Interception of Class II Malocclusion

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The term "interceptive orthodontics" has more or less crept into dental jargon to mean treatment with removable appliances. It would be preferable if incipient malocclusion were evaluated on the basis of the problem at hand rather than the particular mechanics to be employed. Articles and postgraduate courses devoted to interceptive orthodontics generally concern themselves with the mechanics of correction of crossbites, active and passive space maintenance, and similar incipiencies of malocclusion without particular regard to the broader view of the dynamically growing dentofacial complex. Interception of malocclusion should be based on a rationale which relates the dentoalveolar structures to the supporting soft and hard tissues of the face and jaws rather than one which deals with a series of single tooth problems. Conspicuous by its absence in early recognition and evaluation of potential malocclusion is the consideration of certain dysplasias of tooth and jaw relation. While beginning Class III malocclusion gives cause for concern to the parents and dentist, beginning Class I and Class II discrepancies seem to pass unnoticed in the deciduous dentition and are frequently not detected until irregularity of the lower permanent incisors develops or until the permanent maxillary incisor teeth have erupted into protrusive relation. Generally speaking, the orthodontist declines treatment of Class II malocclusion until the maxillary permanent incisors are well erupted or perhaps even longer. As a result, the observant family dentist and/or pedodontist is often forced to watch the malocclusion develop completely before the orthodontist is willing to undertake treatment. He is faced with the dilemma of either waiting for the orthodontist or of initiating treatment himself. In many cases neither of these alternatives is advisable. Careful case evaluation and interception of the anomaly based on tooth and jaw relations with respect to the growing craniofacial complex may well provide some of the answers to the dilemma.

Edward H. Angle astutely designated the relation of the first molars* as the "key to occlusion". He was not active in promoting the correction of malocclusion in the late deciduous dentition until his later years in teaching. It has become evident that the occlusal relation of the second deciduous molars can also be considered the "key to occlusion". As was ably shown by Baume,[1] the presence or absence of the so-called step relation of these teeth in centric occlusion determines whether or not the first molars will erupt into "end-on" or "cusp and groove" relation. While cusp to cusp or "end-on" relation of the first molars is considered normal in the mixed dentition, it must also be realized that this is a most unstable tooth relation. Premature loss of either a maxillary or mandibular second deciduous molar in the absence of adequate space maintenance can be disastrous for the developing occlusion. It is apparent that in the normally-developing occlusion these teeth should be preserved at all costs. Premature loss of a lower second deciduous molar presents a more difficult problem in the maintenance of total arch length than the corresponding loss in the maxillary arch. Absolute

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* All references to "first molars" indicate permanent teeth.

space preservation and maintenance of the existing tooth to tooth relation is difficult, to say the least, following loss of any of the second deciduous molars. One would be hard pressed to deny that establishment of normal interdigitation of the dentition at the earliest possible time is basic in the developing occlusion. Likewise, every possible step should be taken to ensure maintenance of normally occurring Class I relation of the second deciduous and first permanent molars.

As previously statcd, incipient Class II malocclusion in the deciduous dentition is often overlooked. This oversight can be compounded at the time impressions are being taken. A wax bite taken carefully with the jaw comfortably retruded will help the technician in model preparation. Models cut to maximum interdigitation of the teeth are not particularly instructive in cases where varying degrees of jaw translation occur upon closure. While we, as dentists, continue to argue the finer points of centric occlusion and centric jaw relation, few of us would have any particular quarrel with a set of orthodontic models cut to correspond to a "most retruded, unstrained jaw position".

If the maxillary deciduous cuspids occlude one full tooth ahead of their normal interarch relation and the patient has not lost any of the deciduous molars, one can be reasonably sure that he will develop a Class II malocclusion. On the other hand, if these teeth occlude only one-half cusp ahead of their normal relation and the patient is approximately three years of age, one cannot state with any degree of certainty that Class II malocclusion will ensue. Self-correction of this type of incipiency depends, for the most part, on the greater potential of forward mandibular growth over that seen in the maxilla and anterior cranial base structures.

Interest in orthodontic treatment in the late deciduous and early mixed dentition has waxed and waned throughout the years. Interest in mixed dentition treatment was revived in the United States in the early 1950's and has since become more popular among orthodontists. Correction of Class II malocclusion during the deciduous dentition stage has never been very popular. One should ask himself the reasons for this. Irrespective of the reasons for the shifting popularity of early orthodontic treatment, most orthodontists still give lip service to the generalization that growth is their greatest ally in correction of malocclusion. Whether or not full clinical use is made of the phenomenon is another matter.

Various reasons are given for and against orthodontic treatment during the younger years. Perhaps the most compelling reason to delay banding treatment until the early permanent dentition stage is the likelihood that a second period of active treatment will be indicated when orthodontic therapy has been undertaken in the deciduous or early mixed dentition. If one can, for the moment, disregard the economics underlying this argument, it becomes apparent immediately that it is preferable for the patient not to have allowed severe irregularity of the teeth to occur before undertaking correction. Disfiguring malocclusion need not occur if normal relations of the second deciduous and first permanent molars can be established early in the course of dental maturation. Any clinical procedure which will obviate the subsequent need for massive tooth movement benefits the patient. Orthodontists who favor early treatment have indicated the value of establishing normal tooth and jaw relation as well as coordinating dental arch form and function in or-

der to integrate growth processes of the dento-alveolar and facial structures.

Many papers have been written concerning orthodontic treatment methods encompassing the entire gamut of fixed and removable appliances. While the importance of treatment mechanics should not be downgraded, treatment planning and timing with respect to the nature of the malocclusion under consideration are of greater importance for the young patient. Will the patient have sufficient room to accommodate a full complement of teeth? At what age should mechanotherapy be instituted for the various types of malocclusion? When should the serial extraction of deciduous and permanent teeth be undertaken? What will be the probable effect on the soft tissue profile if extraction of permanent teeth is elected in the early mixed dentition stage? Will the patient suffer if treatment is postponed until facial growth is essentially completed and the variable of dentofacial growth thereby eliminated in treatment planning? These as well as many other questions can be posed for which there are no hard and fast answers. Treatment planning for the given patient cannot be predicted strictly on average values compiled from the assorted norms of cephalometric and other analyses with which we seem so enamoured. The experienced orthodontist is well qualified to predict gross deficiencies in dental arch length and equally proficient in prognosticating adequate arch length in which the dentition will be accommodated without crowding. The problem is centered about the cases in the middle ground where it is difficult, and sometimes impossible, to know in advance whether or not a full complement of teeth can be accommodated. Dewel, an outstanding champion of serial extraction as an adjunct to orthodontic treatment, was among the first to point out the pitfalls of this apparently easy solution to a potentially difficult problem.[2]

It is unfortunate that there is a revived school of thought holding that extraction of permanent teeth is not to be tolerated. This might be considered a backlash resulting from ill-advised extraction of bicuspid teeth during the past two decades as part of orthodontic treatment. The thoughtful orthodontist recognizes the need for removal of permanent teeth in given cases but is also aware of its effect on the dentofacial complex. As Wylie and others before him have pointed out, nature has no plan calling, for example, for a full complement of teeth. To say that every person has equal potential in this or any other matter is to be blind to the realities of biology where the underlying theme is one of infinite variation. If we are willing to accept the overwhelming evidence that orthodontic treatment can neither stimulate nor inhibit growth of the mandible or maxilla, it becomes evident that perfectly good teeth must be sacrificed in certain instances to provide room for their neighbors. Various dimensions of the dental arches and the supporting alveolar bone are responsive within rather narrow limits to orthodontic expansion, particularly in the mandibular arch. But it is quite another matter to say that orthodontic mechanics, irrespective of the mechanism under consideration, somehow stimulates jaw growth. The concept of expansion of dental arches to make room for the teeth is as old as the orthodontic specialty itself, and appears to have been based on an erroneous interpretation of Wolff's law suggesting to the profession that improved dental function and occlusion would stimulate growth of supporting bone. The clinical orthodontist has long since learned the futility of indiscriminate expansion of dental arches irrespective of the nomenclature employed to describe it.

