# Limitations In Orthodontic Treatment

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I think all of us can find enough successfully treated cases in our plaster collection to convince ourselves and some of our colleagues that we are proficient orthodontists. I maintain that these cases, carefully selected for presentation, have little relation to reality. The result of orthodontic therapy—good, bad, or indifferent—is only evident many years out of retention. Records of cases many years out of retention are not easy to obtain. Consecutive cases are almost impossible to produce in significant numbers. This I submit is our first limitation. We do not have the evidence on anything resembling a valid statistical sample as to the stability or the success of our results.

What should be the measure of success in orthodontic treatment? The criterion I would apply to determine success or failure of orthodontic results many years out of retention is, "was this a constructive service rendered to the patient and did the improvement warrant the orthodontic procedures involved." If this simple measurement does not apply, then the case must be labeled as a failure. If a sufficient number of our treated cases cannot pass this final examination, we have no justification for our procedures. We are, after all, a health service and our first consideration should be the welfare of our patients.

This also implies an evaluation of the result not only in terms of stability and facial esthetics but also in terms of function and periodontal and enamel conditions. Discussions and statistics in this area are most conspicuous by their absence. However, after seventeen years of orthodontic practice I am convinced that this remains one of the most important of our unanswered questions in clinical orthodontics.

Some of us who have conscientiously followed our results over a long term have been increasingly disturbed by relapse tendencies even in some of our best-treated cases, and disturbed by evidence of premature periodontal disease following orthodontic treatment. We must look at the problems of our failures and limitations objectively and learn from them. If we cannot face these major orthodontic problems, we are cloaking hit-or-miss efforts in a jargon of erudite and high-sounding pseudoscientific phraseology which has little bearing on reality. Unless our efforts viewed many years out of retention represent a constructive service rendered to the patient, unless our treatment represents a real improvement in esthetics, function and periodontal health, our field is an interesting and complicated technical exercise in frustration.

I suspect all practitioners in specialized areas tend to overtreat their patients. If we discount the few unethical people, I think those remaining may still be guilty. Guilty not because of mercenary motives, but guilty because we are eternal optimists and feel that we are able to do more than we actually accomplish in the end. Secondly, I think we are guilty because we are inclined to feel that what we do is more

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Read before the 1964 meeting of the University of Illinois Orthodontic Alumni Association.

important than it actually is. Are we riding the crest of an affluent society that wants all its children as stereotypes of Hollywood beauty including "straight teeth" and college degrees regardless of genetic potential, dental or intellectual.

Why do we treat orthodontic problems? We accept the obvious improvement in appearance and facial esthetics in crowded cases and in pronounced anteroposterior dysplasias. That is a primary and positive indication for orthodontic treatment. We speak glibly of improvement in function. What do we mean by improvement in function? The primary function of the dental apparatus is the mastication of food. I have seen very few patients, even those with severe malocclusions, who were not well nourished because they were unable to masticate. Orthodontic textbooks list one of the benefits accruing from treatment as improved masticatory function and warn darkly of gastrointestinal disease produced by improper chewing. I have yet to see a case that can be positively identified in this category. Recent work has indicated that mastication has much less effect on the digestion of food than we previously thought. Well-chewed food and food hardly chewed at all seem to be processed in the same fashion by the digestive tract. Very few of us still employ the dental apparatus for defensive purposes. I suppose that those that do and have open bites or large overjets will improve their fighting abilities and, therefore, reap huge benefits from orthodontic care.

Many of our patients with temporomandibular joint problems can be helped. I think these represent a relatively small percentage. On the other hand I have observed temporomandibular joint problems produced by orthodontic therapy. Our mechanics are not so exact that we are able to position each cusp where we want it and precisely control the position of the head of the condyle in the glenoid fossa. I have observed a fair percentage of patients, particularly those who have undergone intermaxillary elastic treatment, show joint disturbances that were not evident before treatment. It is difficult to accurately measure which percentage of the change in orthodontic correction is produced by tooth movement, growth or mandibular repositioning.

We speak of proper occlusal relationships which will promote proper function and therefore future periodontal health. We warn our patients of the dim future of the untreated malocclusion, the onset of periodontal disease and resultant premature loss of teeth. On the other hand, if their teeth are straightened and bites corrected, we promise proper function which will resist future incursions of periodontal disease. I am not aware of concrete evidence to support this fundamental indication for orthodontic treatment. It has not been demonstrated to my satisfaction that this promised benefit can be derived from orthodontics.

Quite to the contrary, some observers maintain there has been no demonstrable link established between malocclusion and periodontal disease. The literature provides a conflicting series of opinions on the role of malocclusion in the production of periodontal pathology. Geiger,[1] in a study of the relationship of malocclusion to the severity of periodontal disease, was unable to show a direct correlation of such factors as overbite, overjet and openbite. This corroborated the findings of Ditto and Hall[2] who stated "the degree of overbite is not a factor affecting periodontal distribution".

