Management of Infraoccluded Primary Molars

A comprehensive overview of the considerations during treatment planning of an infraoccluded primary molar

Background

Infraoccluded primary molars (IPMs) is the term now used to encompass primary molars that remain stationary without any apparent physical barriers while the adjacent teeth continue to erupt, grow and occlusally develop.

All of these lead to vertical alveolar bone defects. IPMs were previously referred to as submerged, retained, ankylosed or sunken.
IPMs can be classified simply as mild/Category A, moderate/Category B and severe/Category C (Fig. 1, p. 12).

Mild IPM indicates that the affected molar’s occlusal surface lies between the level of the adjacent tooth’s occlusal surface and the interproximal contact point; moderate IPM being within the interproximal contact point; and severe IPM referring to anywhere below the interproximal contact point. This classification is key for a clinician in treatment planning and for efficient record keeping.
The prevalence of IPMs has been reported to be around 14 percent of children at ages 8–9 and 2 percent above the age of 12 years, and is more common in females than males. The most commonly affected tooth is the primary mandibular second molar.

IPMs have also been shown to have a genetic and familial link. In 1981, Kurol found a familial tendency to IPM, with almost one-fifth of siblings sharing similar problems, indicating a strong genetic link. IPMs have been linked to other dental anomalies such as aplasia of second premolars, diminutive lateral incisors, enamel hypoplasia and palatal displacement of maxillary canines.

Looking at the evidence that links other dental anomalies and familial tendencies, it’s important to be mindful of their implications in the clinical setting when diagnosing and treating patients who present with one or more IPMs. First, it’s crucial to look beyond the tooth or teeth in question and identify any additional dental anomalies. It is then recommended to enquire about family members with a history of IPMs or look to younger siblings to be able to diagnose problems earlier. While a familial tendency is common, other aetiologies may include trauma, infection, iatrogenic (secondary to radiation or chemotherapy) and idiopathic reasons. Early diagnosis of IPMs is essential; the earlier the diagnosis, the more treatment options are available. An interceptive treatment, for instance, is a result of early diagnosis and the ability to monitor the teeth affected regularly.

If IPMs are left untreated, several consequences could be expected, such as delayed eruption of successor, overeruption and tipping of the opposing and adjacent teeth, respectively, as well as resorption of proximal root surfaces.

Furthermore, IPMs might progress to ‘sink’ and consequently become ankylosed, making extraction more traumatic. The resultant space between the opposing tooth and occlusal surface of the infraoccluded primary molar may also instigate a tongue habit with a resultant lateral open bite.

This paper will discuss the treatment options available, the considerations for each option, and whether the optimal treatment would be to extract IPMs in all cases.

**Considerations for treatment planning**

Unfortunately for dentists, treatment planning for IPM is not straightforward. It must be done on a case-by-case basis and a full evaluation of the dentition is required in consultation with a specialist orthodontist and/or pediatric dentist before any definitive plan can be made.

IPMs bring with them many considerations before a line of treatment can be chosen. The first line of investigation upon encountering an IPM is to determine if the successor tooth is present. A radiographical examination will be necessary at this point, not only to determine the successor's presence and position but also to assess the presence of any interproximal vertical bony defect and to screen any potential pathologies.

This should be preceded by comprehensive family history, clinical examination and percussion to determine if tooth is ankylosed. It should be noted, however, that percussion may be the least consistent indicator because there is a level of subjectivity involved; hence, other adjunctive tests and specialist opinion should be pursued if required.

In addition to the abovementioned factors in managing IPMs, there are other paramount factors such as:

- The patient’s medical status.
- The patient’s socioeconomic status— is he or she likely to return for regular appointments if this is what the
Stage of diagnosis. How early the diagnosis has taken place is the first consideration. When the IPM is extracted and the adjacent permanent teeth are still in the process of erupting, the height of the alveolar bone (secondary to extraction) can be expected to reach a similar vertical height as that of the adjacent permanent teeth.

This is due to the eruptive forces of those teeth, which in effect ‘drag’ the bone in a vertical direction, under the influence of transeptal fibres and periosteal stretching. The bone will continue to grow alongside the permanent teeth and this results in a minimal loss of alveolar bone height.\(^{2,9,13,20,21}\)

This is a crucial factor to be considered, because maintenance of alveolar bone (height and width) is essential when considering an implant-supported prosthesis as a definitive restoration after growth ends.

