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Multiple Phases of Orthodontic Treatment/Why and When?

Is there a long-term value to more than one phase of orthodontic treatment in contemporary patient management?

This question is asked every day by those who treat or refer patients for their orthodontic care. The practicing orthodontist constantly confronts this decision during treatment planning.

Are the results of multiple-phase treatment more esthetic? More stable? More functional with better occlusion?

The answer seems to be- it depends! It depends upon the problems to be solved, including the type of dentofacial irregularity and the malocclusion to be corrected.

Orthodontists in contemporary practices see much more than simple Class I high cuspid crowded cases. Recognition of the spectrum of deformities and resulting malocclusion has broadened. No longer are practitioners looking only at molar relationships, incisor rotations and crowding. The concept of "think faces as well as braces" is being emphasized.

In order to understand faces, it is necessary to look at the underlying skeleton and its relationship to the three planes of space:

- I. Transverse (side to side)
- II. Sagittal (front to back)
- III. Vertical (up and down)

Not only is it necessary to look at all three planes of the skeletal, but it is also imperative to include the potential assistance of available growth and the value it might represent to the correction of the skeletal disproportion.

What are the possible stages of treatment? There are five classifications of treatment timing:

- 1. deciduous dentition
- 2. early mixed dentition
- 3. late mixed dentition
- 4. early permanent dentition
- 5. mature adult dentition

Three of these may be considered early treatment. The effectiveness of early treatment can be correlated with the Angle Classification of the Malocclusions: Class I, II, and III. Quite simply, the treatment procedure selected is based on identification of the problem areas and timed with the stages of dentition development that will provide the greatest potential for improvement and correction.

When the problem is to be solved by modifying the skeletal abnormality and the resulting functional problems, it is necessary to evaluate the plane of space in which the abnormality is located. The complexity increases when there is more than one plane involved and when the skeletal discrepancy affects both jaws. In some cases, the facial disproportion may originate in the craniofacial bones rather than in the jaws. The scope of this discussion will be limited to the maxilla and the mandible.



Transverse Discrepancy



Sagittal Discrepancy



Vertical Discrepancy

I. Transverse Discrepancies (side to side)

Management of transverse discrepancies of maxilla has become readily manageable with the advent of palatal expansion to increase the transverse width of the maxilla. The often accompanying mandibular shift in maxillary transverse discrepancies and the alveolar adaptation in both arches result in a posterior alveolar narrowness that often is expressed in a unilateral crossbite of the buccal segments when the teeth are in maximum occlusion. Maxillary transverse discrepancies can be readily corrected with palatal expansion at any age beyond the completion of the eruption of the deciduous dentition and through the late mixed dentition and early permanent dentition. (Fig. 1 and 2)



Fig 1: Midline discrepancy evident with a posterior crossbite



Fig 2: Rapid Palatal Expansion (RPE)

II. Sagittal Discrepancies (Front to back)

Sagittal discrepancies (antero-posterior discrepancies) must be evaluated as to the lack of development or excess development of the maxilla and/or the mandible. Classes II, Division I Malocclusion often are described as either maxillary excess, mandibular deficiency or a combination of both. Oversimplification may create misdiagnosis and, therefore, an inappropriate treatment plan, resulting in subsequent incorrect treatment,

A brief summary of sagittal discrepancy problems, their treatment and timing follows:

A. Early maxillary protrusion and alveolar protrusion with a normal mandible may require only an application of external traction to the maxilla (i.e., headgear) (Fig 3)

plus incisor brackets and an arch wire. Treatment is best effected by intervention in the late mixed dentition and early permanent dentition stages.

B. Hypoplasia and deficiency of the mandible with a normal maxilla may require the appropriate growth modification appliance- such as a Twin block appliance, activator or Herbst/ Mara— to achieve the sagittal correction. Treatment is best effected during active growth. (Fig 4)

C. Maxillary and mandibular skeletal retrusion may require skeletal protraction mechanics to advance the underlying dentition and alveolar processes. These types of skeletal disproportions are best treated from the early mixed dentition to the early permanent dentition stages.



Fig 3: Patient wearing a headgear.