Other dental observers have waved the warning finger at us and accused us of producing periodontal disease by

our therapies. Burket[3] said, "the general impression held by many periodontists is that orthodontic treatment may be one of the etiological factors in the development of periodontal disease in the later years of life".

Stallard[4] in the same vein stated: "It is a mystery how the periodontium can stand the abuse heaped upon it by edgewise orthodontic treatment. Therefore, one cannot say whether or not orthodontic positioning of teeth prevents tooth mobility, tooth migrations, or periodontal degenerations from occurring in later years. Nobody has ever made a statistical study of the survival of orthodontically treated dentitions."

This I feel is our second limitation and one of our weakest areas. We are not sure of the effect of orthodontic treatment on the periodontal structures. We can neither confirm or refute statements of the sort just quoted.

Perfection in any physical dimension is rarely if ever seen in nature. The percentage of ideal occlusions is certainly small. Yet we, as orthodontists, worship at the shrine of mechanical perfection, the mechanical perfection of alignment and interdigitation exhibited by "Old Glory". This is rarely seen in nature yet we still strive for it. Even were this goal attainable in all cases, in how large a percentage is the goal permanently maintained? We talk lucidly and discourse intelligently on a variety of related scientific fields to prove ourselves biological scientists. In the end though, our therapy is for the most part mechanical, and we strive for an unrealistic and unattainable goal. In how many cases do we proceed further in treatment to satisfy our technical instincts rather than to render a service to the patient?

Do not misunderstand me, I am not advocating any lowering of standards of performance but some realism in sometimes accepting a result that is enough of an improvement to warrant our interference. This result may be mechanically less than perfect but in the end may be biologically more desirable. Perfect interdigitation and tooth alignment obtained at the cost of considerable enamel and periodontal damage may look well on a plaster cast but, subsequently, when it begins to exhibit relapse tendencies, it can hardly justify the arduous and tedious procedures endured by the patient.

The orthodontic literature is replete with articles pertaining to the mechanics of tooth movement, perhaps more than any other phase of orthodontics. The range of advocacy is wide and the question of continuous or intermittent forces or even what constitutes a light or heavy force is far from resolved. Most of our carefully evolved orthodontic mechanisms are designed for force delivery in a single direction. Unfortunately, most mechanisms represent a complex system of forces operating in all three planes of space, and then modified by many indeterminate biological factors. These may modify or completely alter the force actually delivered to the teeth, periodontal membrane and alveolar bone. Add to this the one important factor usually not considered, namely, the patient. Let us face the realities of orthodontics. Our patients are children and many of them are resistant to our appliances. Let us also admit that our procedures can be annoying to some, uncomfortable to others, and downright painful to the rest. If the choice of treatment was left to most of our patients, they would be out playing baseball or with dolls, rather than sitting in our offices. One bite of hard candy can completely destroy the most carefully conceived and executed orthodontic design. We come to limitation number three. I maintain these factors, patient attitude and cooperation pro-

duce a significant percentage of our treatment failures. They must be considered in the decision to treat and the mechanisms to be employed.

There exists some divergence of opinion as to what constitutes the ideal force for tooth movement. The consensus, Reitan,[5] Story and Smith,[6] Begg,[7] Burstone,[8] is somewhere around 150 grams for canine retraction. Measurements of the force delivery loops is determined by the various measuring devices before they are applied in the mouth. These are actually meaningless when the same appliance is activated in the mouth. An appliance designed to deliver a constant force of approximately 150 gms over a range of 3-4 mm is difficult to design and employ. When such a complex loop is placed in position, the vertical components and tipping actions so modify the force actually delivered as to make the original measurements meaningless. Recognition of this problem has prompted Teasley, Penley, and Morrison[9] to design a complex electromechanical instrument to analyze orthodontic forces. The instrument will resolve into six orthogonal components the forces produced by orthodontic appliances. At the end the authors state that the instrument indicates the potential of the appliance tested, not necessarily the force exerted on the tooth by the appliance.

Generally speaking, the first procedure in treatment of extraction cases is the retraction of canines. For the sake of discussion all techniques involved with sliding a tooth along a wire have been discarded. Considerations of friction and bind make it very difficult to measure forces actually applied to the tooth. The ideal cuspid retraction mechanism would incorporate the following characteristics:

1. A constant force of approximately 150 gms with minimal drop-off over the entire range of activation.
2. A range of action of 3-4 mm. This would serve to minimize patient visits.
3. The mechanism would maintain axial inclinations linguobuccally as well as anteroposteriorly.
4. The mechanism would act only along a horizontal plane and eliminate any vertical displacement.