Theoretically, correction of any potential deformity should be undertaken as soon as it is detected. Practically speaking, this is not always possible or even advisable. Patients presenting with Class II malocclusion represent a rather large percentage of our practices. Just when *should* correction of Class II malocclusion be undertaken? If Class I relation of the posterior teeth is first among our primary objectives in interceptive orthodontics, treatment might well be initiated in the late deciduous dentition stage. If one can obtain Class I molar relation of the deciduous dentition at this time and guide the first molars into optimal cusp and groove relation, it is preferable to do so rather than to wait for these teeth to erupt into Class II malocclusion and then wait another two or three years for the maxillary incisors to erupt into protrusive relation before undertaking correction.

There is more than one means at our disposal to initiate corrective measures in the late deciduous dentition stage. Banding the maxillary deciduous teeth for the average five or six year old is no more difficult than for the nine year old. It need not concern the clinician whether or not the deciduous maxillary incisors still have enough root structure to be incorporated into the appliance. Retraction of the banded maxillary deciduous cuspids and molars to Class I relation with extraoral traction on a rectangular archwire using sliding headcap hooks bearing against the brackets on the deciduous cuspids is a perfectly rational mechanical approach to the problem. One need only recall the early experimental work of Breitner[3] in monkeys and later work by Mathews[4] in which it was shown that the unerupted permanent teeth tend to follow movement of the deciduous teeth. The orthodontist makes use of this phenomenon in treatment of Class II malocclusion in the mixed dentition.

During correction of the posterior teeth in the late deciduous dentition, one cannot routinely expect the permanent maxillary incisors to erupt into correct relation to the lowers even though the premaxillary segment of the arch is being corrected in part by lip pressures. Knowing this, many clinicians prefer to await the eruption of all four maxillary incisors before initiating treatment. I have no real quarrel with this point of view except to ask myself again in what way the patient will have benefitted by the delay. From a more personal point of view would you, as a dentist, be willing to wait for the four permanent maxillary incisors in your own child to erupt fully into protrusion characteristic of Class II, Division 1 malocclusion before doing anything about it? The answer would be "no" for most parents if they were fully acquainted with the problem. The average five or six year-old child has not yet developed a social awareness which presents problems with respect to the various methods employed in extraoral traction. These youngsters are quite willing to wear either cervical or occipital headgears on a twenty-four hour basis. Once Class I molar relation has been established, subsequent extraoral traction can be conducted on a part-time basis, the limitations imposed by the level of patient cooperation having been markedly reduced. In cases where one will be forced into serial extraction procedures concomitant with correction of Class II malocclusion during these early years, it is generally sufficient to partially control the axial inclinations of the maxillary incisors with removable appliances until the second period of banding treatment. In the final analysis it must be decided what is best for the individual patient in planning treatment.

It is said by some that one cannot count on the corrected posterior occlu-

sion to hold until the premolar teeth are in occlusion. Suffice to say that they do hold in most instances providing the teeth have moved bodily (translated) with solid cusp and groove relation of the molars established. Were this not the case, orthodontists would be experiencing much more difficulty with maintenance of corrected molar relation in Class II treatment of the maxillary arch in mixed dentition cases in which the lower arch is regular and adequate in size. One can easily find examples where the corrected relation did not hold and therefore condemn all early Class II treatment. I can recall once treating a set of identical twin girls in the early mixed dentition presenting with almost identical malocclusions both of whom suffered relapse to a surprisingly similar degree. It was apparent with excellent hindsight that the deciduous and first molars in both children had essentially flat occlusal surfaces. It was not until retreatment when the premolar teeth were in occlusion that the biting relation was stable. In other instances I have retreated children in whom it was evident in retrospect that solid cusp and groove relation of the first molars had not been established although the mesiobuccal cusp of the maxillary molar appeared to be correctly aligned with the buccal groove of the lower molar as viewed from the buccal. The occlusal anatomy of these molars is such that, on occasion, these teeth will appear to be overcorrected when viewed from the buccal yet are in excellent interdigitation when seen from the lingual aspect. One may think he has corrected a Class II molar relation when, in reality, all he had done was tip the maxillary first molar crowns distally while tipping the apices mesially. It would seem advisable to band all available maxillary teeth in course of treatment in either the late deciduous or early mixed dentition to maintain the marginal ridges in alignment and thereby maintain a flat occlusal plane. Differential extrusion and distal tipping of maxillary first molars resulting from treatment mechanics employing bands only on these teeth in conjunction with a face bow and cervical traction can be detrimental to dental and facial esthetics in patients presenting with unfavorable facial patterns.

Many patients are seen in both the late deciduous and early mixed dentition stages with deep close-bites in addition to their Class II malocclusions. If all the maxillary teeth are banded to establish a relatively flat maxillary occlusal plane, one can then use a maxillary bite plane during treatment, allowing the lower posterior teeth to erupt differentially with respect to the mandibular incisors and thereby correct the beginning deep curve of spee in the lower arch without resorting to banding mechanics. It might seem that a bite plane would prevent movement of the maxillary teeth in the course of banding treatment. I have not found this to be the case if the bite plane is relieved periodically on the lingual of the incisal portion and interproximally on the distal to prevent interferences in the course of tooth movement.

A second period of banding treatment will be required in many cases subsequent to early correction of Class II malocclusion. This is particularly true if serial extraction of teeth is indicated as a part of the treatment plan. On the other hand, subsequent treatment is not needed in many typical nonextraction cases. Many orthodontists prefer delaying treatment until the early permanent dentition stage rather than face the parents with the prospect of two sessions of fixed appliance therapy in the course of dentofacial maturation. Yet, there is no reason to charge parents two full fee schedules for a service

which can be performed to the advantage of the patient in two periods of treatment. While the patient will have been under both active and supervisory treatment over an extended period, the actual time spent in active treatment is certainly no more, and generally less, than that needed in one major treatment effort wherein teeth must be moved a considerable distance at a time when the patient has nearly completed his dental maturation and is no longer truly amenable to extraoral treatment mechanics. Progressive development of Class II malocclusion often means disfigurement of the soft tissue profile, particularly the upper lip, and increasing danger of incisor fracture. Early correction of the occlusion in such cases will have helped prevent possible loss of lip coverage of the maxillary incisors when the facial muscles are in repose.

