Sequential Slicing of Deciduous Teeth

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Permanent incisor crowding, frequently seen in the early mixed dentition, is a common chief complaint of parents. Many different procedures have been recommended for this situation, including serial extractions, the use of a lingual arch as a space maintainer (sometimes with the extraction of deciduous canines), lip bumpers, and fixed appliances. The clinician's quandary is whether to treat the problem at once or to await further growth.

Development studies have shown that an increase in arch length and intercanine width can be expected during the eruption of the permanent lateral incisors.[1-3] Thus, in some cases, spontaneous self-correction of the incisor crowding may occur; in any case, treatment can safely be postponed at least until the permanent lateral incisors have completely erupted.

Leeway space, if properly maintained, is sufficient for the correction of incisor crowding in 77% of all patients.[5] The space maintenance can be accomplished by a number of methods, including lingual arches,[6,7] palatal bars, lip bumpers, and fixed appliances.

Sequential slicing of the deciduous teeth is a procedure introduced in 1970 by Hotz[8] and revived in 1990 by Van der Linden.[4] This technique can maintain the leeway space without any appliances or special patient cooperation. It transfers the leeway space from the buccal segments to the anterior segments in a controlled manner, as desired by the clinician.

Clinical Procedure

Sequential slicing should be reserved for patients with fully erupted permanent lateral incisors and with no more than 2-3mm of anterior crowding, which can be resolved using the leeway space alone.[5]

Space analysis in the mixed dentition is not merely a matter of determining available and needed space, but also involves consideration of the physiological changes that occur during the transition from the mixed to the permanent dentition. Permanent lateral incisors normally erupt lingual to the central incisors and tend to align spontaneously.[2,3] Because excessive enamel

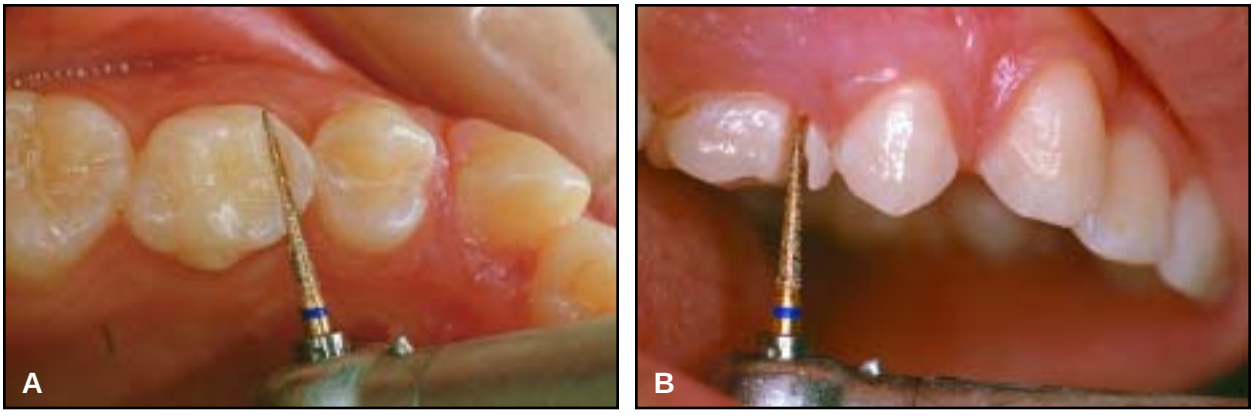

Fig. 1 Slicing of maxillary second deciduous molar with diamond bur in two phases: A. Occlusal shape designed according to desired movement of adjacent permanent tooth crown. B. Slice extended parallel to distal surface of permanent tooth to about 2mm below gingival margin, almost to cementoenamel junction.

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removal would prevent this normal arch widening, the deciduous canines should be sliced just after the complete eruption of the permanent lateral incisors.

The interproximal enamel is removed with a diamond bur* under an abundant warm-water spray (Fig. 1). No anesthesia is necessary, but to avoid sensitivity, the deciduous tooth should not be sliced until at least half the root has been resorbed. When 2-3mm of deciduous enamel are sliced away, no protection is necessary for the distal surface of the adjacent permanent tooth (Fig. 2A). If only 1mm of enamel is to be removed, an interproximal matrix can be placed in the contact area.

The slice is done in two phases. First, its occlusal shape is designed to allow the desired movement of the adjacent permanent tooth crown (Fig. 1A). Second, the cut is extended parallel to the distal surface of the permanent tooth to about 2mm below the gingival margin, almost to the cementoenamel junction (Fig. 1B).

