

Treatment Planning in Class II Malocclusions

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INTRODUCTION

Planning treatment in orthodontics involves the compounding of one's concepts of occlusion, growth, physiology and psychology into a logical and practical plan for a particular case. And just as a building does not exist as a blueprint, but only after the architect's design has been carried out, a treatment plan for an individual with a malocclusion cannot be judged until the orthodontist's scheme is executed and its validity established. A theoretically perfect treatment plan may be the poorest choice for a patient unable to meet its requirements, or equally poor if the appliance chosen is incapable of delivering the force requirements of the plan.

Neither the perfect patient nor the perfect orthodontic appliance exists, and to plan treatment as if either does, invites a high degree of failure. Until a great deal more is known about the factors influencing orthopedic and orthodontic changes, we are far wiser to offer the public modest successes rather than noble failures.

This concept is not to be construed as an invitation to sloppy orthodontic treatment, such as routine extraction of maxillary bicuspid in Class II cases or the frequent extraction of a mandibular incisor in cases of arch length deficiency. It does suggest that many of our failures in orthodontics are established the moment we plan treatment and before the first band is cemented.

All of us have had cases where we ended treatment before all of our

original objectives were achieved. Many of these were Class II cases with definite crowding in the lower arch in a poor skeletal pattern.

Despite the use of extraoral force and Class II elastics we may find that, while the crowding was eliminated, the Class II problem was incompletely reduced. In many of these cases we conclude that poor patient cooperation was responsible for the incomplete result.

In fact, the orthodontist had contracted for case failure before treatment began. His plan, the extraction of four first bicuspid, was predicated on driving the maxillary molars distally a full cusp, since the lower extraction site would be consumed by the crowding. In a poor skeletal pattern this can be regarded as courting disappointment.

Superior treatment plans may have included extraction of four first bicuspid and maxillary first or second molars, extraction of maxillary bicuspid only, or conceivably the extraction of maxillary lateral incisors. Each of these plans would have produced a compromise occlusion. Yet, one or all of them may have provided an opportunity to achieve a result superior to that obtained with the extraction of four bicuspid.

We have attended meetings and seen clinicians flash slides showing a case, as the one just described, beautifully treated with four bicuspid extractions. This so-called trophy case is one of perhaps ten that presented such a challenge. The other nine remain in the model closet as silent sacrifices to a trophy.

When I had been in practice long enough to watch several of my cases out of retention and had attended enough meetings to see many fine ABO cases,

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I became somewhat depressed over the disparity between many of the ABO cases and my postretention cases. I practice in a community with a large naval installation; as a result I see a substantial number of transfer cases from all over the country each year. I see no reason to believe that they are not a representative cross section of what is being done in orthodontics today.

While my depression hasn't been replaced with outright euphoria, I know we are all having the same problems.

This study was conceived in the hope that by looking over the shoulders of men as they plan treatment, some insight could be obtained into how the discrepancy between treatment goals and treatment achievements can be narrowed.

REVIEW OF LITERATURE

The history of orthodontics is replete with attempts to define certain universal truths in order to simplify the perplexing problems in diagnosing and planning treatment of orthodontic cases. Angle's¹ final postulate that it is never necessary to extract teeth in orthodontic treatment is an example. Tweed's² reliance on a single angle to determine whether to extract or not is another attempt to substitute a simple rule for a carefully considered treatment plan.

The development of cephalometric radiography spawned a whole generation of numerical indicators for treatment planning. Attempts were made to locate the single point, line or plane that would unlock the key to successful treatment. Triangles, polygons and templates³ were offered; one scheme required a dime to be placed over the confluence of certain facial planes extended.⁴ If all the points intersected within the dime, everything was fine. If not, the pattern was considered poor.

The futile search for simple cephalometric guides to treatment planning continues. In 1963 a new one appeared proposing that, after treatment, the lower incisor should be parallel to the line drawn from sella to articulare.⁵ The obviously contrived nature of this relationship makes it of questionable value.