Superpositioning of successive headfilms is simple when correction of Class II malocclusion has been accomplished in a few months at a rate greatly exceeding that of facial growth. In such cases there is no question whether or not maxillary molars have translated distally. In many cases one is hard put to produce cephalometric evidence demonstrating incontrovertible proof of such movement. The problem of headfilm interpretation is exemplified in Figure 1. This cooperative patient was treated with occipital traction against a fully banded maxillary arch for over two and one-half years. It is tempting to say that the molars were held still while the maxilla continued its downward and forward growth. Irrespective of this, it is evident that there has been marked and favorable mandibular growth in the course of treatment as an equally valid interpretation for the correction of the Class II malocclusion. As was said earlier, the preponderance of evidence at hand does not support the

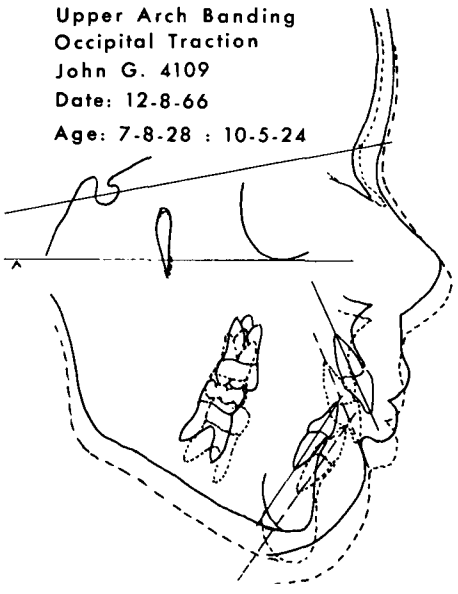


Fig. 1 Correction of Class II, Division 1 malocclusion employing occipital traction and a completely banded maxillary arch. Tracings superimposed on SN, registered on S. There is no apparent distal movement of the maxillary first molar. Class I relation obtained as the result of markedly favorable mandibular growth and minimal anteroposterior change in the midface.

view that orthodontic procedures can inhibit maxillary growth. Yet, whether or not the maxillary dentition has been moved distally, the clinical fact remains that the patient's teeth now occlude in normal relation following reduction of the Class II malocclusion. It is regrettable that a considerable body of dental reasoning is predicated on the all-or-none basis. Correction of Class II malocclusion is not necessarily explained by a single factor. By the same token, adjustment of the so-called edge-to-edge relation of first molars to cusp and groove relation doesn't necessarily occur only by differential forward drift of the lower first molars upon loss of the mandibular second deciduous molars. One recalls that the rate and amount of downward and forward growth of the mandible exceeds that of the maxilla.

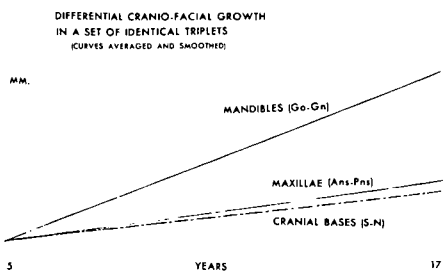


Fig. 2 Anteroposterior growth of three craniofacial structures in identical triplets over a twelve year period demonstrating the greater rate and amount of mandibular growth over that seen in midface and cranial base structures.

Maxillomandibular dysplasia is particularly evident in the newborn who appears to be destined for Class II malocclusion and a retrognathic chin only to grow out of it within a span of about three years. Differing rates and amount of growth of craniofacial parts continue during the entire growth period. This can be seen in Figure 2 which demonstrates differential anteroposterior growth of anterior cranial base, maxilla, and body of the mandible in a set of normal, untreated identical triplets followed annually from age five to seventeen years. These smoothed and averaged curves show clearly the markedly steeper slope of the line representing mandibular growth over that seen in midface and cranial base structures.

There is no reason to believe that the mechanism of forward growth of the maxilla and mandible in Class II malocclusion is any different from that seen in Class I relation. It has been well established that during forward growth of the mandible the lower permanent incisors move lingually if uncomplicated by arch length deficiency. Thus, point "B" of cephalometric nomenclature is established, not by growth at pogonion, but rather by lingual tooth movement and concomitant bony additions on the lingual of the mandibular symphysis. At the same time cephalometric point "A" is developed while the maxilla is descending and growing forward, not by appreciable growth at anterior nasal spine, per se, but by downward and forward eruption of the maxillary incisors and their supporting alveolar processes. This is the result of adjustment of teeth and alveolar processes as maturation occurs. If the resultant direction of facial growth is downward and forward in a patient in which the mandibular plane is not excessive, the net result is increasing prominence of the jaw and chin point. Offhand, it might appear that the preschool youngster with Class I occlusion should grow into a Class III malocclusion in view of the greater anteroposterior resultant growth of the mandible over that of the maxilla. Normally the existing occlusal relationship of the dentition is maintained as the alveolar processes and teeth adjust during growth. The lingually-directed dento-alveolar adjustment of the lower permanent incisors as point "B" is established helps make possible the maintenance of Class I relation in spite of the greater downward and forward growth of the mandible over that seen in the maxilla.

The orthodontist has little or no control over dysplastic mandibular growth leading to Class III malocclusion. Since the genetically directed potential of mandibular growth is not known for the given patient, the clinician may attempt to establish and maintain some degree of overbite and overjet by tipping the maxillary incisors forward reaching, as it were, for correct incisal relation. The alternative of standing by and watching the maxillary incisor teeth erupt into crossbite, generally well below the occlusal plane, while the mandibular incisors tip lingually is not particularly inviting. The orthodontist has no way of knowing the extent of maxillomandibular dysplastic growth to be expected for any given patient, but on occasion

the developing dentition can be guided into good relation as can be seen in Figure 3. In this instance, dento-alveolar adjustment was possible since antero-posterior mandibular growth was not excessive. In spite of clinical claims to the contrary, the evidence is lacking to support the view that extraoral traction on the chin either slows or inhibits over-all mandibular growth. On the other hand there appears to be some evidence that orthopedic level of traction against the chin will change the resultant direction of mandibular growth.[5] In any event it seems worthwhile to attempt the intervention of Class III malocclusion as early as possible irrespective of whether the rationale hinges on possible alteration of the resultant direction of facial growth or, as I have pointed out, on the basis of dento-alveolar adaptation to guiding forces generated by removable appliances.

