

Serial Extraction in Class II Malocclusions

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In 1954 the first control study of serial extraction was made at St. Louis University. Using experimental and control samples, the effects of serial extraction were studied over a five-year period.

In this initial study it was observed that there was a spontaneous uprighting of the anterior teeth; the cuspids moved down and back at a more rapid rate. Most important was the positive finding that growth had been affected.

This led to a second study from 1959 to 1964 using a larger sample. The findings were similar, but there was no indication that growth had been affected. There were two areas of this study, during the guidance period, and through completion of treatment.

The final results between the control and the experimental groups showed them to be alike. However, in doing a similar study with Class II malocclusions, there was no consistent answer and the findings were unreliable. In this group both the extraction and non-extraction cases used headgear during the guidance period.

It was evident that the use of headgear in Class II malocclusions had some effect on the evaluation of discrepancies because there was a measurable decrease in the amount of arch-tooth discrepancy in those individuals.

In 1967 a Class II headgear study was instigated to determine the effects of headgear upon dental arches. A significant finding was the reduction of the angle ANB. However, this did not relate to a significant decrease in SNA or increase in SNB, but the resultant changes of both these angles related to a significant change in the ANB angle.

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In 1971 a posttreatment serial-extraction study was made. Evaluations were made on both control and experimental groups. There were no exciting cephalometric differences. These patients were six or more years out of retention. The following findings were noteworthy:

1. It was obvious that lower anterior crowding could not be, in itself, a criterion in serial extraction.
2. Unpredictable growth and functional changes took place after the adolescent growth spurt, as well as before.
3. Arch-tooth discrepancies in Class II cases involved more than arch insufficiency.
4. Skeletal, dental and functional entities must be assessed in diagnosis of serial-extraction cases.
5. The amount of overbite and overjet must be considered.
6. The inclination of anterior teeth, when in lingual axial inclination, contradicted serial-extraction procedures.
7. Headgear treatment affected the arch-tooth discrepancy values.

From these seven factors diagnostic methods evolved for evaluation of cases in mixed dentition treatment.

The mixed dentition period from the ages of six to twelve can be considered the intermediate stage of development of the dentition and it is at this time that more can be done to affect functional and structural patterns of the dentition. The amount of this change may vary with the amount of growth left and the types of force applied.

From birth to five years of age there is a tremendous increase in size of the head. Between five and eight years of age this increment of growth decreases somewhat. The adolescent growth spurt comes in the latter portion of the inter-

mediate stage. It is during this phase that there is an opportunity to effect skeletal changes.

Hence, the intermediate stage is the optimum period for treating the Class II, Division 1 and Class II, Division 2 nondiscrepancy cases.

The Class II case may follow the most irregular pattern of treatment timing in this intermediate stage. It may vary from boys to girls. It is most likely that girls will be treated at an earlier age than boys because of their accelerated dental development.

Treating at the time of the adolescent growth spurt is identified as occurring between the ages of eight and fourteen. The earliest point to be considered in treatment of the Class II, Division 1 is after the eruption of the maxillary lateral incisors.

The latest that Class II headgear therapy should be initiated is 14 years of age, when all deciduous teeth have been lost and second molars may even be present. However, if there is an extremely large apical base, treatment can be initiated at an earlier age.

In this stage the purpose is to establish a normal denture and skeletal relationship, as well as a muscular relationship. After these relationships have been reached, they must be maintained with retention through the transition period. If further treatment is necessary, it is done in the second stage in the permanent dentition.

Once a normal functional relationship has been established, it can be expected that growth will proceed in a more perfect manner. Reliance is placed upon two basic facts in the treatment of the Class II, Division 1 case: first, cooperation of the patient and second, good growth potential.

Diverse growth trends are familiar. These trends must be considered inherent in nature. In the first-stage treat-

ment the basic plan is to develop a climate for the best possible growth. This climate is established by producing a normal interdigitation of teeth during the period that the major growth and development of the face is taking place.

With this best possible functional pattern the ultimate treatment goal can be obtained more readily. Further correction is minimized if a normal cuspal relationship is established in anchor teeth.

A differential diagnosis relating to growth patterns must be made. The Class II, Division 1 relates to both the vertical and horizontal growth abnormalities. Since the greater growth of the face is in height and depth during this time, it is logical that corrections in these directions would be the treatment of choice.

If vertical dimension were to be changed, there would be four areas in which an attempt would be made to change growth patterns: increase the lower facial dimension, increase the upper facial dimension, decrease the lower facial dimension, or decrease the upper facial dimension. Probable limitations in making all these changes are well-known.

The changes of greatest interest would be to retract the maxilla, advance the maxilla, retract the mandible or advance the mandible. There is agreement that it is impossible to control the vertical and horizontal dimensions as enumerated with the exception of cases with surgical orthodontics.

Criteria must be established regarding Class II treatment. These must be based on both denture pattern and skeletal pattern, growth and development, sex and age.

The apical base relationship must be the first consideration, and its possible change must be anticipated. This change may be effected with or with-

out a vertical dimension change in either the upper facial height or the lower facial height.

