Bio-Progressive Therapy, Part 3: Visual Treatment Objective or VTO

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A Visual Treatment Objective (VTO) is like a blueprint used in building a house. It is a visual plan to forecast the normal growth of the patient and the anticipated influences of treatment, to establish the individual objectives we want to achieve for that patient. Treatment for a growing patient must be planned and directed to the face and structure that can be anticipated in the future, not to the skeletal structure that the patient presents initially. The treatment plan should take advantage of the beneficial aspects of growth and minimize any undesirable effects of growth, if possible.

The Visual Treatment Objective permits the development of alternative treatment plans. After setting up the teeth ideally within the anticipated or "grown" facial pattern, the orthodontist must decide how far he must go with mechanics and orthopedics to achieve his goals, whether it is possible to achieve them, and what the alternatives are.

Once treatment has begun, there is a continuing need for a visual goal against which treatment progress can be measured and monitored. By superimposing a progress tracing between the original tracing and the forecast goal, the orthodontist may evaluate progress along a definitely prescribed route. Any deviation from expected progress will become apparent immediately and the need for midcourse corrections will be recognized and can be instituted early. Although the majority of individuals react predictably to treatment, particular individuals may deviate from the usual pattern and require alterations in strategy. Differences in response to treatment may result from lack of patient cooperation, variations in growth patterns, or from ineffective orthodontic mechanics. The necessity for this type of monitoring is important in accommodating treatment to individual variability.

The VTO forecast is valuable for the orthodontist's self-improvement in that it permits him to set his goals in advance and compare them with the results at the end of treatment. Identification of the discrepancies between goals and results provide him with an objective picture of the areas in which his treatment could be improved.

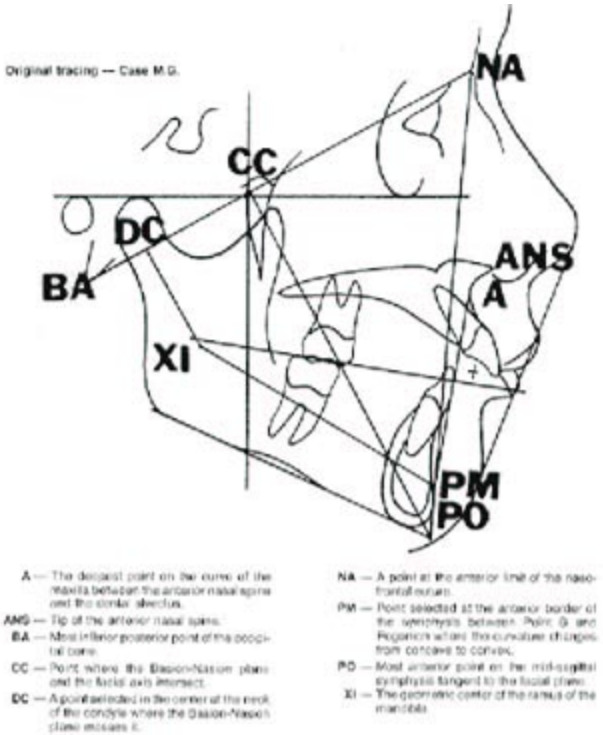
Construction of the VTO

We are going to present a step-by-step procedure to permit you to construct a VTO for Case M.G. in the following sequence (putting in average growth for an estimated two-year period of active treatment and the objectives that we wish to achieve with our mechanics):

1. the cranial base prediction
2. the mandibular growth prediction
3. the maxillary growth prediction
4. the occlusal plane position
5. the location of the dentition
6. the soft tissue of the face

You will need tracing paper, a red pencil, and a millimeter ruler.

Read the instructions for each step in the construction of the VTO carefully, and return to the original tracing of Case M.G. on this page to trace the successive portions of your VTO. When you have completed each step, check your tracing with the red tracing for that step and with the composite on the same page.