In cases where correction of Class II malocclusion cannot be explained by distal movement of maxillary molars, it is possible that the orthodontist merely disturbed the existing tooth-to-tooth relation of the posterior teeth while the patient was enjoying a high level of mandibular growth and accompanying dento-alveolar adjustment. So-called functional appliances may well act in the same way. The jaw is held forward, albeit intermittently, as facial growth proceeds. One recalls that these functional orthopedic appliances find their best application during the years of intensive growth and are worn for rather extended periods to achieve results. It is tempting to say that function has stimulated mandibular growth since it is possible to show headfilms at the beginning of such treatment with the appliance in place and the head of the mandibular condyle well forward on the articular eminence. Following a year or so of treatment the head of the condyle is now in its normal relation to the fossa while the teeth are in Class I relation. One may also conclude that the favorable mandibular growth occurred not because of, but in spite of, the treatment. Functional appliances are most successful in cooperative young patients presenting with what the orthodontist calls "good faces" in whom their mandibular plane angles are well within normal range. If this line of reasoning, based on an interpretation of the facts at hand with respect to the greater increment of mandibular growth relative to midface structures, is valid, then one should be able to correct Class II relation of posterior teeth in selected youngsters simply by disturbing the existing interdigitation of teeth. The following are representative of a few of my many cases in which this has been accomplished by using a maxillary Hawley bite plane to temporarily hold the posterior teeth out of occlusion while the molars were tipped slightly to the distal with light finger springs. Teeth immediately anterior to those being clasped distally tend to follow along if the retainer is relieved to permit them to do so. This phenomenon is seen many times in the course of tooth movement with fixed appliances if the force application is relatively light; it is probably explained by the presence of transseptal fibers extending around the dental arch. An example of this is in Figure 4, a patient for whom correction of Class II molar relation beginning in the late deciduous dentition was accomplished with activated maxillary retainers. It can be seen that the basic aim of Class I molar relation has been obtained but axial control of the incisors is lacking. Accordingly, banding treatment is generally needed at a later time to consolidate and axially align the maxillary incisors as can be seen in Figure 4. One should consider treatment with

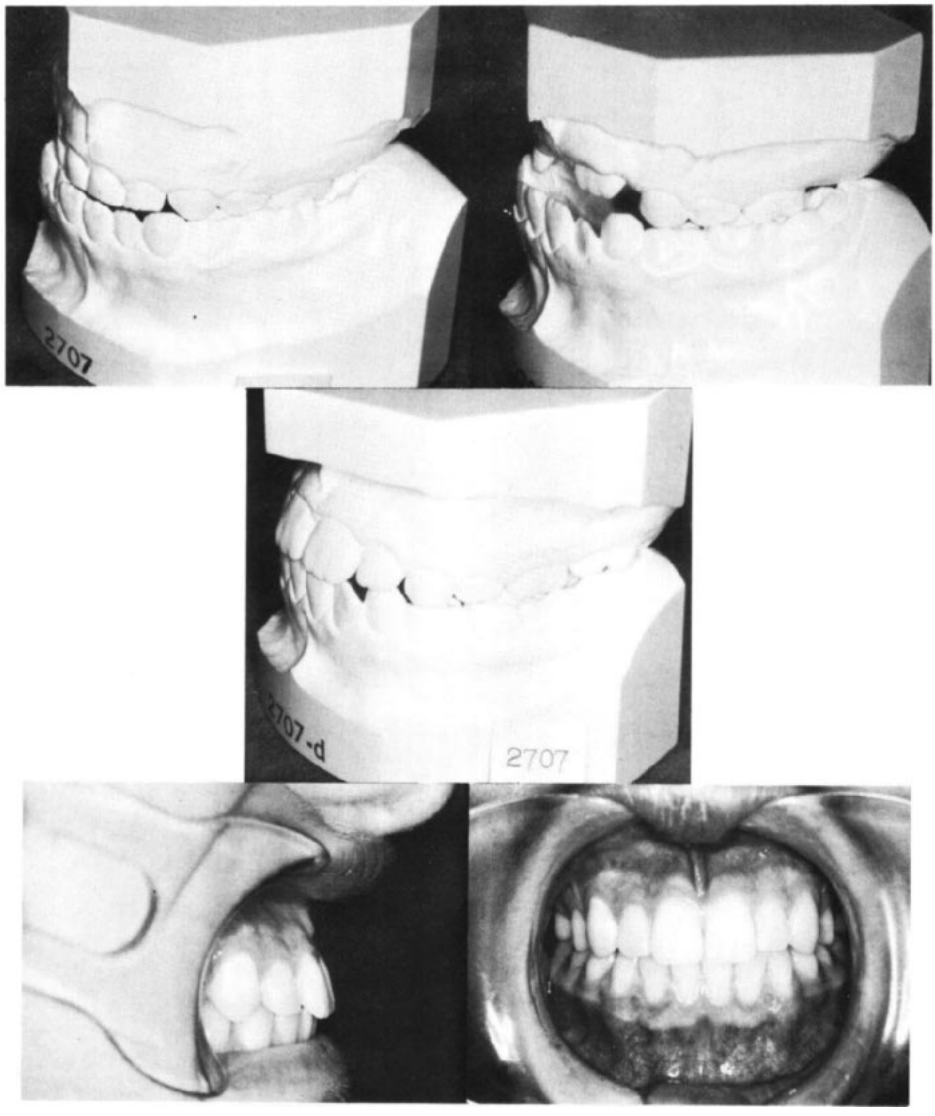


Fig. 3 Correction of Class III malocclusion beginning in the early mixed dentition employing a series of active maxillary retainers to guide the developing dentition and encourage dento-alveolar adjustment. Top-left, beginning treatment in early mixed dentition. Top-right, erupting maxillary incisors. Tipping incisal segment forward and expanding posterior segments with activated retainer wires. Middle, stabilization of maxillary incisors and continuing expansion of posterior teeth. Bottom, profile and front views of dentition approximately two years following completion of removable appliance treatment.

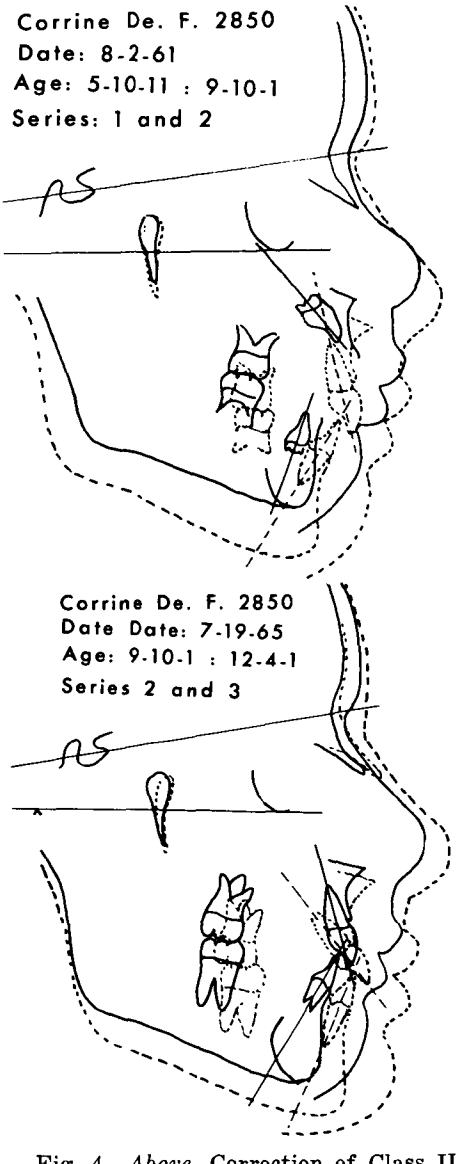
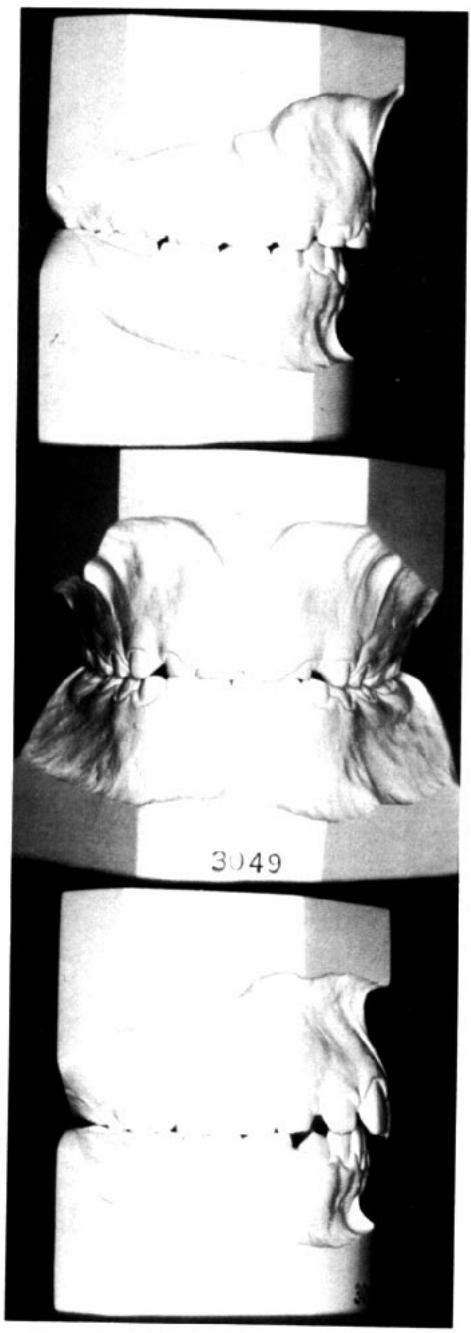