Fig 4: A Herbst Appliance

III. Vertical Discrepancies (Up—down)

Maxillary vertical discrepancies may additionally have a component of sagittal as well as transverse deficiency. Protraction of the maxillary complex with an orthopedic facial mask can change the relative position of the maxilla in both the vertical and sagittal relationships. The effect of maxillary protraction is enhanced with maxillary transverse expansion in combination with the vertical lengthening vector of the protraction. (Fig 5)

A pseudo-mandibular prognathism may result from the forward positioning and over closure of the mandible in a maxillary deficiency case. The mandible may be repositioned in such a case by the reciprocal force of the protraction of the maxilla. If form follows corrected function, normal upper and lower jaw relationships should develop when the disproportion is corrected.

There are three planes of space to consider when diagnosing a case : transverse, sagittal and vertical.

Early recognition, referral and treatment of patients demonstrating maxillary deficiency is important. The greatest impact of Class III treatment with maxillary advancement is achieved if treated in the deciduous dentition and early mixed dentition stages, with less effect in the late mixed dentition stage. This is partially the result of improved patient cooperation in younger children.

True mandibular prognathism is not managed in this fashion. Currently it is best treated as a combined orthodontic and surgical correction after substantial growth has been completed. A family history and consideration of genetic background is important to determine the probability of the development of a True Class III.

Multiple stages of orthodontic treatment can have a satisfactory result if applied properly to the skeletal abnormality through interceptive and growth modification therapies and can have a positive effect on the developing jaws, alveolar processes, dentition and final facial form and appearance.

Multiple phases of treatment must have defined goals and time frames for each phase. The existing literature concerning multiple phases of treatment indicated that one stage of treatment alone does not always satisfy the patient's needs with predictably consistent results, i.e., a stable occlusion in a well-balanced face. When the skeletal components can be modified early into a more balanced relationship, the final phase of tooth alignment with alveolar ridge adaptation often will be more predictable and stable, requiring shorter period of treatment. The definitive phase of treatment usually is started close to the time of second molar eruption.

The two phase-concept of the "first balancing the underlying skeleton, then aligning the dentition" does not address the issues of extraction, non-extraction, rotations, crowding, etc. These issues tend to more tooth-to tooth and alveolar ridge adaptation problems. The long-term stability of altered jaw relationship and the stability of the final occlusion in the multiple-phase treatments is being studied in orthodontic graduate departments. Proper understanding and diagnosis of the etiology of the malocclusion is the key to its correction. Today's clinician is better able to handle skeletal disproportions and reform "facial orthopedics" than at any time in the history of orthodontics. This factor provides the patient with a better prospect of a well-balanced occlusion in a well-proportioned face.

Effectiveness of the multiple-phase treatment concept as opposed to single-phase treatment should constantly be evaluated by the practitioner for best treatment results. Differential diagnosis carefully considering the nature of the orthodontic and skeletal discrepancies in the individual patient is the key to successfully determining whether multiple-phase treatment is indicated. Delayed single-phase treatment may well be the treatment plan of choice. The patient will benefit if thorough consideration is given to treatment time, quality of final treatment results, cost, ease and comfort to the patients in determining whether multiple -phase treatment is indicated.



Fig 5 : Skeletal Class III Early Treatment. Patient is given a face mask to wear.

References

1. Orthodontic Dialogue, Vol 5, number 2, 1993
2. Proffitt et al, 1998 edition

*****Please note : all cases shown in this newsletter were treated by The Brace Place Doctors*****

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1. T, 2. T, 3. T, 4. F, 5. T,

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Our next issue will be on Clinical Management of Class II Malocclusions : Guidance During Growth

1. T F Transverse discrepancies can also be described as "front-back" discrepancies.
2. T F A sagittal discrepancy can be described as a maxillary protrusion with a normal mandible.
3. T F Many maxillary vertical discrepancies may have a sagittal as well as transverse deficiency.
4. T F True mandibular prognathism is best managed by orthodontics alone.
5. T F In order to understand faces, it is necessary to look at the underlying skeleton and its relationship to three planes of space : transverse, sagittal , and vertical.