

Management of Compromised First Permanent Molars

Purpose

Clinical Practice Guidelines (CPG's) are systematic developed statements intended to support clinicians in providing high quality, best practice evidence based care. They are not intended to be wholly prescriptive or a legal directive for clinical decisions. While their application is an acceptable ground for patient care, clinicians should carefully consider the individual circumstances and the specifics of their work environment in conjunction with these guidelines. Selection of alternative treatment modalities, based on clinical judgement and/or specialist advice, may be justified in various clinical scenarios. In such cases, justification must be clearly documented in the patient record

The aim of this clinical guideline is to assist the dental clinician in the appropriate planning for the management of severely carious, hypoplastic or hypomineralised first permanent molars (FPM). Evidence-based clinical guidelines are intended to provide guidance, and are not a standard of care, requirement, or regulation. However, the application of clinical guidelines in publicly-provided oral health services allows for consistency to occur across large patient cohorts with a variety of oral health clinicians.

Deeply decayed, severely hypoplastic or hypomineralised FPMs in a child during the mixed-dentition stage of dental development poses a difficult dilemma for practitioners in treatment planning. The dilemma occurs when the teeth are restorable but have a questionable prognosis. The early presentation of the patient is optimal in obtaining the most favorable results.

When a molar is unrestorable, extraction may be necessary. Careful consideration needs to be given to the various factors that influence the decision to restore or to extract FPMs.

Dental Therapists/Oral Health Therapists should discuss individual patients with the Dental Officer (D.O) when determining the likely prognosis of a grossly decayed, hypoplastic or hypomineralised FPM. Clinicians may refer patients to the Royal Dental Hospital of Melbourne Orthodontic Unit or other Specialist Unit for an opinion regarding FPMs with a questionable prognosis.

Guideline

It is important to approach the management of a patient with compromised FPMs with a plan. A six step management approach has been suggested by William et al 2006.

- 1.Risk identification
- 2.Early diagnosis
- 3.Remineralization and desensitization
- 4.Prevention of dental caries and post-eruptive enamel breakdown
- 5.Restorations and extractions
- 6.Maintenance

Principles of Management

Patient Assessment/Risk identification

- History (medical, social and dental)
- Presenting situation
- Co-operation towards future dental care

- Radiographs (OPG and peri-apical film if suspected pulpal/ periodontal involvement)
- Patient/parent/guardian expectations

Patient Management

These patients are clinically challenging to treat for a number of reasons:

- The sensitivity and post eruptive breakdown of FPMs due to occlusal forces and caries
- The limited co-operation of the young child.
- Difficulty in achieving anaesthesia
- Repeated marginal breakdown of restorations(William et al 2006)

Remineralisation/Desensitization & Prevention

This is an important part of the treatment approach. Hypomineralised molars are fragile, the enamel is 10 times more carbonated (10 x more soluble) so caries and post eruptive breakdown develop easily (Weerhijm 2004). Caries development is aggravated by the sensitivity of the teeth which results in the children avoiding the molars when brushing (Weerhijm 2004).

- **Diet:** needs to be discussed in terms of cariogenic and erosive foods and fluids.
- **Toothbrush:** should have a small head and soft bristles
- **Toothpaste:** with a fluoride level of at least 1 000 ppm
- **Fluoride:** Topical fluoride varnishes can assist in reducing sensitivity *and* aid mineralization of the hypomineralised areas (Willmott 2011).
- **Casein phosphopeptide:** e.g. GC Tooth Mousse, creates and stabilizes a concentrated solution of phosphate and calcium which can then be deposited on the enamel surface (Willmott 2011).
- **Fissure sealants:** are indicated for PFM's that are only mildly affected by hypomineralization where the enamel is intact and there is limited sensitivity. As with healthy teeth, the sealants require monitoring as they may fail (Fayle, 2003).

Restorative Options

When restoration of the grossly decayed tooth is considered, its long-term prognosis should be taken into account including the potential future requirement for endodontic treatment, fixed prosthodontics and the likely cost of these. Treatment options and costs should be communicated to the patient/parent to gain informed consent.