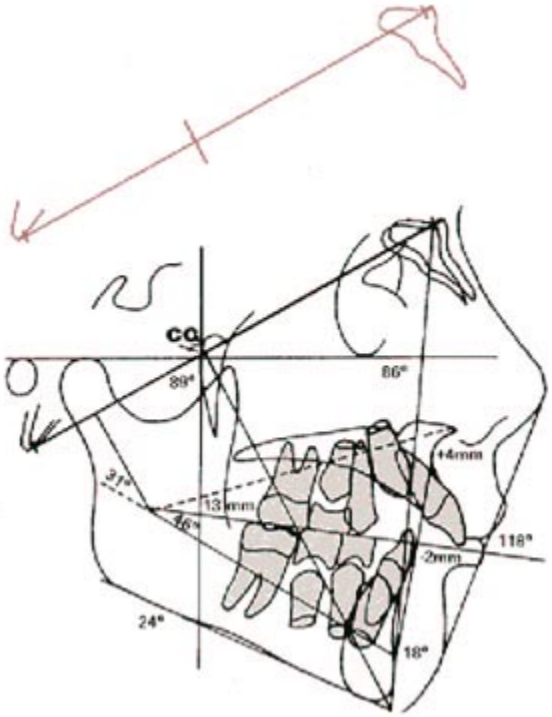


A — The deepest point on the curve of the maxilla between the anterior nasal spine and the dental alveolus.
ANS — Tip of the anterior nasal spine.
BA — Most inferior posterior point of the occipital bone.
CC — Point where the Basion-Nasion plane and the facial axis intersect.
DC — A point selected in the center of the neck of the condyle where the Basion-Nasion plane crosses it.
NA — A point at the anterior limit of the naso-frontal suture.
PM — Point selected at the anterior border of the symphysis between Points B and Pogonion where the curvature changes from concave to convex.
PO — Most anterior point on the mid-sagittal symphysis tangent to the facial plane.
XI — The geometric center of the ramus of the mandible.

VTO -- Cranial Base Prediction

Place the tracing paper over the original tracing (page 745) and starting at CC point, follow these steps to construct the cranial base:

1. Trace the Basion-Nasion Plane. Put a mark at point CC.
2. Grow Nasion 1mm/year (average normal growth) for 2 years (estimated treatment time).
3. Grow Basion 1mm/year (average normal growth) for 2 years (estimated treatment time).
4. Slide tracing back so Nasions coincide and trace Nasion area.
5. Slide tracing forward so Basions coincide and trace Basion area.



VTO -- Mandibular Growth Prediction -- Rotation

The construction of the mandible and its new position start with the rotation of the mandible. The mandible rotates open or

closed from the effects of the mechanics used and the facial pattern present. The average such effect on mandibular rotation is as follows:

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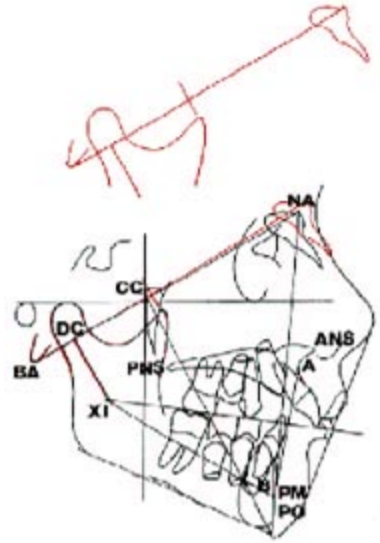
Mechanics

1. Convexity Reduction-- Facial Axis opens 1°/5mm.
2. Molar Correction -- Facial Axis opens 1°/3mm.
3. Overbite Correction -- Facial Axis opens 1°/4mm.
4. Crossbite Correction-- Facial Axis opens 1°-1½°. Recovers half the distance
5. Facial Pattern-- Facial Axis opens 1°/1 S.D. dolichofacial; 1° closing effect against mechanics if brachyfacial.

In constructing the VTO, these factors must be taken into consideration in deciding what can be expected to happen to the facial axis. Treatment may open the facial axis as with Class II mechanics, or it may close the facial axis as with the use of high pull headgear or due to extraction. Facial axis opens 1° for 5mm of convexity reduction, for 3mm of molar correction, and for 4mm of overbite correction. It opens 1° to 1½° in crossbite correction and recovers half that amount. For every standard deviation on the dolichofacial pattern side, it opens 1° and for every standard deviation toward the brachyfacial side, it tends to close one degree.

Return to tracing on page 745.