Even if topical fluoride isn't necessary because of the minimal sensitivity of the sliced teeth, which are close to exfoliation, it is advisable to prescribe a .2% chlorhexidine gel to control the marginal gingivitis that often appears for a few days after the slicing.

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Mandibular Arch

In the mandibular arch, the deciduous canines are sliced first, creating enough space for spontaneous alignment of the permanent incisors[9-11] (Fig. 2).

Next, the first deciduous molars are sliced to allow proper eruption of the permanent canines (Fig. 3). This step is sometimes not necessary because the first premolars erupt immediately after the permanent canines, and by that time the first deciduous molars are usually without roots and about to exfoliate.

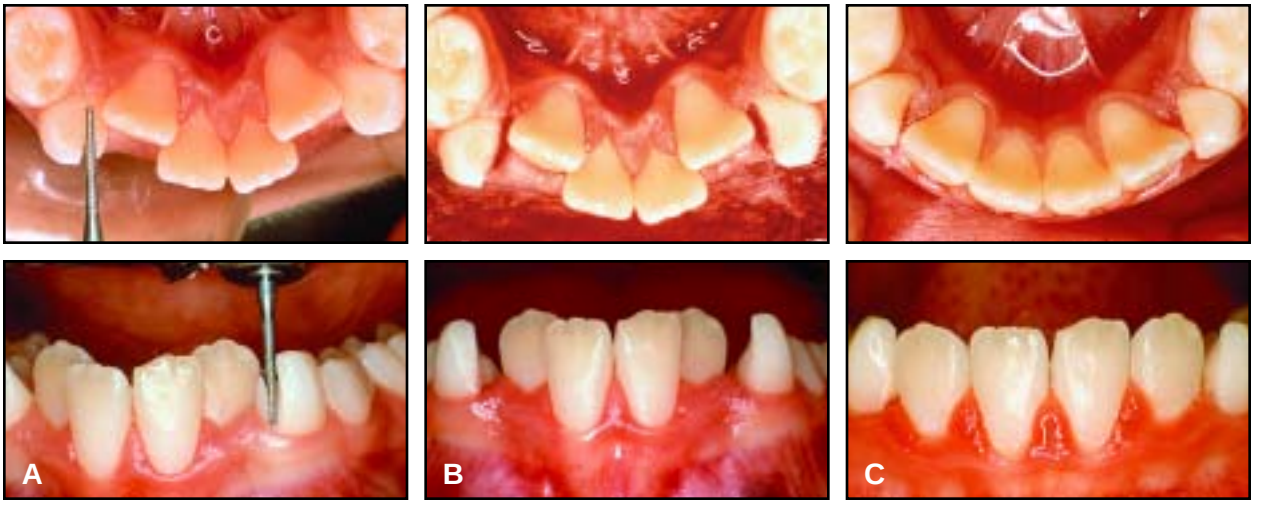

Fig. 2 A. Slicing of mandibular deciduous canines. B. Teeth immediately after slicing. C. Self-alignment of permanent incisors after eight months and two slicings.

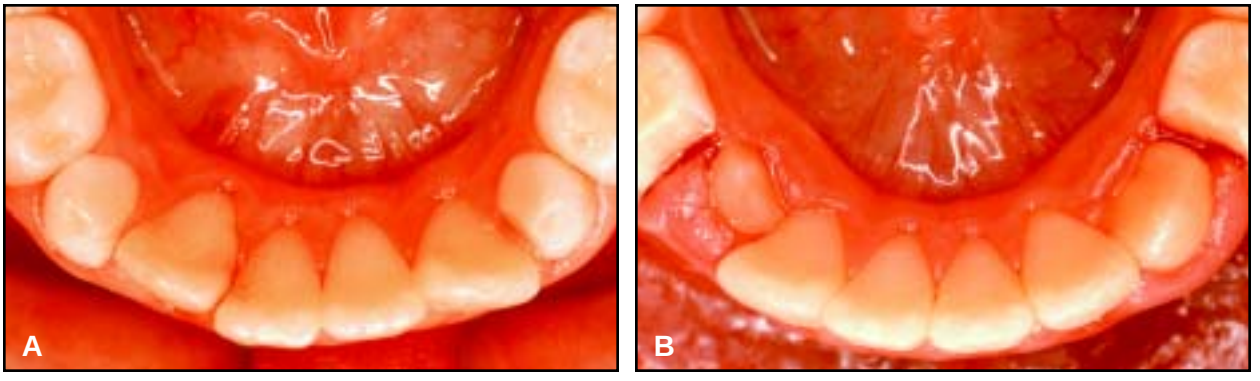

Fig. 3 Slicing mandibular first deciduous molars creates space for proper eruption of permanent canines and provides sliding surfaces that help erupting permanent canines align spontaneously.