In recent years a mechanical device has been offered to orthodontists which relegates treatment planning to a minor role. It does away with the need for headgear; mixed dentition treatment is never indicated.⁶ All Class I and Class II cases receive the same treatment, regardless of dental configuration, skeletal pattern or degree of overbite. All cases receive Class II elastics and strong tip-back bends, even if the case presents an anterior open bite. These oversimplifications satisfy the subconscious desire of many orthodontists to avoid the mental exercise of taking a careful history, performing a thorough examination, making a differential diagnosis and planning an effective treatment. Large groups of orthodontists, dissatisfied with their own achievements, become followers of those men offering such treatment panaceas. Later, disenchantment sets in and the orthodontist, alone in his office, finds he has the same problems, but this time with different brackets.

The 1940's saw a rush to bicuspid extractions as the early returns of cephalometric studies on treated cases showed many changes in the mandibular arch from Class II elastics.⁷ Tweed, adapting a prosthetic concept to orthodontics, advocated an upright lower incisor over basal bone.⁸ This often necessitated the extraction of four bicuspids. Other men^{9,10} resisted the reliance on such formulae and it seemed that the extraction debate of 1911 was being re-enacted.¹¹

The 1950's saw a revitalized interest

in growth. Lande's¹² work on the facial profile documented the straightening of the facial profile with age, resulting in many extraction cases becoming "dished in" at maturity. Coben's¹³ monumental study on the integration of skeletal variants was widely praised, but few recognized that it was a growth study. In 1957 Ricketts¹⁴ advanced his ideas on the impact of growth estimation on treatment planning.

More recently Coben¹⁵ has applied his growth concepts to treatment planning. He suggests that some Class II cases require no extractions, others maxillary bicuspid only, others four bicuspid removal and in some, he advocates the extraction of six teeth: the four first bicuspid and the maxillary first molars. He concludes that the key to successful treatment planning is the better understanding of facial growth.

In 1950 Fischer¹⁶ wrote, "The analysis and treatment of each case must be directed toward the attainment of the achievable optimum in the dental, dentofacial and facial traits. This achievable optimum must be attained within the structural pattern of the individual dentofacial complex." His observations remain sound.

MATERIAL

Five cases from the author's practice were chosen as presenting certain hazards in treatment planning. Each of the cases was a Class II malocclusion. This was done because the author believes that Class II cases present more challenges in planning treatment than other malocclusions. Class I cases are generally arch-length deficiency cases or bi-maxillary protrusions. Usually they do not present difficulties in planning treatment. Class III cases are a group unto themselves. Either orthodontics can be helpful or not, in which case surgery may be required.

The cases chosen presented diverse

skeletal patterns. The facial angle of the cases varied from 78° to 93°. The convexity as measured by ANB ranged from 1° to 8°. Three of the patients were female and two were male. Their ages ranged from 10 years, 7 months to 16 years.

Cephalometric tracings were made of each headplate including soft tissue outlines. Each tracing was coupled with three dental findings. The dental conditions were: (1) no crowding in the lower arch, (2) slight crowding in the lower arch and (3) moderate crowding in the lower arch. The accompanying photograph defined the degree of crowding (Fig. 1). This combination produced fifteen cases to be submitted for treatment planning.

METHOD

One hundred fifty orthodontists were selected at random from the 1964 edition of the Orthodontic Directory of the World. Each man chosen was sent a kit containing instructions, medical history, intraoral x-ray report, presence or absence of habits, along with the cephalometric tracings and occlusal photographs of the mandibular casts.

The instructions requested each recipient to write a brief treatment plan indicating if any extractions would be performed and describing the anchorage control in the case.

Sixty-two kits were returned. Two were discarded, as it seemed that the instructions were misunderstood. In all, 836 treatment plans were returned.

