eruption of the opposing upper FPM may occur. This could not be a problem if the maxillary FPM is in occlusion with lower buccal teeth mesial to the extraction site of the lower FPM. But if it does over-erupt it will obstruct the spontaneous forward movement of the lower second permanent molar. Then, in such situation, the compensating extraction of the opposing maxillary FPM should be considered.¹⁰

When there is crowding in the lower arch, the balancing extraction of the contralateral FPM molar should be considered, because a unilateral extraction may lead to centerline shift. However, depending upon the stage of development of the dentition, it could be best to extract a contralateral premolar rather than the FPM, possibly reaching better spontaneous improvement or simplified orthodontic treatment.¹⁰

Extraction of upper first permanent molars

An unerupted upper second permanent molar may move forwards quite satisfactorily following the extraction of a maxillary FPM, although space will remain if there is insufficient crowding. If the maxillary second molar is already erupted when the extraction of upper FPM is carried out, it may tip and rotate forwards.¹⁰ Then, fixed appliance treatment could be needed to achieve good tooth angulation and space closure. The extraction of upper FPM has little or no effect on spontaneous reduction of crowding in the maxillary labial segment.¹⁰ The upper FPM removal can help the right eruption of upper third permanent molars.¹⁰ Because of occlusal contacts, the lower FPM

does not usually over-erupt into the extraction site of the upper first permanent molar. Indeed, there isn't need of compensating extraction of the opposing FPM.¹⁰ If there is crowding in the maxillary arch, we should consider the balancing extraction of the contralateral upper FPM. A unilateral extraction risks asymmetry and centre line shift. But, as in the lower arch, the contralateral extraction of a tooth other than the molar may be of greater benefit.¹⁰

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Clinical studies about extractions and orthodontics in MIH

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Mejare et al. found that at 18-years of age the space closure that had happened was satisfactory in 87% of the patients with extracted MIH molars, and the sagittal relationships did not differ between individuals with and without extraction, from a sample of 76 individuals that 24% had 1-3 molars extracted and 18% had all four FPM extracted.¹³ Additionally, Järvelin and Mäkitier stated that the extraction of severely affected FPM in MIH patients was an adequate treatment alternative to restorative care. They examined the orthodontic status of 20 patients 3.8-8.3 years after extractions and concluded that 15 of them had a satisfactory occlusion.¹⁷ However, we have to consider that these two studies included patients first seen and treated in the 1990s, a period when the dentists were not fully aware of MIH and not many options for treatment were available.¹¹

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Cost-effectiveness of extraction strategy in MIH

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A German study analyzed cost-effectiveness of extraction strategy in MIH, comparing FPM removal and orthodontic treatment with restoration using composite and with restoration using an indirect metal crown after temporizing it using a preformed metal crown. They stated that the extraction/orthodontic therapy, if performed at the right age, was more cost-effective than other strategies.¹⁸

Conclusions

Orthodontic therapy with extractions could be a valid therapeutic strategy in patients with severe MIH and severely affected FPM. The pediatric dentist should always consider the orthodontic consequences of the extraction of first permanent molars before doing it. The timing of extraction is essential to have a good result. If the extraction is performed at ideal stage, this

strategy is also cost-effective.

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