Restoring MIH affected FPMs is often complicated by difficulties in defining the margins of the cavity. Considerations regarding tooth preparation:

- All the defective enamel can be removed to sound surfaces. This is a less conservative approach but is best when an adhesive material is being used relying on enamel for bonding (Williams et al 2006)
- Removal of only the very porous enamel (Fayle 2003). This is more conservative however it can result in defective enamel being left which continues to break down (Willmott 2011).
- Hypomineralised enamel should be left if in the 3-4 years after eruption it has shown no sign of clinical breakdown. If not sure of quality of enamel, run a slow speed bur over the enamel, once it begins to produce a clean chattering sound it should be conserved (Manton, D 2012- Presentation ED seminar)
- Hypomineralised enamel contains more blood products with 3-15 x more protein present. The enamel can be treated with Sodium Hypochlorite to remove protein content prior to etching/filling tooth to improve bond for adhesive materials (Mangum et al 2010)

Restorative Materials

- **Amalgam** – due to the atypical shape of these cavities and the non-adhesive nature of amalgam it is probably best avoided in most hypomineralised cavities (Willmott 2011).
- **Glass ionomer cements** – have the advantage of being adhesive and leaching fluoride, however they have poor wear resistance and are best used as temporary restorations (Willmott 2011)
- **Composite resins** – these have better wear resistance, they are more suitable in small class 1 or 2 surface cavities not involving cusps, where teeth are not sensitive (Willmott 2011). The gingival 1/3 of hypomineralised teeth tend to have normal enamel, bonding in these regions usually produces stable results (Manton 2012)
- **Stainless steel crowns** – these have the advantage of providing full coverage which protects the remaining tooth structure and eliminates sensitivity (Willmott 2011)
- **Laboratory made adhesive or cast crowns** – these also provide full coverage with excellent fit. They can be done with minimal preparation; however they require two visits, patient co-operation and are more expensive (Willmott 2011).

*When it is preferable for the extraction of a FPM to be delayed due to orthodontic considerations, temporisation and the control of pain is essential. *Refer to the clinical guideline on Exposure of Dental Pulp in Permanent Teeth CG-A012-02

Committing a FPM to a restorative cycle early in a patient's life is not favorable. If the tooth requires extraction later and the space is left unrestored this can lead to unfavorable occlusal changes (Gill et al 2001). Permanent first molars are not an orthodontist's first choice for extraction in the treatment of malocclusions however if it has been decided the tooth has a poor prognosis timely extraction of the FPM in the mixed dentition stage is the more favorable treatment option (Willmott 2001).

Factors to consider for Planned Extraction of FPM

- Immediate management of dental pain (when required)
- Long-term prognosis of the restored tooth
 - Large occlusal or aproximal restorations
 - Pulpal symptoms
 - Severe hypoplasia
- Dental age of the patient - The optimal time to extract FPMs is between the dental ages of approximately 8.5 and 10.5 years (Houston, 1983), which usually co-incides with the commencement of calcification of the bifurcation of second molars (Battagel 1985).
- Timing - more critical in the **mandibular arch** (Hallet and Burke 1961). If space closure is to be encouraged, especially in the mandible, FPM should be extracted early rather than late i.e towards dental age of 8.5 yrs rather than 10.5 yrs (Thunold, 1970).
If mandibular FPMs are extracted before 8 years of age, the second premolar may drift distally and become rotated. This can occur due to the socket of the FPM providing less resistance to the eruption of the second premolar or the second premolar escaping the guidance of the distal root of the second deciduous molar. A further risk occurs when there is some distal angulation radiographically of the premolar resulting in impaction against the second permanent molar (Gill et al 2001, Thilander and Ronning, 1985).

Extractions undertaken after 12 years of dental age may result in excessive residual spacing, and in tilting and rotation of teeth, especially of the second premolar and second molar (Thilander and Skagius 1970). The relationship between the second premolar and the second deciduous molar requires careful consideration in all cases. In the above scenarios removal of the second deciduous molar at the same time as the FPM may need to be considered in order to encourage more vertical eruption of the premolar (Gill et al 2001).