In actual practice it is very difficult to produce a mechanism incorporating all four characteristics because of opposing considerations. A loop designed with only gingival legs, on activation produces a reciprocal tipping of the archwire sections adjacent. When these archwire sections are seated in the brackets, the force delivery is so modified as to make the original measurement invalid. The same would be true when the loop is displaced vertically in order to seat it. In order to overcome the tipping of the legs, loops have been designed with occlusal extensions. These tend to pose the problem of occlusal interferences, so two shorter occlusal legs are now incorporated. Now the loop is finally designed to operate only in a horizontal plane and to deliver the desired force over 3-4 mm of activation. A vertical extension has been added to help control tipping. This may not move the teeth where we want them but it would probably win first prize in a modern-art wire mobile contest. But now axial control has been lost and a tipping movement produced. The circle has been completed and we are back to a length of coil spring or an elastic. These are certainly simpler to use. Practically speaking, it has been found that a loop design capable of producing 150 gms without excess drop-off serves mainly as a tipping mechanism; there are much simpler

devices available to accomplish the same ends. Although the difficulty in maintaining axial inclinations is recognized, it is my feeling that the effort should be made, when retracting canines, to maintain as upright a position as is practicable. There is some evidence that in bodily tooth movement we are likely to produce a surface type of resorption when the force is distributed evenly over the entire root surface of the pressure side. In tipping movements a fulcrum point of concentration of force is likely to occur and a point of undermining resorption or a cell-free area as described by Reitan[5] will result. Subsequent mechanics are somewhat simplified if the canine is in a reasonably upright position following space closure. I do not believe our measuring techniques are accurate enough to determine which of the two procedures (tipping followed by uprighting or bodily movement) is the more effective in achieving maximum distal movement of the canine. It seems likely that the posterior stabilizing units would not tend to move forward as much with a tipping action. On the other hand it is difficult to measure what really happens when canines or incisors are torqued upright. The possibilities are distal root torque or anterior crown tip. The latter implies further anterior movement of the stabilizing unit, the buccal teeth. Again it is difficult to determine which actually occurs.

In many of our cases the vertical dimension problem is one of the key factors to be resolved. Our mechanics in most instances are designed to open the bite and increase vertical dimension by the reciprocal action of posterior extrusion and anterior intrusion. If our bite opening is achieved by posterior extrusion, we are, in essence, wedging the jaws apart and opening the hinge. This increase in vertical dimension does not, therefore, occur in a horizontal plane and the mandible does not drop down parallel. This is a hinge opening and the chin point tends to drop down and back with obvious implications to our Class II mechanics. It would seem that vertical dimension obtained by wedging of the jaws and increasing the length of the resting position of the mandibular elevating musculature would have dubious future stability.

My concept is, therefore, that vertical dimension should be gained as much as possible by intrusion of anterior teeth. Intrusion of teeth has been recognized as one of the most difficult movements to accomplish. It is also difficult, if not impossible, in a reciprocal buccal-extrusion and anterior-intrusion to measure accurately the movement in either direction. Since the extrusion of teeth is the more easily produced of the two, it would seem that many of our bite-opening procedures have doubtful stability if they involve increase in vertical dimension obtained by opening the jaws. The reaction of the investing tissues to extrusive forces is difficult to assess. If the extrusion is accomplished by elongating the tooth relative to its alveolus without concomitant crest growth, a longer clinical crown is produced and a tooth with less supporting tissue.

Vertical dimension is the key to stability in many cases. If we are able to open the bite and maintain this increase in vertical dimension, our chances for stability in Class II deep-bite problems is probably good. This implies vertical correction without rotating the mandible and obtaining the desired axial relationship of incisors. This would be approximately 135 degrees with the incisal edge of the lower incisor meeting the cingulum of the upper incisor. Obtaining this correction in cases exhibiting large anteroposterior

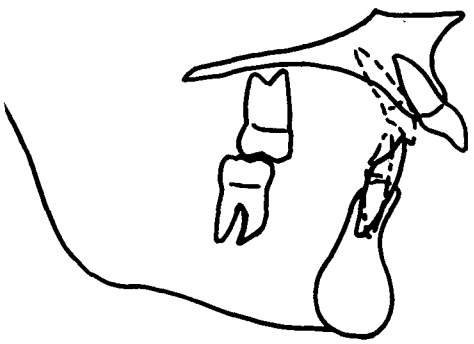

Fig. 1

dysplasias involves considerable intrusion and palatal root torque. Perhaps our appliances are capable of producing more movement than the tissues can tolerate? Can we exceed the limits of the bony support of the teeth? The limits of alveolar bone adaption to tooth movement have not been established as yet. These intrusive and translatory movements are the most difficult to produce mechanically and, I suspect, the most punishing to the investing tissues.