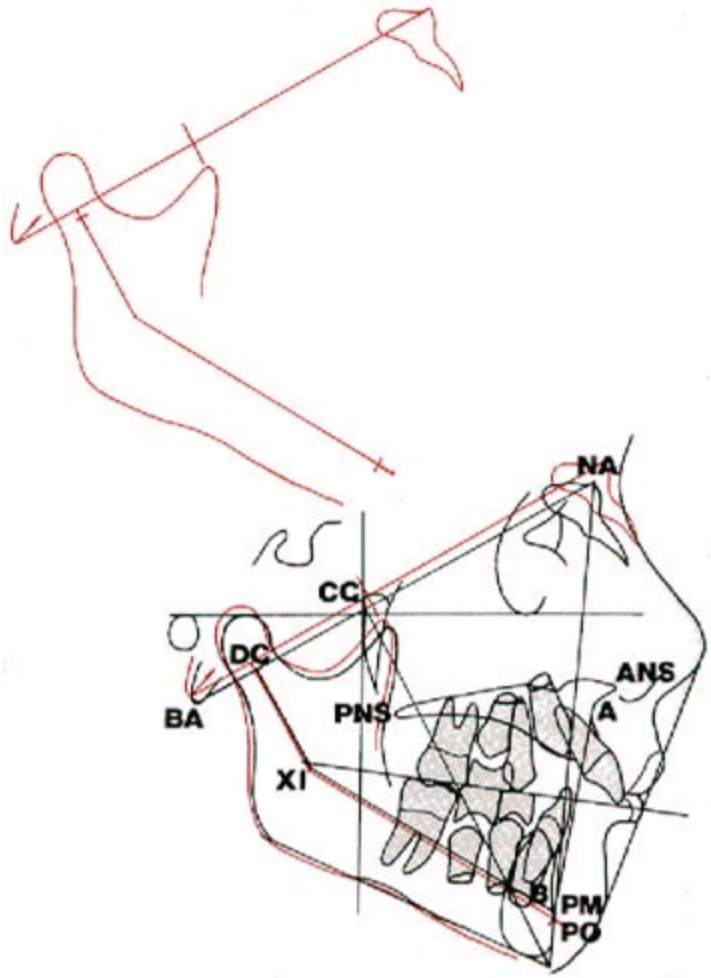
6. Superimpose at Basion along the Basion-Nasion plane. Rotate "up" at Nasion to open the bite and "down" at Nasion to close the bite using point DC as the fulcrum. This rotation depends on anticipated treatment effects (whether treatment can be expected to open or close the facial axis).
7. Trace Condylar Axis, Coronoid Process, and Condyle.



VTO -- Mandibular Growth Prediction -- Condylar Axis Growth & Corpus Axis Growth

Return to tracing on page 745.

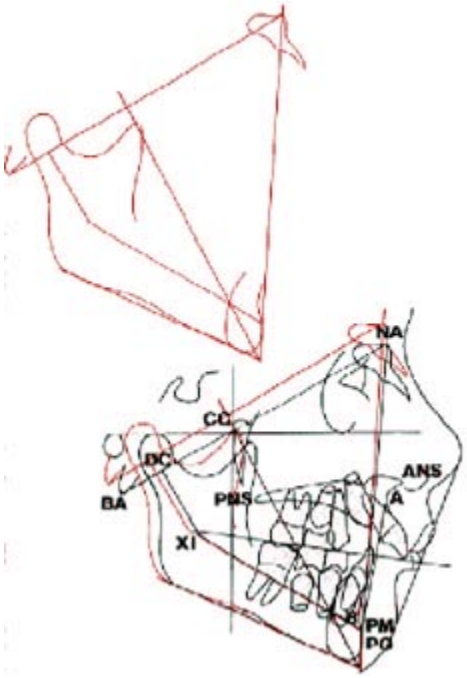
8. On condylar axis, make mark 1mm per year down from point DC.
9. Slide mark up to the Basion-Nasion plane along the condylar axis. Extend the condylar axis to XI point, locating a new XI point.
10. With old and new XI points coinciding, trace corpus axis, extending it 2mm per year forward of old PM point. (PM moves forward 2mm/year in normal growth.)
11. Draw posterior border of the ramus and lower border of the mandible.



VTO -- Mandibular Growth Prediction -- Symphysis Construction

Return to tracing on page 745.