- Type of malocclusion
 - The occlusal relationship
 - Degree of crowding in the buccal and labial segment
- Balancing and compensating extractions
 - Balancing extractions involves removal of a contralateral tooth, which needn't necessarily be a FPM, to preserve the dental midline. For example, radiographic examination may show that a contralateral developing premolar has a hypoplastic crown. It may be more appropriate to balance loss of a FPM with this tooth
 - Compensating extractions involves extraction of an antagonistic molar to prevent it's over eruption.

Balancing and Compensating extractions **should be considered** during the **mixed-dentition stage if no active appliance treatment** is to be undertaken. In the permanent dentition, balancing and compensating extractions of the FPM's **should not be performed** unless space is required for **appliance treatment** (Houston 1983).

- Overjet and Crowding - The amount of overjet and crowding (buccal/labial) also influence the decisions around balancing and compensating extractions (Gill et al 2001). An opinion from an orthodontist is necessary when a number of these factors are present.
- Presence and condition of the other permanent teeth
- Radiographic Investigation - It is essential to verify radiographically that all the other permanent teeth are present and in their correct positions (Crabb and Rock 1971; Richardson 1982). If the second premolar is tipped and only resorbing the distal root of the second deciduous molar, consider its extraction after the second premolar has attained half of its root formation. If the second permanent molar has an excessive meso-angular inclination, it is more likely to tip mesially and require orthodontic uprighting. A distal inclination of the second molar is more favourable.
- There should be no radiographic evidence of hypoplasia or other dental anomalies of the unerupted premolars or second permanent molars. (Hallet and Burke 1961). If a premolar is missing, restoration of the FPM is preferred if at all possible, especially if the deciduous molar has a poor prognosis. If the second molar is absent, the third molar is likely to be absent so every effort should be made to preserve the FPM.

Consequences of the Loss of Mandibular First Permanent Molars (FPMs).

- Mesial tilting and lingual rolling of the second permanent molar. Occlusal forces encourage mesial tilting and the molar tilts lingually because the lingual plate is thinner than the buccal plate of alveolar bone. Lingual rolling may result in the development of a scissor bite and non-working side interference (Gill et al 2001).
- Over-eruption of the opposing FPM if there are no occlusal stops. The occlusal interference created may prevent the lower second molar drifting mesially, increase

its mesial tipping and may predispose to later temporomandibular joint dysfunction. Removal of an upper molar should be considered for compensating extraction if the lower molar is not being replaced (Gill et al 2001)

- Incomplete space closure or formation of a poor mesial contact area relation with plaque stagnation and consequent dental disease if there is minimal arch crowding.
- Minimal space closure if the arch is broad and well spaced.
- Distal drifting and tilting of the second premolar.
- Atrophy of the alveolar bone if space closure is incomplete.

Consequences of the Loss of Maxillary First Permanent Molars (FPMs).

The maxillary molars develop with a distal angulation. This favours spontaneous space closure. Good approximation between the second molar and second premolar may even be achieved if FPMs are extracted soon after the eruption of second molars.

If a class I buccal segment relationship exists, the mandibular FPM will rarely over-erupt as its mesial cusp will occlude with the maxillary second deciduous molar or permanent second premolar.

If a class II buccal segment relationship is present, the mandibular FPM may over-erupt so consideration should be given to a compensating extraction of the mandibular FPM. This can be done providing conditions are favourable for space closure in the mandible, that the dental age is between 8-9 and crowding is present.

Maxillary FPM extraction should be avoided in class III malocclusions.

Orthodontic advice should be sought before carrying out any extractions in CL I, CL II or CL III Malocclusions.

This clinical guideline is to be read in conjunction with the following Clinical Guidelines:

- Direct Restorative Materials, Linings and Bases. CG-A009-02
- Exposure of Dental Pulp in Permanent Teeth. CG-A012-02

Definitions

Nil

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Policy owner

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