Fig. 4 *Above,* Correction of Class II posterior tooth relation of deciduous teeth with activated removable maxillary appliances. Tracings superimposed on SN, registered on S. Dento-alveolar adjustment in conjunction with marked mandibular growth is evident. *Below,* Completion of maxillary arch banding treatment in conjunction with occipital traction. Note excessive lingual root torque of maxillary incisors seen at time of band removal, permitting band space closure to ideal interincisal relation.

removable appliances as part of the over-all therapy rather than an end in itself. By the same token, functional dento-orthopedic appliances also lack axial control of the erupting maxillary incisors, and, unless additional treatment with a fixed appliance is employed, the final result may well be Class I occlusion coupled with excessive lingual inclination of the maxillary incisor teeth.

It is not uncommon to see patients in the late deciduous or early mixed dentition stage with perfectly acceptable Class I relation of posterior teeth in one buccal segment and beginning Class II on the other. Left untreated, a midline discrepancy is developed and solid Class II relation is established on the affected side. It is agreed that small midline discrepancies are of little significance in themselves, providing both arches are symmetrical and the posterior teeth in both buccal segments interdigitate similarly. Small differences in combined widths of teeth sometimes make it impossible for the patient to have perfect mesiodistal symmetry of the dental arches at the midline.

Orthodontic correction is much more difficult in unilateral Class II malocclusion upon completion of the transition to the permanent dentition. By this time both the molars and bicuspids are well established in solid Class II relation on the affected side of the dental arch. Banding treatment is then necessary to differentially reduce the Class II relation to normal Class I interdigitation. The maxillary incisors must also be moved bodily around the arch to gain symmetry. Orthodontic treatment in this type of case is technically more difficult than reduction of bilateral Class II malocclusion. Once growth is completed, the clinician is, for all practical purposes, forced to extract a maxillary bicuspid on the affected side and leave the patient in Class II relation on



one side and Class I relation on the other. This type of malocclusion should be intercepted irrespective of whether the patient will or will not have sufficient room for all the permanent teeth. An example of this is seen in Figure 5 beginning in the very early mixed dentition where correction of the buccal relation of teeth on the affected side was accomplished with a simple bite plane incorporating appropriate finger springs. Axial control of the incisors is lacking and a short period of banding treatment will be indicated to gain an acceptable interincisal angle in a case that no longer presents the problem of correction of unilateral malocclusion of posterior teeth. Essentially, this is a restatement that Class I molar relation is the first order of business in the establishment of normal occlusion.

Many patients in the late deciduous dentition present with a deep close bite in conjunction with their Class II malocclusion. Initiation of orthodontic treatment in the late deciduous dentition or the very early mixed dentition with the objective of Class I occlusion of the posterior teeth either with a completely banded maxillary arch in conjunction with a bite plane, or more simply with the use of a Hawley-type retainer in selected cases with relatively low mandibular plane angles, will have served the dual purpose of maintaining the normal curve of spee as well as having corrected the Class II molar relation.

Fig. 5 *Top*, Beginning Class II relation on patient's right side. Notice early loss of midline alignment of teeth. *Middle*, Correction undertaken at this time with a removable appliance with .020 activated wires bearing distally on the mesial of the deciduous cuspid and second deciduous molar in conjunction with a flat bite plane. *Bottom*, Reduction of unilateral Class II completed with removable appliance. Note lack of axial control of maxillary incisors which will require banding techniques for completion of treatment.

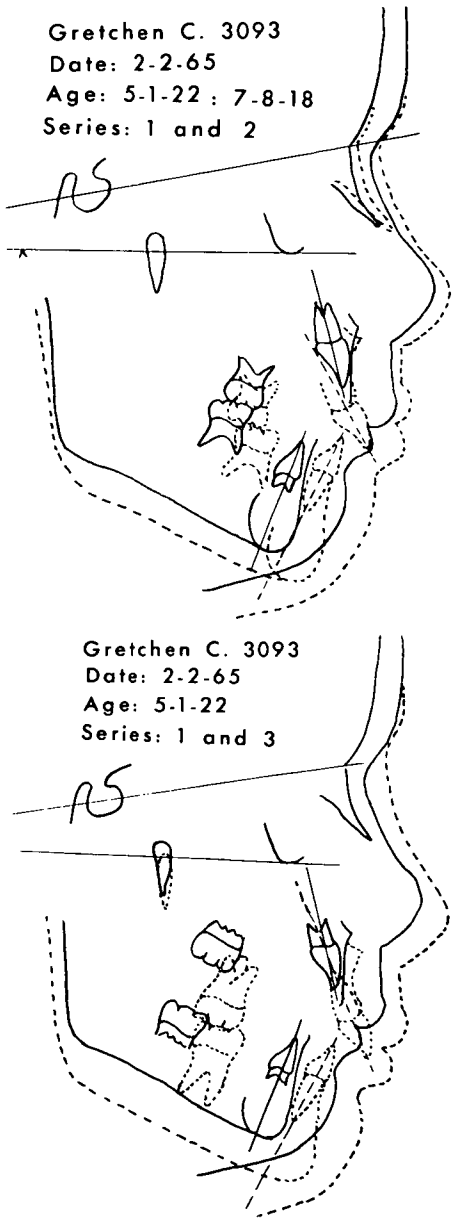
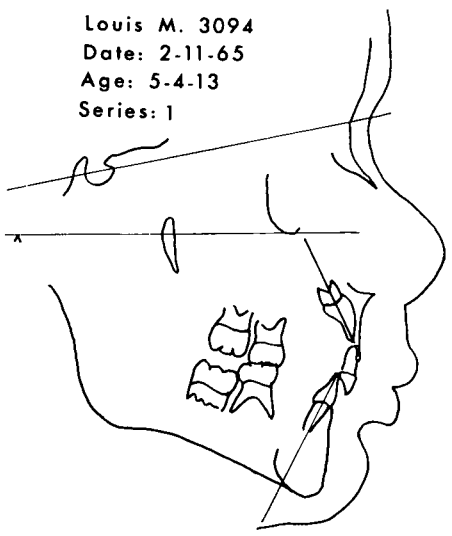


Fig. 6 *Above,* Correction of Class II molar relation with activated removable appliances beginning in the late deciduous dentition. Tracings superimposed on SN and registered on S. Marked anteroposterior and vertical growth of the mandible is evident. *Below,* Over-all dentofacial changes seen between the ages of five and nine and three-quarters years. Lack of axial control of the maxillary incisors is evident. Banding treatment will be initiated later.