This is our fourth limitation. Our mechanics are neither as accurate nor as nearly logical as we would like them to be.

Figure 1 illustrates the problem presented by the large anteroposterior discrepancy case. When the anteroposterior relationship between opposing jaws is large, it would be extremely difficult to achieve the correction of the horizontal overbite within the bony framework. Assume this case is to be treated within the skeletal framework by the movement of teeth alone with no help from growth. The solid lines indicate the present positions of the central incisors. If the lower incisor is kept in its present position because of the limitations on its forward movement, then the accommodation must be reached by moving the upper incisor bodily upward and lingually until the desired relationship is reached. In this diagram the tooth would then have to be moved to a position outside of the present profile of the maxillary alveolus. I question whether our mechanics are always capable of producing and whether supporting tissues can tolerate such drastic movement. Again the question of the limits of the accommodation of the alveolar process to orthodontic tooth movement arises. Will there be enough remodeling or will we succeed in literally moving the tooth through the palatal cortical plate? A further dilemma is presented by the problem of mandibular anterior crowding. If the decision is made to extract mandibular bicuspids, and, in space closure, the mandibular incisors are moved lingually, the overjet is increased, and the distance the maxillary centrals must move increases. The danger also exists of producing a severely concave dental area. Just such a case is illustrated in Figure 2. This girl at eleven years and three months presented a severe Class II, Div. 1 malocclusion with an extremely convex retrognathic facial pattern and protruding maxillary anteriors. A few angular relationships will illustrate the problem with which we are dealing:

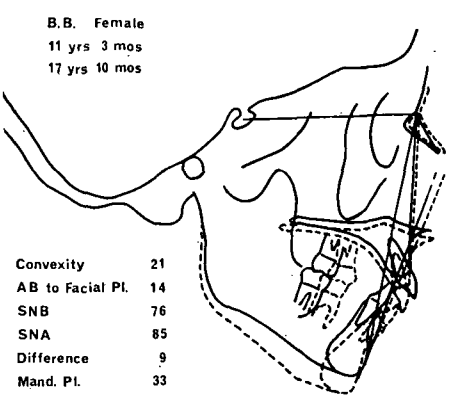


Fig. 2

convexity of 21 degrees, AB to facial plane-14, SNA 85, SNB 76, SNA SNB difference of 9 and a steep mandibular plane of 33. Although the lower incisors were slightly crowded, the decision was made to risk a relapse in this area rather than gamble on lingual movement which would further aggravate the overjet and might result in a severely dished-in profile. Upper first bicuspids were extracted and every effort was made to avoid use of the mandibular arch as a reciprocal stabilizing unit to exert posterior traction against the maxillary arch. The dotted lines indicate the situation some five years out of retention. I am always surprised in attempting to evaluate tooth movement by cephalometric superpositioning to find how little I have actually moved the teeth. There has been some help from growth in that the mandible has seemed to grow farther forward than the maxilla. The maxillary incisor has been moved lingually but this has been tipping to a large extent. Much of the accommodation has been at the expense of forward movement of lower incisors, as much as I had attempted to avoid it. Upper and lower molars have come forward a considerable amount. There has been no tendency for relapse of the overjet and the corrected buccal interdigitation has remained. However, we are not happy with her lower arch (Fig. 3). The first model is the situation before treatment and exhibits a slight crowding of incisors. It was decided to risk crowding of lower incisors rather than extract teeth and possibly increasing the horizontal overbite. The middle model shows the situation at completion of active treatment and the bottom the considerable crowding of the lower arch five years later. I am sure that many will find valid grounds for criticism in the deliberate risk that was taken, and in my treatment planning and therapy. The lower incisors did come forward and this may very well account for some of the crowding. Perhaps I can lay this one on the doorstep of secondary growth changes or the old favorite whipping boy, the third molars. I would like to think that a different decision involving the lower arch may have achieved better permanent alignment but again may have achieved less in permanent correction of overjet. Although our mechanics may be efficient we cannot make up for gross deficiencies in skeletal foundation by mechanics alone.

