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Managing Malocclusion in the Mixed Dentition: Six Keys to Success Part 2

Abstract: Regular recall strategies ensure the general dental practitioner is ideally placed to recognize, manage and correct many occlusal problems in the mixed dentition phase. The first paper focused on recognition of normal and abnormal occlusal development, cessation of habits and correction of crossbites. This paper considers management of leeway space, highlights the importance of palpation of unerupted maxillary canines, and discusses the need for judicious removal of primary teeth (Keys 4-6).

Clinical Relevance: The appropriate management of developing malocclusion may simplify later orthodontic management or, indeed, make such intervention unnecessary.

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Considerable debate has surrounded the optimum timing for definitive orthodontic treatment.^{1,2} Most authorities advocate commencing treatment in the late mixed dentition stage of occlusal development.^{3,4} This approach facilitates optimum compliance;⁵ times treatment with cognitive and emotional development⁶ and maximum growth potential, which may facilitate growth modification to address skeletal discrepancies;⁷ ensures permanent teeth are present to retain appliances; and allows preservation of leeway space for relief of dental crowding.⁸

It is important to be aware,

however, that orthodontic management begins at an earlier stage with ongoing supervision of the developing occlusion in the mixed dentition and, as such, is ideally suited to a general practice setting.⁹ Three basic pillars for management of malocclusion in the mixed dentition were described in part 1 (Keys 1-3). This paper outlines three further Keys (4-6) to early occlusal management namely, preservation of leeway space, palpation of unerupted canines and judicious removal of primary teeth. Implementation of these simple measures may prevent malocclusion from becoming established in the permanent dentition.



Figure 1. Design of upper removable appliance to maintain leeway space. Retentive components: Adam's cribs 6/, /6; ball-ended clasp CD/, /CD.

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Key 4: Consider maintenance of leeway space

The leeway or 'E' space represents the difference in mesio-distal width of the primary canine and molars compared with the permanent canines and premolars. On average, 2-2.5 mm of space is generated per quadrant during the transition to the permanent dentition in the mandibular arch, with slightly less space available in the maxillary arch.¹⁰ However, there is

significant individual variation¹¹ in this dimension, prompting the development of various techniques to predict the widths of unerupted teeth and the corresponding leeway space.^{12,13}

Leeway space may be maintained using simple removable appliances with Adam's cribs on the first permanent molars (Figure 1) or, more usually, with a lingual or palatal arch (Figures 2-4). The natural



Figure 2. Mildly crowded mandibular arch with retained second primary molars.



Figure 3. Lower lingual arch to preserve leeway space.



Figure 4. Aligned mandibular arch following leeway space preservation.

tooth, however, remains the ideal space maintainer and the importance of retention of second primary molars to prevent early mesial migration of first permanent molars and subsequent crowding cannot be overstated. Furthermore, the benefit of space maintenance and risks of occlusal disturbance if space loss occurs should be weighed against the potential for further caries experience and plaque accumulation associated with placement of a space maintainer.

A clinical trial of 107 patients has shown that the use of a lingual arch with bands on the mandibular first permanent molars in the transition to the permanent dentition allows resolution of incisor crowding in 60% of patients, while perfect space preservation may eliminate crowding in 68%.¹⁴ Ideal indications for maintenance of leeway space include mild lower labial segment crowding with the first molars in a Class I relationship.¹⁵ Long-term stability of treatment changes with passive lingual arches are favourable.¹⁶ This approach has further application where severe crowding is present in the arch, such that loss of two premolar units may not be sufficient to alleviate crowding without necessitating excessive arch expansion or proclination of the lower incisors, both of which are inherently unstable.¹⁷

Key 5: Palpate canines

Inspection and palpation for the presence and position of unerupted maxillary canines at 10 to 12 years of age has been advocated as an important orthodontic screening measure.^{9,18} Increasingly stringent guidelines on the use of radiographs in dentistry place a greater emphasis on clinical

assessment of canine position. Indeed, a survey of 505 Swedish schoolchildren has shown the prevalence of non-palpable and unerupted canines, where radiographic examination was necessary, to be just 3% between 11–15 years.¹⁸ Thus, careful inspection and palpation is the key to identifying potential impactions of maxillary canines.