The next two cases serve as examples of correction of Class II relation of the posterior teeth using activated maxillary retainers as outlined previously. The first patient presented during the late deciduous dentition stage with a Class II malocclusion and a close bite and was diagnosed as a serial, four-bicuspid extraction case. Class I molar relation of the deciduous molars was established prior to the early extraction of four first biscupid teeth as is shown in Figure 6 where the first molars are erupting into Class I cusp and groove relation. Figure 6 also shows the over-all change from the first to the third headfilm. The total elapsed time was four years and seven months. Maxillofacial growth has been both extensive and favorable. Overbite relation has been controlled but axial control of the maxillary incisors is lacking. Subsequent banding treatment will be indicated to obtain the best possible relationship of the dental arches.

Figure 7 demonstrates correction of Class II malocclusion in a patient, age five years and four months, presenting with adequate space to support a normal dentition. I rather doubt banding treatment will be needed in this case. Marked mandibular growth is evident over the four and one-half year period under consideration. The existing dentofacial relationship for this patient is seen in Figure 7 (right).

The patient presenting with what the orthodontist considers a poor facial pattern is not a likely candidate for correction of incipient Class II relationship of posterior teeth with removable appliances as can be seen in Figures 8 and 9. This patient was given an activated maxillary retainer at approximately age seven. As can be seen in Figure 8 the occlusion of her posterior teeth had materially worsened. As might be expected, the relatively steep mandibular plane angle of forty degrees with respect to anterior cranial base remained the



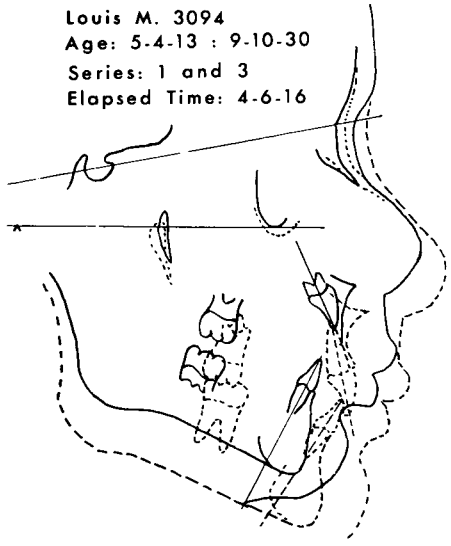
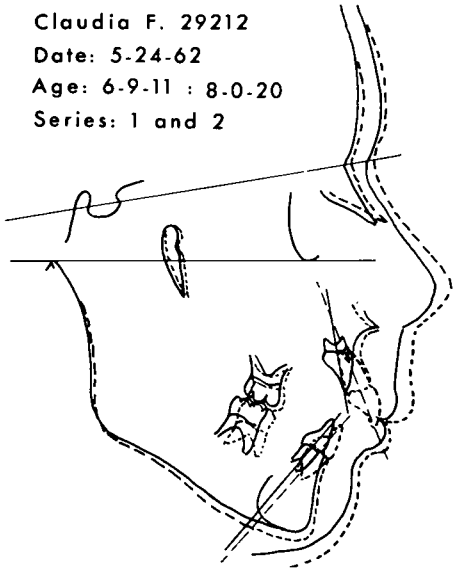


Fig. 7 *Left,* Class II malocclusion at age five years and four months presenting with an adequate lower arch and a deep close bite. Maxillary bite plane treatment begun using 0.020 round wires to tip the second deciduous molars distally. *Right,* Extensive and favorable mandibular growth over a four and one-half year period of removable appliance treatment. Tracings superimposed on SN, registered on S. Note corrected occlusal relations and profile improvement. Banding treatment not required in this case.



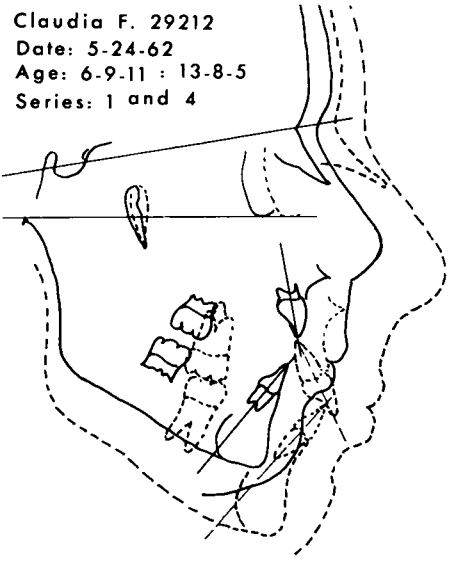


Fig. 8 Headfilm tracings and facial photographs of a patient with an unfavorable facial pattern for whom treatment with activated retainers was not effective. Tracings superimposed on SN, registered on S. *Left,* Maxillary bite plane treatment with activated wires to tip the second deciduous molars distally. No improvement in the facial pattern and negligible improvement of the deciduous molar relation over a fifteen month's period. *Right,* Completion of two periods of banding treatment. Marked mandibular growth and worsening of the facial pattern. Note the vertical growth of the entire dentofacial complex.