RESULTS AND DISCUSSION

Case T. A. was a female, age 11 years 2 months. She presented a Class II malocclusion with a deep overbite. The case was chosen because the cephalometric relationship between the lower incisors and the mandibular plane of 99° was not expressed in the soft

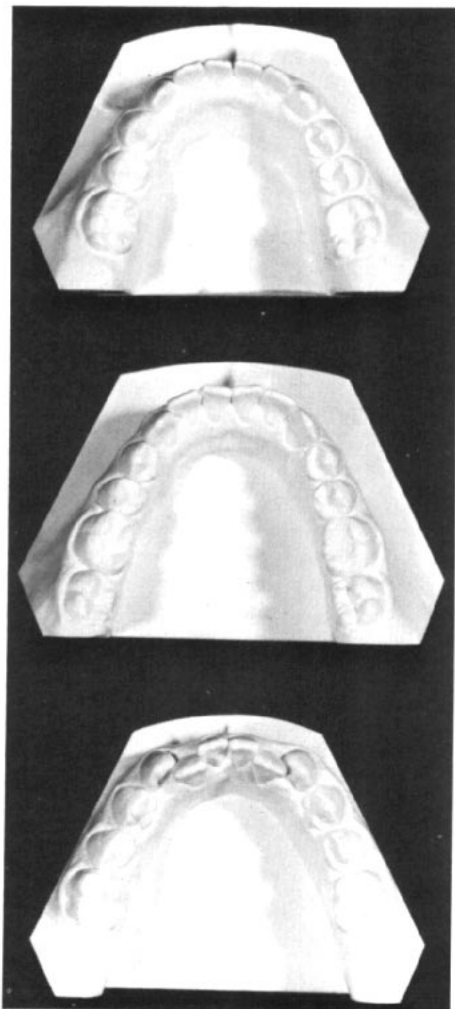


Fig. 1 Top to bottom: Uncrowded lower arch, slightly crowded lower arch, moderately crowded arch.

tissue profile which was somewhat flat (Fig. 2).

In condition 1, no crowding of the lower arch, none of the treatment plans submitted included extraction of teeth in the lower arch. Seven plans (12%) included extraction of two teeth in the maxillary arch. Forty-five percent of the nonextraction plans utilized extraoral traction only to correct the Class II quality, 37% used both extraoral traction and Class II elastics, either simul-

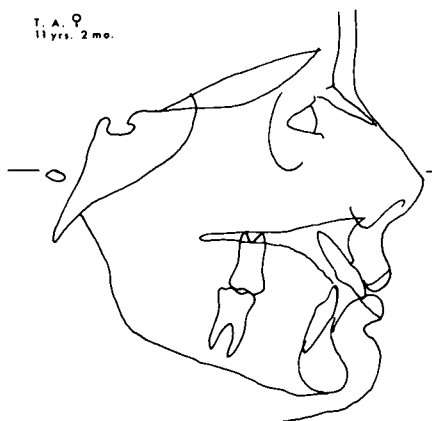


Fig. 2

taneously or alternately. Eighteen percent of the treatment plans used Class II elastics exclusively. In the majority of those using only Class II elastics, the Begg appliance was indicated in the plan.

In condition 2, slight crowding of the lower arch, the nonextraction approach to treatment of this case prevailed, although not as emphatically as in the uncrowded situation. Seventy-seven percent of the treatment plans were nonextraction; 14% called for extraction of four bicuspids; 9% were evenly divided between extracting maxillary first bicuspids and maxillary second molars. Anchorage considerations revealed increased dependence on extraoral traction rather than taxing the lower arch for the Class II correction, with 52% using extraoral traction exclusively and only 12% using Class II elastics alone. Significantly, 77% of the respondents felt that the soft tissue conformation of the patients deserved preservation with a nonextraction program, although the stability of the lower incisors would be uncertain at best.

