

Management of primary molar infraocclusion in general practice

PRECIS

Infraocclusion of primary molars is common. Appropriate management will be dictated by the patient's age, presence of a permanent successor, severity, and rate of progression.

ABSTRACT

Statement of the problem: Infraoccluded primary molars can be managed in general dental practice but clinicians need to understand when intervention is necessary.

Purpose of the study: To review the current literature on infraocclusion in primary molars, and to demonstrate diagnosis and management strategies for general dental practitioners.

Methods and materials: Current literature was sourced via PubMed search using multiple key words. Relevant articles are summarised within the article. Different management strategies will be illustrated using a section of cases of differing severities and age at diagnosis. All interventions, including conservative management, restorative, and surgical management will be reviewed. The importance of early diagnosis, continued monitoring, and interdisciplinary team work will be emphasised.

Results: Infraocclusion of primary molars is a common clinical finding, which can be diagnosed both clinically and radiographically. The severity of infraocclusion is classified according to the relationship of the occlusal surface of the tooth relative to adjacent teeth. The age of the child at diagnosis and rate of infraocclusion play a pivotal role in case management. The majority of primary molar teeth exfoliate naturally when the permanent successor is present, however active intervention may be required in some cases. Possible management techniques include extraction, restoration, and luxation of these teeth.

Conclusions: All children in the mixed and primary dentition should be assessed for infraocclusion of primary molars, particularly mandibular molars. Accurate dental records are essential to assess the severity and monitor the rate of progression of infraocclusion so that the condition can be appropriately managed.

Journal of the Irish Dental Association 2014; 60 (4): 192-198

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Table 1: Classification of infraocclusion.⁷

Severity	Definition	Clinical example
Slight	Between occlusal surface and interproximal contact, less than 2mm.	Figure 1
Moderate	Within occluso-gingival margins of interproximal contact.	Figure 2
Severe	Below interproximal contact point.	Figure 3



FIGURE 1: A clinical photograph of slight infraocclusion.



FIGURE 2: A clinical photograph of moderate infraocclusion.



FIGURE 3: A clinical photograph of severe infraocclusion.

Infraocclusion of primary molars is a common clinical finding. It describes a tooth that has failed to maintain its position relative to adjacent teeth in the developing dentition and is therefore, inferior to the occlusal level.¹

The age of the child at diagnosis and the rate of progression of infraocclusion play a pivotal role in case management. Early diagnosis of infraocclusion within a general practice setting is important in ensuring appropriate management of these cases.

This article reviews the current literature on infraocclusion of primary molars and explains diagnosis and management strategies within general practice.

Introduction

The prevalence of infraocclusion of primary molars is most commonly reported to be in the region of 1.3-8.9%,² however it can be as high as 38.5%.³ The peak prevalence is in eight-to-nine year olds,² with a higher incidence between siblings.^{2,4,5} Infraocclusion has been reported to be common in Caucasians with no gender bias noted.⁶ Overall, mandibular molars are more commonly affected than maxillary molars^{3,5} with the mandibular first primary molar being the most commonly affected tooth.^{2,7} Infraocclusion often presents bilaterally with all teeth showing similar degrees of infraocclusion.^{5,8,9}

Aetiology

Infraocclusion is widely believed to be due to ankylosis.^{10,11} It is suggested that damage to Hertwigs epithelial root sheath leads to a break in continuity of the periodontal membrane,⁶ causing direct contact of cementum or dentine with bone.¹²

Genetic factors have also been suggested given the increased incidence of infraocclusion amongst siblings.^{2,4} In addition, children with one infraoccluded primary molar can frequently develop infraocclusion of additional teeth.⁵ There is an increased frequency of other dental anomalies in children who have infraoccluded teeth such as ectopic eruption of first permanent molars, peg laterals, enamel hypoplasia and palatal displacement of maxillary canines.¹³

Another factor thought to play a role in infraocclusion of primary molars is the absence of a permanent successor tooth.¹⁴ Up to 65.7% of patients with developmentally-absent permanent premolars showed infraocclusion of primary molar teeth.¹⁵

Classification

The severity of infraocclusion was defined by Messer and Cline in 1980 as mild, moderate or severe. (Table 1)

It is important to accurately record the severity of infraocclusion at each assessment, so that the amount and rate of progression of infraocclusion can be monitored. Infraocclusion can be recorded



FIGURE 4: A clinical photograph of an altered occlusal plane due to infraocclusion.