Orthodontic treatment needs. In patients with an absence of the IPM’s successor, space closure may be the treatment of choice if the patient has moderate to severe crowding, open bite tendency, or abnormal overjet with proclined incisors and a full lip profile (all of which are considered to be extraction features of an orthodontic case).

However, for patients with non-extraction features, it might be feasible to retain the IPM, which can be built up using resin composite to be used as a space and bone maintainer, should the patient wish to have a restoration placed in the future.

A study by Bjerklin and Bennett concluded that if primary molars survive 20 years, continued long-term function can be anticipated.\(^{22}\)

The cost implications of the treatment must be discussed with the patient and their parents or guardians at the treatment planning stage. Orthodontic treatment may be a costly and lengthy option, which the patient must be aware of in the same way they must also be aware of the costs of dental implants and likewise the success rates and complications associated with each of the treatment modalities.\(^{13}\)

Maintenance of alveolar bone. If the treatment plan is to close the space of the IPM postextraction, early intervention may precede successful space closure because of the fact that bone remodelling is faster in younger patients than adults.\(^{23}\)

It has also been proven that teeth can move quicker into extraction spaces in the first few months after an extraction because of the ‘regional alveolar phenomenon’.\(^{24}\)

Moreover, if tooth movement is delayed after extractions of the IPMs, there may be considerable alveolar bone loss in the vertical and bucco–lingual dimension, both of which will render treatment slower and suboptimal.

This delay can be overcome by using the controlled slicing and stepwise hemisection method of extraction, where the IPM is sliced and the distal potion of the tooth is removed, the mandibular first permanent molar is gradually mesialised and once that space has closed, the mesial portion of the IPM is then extracted and consequently the remaining space is closed by further mesialising the first permanent molar. In this manner the alveolar ridge width and height is maintained as far as possible.\(^{27,18}\)

Another option in a young patient would be to extract the IPM and allow for spontaneous space closure, with a view to reopening the space using orthodontic treatment in the future when an implant could be placed. The movement of the first permanent molar into the space of the extracted IPM would allow for the alveolar bone width and height to be maintained until needed at a future date. This would mean that when a dental implant was to be placed, there would be adequate bone in both quality and quantity, improving its chances of successful integration and longevity of the implant-borne restoration.
Again, the cost implications of such a long treatment must be considered in addition to the patient motivation, which could be easily burned out by such extensive treatment.

**Retention of primary molar.** While many advocate the early extraction of the IPM, in balance it must be mentioned that Bjerklin and Bennett\(^{25}\) concluded that retaining the infraoccluded molar was a treatment option for those with agenesis of the second premolar, and in the study 90 percent of these retained primary molars survived into the subjects’ adulthood.

While studies like this prove it is a viable treatment option, the tooth in question must be relatively caries-free and preferably classified as mildly infraoccluded, so as not to allow the adjacent teeth to tip mesially toward it. It is also feasible to restore the IPM to increase its occlusal height using a resin composite restoration or stainless steel crown. These options are relatively inexpensive; however, the patient must be made aware of the possibility of their failure and the need for periodic follow-up appointments in the long term.\(^{16}\)

Interestingly, case reports have been published whereby retained, ankylosed IPMs have been used as bone anchors in the same way as temporary anchorage devices (TADs) to provide orthodontic forces to other teeth. This is possible because late-stage IPMs cannot be moved by orthodontic forces. Maxillary IPMs have successfully been used as bone anchors for the application of orthopedic forces to the entire hypoplastic maxillary skeletal complex in a skeletal Class III case.\(^{26,27}\)

### 2. Successor tooth is present

If the successor tooth is present and the infraoccluded primary molar is planned for extraction, numerous factors must be considered.

**Assisting the exfoliation process of the infraoccluded molar.** The deciduous molar is expected to exfoliate naturally when three-quarters of the root of the successor tooth (premolar) has formed\(^{28}\); hence, if the IPM is retained beyond that point, active intervention will be required to assist in the exfoliation process.

Although some studies have shown that eventually all IPM with permanent successors will exfoliate naturally in given time,\(^{2,10,14,29}\) there are a few ways this situation can be managed. Children and parents can be encouraged to use gentle forces to ‘wiggle’ the tooth themselves; however, many are anxious about doing this.

Indeed, many dentists can use topical anaesthetic and gauze to remove the retained tooth, although this may induce some anxiety in the clinical setting. Another documented method illustrates the use of a coloured orthodontic module stretched over the crown of the deciduous retained molar.
and rolled into position at the cemento-
enameled junction and tucked subgingival.\(^{30}\)

Over a period of days, the tooth will separate from its gingival attachment, causing minimal discomfort. This technique can also be used on other deciduous teeth (Fig. 2).