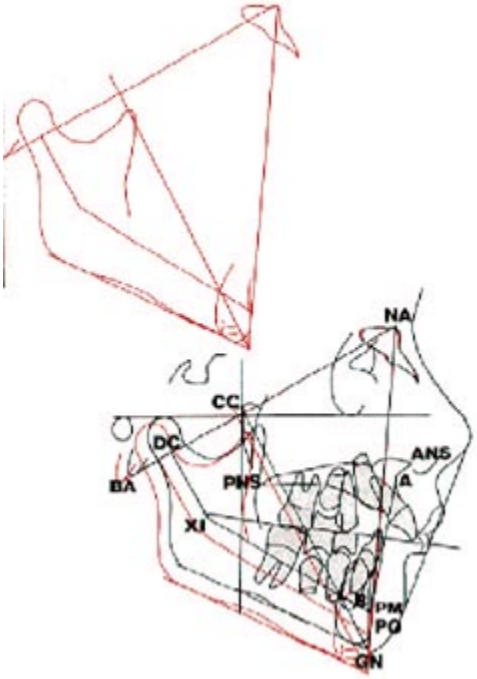
12. Slide back along the corpus axis superimposing at new and old PM. Trace the symphysis and draw in mandibular plane.
13. Construct the facial plane from NA to PO.
14. Construct facial axis from CC to GN (where facial plane and mandibular plane cross).



VTO -- Maxillary Growth Prediction

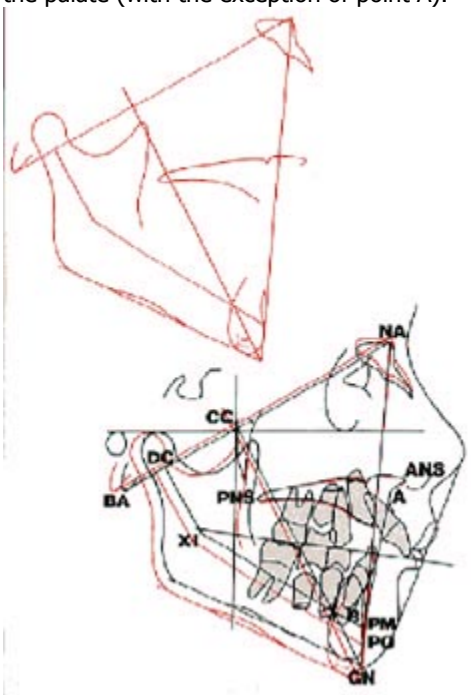
Return to tracing on page 745.

15. To locate the "new" maxilla within the face, superimpose at Nasion along the facial plane and divide the distance between "original" and "new" Mentons into thirds by drawing two marks.



Return to tracing on page 745.

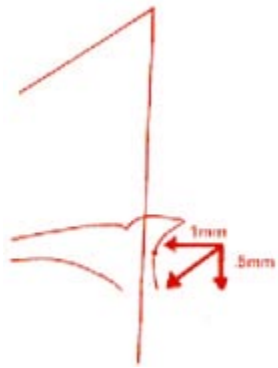
16. To outline the body of the maxilla, superimpose mark #1 (superior mark) on the original Menton along the facial plane. Trace the palate (with the exception of point A).



VTO -- Maxillary Growth Prediction -- Point A Change Related to BA-NA

These are the maximum ranges of Point A change with various mechanics:

Point A is altered as a result of growth and mechanics. Point A and a new APO plane are drawn by the following steps:



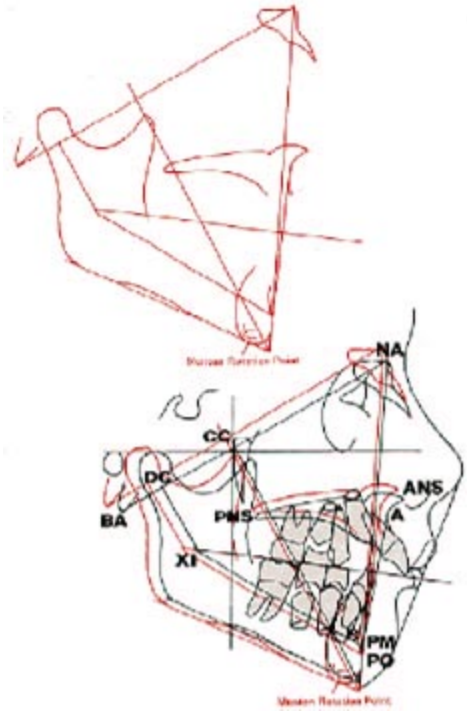
Return to tracing on page 745.

17. Point A can be altered distally with treatment. Place according to orthopedic problem and treatment objectives. For each mm of distal movement, Point A will drop ½mm.

18. Construct new APo plane. VTO -- Occlusal Plane Position

Return to tracing on page 745.

19. Superimpose mark #2 on original Menton and facial plane, then parallel mandibular planes rotating at Menton. Construct occlusal plane (may tip 3 degrees either way depending on Class II or Class III treatment).