At this point the facial depth can be established and the face classified as mesognathic, retrognathic or prognathic. A complete classification of skeletal pattern would evaluate the foundation for the denture pattern in the Class II. It would be associated with overbite, overjet, and molar relationship, as well as relationship of the denture to the skeletal structure, both within and between arches.

Finally, the myofunctional pattern, the position of the tongue and lips, and the proposed improvement of this muscle pattern must be considered to stay within the limits of normal muscle balance.

The Class II, Division 1 denture-oriented malocclusion lends itself well to observation during the mixed dentition stage when good facial depth and height are present in conjunction with a normal or nearly normal denture base relationship, characteristics of a Class I skeletal pattern. Treatment can be delayed in these individuals until late in the mixed dentition or to early permanent dentition.

The skeletal Class II, Division 1 with the convex retrognathic face demonstrating a large apical base difference is at the opposite end of this spectrum.

Most frequently this recessive face shows a more downward than forward growth pattern. The Y-axis and the mandibular plane angle tend to be larger than normal. The overbite is less pronounced and lower facial height tends to be excessive. It is this type case that is most troublesome. The growth manifestation of the mandible is in a more clockwise rotation. With treatment these potentials might be accentuated; the more complex the treatment, the more obvious. The prognosis can be considered poor if not corrected

before the major growth of the face has taken place.

It is wise in these individuals to start extraoral traction at an early age, preferably at the time of the eruption of the maxillary lateral incisors. The object of this treatment is to redirect the maxillary growth to reduce facial convexity. Some authors suggest this therapy at an even earlier age with the intent to get maximum orthopedic effect.

Both the direction and amount of extraoral force are important for desired results. Forces from 500 grams to 2500 grams have been suggested for effective reaction. The success of treatment is based on patient cooperation and growth in *all* orthodontic treatment, but it is of utmost importance here.

When the lower arch is without tooth-arch discrepancy and a normal vertical relationship is present, these cases respond well with single-arch extraoral traction therapy.

This treatment is considered first phase and should not be confused with comprehensive treatment, although on occasion this may be the only correction necessary. The patient must be observed postoperatively over an extended period of time. Furthermore, continued use of the extraoral gear may be necessary to retain the desired results to maturity.

With a Class II, Division I malocclusion lacking vertical growth of the lower face, the patient tends to have adequate depth of face, but at the same time has both a dental and skeletal Class II, Division 1 relationship. This individual may reflect a pseudo arch-tooth discrepancy as is frequently seen in Class II, Division 2 malocclusions.

The characteristics are an acute Y-axis and X-axis. The lower facial height will be inadequate. This case will not respond well to cervical or headgear therapy alone.

To accomplish correction, the vertical dimension of the lower face must be increased. Therefore, intraoral elastics should be applied in addition to extraoral forces. Depression of the lower anterior teeth also assists in effecting a change to normal.

Once correction is made, there is a tendency of regression in the vertical overbite. Therefore, the over-opening of the bite must be emphasized. The prediction is that approximately 50 percent of the vertical overbite will return.

Correction of the vertical dimension deficiencies is best accomplished between the mid and late period of the mixed dentition.

The Class II, Division 1 malocclusions can be deceiving in analyzing the available space for teeth. The clinician can be led to extraction procedures when they do not apply.

The cardinal factors to be evaluated are:

1. The crowded condition of the mandibular incisors.
2. The closed bite.
3. The lingual axial inclination of both the maxillary and mandibular incisors.
4. The presence of a short lower face.
5. The observation of an apparent arch-length insufficiency in the maxillary arch.

This classification is tooth and bone oriented and, with equal magnitude, the muscles of the lip and tongue are affecting mandibular incisor tooth relationship.

Serial extraction studies indicate that the severity of arch-tooth discrepancy is difficult to assess in Class II, Division 1 mixed dentition and conclude that reduction of the Class II to Class I before extraction is the proper approach.

The Division 2 malocclusion follows

a pattern similar to the Division 1 closed-bite case. The lack of vertical dimension of the lower face necessitates opening of the bite. This in turn will minimize the apparent arch-tooth discrepancy of the lower arch.

The Division 2 relationship of the maxillary anteriors can, in fact, contribute to the lingual axial inclination of the mandibular incisors. This incisal contact can also produce a pseudo-retrognathic relationship of the mandible. Ricketts demonstrated that approximately two thirds of the Class II, Division 2 malocclusions are of this character. Upon release of this interference the correction responds favorably as a mandibular relocation.

In summary, a conservative approach should be made to serial extraction in the Class II malocclusion, principally those with a short lower facial dimension as is characteristic of the Class II, Division 2 case.

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DISCUSSION OF DR. Q. RINGENBERG'S PAPER

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I want to thank Dr. Ringenberg for the contribution his paper has made to our scientific session, and also for his promptness in sending me his essay for review. It is not only a distinct pleasure but also an honor indeed to discuss his paper. Most of the time as part of a listening audience or when reading the literature we approach a paper with a receptive, positive mood trying to gain as much knowledge as possible from the experience, rather than having uppermost in our minds a critical evaluation. Even though you have charged me with a discussor's role, I still have approached Dr. Ringenberg's paper with a receptive mood rather than from a

critical standpoint. However, I will try to bring forth honest differences where I found them to exist. I will not try purposely to play the devil's advocate as I have been told before that I already naturally possess those irritating qualities.

