



Correction of Class II Malocclusion: A Composite Change

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Numerous studies have reported Class II malocclusion as the most frequent malocclusion among the treated orthodontic population.¹⁻³ Therefore, it is evident that this relatively common orthodontic problem is a constant challenge to the abilities of the orthodontic practitioner. The many treatment modalities available for Class II treatment, and the enthusiastic "belief" of individual groups of practitioners in the preeminence of their particular modality of treatment, should raise questions: "What is a Class II malocclusion?", "Why are there so many treatment modalities?", and "Is there really only one best way and one best time to treat a Class II malocclusion?"



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Class II malocclusion has been described by some investigators as a skeletal malocclusion with a "small" mandible. However, several independent studies have demonstrated that the growth and size of Class II mandibles are most often comparable to normal-sized mandibles.^{4,5} The etiology of Class II malocclusion has also been identified as a product of localized maxillary mesial dental drift, postural restrained occlusion, or a spatial disharmony between an adequately sized maxilla and mandible. These theories of Class II etiology are actively debated in promotion of particular modalities of treatment.

Although controversy seems to exist in the diagnosis and treatment of Class II malocclusion, I suggest that a gentle form of blindness or more accurately an "unrelenting bias" prevents the exponents of contrasting philosophies from seeing the truth; in reality no one is wrong and no one is right. Successful Class II treatment is the resultant of **composite change** within the dentition and the maxillo-dental alveolar complex. The change is not solely from either distalization of maxillary molars, growth modification, postural repositioning, and/or expansion, but rather from a collective expression of biological responses to orthodontic treatment.

Therefore, it may be a futile and non-productive exercise to attempt to match a suspected etiology with a particular treatment modality. After all, the conversion of a Class II to a Class I occlusion is a 7 mm effort represented as a composite change in the dentition, rather than a singular change of one causative factor.^{3,6,7} It may also be a miscalculation to attribute special advantages to early mixed dentition treatment in order to capture a particular "growth spurt." Bishara states that identifiable significant "growth spurts" do not occur in a consistent predictable pattern. Therefore, we suggest the stage of development most effective and efficient to achieve composite change is the late mixed dentition. Comprehensive treatment should be started when the mandibular second

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premolars have two-thirds to three-quarters of root development complete; the mandibular second deciduous molar may still be present; the maxillary second molars should be superior to the greatest distal convexity of the maxillary first molar; and the maxillary canine should be on a normal path of eruption.

Variations to this dental developmental snap shot may still present appropriate opportunities for commencement of comprehensive treatment.

Components of composite change in correction of Class II malocclusion are:

1. **Rotation of the maxillary first molars.** Appliance activation for distal rotation of the mesio-buccal cusp of the maxillary first molar contributes to Class II correction. Braun and Evans determined that the mean gain in arch length from rotation of the maxillary first molars is 1 millimeter +/-8.

2. **Distalization of the maxillary first molar.** Class II corrective treatment mechanics in the late mixed dentition can be depended upon to produce sagittal change. There are advantages and disadvantages to different available modalities of treatment to accomplish distalization, but in spite of appliance selection there is no significant difference in net millimeters gained. Bolla and then Chiu and McNamara, in separate studies, found this to be accurate. Chiu and McNamara in evaluating distalization appliances, found that "...despite the effectiveness of many of these appliances...they all produce...anterior anchorage loss." They further noted in their study, "the net gain from distalization was 3mm. +/- depending on the anchorage strain devoted to recovery from severe tipping and anterior reciprocal migration." Other studies have arrived at similar conclusions.^{3,9,10}

3. **Differential growth.** Inhibition of the natural spatial translation and skeletal transformation of the maxilla can be achieved with orthopedic forces applied to its sutural network. This altered spatial orientation of the maxilla contrasted with continued normal growth of the mandible can account for 2 millimeters +/- of sagittal change in the dental relationship. Boecler and Riolo, et al agreed with Kloehn and Weislander who found a repositioning of A point in a study of cervical headgear treatment. They concluded that it was a result of maxillary restraint and/or maxillary retraction, concomitant with mandibular growth.¹⁰ Mao demonstrated in his recent work the validity of modifying sutural growth through sutural strain induced by various orthopedic therapies.¹¹

