Hypomineralised first permanent molars and the orthodontist

J.K. WILLIAMS*, A.J. GOWANSS**

ABSTRACT: Aim This paper discusses the orthodontic implications that need to be considered when a child presents with hypomineralised permanent molars. The various historical and present day orthodontic approaches are outlined and indications for the various sequences or extraction of first permanent molars presented.

KEYWORDS: Hypomineralised molars, Orthodontics.

Introduction

This paper addresses the orthodontic issues raised by an occurrence in a child of a hypomineralised first permanent molar (MIH) of poor prognosis. Its aim is to discuss those aspects of MIH that impact on possible orthodontic treatment of the condition. The problem of defective first permanent molars, whether presenting with MIH or other conditions compromising the life of these teeth, has been a clinical problem for over a hundred years. Many approaches have been taken and these are discussed in detail below.

The history surrounding the management for the extractions of first permanent molars

The commonly accepted orthodontic practice regarding the management of first permanent molars with poor prognosis has been influenced by a number of authoritative and conflicting opinions. Unfortunately there is very little robust evidence for the rationale of the timing and extraction patterns for the first permanent molar.

Angle [1907], writing at the beginning of the 19th century, advocated a non-extraction policy. He in particular resisted extraction of first permanent molars, because he considered them the “keystones of the dentition”. Wilkinson [1940], in the 1940-50’s, by contrast, believed in the removal of first permanent molars. It needs to be remembered that at that time of Wilkinson’s writings, however, many patients suffered from rampant caries in the mixed dentition and restorative/conservative techniques were not as advanced as now. Dental caries is still an issue today as more than 50% of children over the age of 11 years have experienced some dental decay [Todd and Dodd, 1983]. With the advent of improved operative techniques and materials the long-term prognosis of first permanent molars has, however, improved considerably.

Mills [1987], in the 1960’s, took a more moderate opinion of the extraction/non-extraction controversy when considering the extraction of a first permanent molar with a poor prognosis. He was quoted as saying: “One wonders why there are still orthodontists who seem opposed to this very satisfactory form of treatment”. On the other hand, he also recognised the orthodontic complexities following loss of first permanent molars. He said that when you extracted the first permanent molars you “double the treatment time and halve the prognosis”. This generalisation is founded upon the fact that the first permanent molars are particularly valuable to the orthodontist as a source of anchorage because of their large root surface area. Additionally, the space provided by the extraction of a first permanent molar is distant from the anterior teeth so that treatment duration is usually extended. For these reasons, the first permanent molars are rarely an orthodontist’s teeth of choice for extraction.

Much of our present dental practice is still based upon clinical experience or conventional wisdom and
more robust data is needed, for instance, from properly conducted randomised clinical trials, if our clinical activities are to be properly evidence-based. With reference to the issues associated with the extraction of first permanent molars, there are some recent data that can be relied upon, and most orthodontists these days hold the following opinions:
- opinions on non-extraction therapy are not universally applicable;
- functional appliances do not make patients grow significantly in a favourable way;
- extractions do not predispose to TMJ pathology;
- first permanent molars are not the “keystones of the dentition”.

Clinical management

The first permanent molar is rarely the tooth of choice for extraction because of the likelihood of making orthodontic treatment more difficult and of longer duration. However, when prognosis is poor, extraction of first permanent molars has to be considered. Large carious lesions, severe hypoplasia including MIH, large restorations, irreversible pulpitis and peri-radicular infection are the main indicators of poor prognosis.

When a first permanent molar with poor prognosis is identified, there are two issues to be considered:
- a) should it be extracted as soon as possible, or should it be temporarily restored?
- b) if the prognosis of one of the first permanent molars is in doubt should we consider extraction of other first permanent molar teeth?

The answers to these questions are not straightforward. The situation varies between the maxilla and the mandible, and depends upon the amount of crowding, the presenting malocclusion, as well as being influenced by the stage of development of the dentition.

In discussing the various orthodontic approaches to be taken, the terms “balancing” and “compensating” will be used. “Balancing” is the extraction of the contralateral tooth in the same arch. “Compensating” is the extraction of the opposing tooth in the other arch.

It must be remembered that the treatment plan will need to be adjusted if any permanent teeth are absent, severely displaced, of doubtful prognosis or if there is other pathology present. Indeed, it is vital that a comprehensive examination of the whole dentition is carried out, together with due consideration of the patient’s circumstances. If the patient will require orthodontic treatment in the future the timing and pattern of the extractions will need to be tailored to achieve the optimal outcome.

Extraction of a mandibular first permanent molar

For lower first permanent molars the ideal age for extraction is 8-9 years [Thunold, 1970], when the crown of the mandibular second permanent molar is complete on radiograph or when the bifurcations of its roots are just visible. When a lower first permanent molar is extracted at the ideal stage the second permanent molar can be expected to erupt into a good contact point relationship with the second premolar where there is crowding present. There may be some spontaneous improvement in crowding further forward in the arch [Richardson, 1979] as well as an improved chance of the third permanent molar erupting satisfactorily [Williams and Hosila, 1976]. 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.