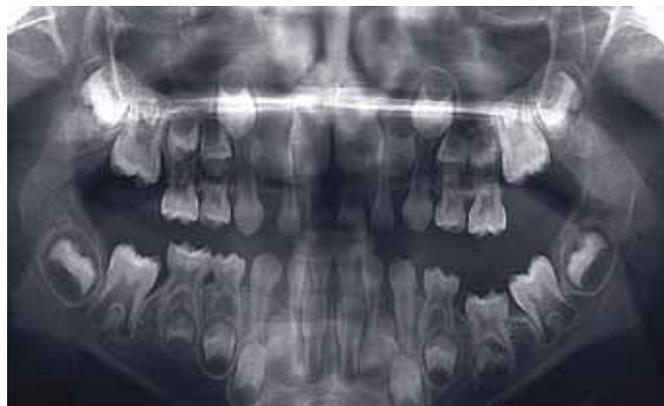


FIGURE 5: An OPG radiograph of an altered occlusal plane due to infraocclusion.

Table 2: Consequences of infraocclusion of primary molars and their implication for the patient. ^{13,17,21}	
Consequences of infraocclusion of primary molars	Implication for patient
Tipping of adjacent teeth	<ul style="list-style-type: none"> ▶ Orthodontic treatment to upright tooth. ▶ Risk of caries. ▶ Increases need for active intervention.
Overeruption of opposing teeth	<ul style="list-style-type: none"> ▶ Orthodontic treatment.
Lateral open bite or crossbite	<ul style="list-style-type: none"> ▶ Increased need of orthodontic treatment.
Caries of infraoccluded teeth or adjacent teeth	<ul style="list-style-type: none"> ▶ Restorative dental treatment. ▶ Extraction if causing pain or infection.
Hypoplasia or deflection of successor tooth	<ul style="list-style-type: none"> ▶ Restorative dental treatment.
Impaction of successor tooth	<ul style="list-style-type: none"> ▶ Extraction if severe.
Delayed exfoliation of primary tooth	<ul style="list-style-type: none"> ▶ Delay in commencing orthodontic treatment.
Progression of infraocclusion	<ul style="list-style-type: none"> ▶ Possible need for extraction if rapid.
Early extraction of severely infraoccluded primary molar	<ul style="list-style-type: none"> ▶ Space maintenance. ▶ Orthodontic treatment to correct space loss.
Increased difficulty of extraction	<ul style="list-style-type: none"> ▶ Fracture of primary molar tooth/retained roots. ▶ Surgical extraction.

clinically with direct measurement using adjacent teeth as reference or with clinical photographs. Many clinicians also use study models already available for orthodontic treatment planning.

Diagnosis

A diagnosis of infraocclusion is made by clinical examination where a disturbance in the occlusal plane is evident. The infraoccluded primary molar tooth will lie apical to the occlusal plane (Figure 4).¹⁶ These teeth have the classical, high-pitched, ‘cracked-teacup’ sound of ankylosis when percussed with a metal instrument.¹² Radiographs are required to verify the presence or absence of the permanent successor.

Radiographs also illustrate a step in the occlusal plane and there is often an angular defect of alveolar bone which is angled towards the ankylosed tooth (Figure 5).¹⁶ Many clinicians will take an orthopantomograph radiograph rather than periapicals, due to the association of infraocclusion with bilateral presentation and other dental anomalies and to determine any orthodontic treatment need. A combination of a clinical and radiographic assessment is advised to rule out other causes, such as primary failure of eruption, impaction or other pathology.¹⁷

Consequences

The potential consequences of infraoccluded teeth have been widely reported in the literature and are summarised in Table 2.^{14,18,19} Several of these consequences are clearly illustrated in Figure 6.

Treatment planning

There are several different factors that will influence the management of infraoccluded teeth. These factors must be considered when a patient presents to general practice with infraocclusion to determine if they can be managed appropriately or require referral on for specialist management. These include the presence or absence of a permanent successor, age of onset and severity, rate of progression of infraocclusion, tipping of adjacent teeth, presence of other anomalies and other concurrent dental needs of the patient.



FIGURE 6: A clinical photograph illustrating the consequences of infraocclusion.



FIGURE 7: A clinical photograph of a composite build-up on an infraoccluded mandibular molar without a permanent successor.

Presence of a permanent successor

Children presenting with an infraoccluded primary molar should have radiographs taken to assess for the presence of a permanent successor. It has been reported that 96.7% of infraoccluded primary molars, with a permanent successor present, exfoliate with normal eruption of the permanent successor with a delay of up to six months compared to a contralateral, non-infraoccluded primary molar.²⁰

Mild to moderately-infraoccluded primary molars with a permanent successor should be monitored clinically at three to six-monthly intervals and may require no intervention.²¹ Radiographic review should be undertaken if there is rapid progression or need for intervention. It may also be advisable to re-establish the mesio-distal dimension and occlusal table of an infraoccluded tooth in mild or

moderate cases. This can be completed using composite crowns or onlays or possibly with the placement of a stainless steel crown without occlusal reduction.