In condition 3, moderate crowding of the lower arch, the majority (60%) of treatment plans included the extraction of four bicuspids. A significant number (37%) believed that the haz-

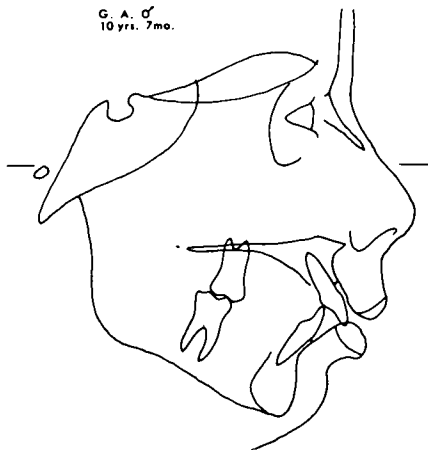


Fig. 3

ard of flattening this profile further outweighed the hazard of advancing the lower incisors to accommodate the crowding. None of the extraction treatment plans utilized extraoral traction, as could be expected. In the nonextraction plans, 72% used extraoral traction exclusively for the Class II resolution and none used Class II elastics alone for this purpose.

This case presents the orthodontist with the dilemma of potentially damaging the esthetics of the face, versus facing the likelihood of instability in the lower incisal segment. Neither stability nor esthetics can be regarded as the sole determinant in planning treatment.

Case G. A. was a white male, aged 10 years 7 months. He presented a Class II, Division 1 malocclusion with a deep overbite in a convex profile (ANB 8°). His lips were held apart by the protrusion of his maxillary incisors. His lower incisors related to A-Po plane at 2 mm at 23° (Fig. 3). In the uncrowded mandibular arch, 64% of the treatment plans called for the extraction of the four first bicuspid. Thirty-two per cent felt that no extractions were indicated and 4% extracted in the maxillary arch only.

In the case of slight crowding in the

lower arch, these percentages changed to 74% indicating four bicuspid extractions as opposed to 22% treating the case without any extractions.

In condition 3, moderate crowding, 96% indicated four bicuspid extractions, 2% a nonextraction treatment plan and one individual planned treatment with the extraction of eight teeth, the four first molars and the four first bicuspid. This treatment plan would permit achieving a similar profile result as the four bicuspid extraction plan in the uncrowded situation. Another way of expressing this is that the four bicuspid treatment plan in the moderately crowded case would yield a similar resultant profile as the nonextraction plan in the uncrowded case, since the crowding in condition 3 would consume almost all the extraction site. Expressed mathematically, 96% of the men would find acceptable a result that 64% of them found unacceptable earlier in the uncrowded case. This is not intended to be critical. Surely the patient with both crowding and protrusion is less fortunate than the patient with just one of these attributes. However, one orthodontist found a remedy by extracting eight teeth. This treatment plan, formerly regarded as radical, is finding more acceptance lately.

Case E. G. is a white male, aged 16 years. He had a Class II malocclusion with a deep overbite and concave profile (Fig. 4). He had objectionable facial esthetics with thick perioral tissue and exaggerated contours of the lips. The lips were considerably posterior to the E plane, formed by drawing a tangent to the nose and chin. The patient's age raised the question of the prognosed posterior occlusion in this case. It is generally conceded that a substantial portion of facial growth is completed at his age.

