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Volume 2, Issue 2
May, 2007

Diagnosis and Clinical Management of Class II Malocclusion: Guidance during Growth

BRACE PLACE Orthodontic Update

Diagnosis and Clinical Management of Class II Malocclusion

Class II malocclusions are frequently diagnosed orthodontic clinical findings. This occurs in 25 percent of the general population. The Class II malocclusion has several components that may lead to early diagnosis. The typical large maxillary protrusion or "overjet" can readily be observed by all clinicians. When this overjet is significant it is evident to both parents and patients. Orthodontists are successful in treating this type of malocclusion especially when it is diagnosed early.

Diagnosis

The simplicity of the Angle classification of malocclusion belies the fact that Class II malocclusion is not a single diagnostic entity. Edward Angle based his classification system solely on the relationship of the upper and lower first permanent molars. Underlying this occlusal condition can be numerous combinations of skeletal and dental conditions, some intuitively obvious, some not.

Anteroposterior Components

The relationship of the upper and lower teeth can be affected by various sagittal components of the malocclusion, either alone or in combination. Most of these components are obvious and may include:

-maxillary skeletal or dentoalveolar protrusion or retrusion
-mandibular skeletal or dentoalveolar retrusion or protrusion

Fig 1 : Dental and skeletal class II correction.

Vertical Components

Although a Class II malocclusion usually is perceived as a sagittal problem, the vertical dimension of the patient also must be considered. Variations in facial height may conceal or intensify the clinical appearance of the malocclusion.

Decreased Vertical Dimension. It is well noted in prosthodontics, a decrease in vertical dimension causes the mandible to rotate upward and forward. This same phenomenon occurs in the orthodontic patient whereby a short lower anterior facial height can camouflage a mandible that is structurally small relative to the midface. These patients typically have a low mandibular plane angle, a deep overbite with a strong chin, and either retruded or flared upper incisors. **(Fig 2)**

Increased Vertical Dimension. A patient with an increased lower anterior facial height often is characterized by a retruded mandible (and occasionally the maxilla as well), a poorly defined chin with a hyperactive mentalis muscle ("golf-ball chin") and a tendency toward an anterior open bite.

Fig 2 : Decreased vertical dimension

Transverse Components

A dimension often overlooked in the evaluation of the Class II patient is the transverse relationship of the maxilla to the mandible. Most class II patients appear to have normal relationship of the buccal segments when the patient closes in centric occlusion. An underlying transverse discrepancy of the 4-5 mm can be unmasked clinically by having the patient posture that mandible in an anterior position so that canines are positioned in a Class I relationship. More significant transverse discrepancies are evidenced by unilateral or bilateral posterior crossbites in centric occlusion.

Fig 3: Left: High Pull Headgear. Below : A Herbst appliance (helps correct skeletal mandibular retrusion in a growing adolescent.)

The Class II malocclusion can be diagnosed by a combination of skeletal and dental conditions.

Available Treatment Strategies

Many treatment approaches currently are available for altering the occlusal relationships typically found in Class II malocclusions in growing patients. These treatments include a variety of fixed appliances, extraoral traction appliances (headgear), arch expansion appliances, extraction procedures, and functional jaw orthopedic appliances. Each treatment approach differs in its effect on the skeletal and dental structures of the craniofacial region, sometimes accelerating or limiting the growth or movement of the various structures involved, producing favorable, and occasionally unfavorable growth changes.

Maxillary Skeletal Position

The most common treatment for true maxillary skeletal protrusion is extraoral traction, a family of appliances typically used to restrict the normal downward and forward growth of dentofacial complex. The cervical-pull facebow incorporating a neck strap is used most frequently in patients with decreased vertical dimensions, in that the direction of the force application also can lead to increases in lower facial height by erupting maxillary molars. The high-pull facebow is appropriate for use in individuals in whom an increase in vertical dimension is to be minimized or avoided. The high-pull facebow is anchored to an occipital anchoring unit (headcap) so as to decrease the vertical development of the maxilla, **(Fig 3)** thereby allowing forward rotation of the mandible and maximizing the horizontal expression of mandibular growth. Maxillary skeletal retrusion, occasionally seen in Class II patients, is extremely difficult to treat directly, except through orthognathic surgery, and usually no attempt is made to treat this condition in growing patients. The use of extraoral traction usually is contraindicated.

Maxillary Dentoalveolar Position

Problems with the position of the maxillary dentition may involve simply the glaring or retrusion of the upper four anterior teeth. Various types of fixed appliances can be used to reposition these teeth within the alveolus.

A protrusion of the entire maxillary dental arch relative to the skeletal portion of the maxilla also may exist. Treatment may involve the retraction of the six upper anterior teeth following the removal of two premolars, or the en masse movement of the maxillary dentition posteriorly without extraction. Class II intermaxillary elastics are commonly used to create changes in occlusal relationships, with or without the extraction of teeth. Due to the nature of intermaxillary elastics, the clinician must be prepared to counteract the potentially undesirable components of force, particularly in the lower arch, to avoid harmful reactions.

