

EARLY ORTHODONTIC AND ORTHOPEDIC TREATMENT

Dr. McNamara presented an overview of his current understanding of growth modification — what works, what works for a while, and what has proven to be relatively unsuccessful.

TRANSVERSE DIMENSION

In his opinion, of all facial dimensions, the transverse dimension of the face, particularly the maxilla, is modified most easily, with results that appear to be stable over the long term. One of the major themes throughout Dr. McNamara's presentation was the use of rapid maxillary expansion (RME) in situations other than crossbite correction. RME can be used in juveniles and adolescents not only to correct anterior and posterior crossbites, but also to increase arch length. Studies at the Universities of Oklahoma have shown that a millimeter of maxillary arch expansion results in about a 0.7 mm increase in arch perimeter.

Also described was the use of the lower Schwarz appliance in mixed dentition patients. This removable type of expander can be used to upright the lower posterior teeth while creating a modest amount (4-5 mm) of arch space in the lower anterior region — simply providing orthodontic tipping of teeth, not orthopedic change.

This phase of treatment also may incorporate the placement of brackets on the upper anterior teeth, which are used to achieve alignment of the upper incisors.

■ Presented by James A. McNamara, DDS, PhD, on September 13, 1999, at the Southern Region meeting. Summarized by Dr. Brian Bergh, Southern Region Editor.

SAGITTAL DIMENSION: CLASS II CORRECTION

■ **Pendulum Appliance.** The Pendulum appliance and its variation, the Pendex appliance, which incorporates a midsagittal screw into the palatal acrylic, were developed by Jim Hilgers, and are very useful in patients in whom maxillary molar distalization is indicated. Dr. McNamara cited a study by Bussick and McNamara that soon will appear in the *American Journal of Orthodontics and Dentofacial Orthopedics* that reported that the Pendulum appliance moved maxillary first molars distally an average of 6.2 mm.

■ **FR-2 of Fränkel.** Dr. McNamara then provided an overview of his current use of functional jaw orthopedics. He stated that he still felt that the "gold standard" for functional appliance therapy was the FR-2 appliance of Fränkel. This appliance, although technically more demanding than other currently used functional appliances, produces a direct effect on the orofacial musculature and creates an environment that encourages maximal skeletal development with minimal sagittal dentoalveolar change.

■ **Twin Block Appliance.** A frequently used appliance in the mixed dentition is the Twin Block appliance, developed by Dr. Bill Clark and modified by the speaker. This type of appliance is selected

primarily because of ease of clinical management in treating Class II problems. Dr. McNamara recommends adding a lower labial wire covered with acrylic (as in a Barrer spring retainer) in order to increase the retention of the lower part of Twin Block during the transition to the permanent dentition. He also prefers to include two expansion screws in the maxillary component of the Twin Block appliance. In addition, a strong clasping system is recommended to provide adequate retention of the appliance during full-time appliance wear. The appliance should not be free-floating in the mouth, but rather should be attached snugly to the maxillary and mandibular dentitions.

One of the most important aspects of the clinical management of the Twin Block appliance is the specific amount of vertical opening in the posterior region. The bite blocks should be at least 5-7 mm in height in order to allow for an appropriate muscular adaptation while wearing the appliance.

The speaker recommended the use of the Projet™ bite fork (Great Lakes Orthodontic Products) when constructing functional appliances such as the Twin Block and the FR-2 appliance of Fränkel. The serrations in the Projet™ bite fork allow the patient to "feel" where the bite needs to be and makes it easier for the clinician to guide the patient to the desired bite.

• **Bionator.** Dr. McNamara also offered his opinion regarding the current use of the Bionator. Although many



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orthodontists both in the U.S. and in Europe have used this type of appliance frequently for the last 30 to 40 years, the bionator now appears to be decreasing in popularity (at least according to data obtained from six of the major orthodontic laboratories). Dr. McNamara sees only a limited use for the Bionator in routine orthodontic practice today, in that the Twin Block appliance (which appears to be worn more easily by the patient) can produce equal or superior treatment outcomes.

• **Herbst Appliance.** The most commonly used functional appliance in the permanent dentition is the Herbst appliance. Dr. McNamara began using this appliance in 1980 when Hans Pancherz introduced it to him. Dr. McNamara feels that the Herbst appliance is the most predictable of all functional appliances. Today he prefers a design that incorporates stainless steel crown on the maxillary first molars and mandibular first premolars. In addition, a sagittal screw usually is incorporated into the

maxillary part of the appliance, and lingual arch is connected to bands on the lower first molars. Dr. McNamara rarely used the Herbst appliance in the mixed dentition because of the difficulty he has experienced in maintaining Class I correction after appliance removal.

The issue of the bite registration for the Herbst appliance, as well as other types of functional appliances, was discussed. There is no universal agreement as to the "ideal" amount of bite advancement. The suggested amount of bite advancement ranges from a "step-by-step" approach advocated by Rolf Fränkel to an end-to-end incisor bite registration recommended by Hans Pancherz and Bill Clark. Based on his own clinical experience, Dr. McNamara recommended that in patients with an overjet of approximately 7 mm or less, the bite should be advanced into an end-to-end incisal relationship. If the overjet is greater than 7 mm, a bite registration that represents half of the overjet distance is obtained for initial appliance fabrication,

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and then the Herbst appliance is reactivated every two to three months in increments of 2-3 mm until an end-to-end incisal relationship is achieved.