In condition 1, the uncrowded dental finding, 67% of the respondents

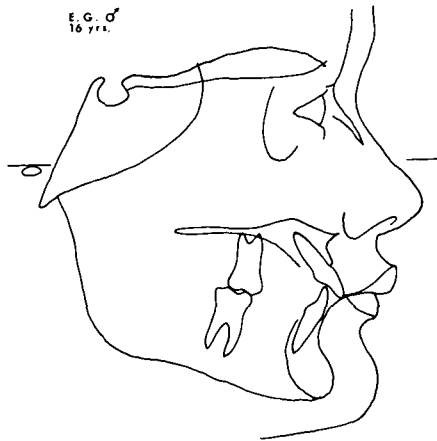


Fig. 4

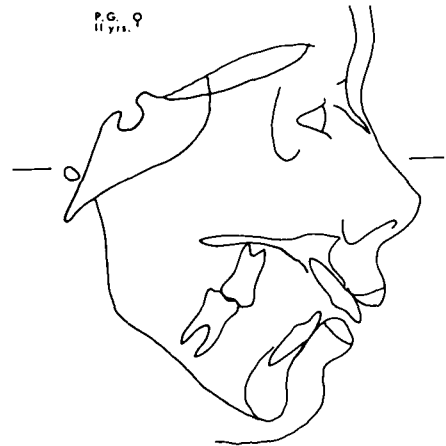


Fig. 5

planned treatment without any extractions. Of these, 19% utilized extraoral traction exclusively, 42% used Class II elastics only and the remainder used both. The next most popular treatment plan (19%) was extraction of maxillary bicuspids only. The extraction of four first bicuspids was advocated by 9% of those submitted. This was a surprising plan for a patient with his skeletal pattern. It was probably the choice of those men who object to a Class II molar relationship.

In the slightly crowded dental condition, the predominant treatment plan remained nonextraction, with 60% advocating this approach. Their choice of anchorage gravitated more toward extraoral traction with fewer resorting to Class II elastics. Extraction in the upper arch only was supported by 19% of the submitted plans. Four first bicuspid extraction was utilized by 16%.

In the moderately crowded dental situation the dominant treatment plan included the extraction of four bicuspids. Many of these involved mandibular second bicuspids. Fifty-four per cent wrote treatment plans with the extraction of four teeth; 20% adhered to a nonextraction plan in deference to the profile; 9% extracted two upper bicuspids and 5% extracted maxillary

second molars. One treatment plan called for the extraction of the maxillary first bicuspids and one lower incisor.

P. G. was a white female 11 years of age with a retrognathic, convex profile and a steep mandibular plane angle (38°). She had an anterior open bite (Fig. 5) associated with a tongue-thrust habit on deglutition. In condition 1, the uncrowded dental finding, 48% of the treatment plans advocated the extraction of four bicuspids. Twenty-seven per cent would treat the case with a nonextraction plan. Of those who indicated their source of anchorage, 82% of the nonextraction plans utilized extraoral traction solely for the Class II correction. One fourth of the responders designed a treatment plan including the extraction of two maxillary bicuspids. The nonextraction plan, particularly utilizing extraoral traction, would appear to have a damaging influence on the orientation of the mandible in the pattern, since any steepening of the mandibular plane would seriously injure the profile. Some of the respondents, aware of this, prescribed high-pull headgears to the maxillary molars, as advocated by Schudy.¹⁷

In the slightly crowded case, the substantial majority, 68%, planned treatment with four bicuspid extractions. Sixteen per cent refrained from any extractions and the same number extracted maxillary bicuspids only.

In the moderately crowded condition, 91% would extract four bicuspids. Four per cent maintained a nonextraction approach and one replier would extract eight teeth, the four first bicuspids and the four first molars. One man advised extracting two upper bicuspids and one lower incisor. This latter treatment plan has some appeal, since the anterior relationship is unlikely to revert to a deep overbite in the presence of a tongue thrust habit. Sturman¹⁸ has shown that this approach can be a sensible one in a difficult problem.

L. S. was a white female, aged 15 years 5 months. She exhibited a Class II occlusion and a deep overbite in a convex skeletal pattern. The lips were 4 mm posterior to the E plane. (Fig. 6) The case was included to determine the influence that the patient's age would have on the treatment plan. Many would agree that the achievement of Class I occlusion in this case would raise questions of stability, since her facial growth can be regarded as largely concluded. Yet 60% planned treatment without any extractions in condition 1, the uncrowded dental finding. Twenty-six per cent would extract maxillary first bicuspids and the balance would extract maxillary second molars. In the nonextraction group 35% would use extraoral traction solely for the Class II correction, while 54% advocated extraoral force and Class II elastics.