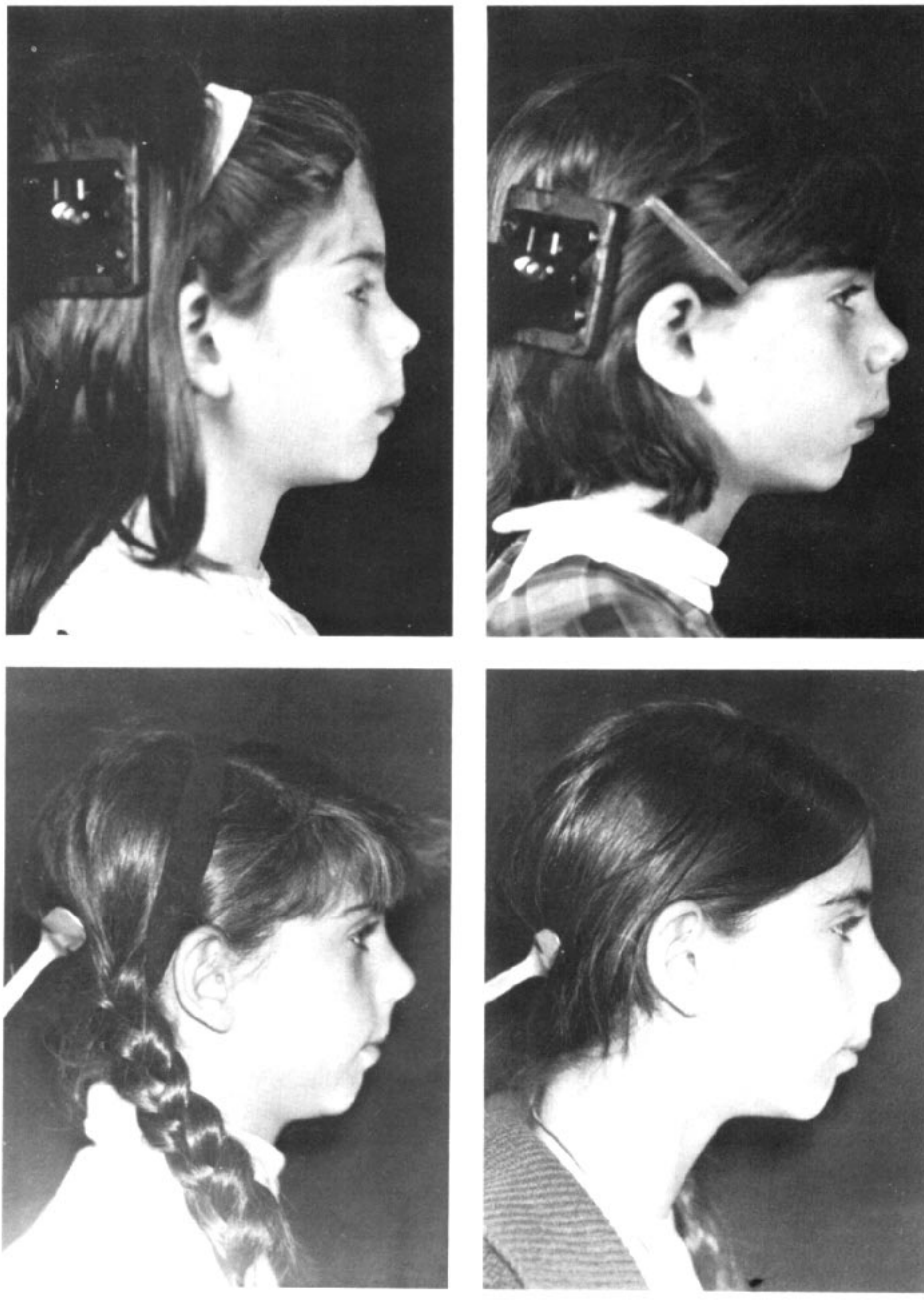


Fig. 9 Serial photographs, from above left to lower right, demonstrating the relative constancy of the facial pattern.

same and the facial pattern had not improved. Treatment was completed in two stages of fixed appliance treatment employing occipital traction between the ages of eight and fourteen years. While mandibular growth was extensive during this period as can be seen in Figure 8 (right), the unfavorable facial pattern continued to evolve and the mandibular plane angle increased. This is further demonstrated in the serial profile photographs of the patient (Fig. 9).

The close-bite relation of the incisor teeth is a continuing problem throughout the mixed dentition years until facial growth is essentially completed irrespective of whether the patient is treated with a fixed or removable appliance. It is interesting to review the serial studies of Nance,[6] Baume[1] and, more recently, Moorrees[7] concerning intercanine dimensional changes in width of the mandibular arch during the deciduous and early mixed dentition years. It appears that none of these investigators have concerned themselves with the degree of overbite in relation to the changing intercanine dimension. Moorrees' evaluation in serial study of the developing dentition suggests that overbite relation may increase, decrease, or remain essentially the same in any given case as the patient progresses from the deciduous to the permanent dentition. He wisely reminds the reader that the degree of overbite is the product of several interrelated factors and can best be dealt with during periods of active vertical growth. This poses a problem since one does not know in advance just when the vertical component of growth will predominate. Accordingly, it would seem advisable to initiate corrective measures in the late deciduous or very early mixed dentition stages in order to take advantage of a great proportion of the time during which overall facial growth is occurring. The dentist has only to review the dental records of his child patients over a period of time to recognize the effects of close bite on the lower dental arch. All too frequently the intercanine width will have decreased and the lower incisors become crowded. I have pointed out the possible interrelation of a deep close bite in the deciduous dentition and failure to reach the full potential of mandibular intercanine dimension upon eruption of the lower permanent incisors.[8]

Loss of mandibular intercanine width is demonstrated in models of an untreated patient at age three and one-half years and at five years during a time period when one expects no dimensional change in this measurement (Fig. 10). A deep close bite, whether in the deciduous, mixed, or permanent dentition is an undesirable dental environment. While bite opening with a maxillary bite plane is relatively easy to accomplish at any level of dental maturation, maintenance of the newly established relation is quite another matter. Loss of mandibular intercuspid dimension, crowding of incisors, and increase in overbite relation go hand in hand. Fixed retainers for the lower arch or maxillary bite planes to prevent bite closure are both useful stopgap measures in our treated cases and not a great deal more. Correction of excessive overbite relation cannot ordinarily be expected to maintain itself in the patient whose facial growth is essentially completed unless the angulation between the upper and lower incisors is within normal range. One prefers not having the incisal edges of the maxillary incisors tipped lingually or the long axes of these teeth approximately parallel to the long axes of the mandibular incisors. Fixed appliance treatment is necessary in order to establish a more ideal interincisal angulation. From a mechanistic point of view one

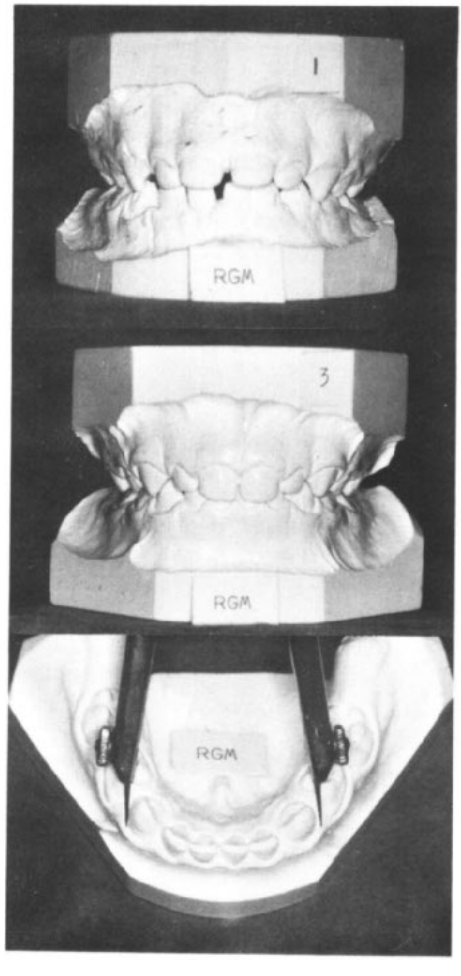


Fig. 10 Models of a patient taken at age three and one-half (*above*) and at five years (*middle*) showing spontaneous increase in overbite relation. *Below*, Mandibular arch at five years of age demonstrating loss of intercanine dimension. Dividers set at intercanine width seen at three and one-half years.

might say that the incisors of both arches should be braced or "stopped" against each other upon closure.