Reasons for considering extraction of infraoccluded primary molars with a permanent successor include: an altered path of eruption for the successor; failure of root resorption; delayed exfoliation of the primary tooth beyond six months; or, significant tipping of adjacent teeth causing occlusal discrepancies.²¹

Other patient-related factors, such as concurrent dental treatment need, medical history, and the behaviour of the child will also influence the decision and timing of any intervention for infraocclusion. A more aggressive approach will be considered if a child is planned for a dental general anaesthetic visit. Alternatively, extractions should be avoided in immunocompromised children or those with bleeding disorders and a more conservative approach for severely infraoccluded teeth is advised.

In addition, a space maintainer can be considered to maintain arch length. It may be in the interest of the patient to consider an orthodontic consultation if there are additional orthodontic issues or significant space loss due to the infraocclusion. The general dental practitioner is well placed to monitor these children.

The absence of a permanent successor

When a patient presents with an infraoccluded primary molar tooth without a permanent successor, a decision needs to be made whether to retain or extract this tooth. The rate of progression of infraocclusion, age at diagnosis and rate of root resorption in addition to the orthodontic needs of the patient play a role in treatment planning.^{22,23} An orthodontic opinion would be advisable.

Infraocclusion of late onset with a slow progression and root resorption will generally be retained for longer periods, perhaps indefinitely.¹⁹ Mild to moderately infraoccluded teeth without a permanent successor in uncrowded arches may be retained and restored to function.¹⁷ Restoration may be completed with full-coverage composite onlays. (Figure 7). Such restorations will restore the occlusal level of the infraoccluded tooth, preventing tipping of

Table 3: How to monitor infraocclusion of primary molars in general dental practice.

1. Record the number and position of infraoccluded teeth.
2. Measure and record the severity of infraocclusion (use a periodontal probe, photo).
3. Take radiographs to determine the presence or absence of successor.
4. Determine if active intervention or monitoring of infraocclusion is required.
5. Inform parents of teeth involved and need to return for re-evaluation.
6. Review patient at three-to-six monthly interval to reassess the rate of progression of infraocclusion in conjunction with other dental needs.
7. Subsequent radiographs may be required.
8. Establish an appropriate interval and re-evaluate treatment options for the infraocclusion at each recall appointment.



FIGURE 8: A clinical photograph of a severely infraoccluded mandibular right second molar in a five-year old.

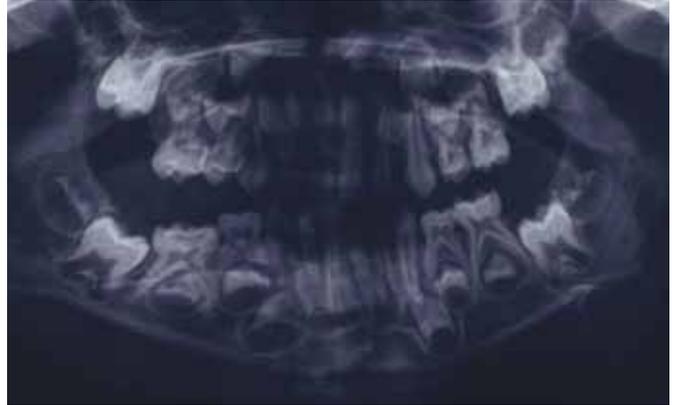


FIGURE 9: An OPG radiograph of a severely infraoccluded mandibular right second molar in a five-year old.

adjacent teeth and overeruption of the opposing dentition, however it is impossible to predict when these teeth will exfoliate, or if they will be retained indefinitely. Alternatively extraction may be warranted in crowded arches which require orthodontic treatment; this should only be completed as part of an orthodontic treatment plan.

Age of onset and severity

While the peak age of infraocclusion has been reported to be around eight to nine-years old² with most ankylosed primary molars showing slight-moderate infraocclusion,²¹ it can be seen in younger children. As infraocclusion is often progressive,²¹ its presentation in a younger child can lead to a more severe infraocclusion, leading to an absence of vertical alveolar development at that site and possibly deflection of the permanent successor.

Figure 8 shows an intraoral image of a five-year-old child who presented with a severely infraoccluded 85. Clinically, there was distal tipping of tooth 84 towards the infraoccluded tooth. Radiographic examination showed the presence of all permanent successors (Figure 9). Clinically and radiographically caries were observed.

The decision to extract this tooth was made due to the severity of infraocclusion at a young age and the evidence of caries in the tooth. On-going monitoring of the eruption of 46 and 45 will be required with the likelihood of space maintenance.