In the slightly crowded case, the predominant treatment plan remained nonextraction (53%). Twenty-eight per cent would extract maxillary bicuspids only and 10% advocated the extraction of maxillary second molars.

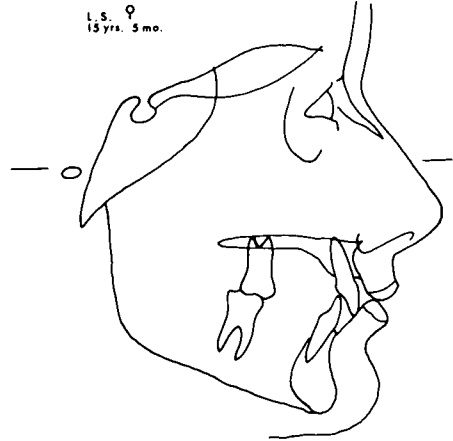


Fig. 6

Only 9% advised the extraction of four bicuspids. In the nonextraction group, 46% relied on extraoral force with no Class II elastics, 46% used both and the remainder utilized Class II elastics exclusively to achieve a Class I relationship.

In the moderately crowded lower arch, the predominant treatment plan was four bicuspid extraction (67%). Eighteen per cent clung to a nonextraction plan and 9% would extract maxillary bicuspids only. One respondent recommended extracting six teeth, the four first bicuspids and the maxillary first molars. Of the four bicuspid extraction treatment plans, 60% used Class II elastics alone to correct the molar relationship in an attempt to maintain the lower incisor position.

CONCLUSIONS

A variety of treatment plans was submitted for each of the fifteen hypothetical cases. In a few the differences cannot be regarded as critical to success or failure. Yet in some of the cases it can be concluded that the likelihood of reaching a successful result was severely handicapped by the treatment plan. For example, in case E. G., a 16 year-old male, treatment plans that did not include a reduction in dental units

in the maxillary arch, but were committed to distal driving of the maxilla, would seem to be at variance with the realities of facial growth. Likewise in case L. S., a 15 year-old female with a complete Class II occlusion, similar planning seems destined to disappointment.

In case P. G., an eleven year-old female with a mandibular plane angle of 38° , the use of cervical traction appliances could be a distinct disservice to the patient. The tendency of such appliances to elongate the maxillary molars would adversely affect her retrognathic profile. This could create the rather bizarre paradox of the patient who cooperates to a high degree causing more damage than the uncooperative one. In the latter case the orthodontist may be forced to change his treatment plan. Hopefully the change would be for the better.

In the slightly crowded and even the moderately crowded lower arch in case E. G., lower bicuspid extractions can be regarded as having an undesirable influence on the profile result. Experience has shown that in skeletal configurations of this kind, great difficulty is encountered in dragging lower molars forward, so there would be some retraction of the lower incisors. The patient's profile can hardly tolerate a change of this nature.

Twenty-six percent of the treatment plans submitted in this study were regarded as raising serious doubt as to their efficacy. While this is a subjective evaluation of the author, it is likely that if each plan could be put to the actual test of treatment, the percentage of failures would be reasonably close to this estimate.

No one method of evaluation of the cephalometric headplate was uniformly successful in appraising lower incisor position. In case G. A., the lower incisor position appears to be too far

anterior when related to the mandible, (lower incisor to mandibular plane 104°) or the Frankfort plane (lower incisor to Frankfort plane 51°). Yet the lower incisor relates fairly well to the A-Po plane at 23° and +2 mm. An important determinant in this particular case is the configuration of the soft tissue. The patient presents a thick, but short upper lip, which accentuates his protrusive quality. For this reason an extraction plan offers a great deal more than a nonextraction plan in all three dental conditions.