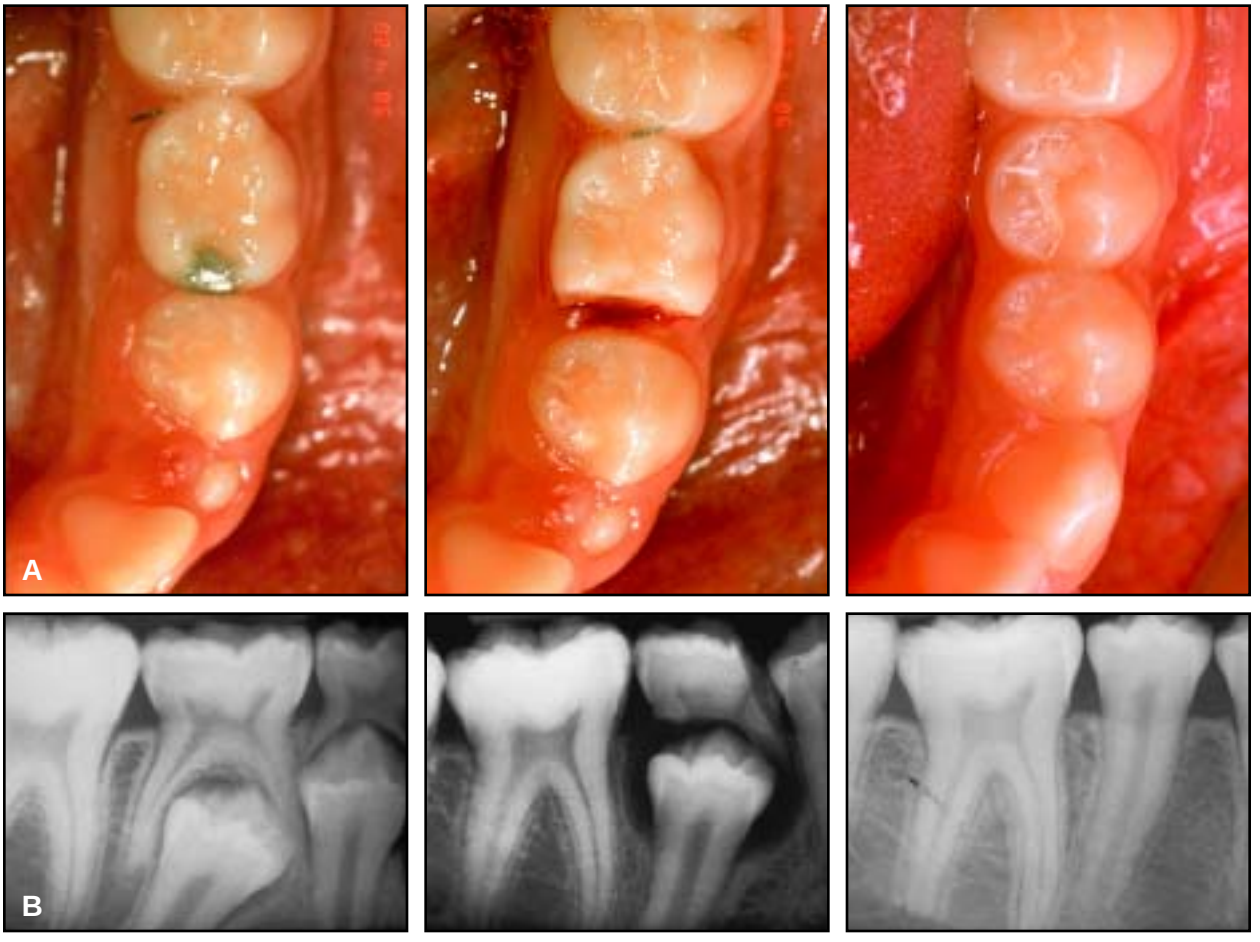

Fig. 4 A. Slicing mesial portion of mandibular second deciduous molar provides adequate space for distal eruption of first premolar and proper eruption of permanent canine. B. Contact area between first permanent molar and sliced second deciduous molar prevents mesial drift of permanent molar.

The last teeth to be sliced are the second deciduous molars, which allow the mandibular first premolars to drift distally and the permanent canines to erupt properly (Fig. 4). It is critical to retain the contact areas with the first permanent molars to prevent mesial drift of the permanent teeth.