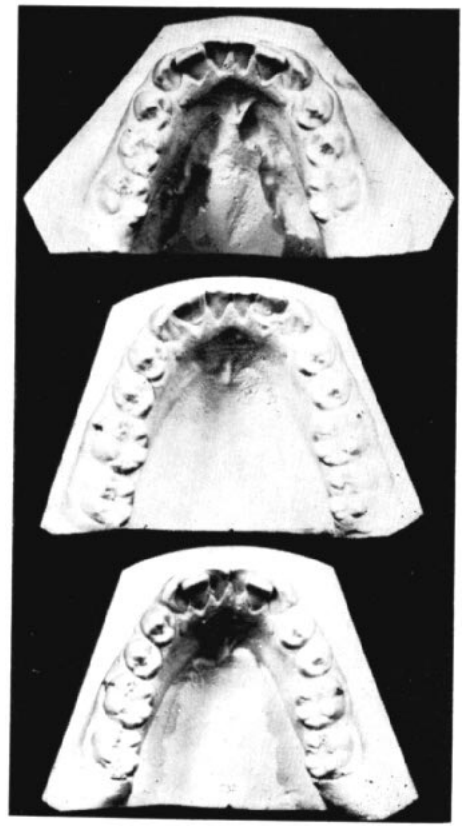

Fig. 3 Lower arch before treatment, at retention and five years postretention.

The youngster (M. F.) whose casts are in Figure 4 has smilingly and stoically endured three years of unsuccess-

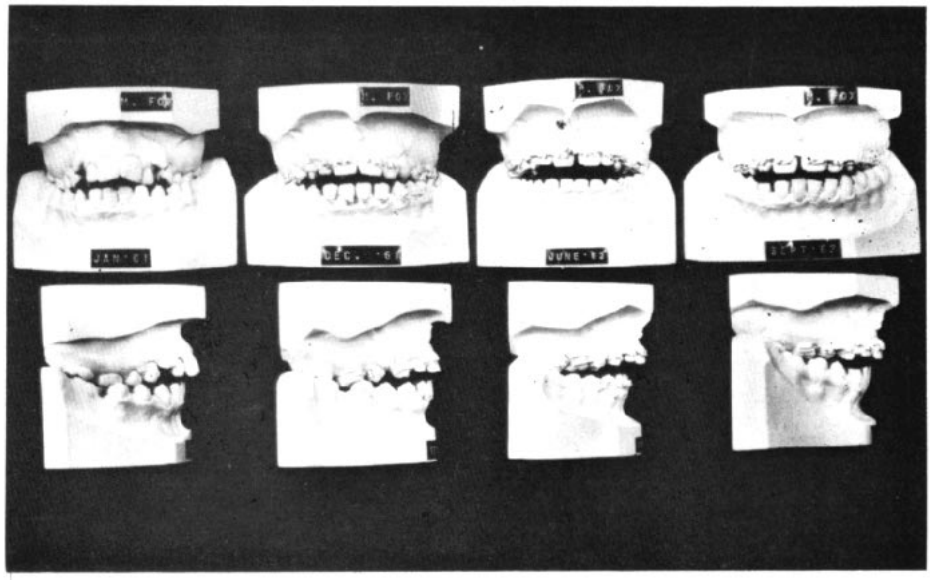

Fig. 4 Open-bite treatment: 1. Pretreatment. 2. Twelve months of active treatment. 3. After attempt to correct buccal crossbite. 4. After arch removal and return of crossbite.

TABLE 1

Comparison of Subtelny and Sakuda open-bite values with open-bite case.

| | NORMAL | | OPEN BITE | | |
|---|---|---|---|---|---|
| | Mean | S.D. | Mean | S.D. | M.F. |
| Facial Angle | 87.4 | 3.96 | 82.9 | 3.94 | 82 |
| SNB | 80.5 | 3.65 | 75.9 | 3.79 | 76 |
| NA to F.H. | 88.2 | 4.17 | 85.4 | 4.25 | 82 |
| SNA | 82.6 | 4.07 | 80.1 | 3.23 | 78 |
| AB to Facial Pl. | –4.4 | 3.11 | –6.8 | 3.58 | –6 |
| Mand. Pl. | 23.6 | 5.30 | 33.9 | 5.88 | 37 |
| Y Axis | 60.5 | 5.66 | 65.6 | 4.16 | 65 |
| Interincisal Angle | 127.4 | 8.27 | 122.6 | 9.33 | 125 |
| U1 to AP (mm) | 4.9 | 1.98 | 7.9 | 3.90 | 7 |
| SN-Mand. Pl. | 29.1 | 5.28 | 39.2 | 6.97 | 41 |
| SBa (mm) | 46.1 | 3.46 | 43.6 | 4.00 | 43 |
| $\frac{NANS}{NMe} \times 100$ | 44.9 | 2.25 | 41.5 | 2.41 | 41.7 |
| Gonial Angle | 123.5 | 5.81 | 129.0 | 6.22 | 130 |
| Palat. Mand. Pl. | 20.7 | 5.03 | 31.2 | 5.66 | 33 |
| Ramal Height | 48.7 | 4.78 | 45.9 | 5.62 | 41.0 |