In case T. A., relating the lower incisor to the mandibular plane might lead to the impression that the lower incisor is too far forward (lower incisor to mandibular plane 99°). Yet relating the lower incisor to the A-Po plane gives an angle of 24° and -5 mm. This measurement gives a more accurate assessment of the lower incisors to the facial profile. The large chin button affects the A-Po plane and also gives the profile its straight quality. The fallacy of using an angle only to locate an object in space is obvious to any student of geometry.

Case E. G. is another example of the patient's profile appearance at variance with the cephalometric hard tissue appraisal. The lower incisor to A-Po plane is 28° and -1 mm, close to the mean value. The lower incisor to mandibular plane is 104° , distinctly suggesting an anterior position. The true appraisal of the case is bimaxillary retrusion. Neither cephalometric standard described the actual situation. Rigid adherence to any single set of cephalometric criteria can lead to disappointments in treatment.

The tendency of some mechanistic cults to treat occlusions as though they existed as plaster on a stage, detached from a skeleton that is draped in soft tissue, is a disservice to orthodontics. The fascination, indeed the challenge

of our profession, is to plan treatment that conforms to the dictates of the case at hand. Facial esthetics, denture stability, overbite control, habits, morphogenetic limitations are all considerations that must be weighed in planning treatment for every malocclusion. Often each of these considerations will point to the same treatment plan. As an example, a case with a slight open bite, with some crowding in a somewhat protrusive profile, points to extractions in the treatment plan. Usually there is some conflict in satisfying each of the considerations named above. A classic example is a Class II, Division 2 case with moderate crowding and a complete overbite. The crowding calls for extraction, while the low mandibular plane angle and the deep overbite flash the warning sign against any extractions. In such cases the orthodontist must utilize all his intellect to perceive the other dictates from the case at hand. Profile, soft tissue, tongue, tooth-size ratios, or one of many other factors may point the way to a more enlightened treatment plan in these dilemmas. The orthodontist will do well to free himself of rigid dogmata in orthodontics such as: never extract in Division 2 cases; never extract in the maxillary arch only; mixed dentition treatment is never indicated; serial extraction is unnecessary. If we seek to plan treatment with a higher degree of success, these prejudices must give way to attuning our antennae to the subtle nuances within the patient's findings that will point the way to better planning.

When the architect is confronted with a sloping site, he doesn't bulldoze the ground into a flat plane, but designs a building that conforms to the landscape. Orthodontists who attempt to treat all malocclusions to conform to a preconceived dental occlusion can be compared to the bulldozers. We must attempt to achieve an occlusion for our

patients that is harmonious with their skeletal landscape.

Case P. G. is an example of a case full of hazards if skeletal morphology in planning treatment is disregarded. Her impoverished cephalofacial configuration cannot be expected to improve with growth. It is markedly retrognathic (facial angle 78°) with a mandibular plane angle of 38° . Since growth will not be an aid to the case management and, indeed, may well be a detriment, the orthodontist will do well to plan treatment as though the patient were an adult and make no effort to achieve Class I occlusion.

In condition 1, no crowding of the lower arch, extraction of two upper first bicuspidis or even the extraction of the maxillary lateral incisors offers an opportunity to fit a reasonable occlusion into this bizarre skeleton. This treatment plan may well be the best plan in conditions 2 and 3 also. Headgear, posterior movement of maxillary molars, or prolonged use of Class II elastics would only add to this patient's problems.

Our dependence on substantial patient cooperation in the majority of our cases assures a definite incidence of case failures. All youngsters do not cooperate throughout treatment and it is impossible to predict accurately who will and who won't. We must try to limit our case failures to our uncooperative patients and minimize the number of failures that are determined before treatment actually begins because of defective treatment planning.

SUMMARY

Fifteen cases were submitted to a random sample of orthodontists to receive their treatment plans. The results were tabulated and discussed in the light of the author's experience with the cases. Twenty-six percent of the treatment plans were regarded as hav-

ing dubious likelihood of success. This percentage can be reduced if we attempt to individualize treatment planning rather than impose preconceived dogmata on the unique findings in each case that presents for treatment.

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