Maxillary Arch

In the maxillary arch, the eruption sequence is different: first the permanent incisors and then the first premolars, followed by the second premolars. Slicing the deciduous canines and the second deciduous molars permits the clinician to take advantage of this sequence.

Only 1-1.5mm of enamel should be removed from a maxillary deciduous canine (Fig. 5). The presence of the whole root and the full vitality of the tooth increase the risk of patient discomfort as well as of pulpitis of the sliced tooth. If more space is needed, maxillary expansion should be considered.

On the other hand, the second deciduous molar can be sliced efficiently (Fig. 1) to promote distal migration of the first premolar and permanent canine[12] (Fig. 6).

A spontaneous midline correction can also be achieved with the slicing technique. The slicing is done only where space is needed, allowing the permanent teeth to migrate and correct the midline (Figs. 7,8).

Discussion

Other common methods of correcting permanent incisor crowding in the mixed dentition tend to be more invasive and expensive. Serial extraction reduces arch length and deepens the bite.[13] Use of a lingual space maintainer often

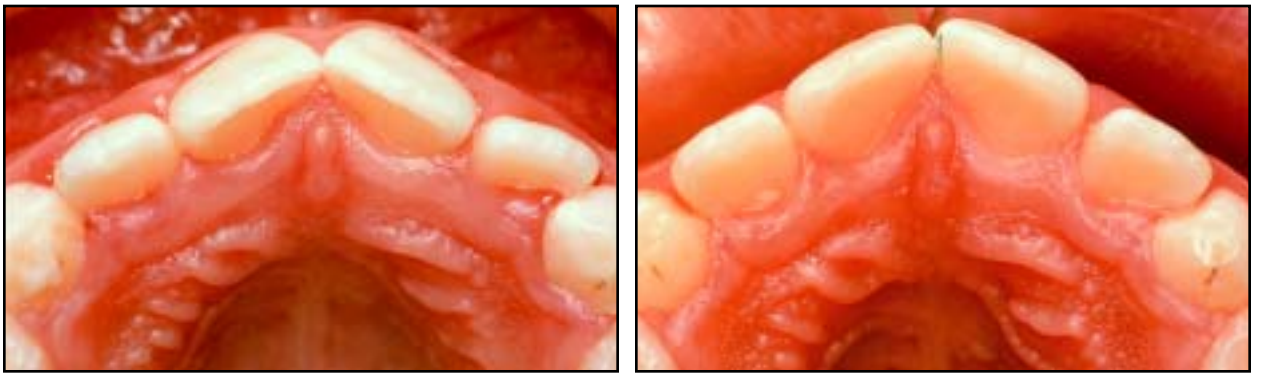

Fig. 5 Only 1-1.5mm of enamel should be removed from maxillary deciduous canine, due to presence of complete root and full vitality of tooth.

Fig. 6 A. Slicing of maxillary second deciduous molar. B. Distal migration of first premolar and permanent canine. C. After full eruption of second premolar in place of sliced second deciduous molar.