ful orthodontics. She has lived through four successive graduate student operators and two clinical supervisors. She still smiles cheerfully at us and never complains or even looks reproachfully. The first set of models is the start of active treatment. She had an open-bite, Class II, Div. 1 malocclusion with protruding incisors and partially blocked-out canines. The second model was made a year later; the maxillary arch has been aligned and some maxillary incisor retraction accomplished. The attempt was then made to expand the maxillary buccal segments to overcome the molar crossbite. With a little hindsight we ran an analysis using values found by Subtelny and Sakuda[10] in their open-bite study as a comparison (Table I). Note the gonial angle, ramal height and all measurements on the open-bite side. It would seem that we were dealing here with a skeletal openbite and that any movement of dental units could not compensate for the deficiencies in skeletal pattern. Subtelny and Sakuda have also indicated that in these cases alveolus and teeth are elongated in the attempt to compensate for the openbite. Further treatment with vertical elastics would obviously only exaggerate this tendency. Then the decision was made to correct the bilateral crossbite by expansion of maxillary buccal segments. The initial movement accomplished here is the tipping out of the maxillary buccal segments. This throws the palatal cusps down against the lower molar and further opens the bite. If complete correction is to be obtained the roots must be torqued to correct the palatobuccal inclinations. That is a difficult movement to accomplish.

If some bilateral crossbites are symptoms of discrepancies in lateral widths of the jaws, then they are skeletal problems and not dental problems. This would imply that they are beyond correction by movement of dental units. Why do we treat bilateral cross-bites? Because like mountains they are there and they offend our technical sensibilities? There is little evidence that they produce periodontal disease and their masticatory function is certainly adequate. Because they are bilaterally symmetrical they rarely produce mandibular shift on closure and the accompanying risk of joint disturbances. Although it may offend our mechanical sense of what is right, there is little real positive indication for their correction.

Figure 5 demonstrates another openbite case. I can proudly lay claim to this one as perhaps one of the most successfully treated cases of my career. This thirteen year old youngster presented with a Class I malocclusion with an obvious openbite. The mother was much distressed by her daughter's appearance. When relaxed, the mouth was open, the lips were apart and teeth protruded. I could elicit no history of habit to help explain the malocclusion. Her tonque seemed large insofar as clinical appraisal can be called a measurement, and she had the typical sibilant pattern of speech often associated with openbites. Diagnostic aids were obtained and, after much thought, it was decided to observe for several months. Mother subsequently admitted to me that she was so disappointed by my failure to immediately undertake the heroic treatment procedures which she felt must be necessary that she seriously considered transferring the child to another orthodontist. Figure 6 shows models of the same child six years later. Probably my most successful result because I did nothing. Treatment consisted of observation and a cooperative child who grew well and in the right direction. Actually I can take no credit for an outstandingly successful result. Tracings illustrating