Herbst therapy usually lasts from 6 to 12 months, depending on the amount of pretreatment overjet. Usually, the appliance is left in place five to six months after the last activation. The net changes during treatment have been reported to be about 50% skeletal and 50% dentoalveolar, with many of the dentoalveolar adaptations, including lower incisor proclination as well as distalization of the upper molars, rebounding during the Phase II fixed appliance stage. Typically, a Herbst appliance produces about 2.5 mm more mandibular growth than would be seen in an untreated Class II individual.

SAGITTAL DIMENSION: CLASS III CORRECTION

Dr. McNamara said that the treatment of Class III malocclusion should start at an earlier age than does the treatment of Class II or Class I problems. He recommends that early Class III treatment begin on or about the time of eruption of the upper

permanent central incisors. The presence of the upper and lower permanent central incisors provides a great advantage in maintaining long-term stability of the occlusion during the transition to the permanent dentition.

The success of early treatment in Class III problems is based on at least four interactive factors, the first being the severity of the problem identified at the time of the initial examination. Second, intervention in the early mixed dentition is far more preferable than intervening in the late mixed dentition or even in the early permanent dentition, as greater skeletal changes are seen in younger patients. Third, any contributory etiological problem should be identified and eliminated if possible. Airway problems such as large tonsils, obstructing adenoid, and nasal constriction should be eliminated if possible; allergies and abnormal tongue posture are far more difficult to manage clinically. Fourth, the family history must be taken into consideration.

Dr. McNamara discussed three treatment options for this type of malocclusion:

■ **Chin cup.** The chin cup is used infrequently as a primary treatment appliance, except in very young individuals with obvious mandibular prognathism. Although some short-term restriction of mandibular growth has been observed in Class III patients treated with a chin cup in comparison to untreated controls, there is little evidence that chincup therapy can reduce the overall length of the mandible over the long-term in most patients.

■ **Facial mask.** His primary Class III treatment modality is the orthopedic facial mask of Petit (Great Lakes Orthodontics or Ormco), combined with a bonded rapid maxillary expansion appliance. This type of treatment has been shown to produce maxillary protraction (1.5-2.0 mm) and forward movement of the maxillary dentition (1.5-2.0 mm), as well as a downward and backward redirection of mandibular growth and an increase in lower anterior facial height.

■ **FR-3.** The third type of appliance that can be used in the early treatment of Class III malocclusion is the FR-3 of Fränkel. This appliance, which has been underutilized by American orthodontists, can be used in the treatment of Class III malocclusions of various severities and has the distinct advantage of working first on the orofacial musculature. The FR-3 appliance produces treatment effects that are very similar to those produce by the orthopedic facial mask, but the duration of treatment is longer, typically one to two years on a full and part-

time basis, as compared to six to nine months for the orthopedic facial mask. Patient acceptance, however, often is higher with the FR-3 than with the chin cup or facial mask.

VERTICAL DIMENSION

The vertical dimension of the face is the most difficult of the three dimensions to alter clinically. Dr. McNamara said that in his study of mixed dentition Class II patients, about 50-60% had a normal vertical development at the beginning of treatment, about 10% had a short lower anterior facial height, with the remainder a long lower anterior facial height.

Dr. McNamara stressed that it was important to recognize the interrelationship between changes in the vertical dimension and changes anteroposteriorly. For example, each millimeter of increased lower anterior facial height camouflages a millimeter of forward mandibular growth.

Dr. McNamara said that one of the most efficient ways of preventing increased vertical development in long-faced individuals is the use of the acrylic splint expander that is made from 3 mm thick splint Biocryl. This type of appliance not only widens the maxilla, but also limits the downward and forward movement of the upper posterior teeth. A mandibular posterior bite block made from the same material also is useful in anterior openbite patients and in patients who have one or more upper incisors in lingual crossbite. If more aggressive treatment of excessive vertical dimension is indicated, ortho-

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gnathic surgery may be the only option.

Many types of functional appliances, including the Twin Block, the FR-2, and the bionator, can be used to increase the vertical dimension in young short-faced individuals. On the other hand, the Herbst appliance generally does not increase lower anterior facial height over the long-term.

Finally, one of the best ways of encouraging normal vertical development is through the conscientious use of lip training, as advocated by Rolf Fränkel. He has shown a change in the direction of facial growth simply by encouraging patients to keep their lips together and breathe through their nose. Most orthodontists generally have not recognized the usefulness of this type of functional intervention concerning lip function.

PRACTICE MANAGEMENT

Dr. McNamara stressed that not all early orthodontic treatment was beneficial to the patient. He avoids extended treatment protocols. He made the following recommendation.

1. The effects of treatment should be predictable, with the ideal early treatment duration being about 12 months.
2. The fee schedule should reflect the amount of work provided in each phase. Generally, the fee is divided into two parts, a Phase I and a Phase II fee, with no fee being charged for the so-called "interim period" during which time only a simple retention appliance such as a maxillary palatal plate is worn.
3. Phase I and Phase II fees and estimated treatment times should be presented at the time of the initial examination.
4. Choose the optimal dental developmental stage for both Phase I and Phase II treatments. For example, in Phase I treatment, the upper and lower first molars, the upper and lower central incisors and the lower lateral incisors should be erupted before treatment is started. Start Phase II treatment after all deciduous teeth are absent and the lower second molars are within about six months of eruption.

Attendees of the Southern Region meeting thoroughly enjoyed Jim McNamara's presentation. ■