A problem caused by 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.

If, however, the extraction of the mandibular first permanent molar is carried out after its adjacent second permanent molar has erupted (in other words well after the ideal stage) 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” and occlusal interferences on the non-working side of the mouth. This is accentuated if the compensating extraction of the opposing maxillary first permanent molar has not been carried out. The result is a combination 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, could risk the development of a significant periodontal pocket on the mesial aspect of the molar that requires correction by using a fixed appliance.

Compensating the extraction of a lower first permanent molar

There is a risk that with the loss of the mandibular first permanent molar there may be over-eruption of the opposing maxillary first permanent molar. This may not be a problem if the upper first permanent molar is in occlusion with lower buccal teeth mesial to the extraction site of the lower first permanent molar. But if it does over-erupt it will impede the spontaneous forward movement of the mandibular second permanent molar. Consideration must be given to compensating extraction of the opposing maxillary first permanent molar when extracting the lower first permanent molar.

Balancing the extraction of a lower first permanent molar

When there is crowding in the mandibular arch then the balancing extraction of the contralateral first permanent molar should be considered, because a unilateral extraction may lead to unfavourable centre-line shift. However, depending upon the stage of development of the dentition, it may be best to extract a contralateral premolar rather than the first permanent molar, perhaps achieving better spontaneous improvement or simplified orthodontic treatment.

Extraction of a maxillary first permanent molar

An unerupted maxillary second permanent molar can be expected to move forwards quite satisfactorily following the extraction of an upper first permanent molar, although space will remain if there is insufficient crowding. If the upper second molar is already erupted when the first molar is extracted then it can be expected to tip and rotate forwards. Fixed appliance treatment may be required to achieve satisfactory tooth angulation and space closure.

Little or no spontaneous relief of crowding in the maxillary labial segment can be expected from the loss of the upper first permanent molar [Thunold, 1970]. With the loss of maxillary first permanent molars the upper third permanent molars erupt more favourable [Plint, 1970].

Compensating the extraction of an upper first permanent molar

Because of occlusal contacts, the mandibular first permanent molar does not usually over-erupt into the extraction site of the upper first permanent molar. Therefore, compensating extraction of the opposing first permanent molar is not indicated.

Balancing the extraction of an upper first permanent molar

If there is crowding present in the upper arch, the balancing extraction of the contralateral maxillary first permanent molar should be considered. A unilateral extraction risks asymmetry and centre line shift. However, as in the mandible, depending upon the state of development of the dentition, the contralateral extraction of a tooth other than the molar may be of greater benefit.

Summary of treatment approaches

Class I malocclusion with crowding.

The removal of the mandibular first permanent molar requires a balancing extraction in the lower arch to allow spontaneous improvement of premolar crowding and maintain or correct the dental centre lines. Compensating of the opposing upper first permanent molar should be seriously considered, otherwise an upper fixed appliance is required to control over-eruption of the opposing first permanent molar. Extraction of a maxillary first permanent molar should be balanced if there is crowding in the upper arch. Compensating extraction in the mandible is not required.

Class II malocclusion with crowding in the anterior labial segment.

Ideally the maxillary first permanent molars with poor prognosis should be maintained until their second permanent molars have erupted. Space created by the extraction of the first permanent molars can then be used for overjet reduction and dental alignment. There is no requirement for compensatory extractions in the mandible.

When a mandibular first permanent molar is extracted in a Class II case, the maxillary first permanent molar may be in occlusion with the lower second primary molar. This prevents the upper first permanent molar from over-erupting into the extraction site of the lower first permanent molar and so the mandibular second molar is not prevented from moving forwards spontaneously. If over-eruption is a problem then a maxillary holding appliance may be used to prevent the over-eruption of the upper first permanent molar. The disadvantage of using an upper
appliance in this way is that it will have to be worn for an extended period of time! If it is not feasible to place a maxillary holding appliance, then the compensatory extraction of the upper first permanent molar should be considered. To reduce the increased overjet at a later time, the creation of space by the distalization of the maxillary second permanent molars may need to be considered, and possibly the extraction of further teeth in the upper arch, usually premolars. In uncrowded arches a balancing extraction may be advisable to facilitate symmetrical orthodontic space closing mechanics without compromising dental centre lines. Advice from an orthodontist should be sought before carrying this out.

Class III malocclusions. Due to the complexities of treating Class III malocclusion, these should always referred for an orthodontic opinion before any extractions are carried out.

Co-operation between paediatric dentists and orthodontists. It is clear that making the right decision in these cases is sometimes difficult, with so many variables needing to be taken into consideration, yet the consequences for the patient’s long-term dentition may well be momentous. Obtaining the optimum outcome for the patient will often require close co-operation between a paediatric dentist and an orthodontist. At a fundamental level, the orthodontist may require expert opinion about the long-term prognosis of doubtful teeth, and the paediatric dentist should always consider the orthodontic consequences of the extraction of first permanent molars.

References