Rate of progression of infraocclusion

The rate of infraocclusion can vary from slow to fast and will dictate the likelihood for intervention. Late onset cases usually show milder infraocclusion and can often be managed more conservatively.¹⁹ If the tooth shows a rapid rate of infraocclusion, particularly at an early age,

there is a greater potential for disruption of alveolar development, whether or not there is a permanent successor. Teeth exhibiting rapidly progressive infraocclusion are usually extracted to limit the extent of vertical defect of bone. The younger the age at diagnosis and the more severe classification, the increased likelihood of intervention.

Tipping of adjacent teeth

Severe infraocclusion of a primary molar tooth can lead to tipping of adjacent teeth and subsequent loss of arch length. Infraocclusion may also lead to food impaction at the site, which may increase caries risk in the infraoccluded tooth or adjacent teeth.¹⁴

It is important for the general practitioner to be vigilant for signs of a food trap or poor oral hygiene in the area of infraocclusion. Appropriate oral hygiene advice should be given regularly to the patient and their parents to prevent the development of carious lesions and the regular use of topical fluoride will aid in caries prevention.

When extraction is the preferred treatment choice for an infraoccluded primary molar, it is important to note that such teeth are more prone to fracture due to ankylosis. Atraumatic extraction technique, including luxation to disrupt the bony union between the alveolus and ankylosed tooth, should be considered before forceps extraction. Surgical extraction may be necessary in teeth with severe infraocclusion, or where access is impeded. Extraction of infraoccluded teeth may be warranted if it is felt that the tipping will cause significant loss of arch length, overeruption of opposing teeth and prevent the eruption of the successor tooth.²¹ Space can be created to improve access by the use of an orthodontic appliance so that management of infraocclusion can be incorporated into an



FIGURE 10: A clinical photograph of a sectional fixed-orthodontic appliance to correct a tipped mandibular molar.



FIGURE 11: An OPG radiograph of a nine-year-old boy with infraoccluded deciduous molars and the presence of permanent successors.

overall treatment plan (Figure 10). This can allow for a more straightforward extraction of the infraoccluded tooth, or even promote eruption of the infraoccluded tooth and prevent the need for further intervention.

Luxation is a treatment that has been discussed in the literature. The tooth is luxated to break the ankylosis and the tooth is retained following luxation to allow continued eruption of the tooth. This technique has had some success.^{6,14} A recent case reported an infraoccluded primary molar in a five-year old, which was luxated twice over a one-month period.²⁴ The tooth subsequently erupted, reaching the occlusal level of the primary dentition.²⁴ While such results are encouraging, further research is required to determine the success rate of this treatment modality.

Presence of other infraoccluded teeth

Children with one infraoccluded tooth frequently have other teeth that subsequently present with infraocclusion.⁵ Infraocclusion is often bilateral with the teeth showing similar degrees of infraocclusion.^{5,8,9} This is likely to be the most common clinical scenario presenting to general practice and when a child presents with an infraoccluded primary molar tooth it is important to regularly review this patient to monitor for infraocclusion at other sites. The number of infraoccluded teeth can impact on the decision to extract or monitor as having multiple infraoccluded teeth can increase space loss or play a role in patient management if multiple extractions are required.

Figure 11 shows an OPG radiograph of a nine-year-old boy who presented with infraoccluded 55, 75 and 85. Teeth 55 and 85 were moderately infraoccluded and tooth 75 classified as slight infraocclusion. All these teeth were caries-free, had permanent

successors and there was no clinical evidence of tipping or space loss. The decision was made to place this child on a three-monthly review schedule to monitor the infraocclusion. None of the teeth progressed beyond moderate infraocclusion and all teeth subsequently exfoliated naturally and the permanent successors erupted as anticipated.

Conclusion

1. All children in the primary and mixed dentition should be examined for infraocclusion at their routine dental visits, as early diagnosis can simplify treatment.
2. If an infraoccluded tooth is noted, the remaining primary molars should be monitored, as they are at a higher risk of infraocclusion.
3. Accurate dental records describing the severity of infraocclusion in relation to adjacent teeth are essential to monitor the rate and severity of the infraocclusion.
4. Clinical diagnosis of infraocclusion and radiographic determination of the presence or absence of a permanent successor are prognostic factors for management.
5. An assessment of the severity and rate of progression of infraocclusion, in addition to the child's other dental needs, are important to determine if the patient can be appropriately managed in a general-practice setting or if referral for specialist treatment is advisable.
6. Oral hygiene instruction should be stressed and preventative regimes implemented to reduce the risk of caries in either the infraoccluded or adjacent teeth.
7. Space maintenance and/or an orthodontic consultation is advised when permanent successors are absent, multiple teeth are involved or where there is rapid progression of infraocclusion.

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