Once the primary tooth is out, if space is adequate moderately abnormal facial or lingual positioning will usually be corrected by the equilibrium forces of the lip, cheeks and tongue.

**Luxation.** Atraumatic luxation is a documented method of mobilising an IPM so it may continue its eruption and natural exfoliation. This treatment depends on factors such as the age of the patient, root position and stage of development, severity of the infraocclusion, tilting of adjacent teeth, and the position of the permanent successor.\(^{10,31}\)

This line of treatment is associated with a risk of replacement resorption (ankylosis) or inflammatory resorption.

**Extraction.** Although earlier studies have shown that if an IPM’s successor is present, IPMs will exfoliate spontaneously, some authors have advocated a straightforward extraction of IPMs to aid the eruption of the successor tooth.\(^{13,32}\) Early extraction of the IPM limits the need for complicated orthodontic treatment or surgical intervention.\(^{2,11,33}\)

**Alignment.** Ponduri and the team\(^ {34}\) reported a case in which the arch was aligned to give sufficient space for all the teeth present, and in this case the IPMs re-erupted and continued to exfoliate naturally. Although it was successful, this was an isolated case report; hence, a long-term, randomised controlled trial with large sample size is required.

The appliance (a 2-by-4 orthodontic fixed appliance) might not be feasible to use in all cases, such as those with questionable oral hygiene for example.

The cost of this treatment must also be taken into account, because it may be more expensive compared to that of a simple early extraction with spontaneous space closure.

**Assisting eruption of the successor tooth.** Once the IPM has been exfoliated or extracted, the successor tooth may proceed to erupt in a normal fashion without assistance.\(^ {30,14,29,32,35}\)

Close monitoring, both clinically and radiographically, is necessary and if the IPM’s successor is not seen to be erupting normally, an intervention may be required. This may be in the form of surgical exposure of the premolar occlusal table\(^ {10}\) or surgical exposure in addition to packing of the site, for example with a reinforced zinc oxide eugenol to maintain patency of the exposure site and consequently the path of eruption. Other options are surgical exposure and orthodontic traction.\(^ {13,32}\)

If the underlying permanent successor is also ankylosed, then the options could vary; one option might be to accept the malocclusion to avoid invasive surgical intervention.

The surgical options have been extensively reviewed by Uribe\(^ {36}\) in his paper. These options could be in the form of:

1. Luxation of the ankylosed permanent tooth, followed by orthodontic traction or periodontal ligament distraction.
2. Osteotomy of the dentoalveolar segment, with immediate repositioning of the dentoalveolar structures.
3. Osteotomy followed by heavy orthodontic forces.
4. Osteotomy followed by a combination of dentoalveolar distraction and light orthodontic forces.
5. Osteotomy with partial repositioning, followed by heavy orthodontic forces.
6. Lingual corticotomy of the dentoalveolar segment, followed by a labial corticotomy three weeks later and a conventional orthodontic force.

**The way forward**

It’s impossible to approach every IPM...
that is encountered with the plan to extract. Many factors will affect the decision of whether to extract an IPM, and the timing of its extraction will be influenced by the time of presentation, degree of severity and long-term treatment plan (Fig. 3).

The long-term treatment plan is subject to numerous factors—many of which are beyond the control of the clinician, such as the patient’s and parent wishes, motivation to have orthodontic interventions, and financial ability to consider certain prosthetic treatments (particularly implants). Even if patients have the means and motivation, for some treatments it may be beyond their tolerance level to undergo extraction or surgical intervention.

For these reasons, when planning treatment for IPMs, we must look beyond the tooth in question to all the surrounding factors, especially the patient and parent’s needs and wants. By presenting them with information on the relevant treatment options available and being flexible in those plans, the best possible outcome will be achieved for the patient.

Fig. 3

Infraoccluded primary molar

- History, clinical and radiographic examination

Successor present

- No treatment, the primary molar may eventually exfoliate.
- Close monitoring required.

- Extract primary molar.
- May need orthodontic traction to help permanent tooth to erupt and align.

Successor absent

- Ortho-assisted extraction and/or traction.

- Extract as part of orthodontic treatment plan.

- Extract and maintain space to prevent difficult extraction in future.
- An option for moderate to severe IPMs cases.

- Maintain primary molar—restore if needed to prevent tipping and overeruption.
- Must take caries status into consideration. Better in ‘mild’ or ‘slight’ IPMs.

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