There is not a great deal in the paper that I would take strong issue with, and it may be possible that some areas of differences may not be differences at all, but only semantic problems.

I do not intend going through the paper, line by line, picking out minor irregularities and base my discussion on them. Instead I hope to grasp the basic concepts developed and comment and expand upon them.

With that in mind I would like to read several statements from various parts of the paper. "It is most likely that girls will be treated at an earlier age than boys because of their accelerated dental development." Another quote, "the earliest point to be considered in the treatment of the Class II, Division 1 case is after the eruption of the maxillary lateral incisors." And, finally, "the latest that Class II headgear therapy should be initiated is 14 years of age when all deciduous teeth have been lost and second molars may even be present." If I am interpreting Dr. Ringenberg's statements correctly, he seems to be relating the timing of Class II treatment to dental development. It would seem to me that a better guide to treatment timing in this type of case would be skeletal maturation or development. I would try to capitalize on as much growth as possible and certainly the entire pubertal growth spurt regardless of the stage of eruption.

Another thought the essayist develops well throughout his paper in regard to Class II early treatment is found in the following quotes. "In this stage it is the purpose to establish a normal den-

ture and skeletal relationship"; "once a normal functional relationship has been established, it can be expected that growth will proceed in a more perfect manner"; "in the first stage of treatment, the basic plan is to establish a climate for the best possible growth. This climate is established by producing a normal interdigitation of teeth during the period that major growth and development of the face is taking place. With this best possible functional pattern, the ultimate treatment goal can be obtained more readily." And, finally, talking about the severe Class II with a retrognathic convex face with a large denture base discrepancy, he feels this type of case is most troublesome. The prognosis can be considered poor if not corrected before the major growth of the face has taken place.

To get things back on the right track so development can proceed more normally is a concept that I agree with and I think most of us do.

I would agree, as Dr. Ringenberg has stated, serial extractions are not indicated in Class II, Division 2 malocclusions. He goes on further to say that the deep bite or incisal contact in such a case can also produce a pseudo-retrognathic relationship of the mandible or a distal shift. In that connection he mentions Ricketts' research where he (Ricketts) demonstrated two thirds of the Class II, Division 2 malocclusions are of this character. Upon release of this interference the correction responds favorably as a mandibular relocation. I would not advocate putting clinical observations up against carefully controlled research, but, nevertheless, it has been my clinical observation that I do not see this very often let alone two thirds of the time. These cases are usually good horizontal growers and one can reduce the Class II in a reasonable time but spontaneous relocation of the

mandible upon unlocking the deep bite is questionable.

Again, speaking of Class II, Division 2 and the vertical dimension or deep bite, it is stated that depression of lower anterior teeth also assists in effecting a change to normal as well as elastics and extraoral force, and that the prediction is that approximately 50% of the overbite will return. I simply want to point out, as Isaacson and others have done in the early 70's, that this may not be so much dental relapse as a continuation of counterclockwise rotational growth of the mandible.

Now just a few words about serial extraction. I, generally, agree with the indications and contraindications that are outlined in the paper. In his very early work the essayist observed that growth had been affected by serial extraction, but did not observe this in his later studies. The explanation is to be found in some of his other writings that many patients in the initial study had enucleation procedures and, therefore, it is understandable that growth could have been affected. I am, also, enthusiastic regarding serial extraction. Physiologic tooth movement is a principle that I highly subscribe to. Serial extraction following through with premolars allows for good self-adjustment. If one is not privileged to examine an overcrowded case until the permanent dentition is complete, the extraction of four first premolars and observation of physiologic tooth movement for 6-12 months with or without holding arches can be a satisfying experience. Appliance treatment time and even anchorage requirements can be reduced. In

nonextraction cases one might start out by extracting deciduous cuspids for incisor adjustment but not follow through with permanent extractions, planning at some point to step in with headgear or a lower lingual arch. I have in mind the maxillary arch of a Class II, Division 2. With just the deciduous cuspids out, one may not see a great deal of mesial movement of buccal teeth even when uncontrolled.

Along with Dr. Ringenberg, I feel there is a distinct group of cases that lend themselves well to serial extraction and that Class II cases are not among them. One question still remains in my mind regarding the following statement, "Serial extraction studies indicate that the severity of arch-tooth discrepancy is difficult to assess in Class II, Division 1 mixed dentition." The question is why; maybe Dr. Ringenberg can explain it.

Dr. Ringenberg has been involved in serial extraction research in excess of 20 years. He is an advocate of serial extraction and is very enthusiastic regarding its possibilities; nevertheless, he has been able to discipline himself in the select and discriminate use of the procedure. In spite of his enthusiasm for the technique, his writings declare the disadvantages and contraindications, the negative things, as much or more than the positive aspects of the procedure. He presents the topic of serial extraction fairly, pointing out that it is no panacea for our orthodontic ills and calls for conservatism at all times; for this I respect him very much.

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