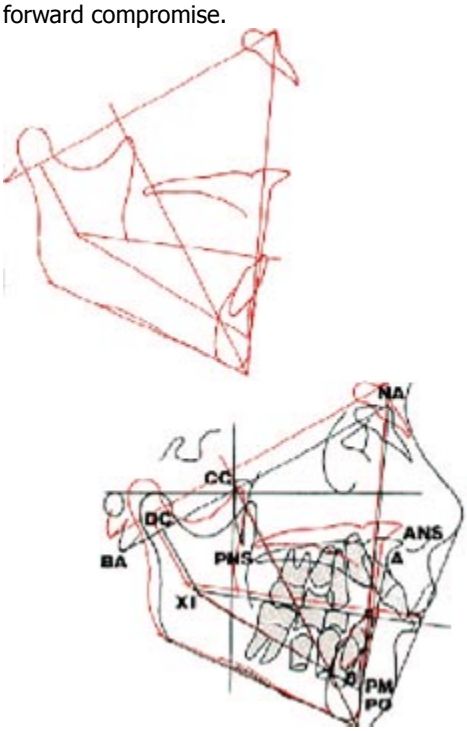


VTO -- Dentition -- Lower Incisor

The lower incisor is placed in relationship to the symphysis of the mandible, the occlusal plane and the APO plane. The arch length requirements and realistic results dictate its location.

Return to tracing on page 745.

20. For this exercise, superimpose on the corpus axis at PM. Place a dot representing the tip of the lower incisor in the ideal position to the new occlusal plane, which is 1 mm above the occlusal plane and 1 mm ahead of the APO plane.
21. Aligning over the original incisor outline or using a template, draw in the lower incisor in the final position as required by arch length. The angle is 22° at +1mm to the APo plane and + 1 mm to occlusal plane, but the angle increases 2° with each mm of forward compromise.



VTO -- Dentition -- Lower Molar

Without treatment, the lower molar will erupt directly upward to the new occlusal plane. With treatment, 1mm of molar

movement equals 2mm of arch length. We moved the lower incisor forward 2mm in this case. There was also 4mm of leeway space. Therefore, the following calculation allows us to move the lower molar forward 4mm on each side:

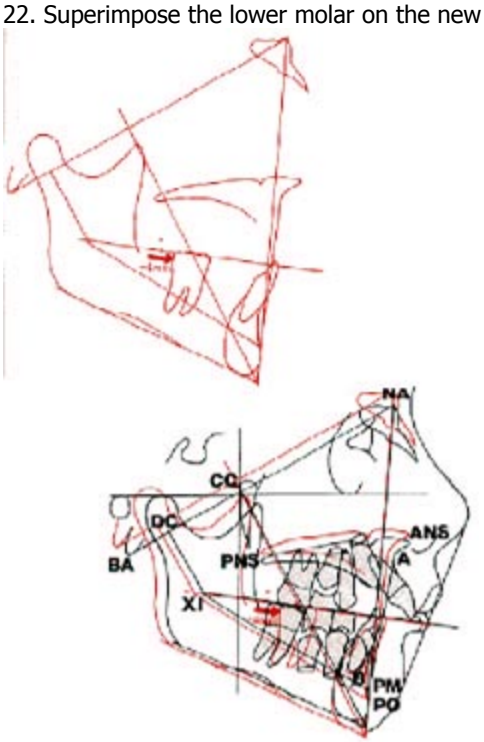
lower incisor forward 2mm = +4mm arch length leeway space = +4mm arch length

+8mm arch length

(lower molar forward 4mm on each side)

Return to tracing on page 745.

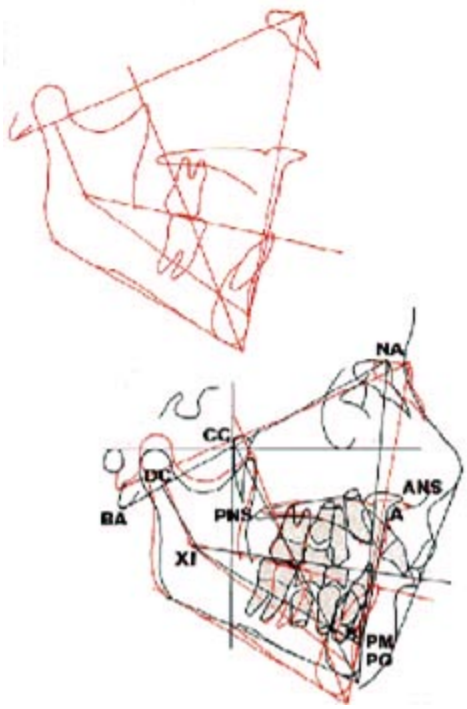
22. Superimpose the lower molar on the new occlusal plane at the molar (*), slide forward 4mm, upright molar and draw it in.