It is fortunate that part-time wear of retainers with incisal bite planes is sufficient in most cases to maintain the newly established vertical dimension in young children. Since most deep close bites appear to be of genetic origin, the tendency to return to this condition must be recognized. Overbite relation is considerably more stable once facial growth is more or less completed provided that an acceptable interincisal angulation has been achieved. Treatment timing in correction of close bite and Class II malocclusion seems amenable to the same rationale which suggests early interception to take full advantage of the accompanying processes of dentofacial growth.

Summary and Conclusions

It has not been the purpose of this paper to attempt to persuade my fellow orthodontists to undertake beginning treatment of Class II malocclusion with removable appliances. Yet, I would try to persuade them that interception of such malocclusions with the primary aim of Class I relation of posterior teeth should be undertaken preferentially during the late deciduous or very early mixed dentition stages.

Correction of Class II relation of posterior teeth with removable appliances may provide additional insight into the biomechanics of Class II therapy in general. Such correction with removable appliances as described in this paper cannot be readily explained in terms of holding the molars still while the body of the maxilla grows forward. Neither can it be explained by saying that these palatally-bearing appliances without visible means of support such as ball clasps, Adams clasps and the like, inhibit over-all maxillary growth. The greater increment of downward and forward mandibular growth over that seen in the maxilla coupled with dento-alveolar adjustment provides a logical explanation in these and many of the cases treated with fixed appliances.

If one accepts the premise that cusp and groove relation of the first molars is the first order of business in the interception of malocclusion, activated re-

movable appliances have a place in orthodontic therapy. Results can be obtained in a rather high percentage of selected young patients and provide an effective means of controlling overbite relations at the same time.

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Discussion

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The thought-provoking ideas and evidence presented by Dr. Mathews in his paper were certainly impressive. His continued zeal and plea for early treatment are commendable. His concern for the early correction of anteroposterior orthodontic problems involving skeletal dysplasias, wherein environment may be the primary causative factor in producing the Class II malocclusion, should also be the concern and goal of all serious and perceptive orthodontists.

I believe the point is well made that "interceptive orthodontics" and all that the name "interceptive" implies may well denote a technique or approach to an orthodontic situation that to some orthodontists is taken to include orthodontic problems beneath their dignity or technical skill.

The dislike for the term "interceptive" is well understood since many of our patients have suffered through some form of preventive or interceptive treatment with less than desirable results. Perhaps the name "contraceptive orthodontics" should be used for those occasions where many devices are inserted or worn, some succeeding beautifully, others causing more harm than pleasing results.

Too often the excuse for not treating early is the overriding additional expense without appreciable benefit to the patient. Too often the excuse is that the practice will become cluttered with deciduous or mixed dentition cases leaving little time for full banded treatment. However, I fear that the real excuse is that frequently we have been burned by inappropriate diagnostic acumen and lack of information about the growth and treatment of deciduous and early mixed dentition malocclusions. I do not believe that protrusive maxillary incisors alone, without an accompanying skeletal Class II deformity, is sufficient reason to force patients into early interceptive treatment unless there are extenuating behavioral problems for the patient.

Horowitz and Hixon have stated that nothing is known to date which can be measured on a cephalometric film which is of sufficient accuracy to be clinically

useful. I may add that their statement is particularly true concerning the parameters for cephalometric films of the very young when perhaps the major dental eruptive and adaptive bone changes are taking place.

Dr. Charles Tweed stated repeatedly that the best and most rewarding orthodontic changes are obtained through early orthodontic treatment. Dr. Tweed has investigated, longitudinally, the growth patterns of young children in order to evaluate the skeletal types most responsive to early treatment. Unfortunately, the stigma of the Class II malocclusion has been blamed by Angle on the mandible. Angle's plea was for manipulative development of the mandible to accommodate all the teeth or for movement of the mandibular alveolus forward to accommodate occlusion in the hope that subsequent mandibular basal development would occur. His idea that the maxilla with its keyridge was the center of the dental universe has not been borne out. It is perfectly possible for the maxilla to be too far forward or too far back.

Enlow and Bang have illuminated the complex remodeling and growth process of the maxilla and have shown the maxilla to be the most changeable, plastic and perplexing bone in the face.

I do not believe that the evidence pointing to hopeful changes of the mandible other than alveolar remodeling has been reported using removable appliances. Only orthopedic pressures of constant and large magnitudes have been shown effective for the remodeling of the mandibular base.

Björk reported that mandibular prognathism increased with activator treatment; however, he was unable to differentiate the prognathism from the normal growth range of the individual. Both Moore and Sandusky showed that treatment during the mixed dentition with forces applied to the maxillae would reduce facial convexity in a way which was not always attainable at a later stage. King, Kloehn, and Epstein found that extraoral pressure could retard and alter growth of the alveolar parts of the maxilla, and perhaps, directly or indirectly, cause welcome changes in the occlusion.

The work of Jakobsson is singularly important and applies directly to some of the comments heard here today. Jakobsson evaluated and compared growth of one group of patients wearing activators against one group of patients wearing headgear, with a group of controls. His experimental groups consisted of eighty-five subjects with an average age of eight and one-half years. Both the activator and headgear groups were treated for eighteen months. Jakobsson came to the following conclusions:

1. The activator and headgear both caused distal movement of the maxilla with the headgear causing greater movement than the activator.
2. Bite opening (increase in the mandibular plane and vertical) was greater in those patients using the activator than in those patients using headgear alone.
3. The activator had a greater effect on lingual tipping than did the headgear; however, both the activator and headgear caused almost equal amount of distal retraction of the upper anterior teeth.
4. The overjet was reduced more in the activator group due to labial tipping and forward movement of the lower anterior teeth.
5. Point B in the activator group, the headgear group and the controls showed no statistically significant change during the course of study.

Another finding of interest, in addition to the normal growth changes, was a slight descent of the entire mandible rather than a purely backward swing as would be expected using headgear or

activator. The slight descent of the mandible with distal traction of the maxillae had already been previously reported by Wieslander. How these findings of Jakobsson and others can be correlated or applied to children under six years of age remains an open question. Indiscriminate unlocking of the occlusion or opening of the bite, particularly in cases with steep mandibular plane angles, has been described by Schudy and others as the worst form of orthodontic therapy.

However, as Mathews has previously shown, bite opening procedures in specially selected Class I cases may alter the environment sufficiently to allow favorable developmental arch width increases in deep-bite cases. To wait until a malocclusion has come into full bloom has well earned the deciduous and early mixed dentition stages of dental development the label of "the period of watchful neglect."

I fear that we are passing through a period in deciduous denture treatment similar to that of tooth extraction. At first no one would admit to tooth extraction for orthodontic purposes since it was not considered fashionable, nor did it then denote technical competence. However, "when the cat was out of the bag," everyone admitted to having had cases of extraction in his practice. The evidence presented by Dr. Mathews does not justify the conclusion that major changes occurred in the mandible. However, I do believe that some adjustment in growth has taken place. The evidence presented points to the need for further study in the direction Dr. Mathews has taken us today. A review of the literature and many of the papers already given at this meeting, point to the merits of early simple orthopedic treatment for the best skeletal changes. Data, criteria and judgments should be developed for those deciduous and early mixed dentition cases which can respond most favorably to early treatment. In addition, greater interest must be taken to discover, control and correct the environmental factors causing early Class II malocclusions.