4. **Postural effects.** Functional reorientation of the mandible and compensatory supportive skeletal remodel-

ing is sometimes considered compatible mesial shift of the mandible rather than appliance-enhanced mandibular growth. This postural effect may be considered the reorientation of a posteriorly restrained mandible and musculoskeletal adaptation, or viewed as normal compensatory remodeling after translation and rotational mandibular growth. Bondemark, when referring to the surprising skeletal and positional results of mandibular repositioning said, "...This might be the result of remodeling influence on the mandible as a compensatory reaction to bite jumping, or to functional adaptation in mandibular position."¹² McNamara wrote that his initial procedure in treatment of Class II malocclusion is Rapid Palatal Expansion. "A most interesting (and somewhat surprising) observation following our initial efforts to expand Class II patients in the early mixed dentition was the occurrence of a spontaneous correction of the Class II malocclusion..."⁶ Spontaneous mandibular repositioning and concomitant skeletal adaptation continues to be argued among our most prestigious investigators, however, in spite of academic debate, the postural effect can often be depended upon for 1 millimeter +/- of sagittal change.⁶

5. **Mesial movement of the mandibular dentition.** Treatment and appliance design for mesial movement of the mandibular first molars in premolar extraction cases can provide 3+/-millimeters of sagittal dental change (the available space for this mesialization is dependent on the amount of extraction space required for correction of associated arch length deficiency and/or facial procumbency). Mesialization of the entire mandibular dentition with anterior advancement of 1 millimeter +/- to achieve final interdigitation is sometimes necessary as a last resort.

Acceptance of the concept that Class II correction is a composite change of skeletal, spatial, and dental relationships delivers a range of excellent treatment options. The passionate "belief" in one particular technique as opposed to another can be modified. Efficient and effective biological response in treatment should not be assigned to the efficacy of a particular shape of plastic or space age wires and magic brackets, but to the biomechanical dynamics of applied orthodontic and orthopedic force to living tissue.

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and funding in order to keep the program viable and functioning. Numerous alumni and others in the orthodontic community lent their financial and material assistance as well. Dr. Armbruster turned his station wagon into a virtual clinical transport in order to move all the clinic supplies and consumables from Dr. Charbonnet's office to Dr. Olivier's office.

On August 25, 2006, the persistence and dedication of all involved with the program was rewarded when LSU graduated its first post-Katrina class: Dr. Hopkins, Dr. Jill

Zerangue-Simon, Dr. Cindy Norris-Pulitzer, and Dr. Tripp Leitner. The prior month, the first new group of residents, the class of 2008, was admitted with 125 new patients enlisted for the class.

"We are very proud of the past graduating classes of 2006 and 2007 for trusting the department to continue to complete their education which was interrupted by Katrina," said Dr. Armbruster recently. "We're also proud of our current classes of 2008 and 2009, and the incoming class of 2010, for believing that the quality of education lies not in the location within which the education takes place, but in the dedication of the faculty, the staff, and the students themselves."

"At my interview, all the faculty expressed great pride in their program, and the residents were also very enthusiastic about LSU," remarks 2nd year resident Dr. Adam Hall. "No other program I went to had the sense of pride that LSU did."

In September 2007, almost two years after Hurricane Katrina, the LSU School of Dentistry and its Department of Orthodontics returned to its New Orleans campus to

continue classes and patient care.

Today, after surviving the crisis that Katrina presented the program, Dr. Chadha and Dr. Armbruster feel confident that LSU will continue its tradition of excellence in orthodontic education for years to come. However, they also acknowledge the continuing concern and difficulties that orthodontics faces as it attempts to recruit the educators of tomorrow.

"I've devoted 46 years of my life to academics and have no regrets," said Dr. Chadha. "It is true that there is a disparity in pay between the academic and private sectors, but I find myself in a comfortable situation financially in that I can have a decent retired life when I decide to choose to do so. We need bright minds to enter academics, and I urge you all to consider a career in academics and enjoy a very rewarding experience."

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