General dental practitioners should note the following features as indications for further assessment and specialist referral where maxillary canines are unerupted:

- Non-palpable permanent canines in the buccal sulcus at 11–12 years of age;
- Firm, immobile primary canine when the contralateral permanent canine has erupted 6 months earlier;
- Significant displacement including tipping and abnormal inclination of adjacent lateral incisors;
- A palatal bulge in the presence of a firm retained primary canine;
- Diminutive maxillary lateral incisors. Palatal impaction of canines is also associated with ectopic development, with 42% arising adjacent to diminutive or congenitally absent maxillary lateral incisors.¹⁹

Timely intervention in patients with palatally ectopic canines has proven effective, with 78% erupting in uncrowded arches in 10–13-year-olds following extraction of their primary predecessors²⁰ (Figures 5, 6). Success rates are thought to relate to the position of the canine tip relative to the midline of the adjacent maxillary lateral incisor. It is important to note that improvement in the eruption path of the permanent canine is unlikely to arise later than 12 months after the extraction of the primary canine.²⁰

Similar findings have been reported in a more recent study in the United Kingdom.²¹ However, a recent randomized controlled trial has challenged these findings, showing little difference in the response of ectopic palatal canines to extraction of the primary canine.²² At this stage, removal of primary canines, where palatal impaction of the permanent successor is confirmed radiographically, remains sensible practice in many cases. Early detection of ectopic development facilitates early intervention and may allow specialist input, as cases should be dealt with on an individual basis. However, failure to diagnose an ectopic canine is likely to result in the need for protracted orthodontic treatment, general anaesthesia and a surgical procedure, and may culminate in resorption of permanent incisors, or cystic change of the associated tooth.

Key 6: Consider judicious primary extractions

Extraction of primary teeth should be performed when they are displacing or preventing eruption of their permanent successors. A permanent tooth should erupt when 75% of its root has formed.²³ While primary teeth often fail to resorb owing to ectopic positioning of the permanent teeth, subsequent extraction of the primary tooth often results in improved positioning of the associated permanent tooth (Figure 7a, b).

Loss of primary canine teeth may be considered where crowding of the incisors results in significant displacements, typically lingual migration of lateral incisors. However, it should be borne in mind that early loss of primary mandibular canines in



Figure 5. Panoramic view of palatally-impacted maxillary canines.



Figure 6. Favourable eruption of maxillary canine subsequent to extraction of primary predecessor.

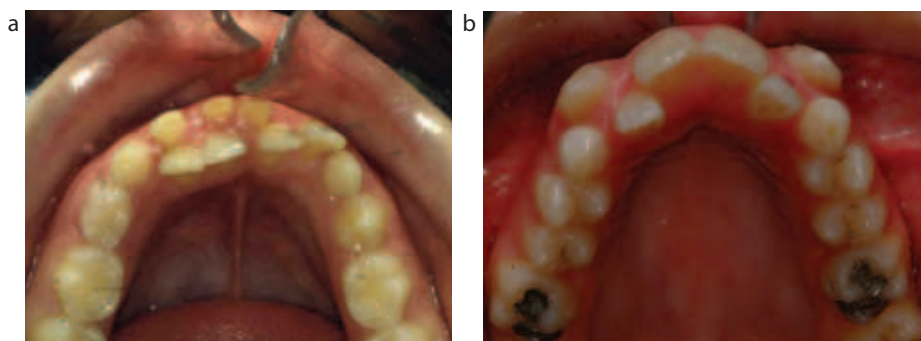


Figure 7. (a, b) Displaced permanent teeth with retained primary predecessors.

the presence of significant crowding has been shown to relieve anterior crowding at the expense of reducing arch length, with only a 5% chance that the amount of crowding in the arch will be reduced.²⁴ Where incisor irregularity is severe enough to warrant extraction of a primary canine, consideration should be given to balancing the loss of a primary canine with loss of its antimere to preserve the dental midline.

Infraocclusion of primary molars, seen in 5–11% of individuals, is usually not an indication for their removal.²⁵ The presence of the permanent successor is the critical factor in treatment planning and timing in such cases.²⁵ Where the permanent successor is present radiographically, the primary molar will normally exfoliate within the expected timeframe.²⁶ The indications for removal of the involved primary tooth in such cases include its severe infraocclusion beneath the adjacent contact points with resultant risk of tipping of the adjacent teeth, and overeruption of opposing teeth.

The prognosis for retention of the mandibular second primary molar into the 3rd or 4th decade is often good when the second premolars are developmentally absent, particularly where root morphology is favourable in the absence of dental caries,²⁷ although the prognosis for the retained maxillary second primary molar may be more guarded.²⁸ However, where orthodontic treatment is planned, early referral for specialist advice is advisable, particularly if the permanent successors are absent, as early loss of the primary tooth may be performed to relieve crowding and to facilitate spontaneous space closure.

Conclusions

The general dental practitioner is ideally positioned to monitor dental development. This two-part paper highlights six key areas which should be considered during occlusal management in the mixed dentition and offers guidance on simple measures to avoid or minimize the risk of a significant malocclusion developing. In particular, earlier orthodontic management should be directed at specific aims, namely crossbite correction; monitoring eruption and position of developing teeth, particularly the maxillary canines; dissuasion of habits and removal of primary teeth contributing to the development of a localized malocclusion.

If in doubt, specialist opinion should be sought before any intervention, but supervised neglect can compound problems, making potentially simple orthodontic treatment protracted and complex.

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