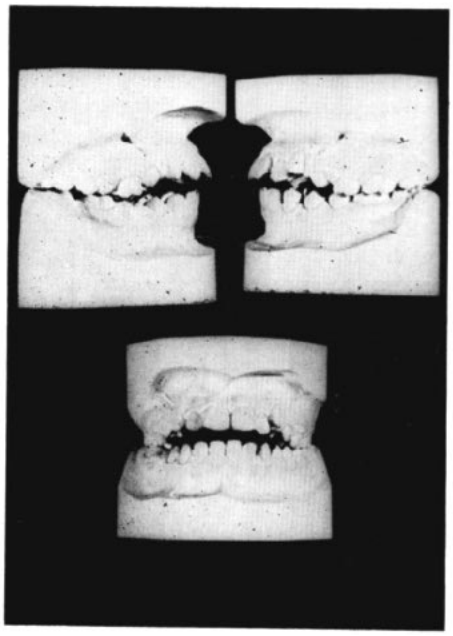

Fig. 5

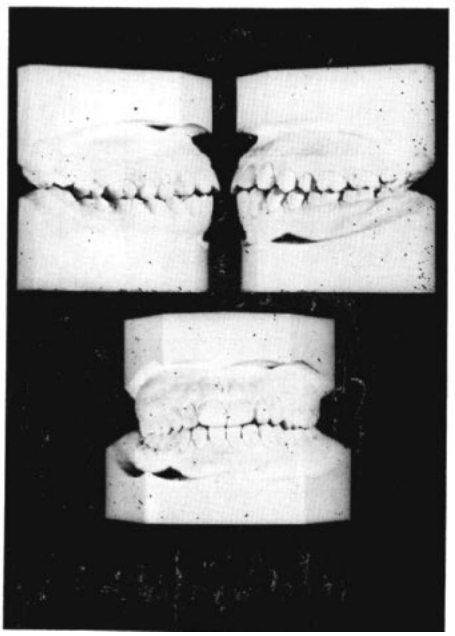

Fig. 6

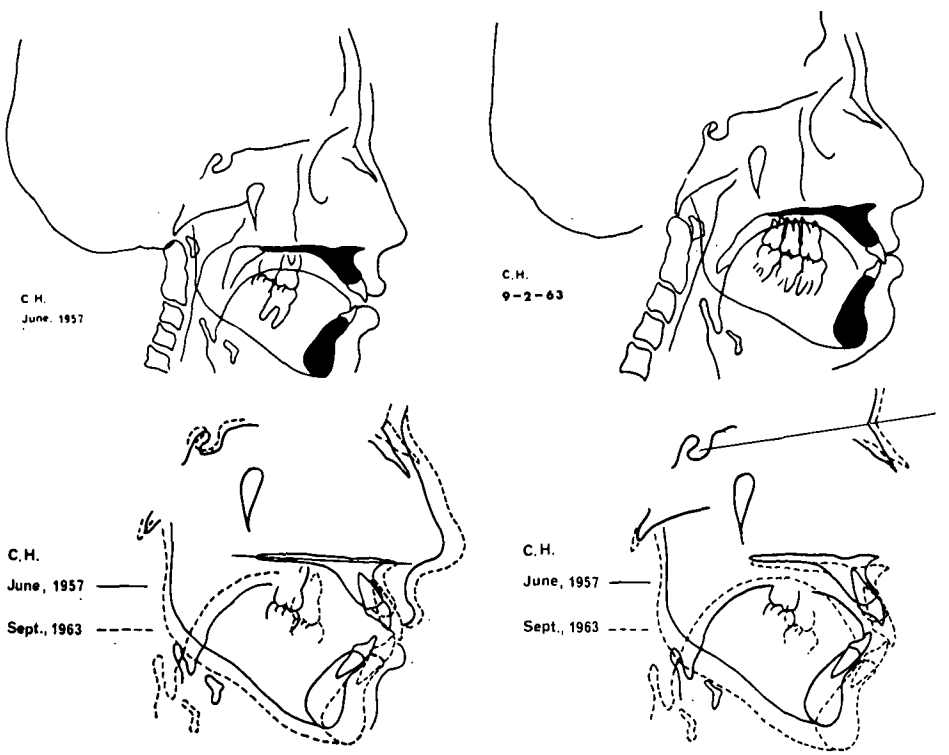


Fig. 7 Cephalometric tracings of open-bite case illustrating self-correction. Note the pattern of mandibular growth and the increments anteriorly in the vertical dimension.

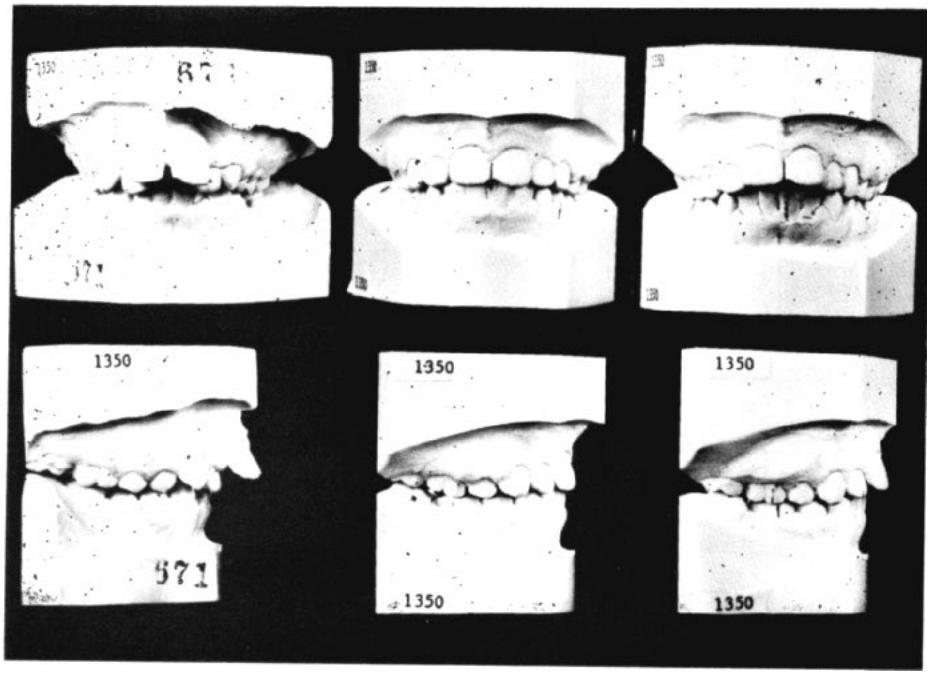


Fig. 8 Class II, Div. 1 treated twice and ending with failure: 1. Pretreatment. 2. Retention, first time. 3. Two years postretention after retreatment.

growth over the six year period are in Figure 7. The first is oriented along the palatal plane and registered on PTM and the second on SN and registered on S. Particularly, note the pattern of mandibular growth and the increments in vertical dimension anteriorly.