The maxillary molars also can be moved posteriorly using a variety of adjunctive appliances. Palatal plates incorporating finger springs can produce a posteriorly-directed force against the first molars. More recently, NiTi coils, repelling magnets and jumper modules have been incorporated into traditional fixed appliances to distalize maxillary posterior teeth.

Mandibular Dentoalveolar Position

The relative anteroposterior position of the mandibular incisors is variable in Class II patients. The goal of virtually all orthodontic treatment is to have the lower incisors as upright as possible over basal bone at the end of treatment and in position of functional harmony relative to the surrounding soft tissue. In most instances, the position of the mandibular dentition is effected through the use of fixed appliances, with or without the removal of permanent teeth.

Fig 4 : Before and after photos of an Adult surgical case.

Mandibular Skeletal Position

A common finding in Class II malocclusion is mandibular skeletal retrusion, with this condition observed in over 50 percent of mixed dentition Class II patients. A family of functional jaw orthopedic (FJO) appliances has been developed to encourage mandibular development. All FJO appliances induce a forward mandibular posturing as part of the treatment effect. Presumably this alteration in the postural activity of the craniofacial musculature ultimately leads to improvements in both skeletal and dentoalveolar relationships.

A variety of so-called functional appliances is available to the practitioner. The oldest of these appliances is the activator. This intraoral appliance usually is worn by the growing patient 14-20 hours per day. Patient cooperation is more of a problem with these appliances

The Herbst appliance also had gained in popularity. The Herbst appliance features a telescoping mechanism that encourages forward repositioning of the lower jaw as the patient closes into occlusion. The Herbst bite jumping mechanism is attached to the dentition through the use of bands, stainless steel crowns or acrylic splints. **(Fig 3)**

Timing of Treatment

There have been numerous studies dealing with the treatment effects produced by various Class II therapies, there is no universal agreement among orthodontists as to an "ideal" class II treatment time. Thus there is wide variation among practitioners as to the best time to being Class II treatment. However, there is agreement that early detection permits differential diagnosis and early referral allows more time for treatment planning.

Treatment timing can be divided into five categories on the basis of the stage of dental development.

Deciduous Dentition. Although satisfactory treatment may be provided at this stage, problems with patient cooperation may be encountered. Also the lack of solid interdigitation of the deciduous dentition may result in regression of the occlusion toward the original condition being encountered post-treatment

Early Mixed Dentition. Treatment typically is begun after the eruption of the permanent central incisors and first molars. Many treatment options are available including extraoral traction and FJO. Transverse discrepancies also can be handled at this stage through rapid maxillary expansion **(Fig 5).** In patients with mild to moderate problems, expansion of the maxilla alone occasionally will lead to a spontaneous Class II correction. Clinicians often choose to initiate treatment at this developmental stage in instances of severe skeletal dental or neuromuscular problems, thus reducing the frequency of incisal trauma and psychosocial problems associated with excessive overjet.

Late Mixed Dentition. Many clinicians prefer to delay initiation of definitive Class II correction until about 12-18 months before the loss of deciduous dentition. Both extraoral traction and FJO are effective during this time, and patient compliance generally is good. The response to many growth guidance appliances often is greater during the circumpubertal growth period than at earlier or later stages of dental development.

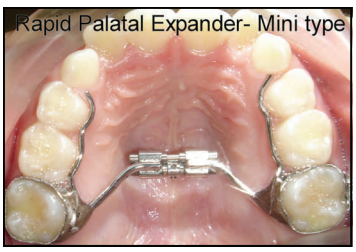
Early Permanent Dentition. Fixed appliances with or without the extraction of permanent teeth are primary components of Class II treatment at this stage. Orthopedic Class II correction remains a viable option in the early permanent dentition, although patient compliance problems are encountered more frequently, especially during the high school years. Sexual dimorphism is an important consideration in that craniofacial growth tends to diminish in females 1-2 years after the onset of menarche. The potential to modify growth in males generally remains until the mid to late teen years.

Adult Dentition. Most treatments of Class II malocclusion at this development stage are limited to changes within the dentoalveolar structures, unless orthognathic surgery is undertaken. **(Fig 4)**

Final Remarks

Significantly more is known today about normal and abnormal craniofacial growth and about the effects of various treatment protocols. Subjecting a patient to unnecessary "prolonged" multiple phases of treatment should be avoided. The comprehensive treatment plan established to correct a malocclusion should not only have a sound biological basis. It should also be designed for efficiency, taking patient management and compliance issues into consideration as well.

Fig 5: Transverse discrepancies are corrected using a rapid palatal expander.



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Our next issue will be on The Management of The Developing Class III Malocclusion

QUIZ

1. T F A patient with an increased lower facial height is characterized by a retruded mandible, hyperactive mentalis muscle and a tendency toward an open bite.

2. T F A class II malocclusion can be diagnosed by a combination of skeletal and dental conditions.

3. T F The most common treatment for true maxillary protrusion is a herbst appliance.

4. T F A family of FJO appliances have been developed to encourage maxillary development.

5. T F Patients with a decreased vertical dimension have a low mandibular plane angle, a deep overbite with a strong chin, and either flared or retruded upper incisors.