Crowding: timing of treatment

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Mandibular incisor crowding is one of the most common problems resolved by orthodontic treatment. The space necessary for alignment can be obtained by a number of nonextraction and extraction strategies. One nonextraction procedure, recommended by the author, is to start treatment in the mixed dentition stage of development in order to use the leeway space for alignment.

The reason for endorsing this plan of treatment is the finding that arch length preservation can provide adequate space to accommodate an aligned dentition in the vast majority of individuals.[1] The clinical implication of this observation is that clinicians who start treatment in the mixed dentition can choose whether or not to pursue a nonextraction approach in patients with crowding. The same crowded conditions in the permanent dentition may dictate extraction therapy.

The mandibular models of 100 patients in the mixed dentition stage of development were examined to determine the incidence and quantity of incisor crowding. Crowding was present in 85 of the 100 models.[1] (Only mandibular arch conditions were recorded since they generally dictate the strategy for maxillary arch treatment.) The crowding, which averaged 4.5 mm, was assessed by comparing the mesiodistal diameters of the primary and permanent teeth to arch perimeter. When teeth were absent, their sizes were estimated from their antimeres, when present, or from data in Moyers et al.[2]

When the leeway space gain was included in the tooth-size--arch-size analysis, only 23 of the 100 subjects had insufficient space to accommodate an aligned dentition. Thus, arch length preservation insured that 77% of the individuals in this sample would have adequate space to accommodate an aligned dentition. The size of unerupted permanent teeth was derived

Abstract

The late mixed dentition stage of development, after the eruption of the first premolars, is a favorable time to start treatment to resolve crowding. This protocol offers the clinician choices. If nonextraction treatment is preferable, arch length preservation can provide the space for alignment in approximately 75% of all patients with crowding. If extraction treatment is indicated, the first premolars are available.

Key Words:
Crowding • Mixed dentition • Arch length preservation • Nonextraction

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from mesiodistal diameter ratios of primary to corresponding permanent teeth as defined in Moyers et al.[2]

A question was posed: What would the incidence of crowding be if a lip bumper were used to move the first molars distally 1 mm? In this circumstance, 84 of 100 patients would have ample space for alignment. One reason for limiting the increase in arch length to 1 mm is the report by Little et al.[3] which indicated that arch length expansion that exceeded 1 mm was associated with the largest amount of postretention irregularity.

An obvious conclusion is that an aligned dentition can be achieved in 84 of 100 (84%) individuals with modest treatment started in the mixed dentition stage of development. The author's preference is the late mixed dentition stage, after the eruption of the first premolars. The one exception is the need to place a lingual arch for arch length preservation when conditions such as the early loss of a primary canine require arch length control. Since a lingual arch is a passive appliance, it is not considered an active treatment procedure.

Some might argue that earlier active intervention could also provide the space necessary for the other 16 patients. For example, one strategy is to expand the maxilla (RPE) to gain space in the maxillary arch and at the same time provoke spontaneous transverse expansion of the mandibular arch.[4] Most emphasis has been placed on expanding the mandibular anterior area because an increase in intercanine width provides the most space to correct crowding when compared to other transverse changes. Specifically, one estimate is that 1 mm of mandibular intercanine expansion produces a 1 mm increase in arch length while 1 mm expansion at the level of the molars produces only a 0.25 mm increase in arch length.[5]

Although there are too little data to assess the merits of this approach adequately, the results of two studies are not optimistic. Sandstrom et al.[6] evaluated the records of 28 patients whose maxillae were expanded orthopedically and found only a 1.1 mm postretention increase in mandibular intercanine dimension. Similarly, Adkins et al.[7] determined changes in the mandibular arch after maxillary expansion in 21 patients and noted that "descriptive statistics for mandibular digitized measurements indicated that overall changes were small (less than 0.8 mm)...."

If "passive" expansion of the mandibular arch proves inadequate, there is the possibility of actively expanding the transverse dimension of the arch with an appliance such as a Schwarz plate.[8] As Burstone[9] indicated, the ability to expand the apical base skeletally is limited since there is no suture. Therefore any expansion is principally dental in nature.

The available data are sparse and equivocal concerning this strategy. Lutz and Poulton[10] expanded the transverse dimension of 13 patients in the primary dentition and compared the changes with those observed in 12 control subjects. Expansion was accomplished with removable appliances in the remaining two patients. After a 3-year retention period, the patients were followed for another 3 years. At this time (6 years posttreatment), the intercanine dimension of the treated sample was no different from that of the control group, indicating total relapse of the treatment gain. The findings of this study are consistent with the many investigations which concluded that expansion of the intercanine dimension of the mandibular arch is inherently unstable.[11-19]

On the other hand, McInaney et al.[20] used Crozat appliances to expand the transverse dimension of the mandibular arch in 5- to 6-year-old patients and retained the changes until all the primary teeth exfoliated. The intercanine dimension was expanded approximately 5 mm. After retention was discontinued, the arches remained stable. In this study, there were no control subjects and data from other published sources were used to represent the

controls. As such, the actual net expansion (treatment change-growth change) was not reported. The net expansion would depend on the control sample chosen for comparison. If the control sample was comparable to the control group identified by Lutz and Poulton[10] in which the intercanine width increased 4 to 5 mm, there would be no net expansion. If, on the other hand, the comparison involved the control sample reported by Moorrees and Chada[21] in which the intercanine width increased only 2+ mm as the permanent incisors erupted, a net gain approximating 2 mm would be apparent.

A reasonable summary concerning crowding is that it can be easily resolved with a nonextraction approach to treatment in at least 85% of all patients, when treatment can be started in the late mixed dentition after eruption of the first premolars (unless, as indicated, conditions require the placement of a lingual arch at an earlier age.)

The fate of the other 15% of the patients can be debated. Should these be "extraction" type patients (assuming there are no skeletal contraindications) or should they be treated more aggressively by expansion to pursue a nonextraction approach?

A view, shared by the author, is that extractions are the preferable route. One reason is that the long-term consequences of procedures which are designed to avoid extraction by producing active and/or passive expansion of the anterior part of mandibular dental arch (arch development) are not clear. Often, the focus is on lateral expansion of the intercanine dimension since this procedure, as indicated, can provide ready space for alignment. In this context, arch development is contrary to the vast majority of available data which document the instability of mandibular intercanine expansion.[11-19] In addition, others who have discussed and demonstrated posttreatment stability have emphasized that a guiding principle for them is that the mandibular intercanine dimension should not be expanded during treatment.[22,23] Although most of the information for this conclusion has been obtained by evaluating records of patients who were not treated "early," it places the burden to verify its stability on those who propose this treatment goal.

If extraction treatment is preferable, it can also be delayed until the eruption of the first premolars with little consequence. For instance, Ringenberg[24] found no difference in the treatment results obtained in a group of patients treated according to a serial extraction protocol when compared with those patients whose premolars were extracted after the eruption of the permanent teeth. Active treatment for the serial extraction group was approximately 6 months shorter.

In summary, if the treatment of patients with crowding is started in the late mixed dentition stage of development, after eruption of the first premolars, the clinician has a treatment choice to resolve crowding. A nonextraction strategy can be pursued in the vast majority of patients simply by preserving arch length and/or moving the mandibular molars 1 mm distally. Or, if extraction treatment is preferred, the first premolars can immediately be extracted.

Thus, for those who desire a choice between nonextraction and extraction treatment for patients with crowding, the late mixed dentition is a favorable time to begin treatment.

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