I think the comparison between these two open-bite cases is obvious. In the first instance we were attempting to correct a skeletal problem which defied our mechanics and was impossible to correct by the long and difficult procedures employed. The second was corrected without any orthodontic interference.

Limitation number five is the skeletal pattern. Figure 8 shows a severe Class II, Div. 1 with crowded teeth in both arches. The patient also exhibited a procumbent denture. The decision on treatment planning was simple here. Heroic measures were indicated and nothing less than four bicuspids would suffice. The middle set of models is at retention the first time. I repeat the first time because I treated this case twice. I did as well as I know how both times and the final result I would classify as a failure.

It would be convenient if I could lay this one on the doorstep of the number two whipping boy, that is the one after the third molar, lack of patient cooperation. The patient was neither an excellent cooperator nor a poor one. I simply classify this case in the category of the unknown failures. I still do not know why it did not remain stable and, if I had to do it again, I would probably treat it in the same manner.

Limitation number six I would call the unexplained failures of adequately treated cases. I label this one as ade-

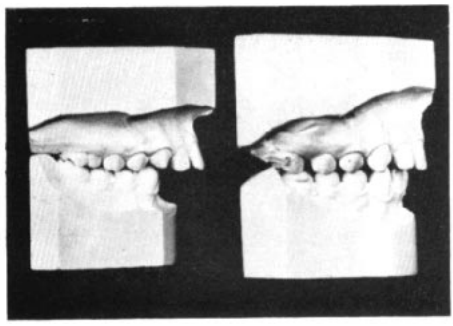

Fig. 9 Severe Class II, Div. 1 thumb-sucker after six months with headgear and lip bumper.

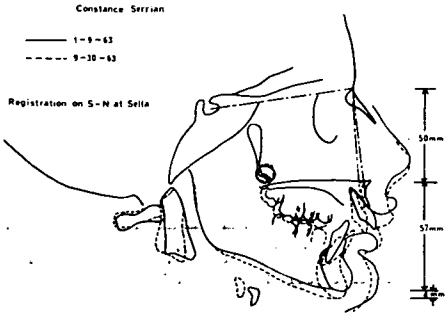


Fig. 10 Tracings of case in Fig. 9.

quately treated and it is done as well as I am capable of doing anything. There are some I am sure who can do better and very likely might have succeeded where I failed.

Figure 9 depicts the models of a Class II, Div. 1 case complicated by a thumb-sucking habit. She was started with a headgear with an anterior elastic and a lip bumper. We felt that the thumb and lip had produced a retroclination of lower incisors and the bumper was placed to allow these to come forward. The case was treated by one of our more competent and very enthusiastic students. After a few months of minimal progress he instructed his patient to wear the headgear twenty-four hours a day. The result in a few months was quite dramatic. There has been a radical change for the better in both the malocclusion and obviously in appearance as a result of the reduction of the horizontal overbite. Figure 10 is the tracing oriented on SN and registered on sella. Some of the conclusions as to where the change occurred are obvious. There has been no measurable forward growth of maxilla or mandible, so there has been no growth assistance in obtaining the change. The maxillary incisors have tipped back and mandibular incisors have tipped forward. These two account for the dramatic reduction in overjet. The maxillary molar has been tipped back and extruded in opening the bite four mm. This has been the rotational opening down and back that was previously noted. This also resulted in the establishment of a Class I molar relation. Two orthodontists well trained in cephalometrics interpreted the headplates without consulting each other. One reported no growth at nasion and the points A and ANS moved posteriorly. The second indicated no change in the position of point A. One reported the palatal plane and by inference the maxilla tipped, the other indicated no change in palatal plane or maxilla. Both were in agreement on the tooth movements accomplished.

Others have reported inconsistencies in appraising orthodontic and growth changes interpreted by cephalometric superpositioning technics. Limitation number seven is that our most valid measuring tool is to some extent subjective and interpretive, and presents difficulties in accurate assessments. We are dealing with a three dimensional phenomenon, but with lateral headplates we can measure only two. We are dealing with a continually changing pattern offering no fixed point from which to measure and we must be careful not to draw unwarranted assumptions from a technique which is not able to offer completely accurate and measurable data.

In conclusion, I would like to voice a plea for more conservatism in our treatment procedures. We must look more realistically and objectively at our shortcomings and our failures, and devote more of our research energies in an attempt to supply the answers to some of these basic problems that plague the clinical orthodontist.

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