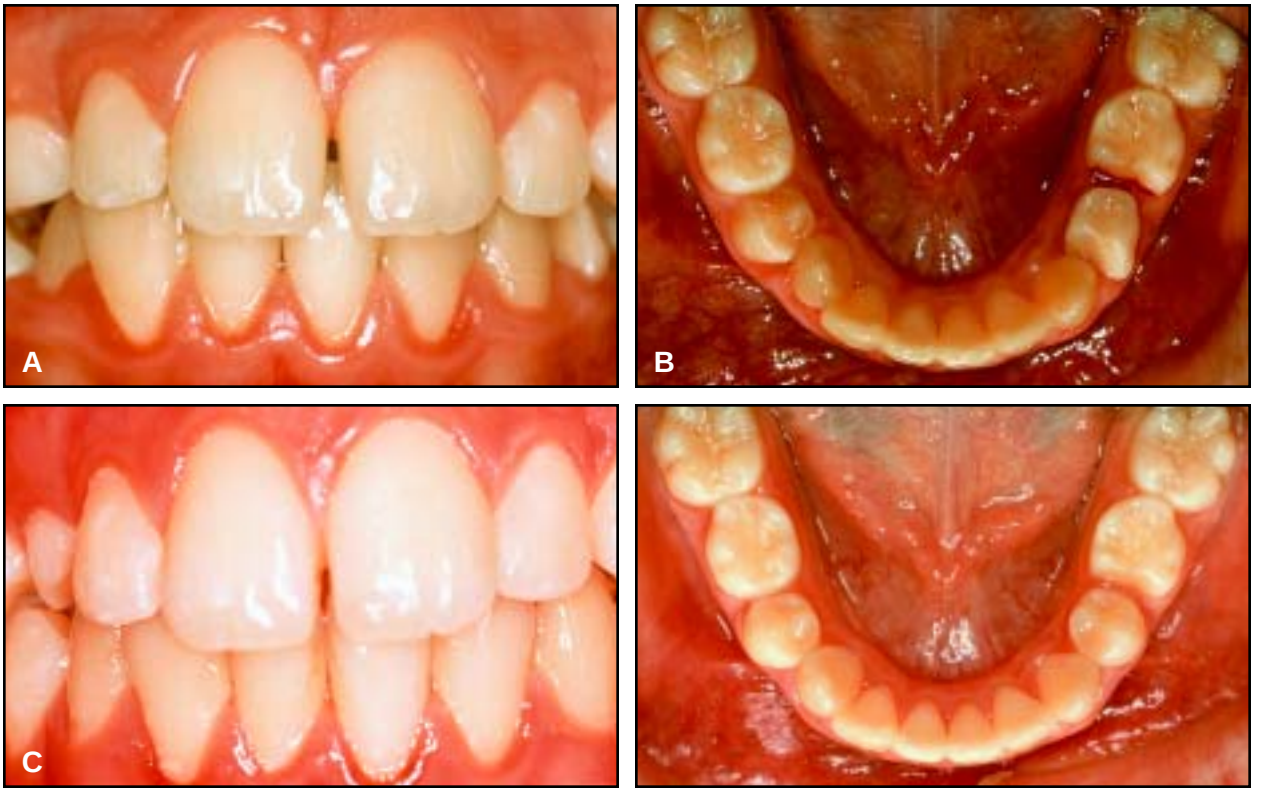

Fig. 7 A. Mandibular midline deviated to right. B. Slicing of mandibular left first and second deciduous molars. C. Migration of permanent incisors for midline correction.

requires extraction of the deciduous teeth; it also involves bands cemented to the first permanent molars and time-consuming laboratory procedures. A lip bumper or palatal bar attached to the first permanent molars has the same disadvantages as the lingual arch and is recommended only in cases where the leeway space is insufficient for spontaneous self-correction and arch expansion is needed.

Early treatment with a utility arch implies prolonged orthodontic treatment, with resulting higher costs and demands for patient cooperation. One-phase treatment, starting in the late mixed dentition, could be used to maintain the leeway space and retract first the premolars, then the canines, and finally the incisors, but this calls for more sophisticated biomechanics and obviously involves more time, cooperation, and expense.

Even if indicated for other clinical reasons, fixed appliance therapy will benefit from prior sequential slicing, which can shorten the fixed appliance phase by allowing spontaneous incisor derotations (Fig. 3), with minimal risk of relapse. In fact, it has been demonstrated in dogs that "the attachment site of the transseptal fibers was not determined by the tooth anatomy itself, but by the tooth position and its orientation in the dental arch during transseptal fiber development". Therefore, "early derotation, before transseptal fibers have fully developed, will probably diminish the amount of relapse".[14]

Compared to the above alternatives, sequential slicing of deciduous teeth is less time-consuming and thus less costly. It also provides more accurate space control: the clinician can slice only the amount needed in the desired locations, making it possible to act selectively on just one or a few teeth.

Occlusal forces seem to play a crucial role in determining the ideal movements of permanent teeth in the sliced areas. Therefore, cases with a deep curve of Spee, especially due to overerupted permanent incisors, have a poor prognosis. Still, the presence of a deep bite does not absolutely contraindicate slicing of the mandibular canines, because some increase in intercanine width could be helpful in allowing self-alignment of the permanent incisors. If the amount of maxillary incisor crowding is more than 2-3mm in the transition dentition, arch expansion will be more successful than sequential slicing.

Clinicians might fear that slicing could be painful and difficult for young children, but I find these patients accept the procedure well if

Fig. 8 A. Mandibular midline deviated to left. B,C. Slicing of maxillary left and mandibular right first and second deciduous molars. D. Spontaneous midline correction.

they are adequately informed and prepared by the orthodontist. If the root is at least half resorbed, anesthesia isn't necessary, even when—as sometimes happens—the slicing involves the pulp. The only discomfort reported by patients is from contacting the gingival margins. Therefore, I advise slicing quickly with a new bur. At any rate, slicing of deciduous teeth is much better accepted than extractions.

Conclusion

This simple and minimally invasive technique, if properly applied, provides predictable results by itself or in association with utility arches or lingual space maintainers. Further investigation may be needed to evaluate the predictability and long-term stability of sequential slicing, as well as its effect on periodontal health.

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