
Space supervision and guidance of eruption in management of lower transitional crowding: A non-extraction approach

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Mandibular incisor crowding in the mixed dentition is one of the most common problems presenting to the orthodontist. Asymmetry of alignment, premature loss of primary canine(s), and disruption in arch integrity are all early benchmarks of a tooth size/arch length discrepancy in the transitional dentition that can occur independent of any skeletal discrepancy. *Space supervision and guidance of eruption* refer to treatment interventions during the early to mid-mixed dentition periods that influence the eruption patterns and positioning of the permanent teeth during their transition. Generally considered applicable to individuals with adequate overall arch dimensions to accommodate a normal complement of permanent teeth with an acceptable esthetic and functioning occlusion, guidance of eruption involves the implementation of directed interventions to optimize the eruption and alignment patterns of the permanent teeth as part of a non-extraction protocol. (Semin Orthod 2014; 20:16–35.) © 2014 Elsevier Inc. All rights reserved.

The concept of an early phase of treatment intervention with guidance of eruption procedures to correct mandibular incisor crowding is not a new one. *Space supervision, guidance of eruption, pre-orthodontic guidance, and interceptive orthodontics* are all terms that have been used to refer to the treatment of crowding discrepancies presenting during the early to mid-mixed dentition (Nance, 1947¹; Popovich, 1962²; Hotz, 1970³; Ackerman and Proffit, 1980⁴; Moyer, 1988⁵). While considerable debate has ensued as to the proper terminology, the definitions are far less important than the concepts of intervention. The authors have elected to utilize Hotz's³ term *guidance of eruption* in referring to "treatment procedures that influence the eruption patterns

and positioning of the permanent teeth during the transition from the primary dentition through the mixed dentition." The effectiveness of preserving "leeway space" with a lingual arch to resolve mandibular crowding was reported by Nance¹ in a presentation to the Southern Society of Orthodontics in 1946 and in an article in the American Journal of Orthodontics in 1947. Nance describes a series of cases dating back to 1934 that were successfully treated with passive lingual arches in the mixed dentition. A similar approach to preserving arch length was described by Hotz³ in 1970 and later by Singer⁶ in 1974. These opinion articles and case series were later substantiated in clinical studies by Wagers,⁷ Arnold,⁸ Gianelly,⁹ DeBaets and Chiarini,¹⁰ Dugoni et al.,¹¹ Gianelly,^{12,13} Rebellato et al.,¹⁴ Brennan and Gianelly,¹⁵ Villalobos,¹⁶ Gianelly,¹⁷ and Bell.¹⁸ Despite these positive reports, opponents of early intervention have argued that a second phase of therapy is frequently necessary, resulting in both increased length of treatment time and cost. While this opinion is frequently mentioned in the literature, there is scant research to substantiate such a conclusion. Wagers⁷ reported in a survey of 100 patients undergoing mixed dentition treatment a 0.2-month difference in treatment

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1073-8746/12/1801-\$30.00/0

<http://dx.doi.org/10.1053/j.sodo.2013.12.003>

time over those patients treated in the permanent dentition (21.6 months vs. 21.4 months). Popowich et al.¹⁹ reported very similar results of patients treated in the mixed dentition with average treatment durations of 20.25 months in non-extraction Class I cases.

The short-term and long-term dental health benefits of early mandibular incisor alignment also remain unclear and unsubstantiated. Empirically, one would think that well-aligned teeth are easier to clean and thus less prone to plaque-mediated dental disease, namely caries and periodontal disease. Yet clinical studies fail to consistently demonstrate a causal relationship. A 2007 review by Burden²⁰ entitled "Oral Health-Related Benefits of Orthodontic Treatment" in this same publication concluded that "orthodontists today could not claim to prevent caries by orthodontic intervention" and that "orthodontic treatment confers neither harm nor benefit in terms of long-term periodontal health." A more recent systematic review of the literature by Hafez et al.²¹ arrived at this same conclusion.

If not for overall dental health benefits and with questions regarding multiple-phase efficiency, then why treat crowding in the mixed dentition? Proponents of early treatment argue long-term lower incisor positional stability is better in patients treated during this period. The study by Dugoni et al.¹¹ is often cited as evidence supporting such early guidance intervention. However, while the abstract of this study shows impressive results with 19 of 25 (76%) patients showing clinically satisfactory lower anterior alignment 10 years post-retention, a close review of the study suggests the reader may be misled by the abstract. Although it is unclear as to how patients were selected for the study and while no patients were stated to receive lower Edgewise treatment, it is clear the patients received more than just a passive lingual arch to maintain leeway space. Quoting the article, "In most cases the lingual arch was removed and a lower fixed canine-to-canine retainer was placed" for a period of time. In addition, 16 (64%) patients had circumferential fiberotomies and 18 (72%) had interproximal enamel stripping. In contrast, while the classic 10-year post-retention follow-up study of first premolar extraction cases by Little et al.²² found satisfactory incisor alignment to be less than 30%, no circumferential fiberotomies were per-

formed on any of the patients, and presumably none had interproximal enamel stripping. Consequently, to suggest that incisor alignment exhibited better long-term stability in the Dugoni et al.¹¹ study compared to the first premolar extraction cases reported by Little et al.²² may be somewhat misleading. Unfortunately, in another study by Little et al.²³ that examined post-retention stability in non-extraction cases treated in the mixed dentition that involved an increase in lower arch length, patients treated with leeway space preservation were specifically excluded from the study. The study results involving mixed dentition arch dimensional expansion did demonstrate an instability and high relapse potential even when small amounts of expansion were utilized to resolve incisor crowding. Consequently, it is unclear whether one can conclude resolution of lower crowding via leeway space preservation is any more stable than either premolar extractions or mixed dentition arch expansion. In addition to "relapse" of incisor alignment, some of the recurrence in crowding is likely related to normal physiologic changes as those observed in untreated individuals. The results of the Belfast longitudinal studies^{24,25} showed a mean decrease in crowding of about 1 mm between 7 and 11 years of age; the crowding increased an average of 2.3 mm from 13 to 18 years.

Given the information available suggesting post-treatment lower incisor stability is likely comparable with any of these approaches, the clinician might again ask—why bother with early treatment? In an essay entitled "Timing of early treatment: An overview," Proffit²⁶ suggested the indications for considering early treatment basically involve two issues—the effectiveness and the efficiency of treatment. The authors of the present article would argue that two "guidance of eruption" concepts meet these effectiveness and efficiency requirements: the utilization of E-space just prior to exfoliation of the mandibular second primary molar and the sequential utilization of leeway space for the relief of mixed dentition lower incisor crowding. An understanding of normative eruption patterns and arch dimensional changes in relation to the primary to mixed dentition transitional stages is imperative in understanding the rationale for the various treatment approaches that will be discussed under the general concept of "guidance of eruption."

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