VTO -- Dentition -- Upper Molar

Return to the first tracing in the article.

23. Trace the upper molar in good Class I position to the lower molar. Use the old molar as a template.



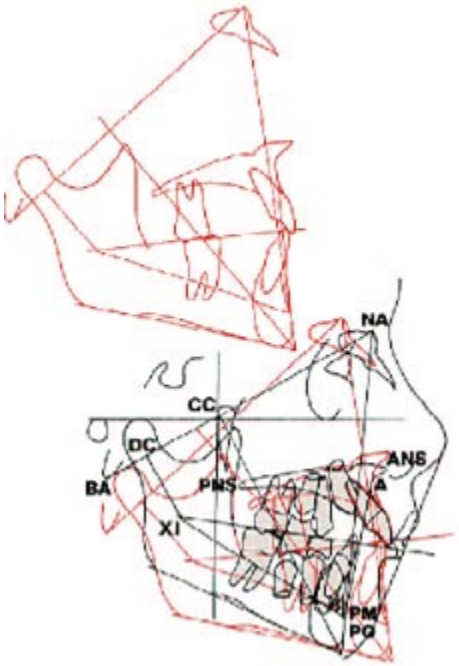
Example of using the upper molar as a template.

VTO -- Dentition -- Upper Incisor

Place upper incisor in good overbite-overjet position (2½mm overbite, 2½mm overjet) with an interincisal angle of 130° ± 10°. Open bite patterns at a greater angle, deep bite patterns at a lesser angle.

Return to tracing on page 745.

24. Trace the upper incisor in its proper relationship, aligning over the original incisor or by use of a template.

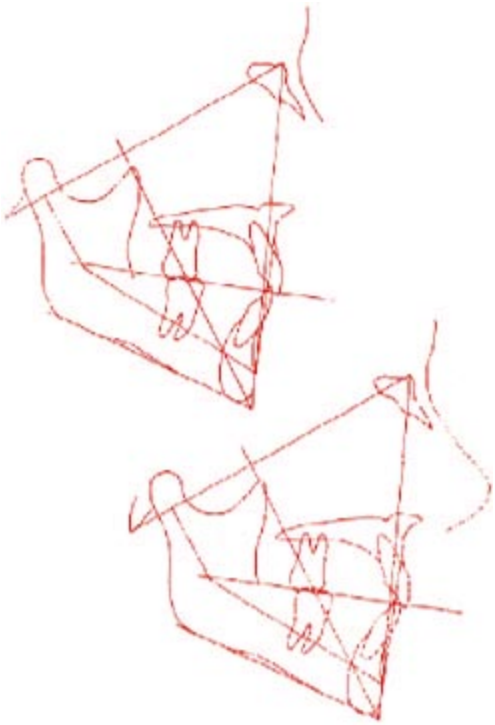


Example of using the upper incisor as a template

VTO -- Soft Tissue -- Nose

Return to tracing on page 745.

25. Superimpose at Nasion along the , facial plane. Trace bridge of nose.

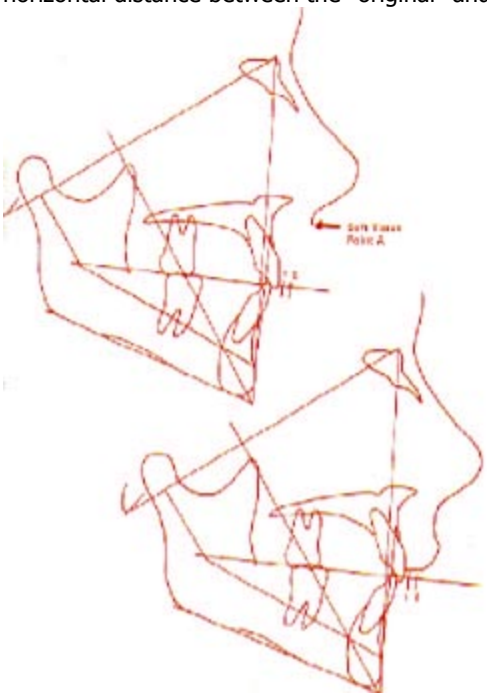


26. Superimpose at anterior nasal spine (ANS) along the palatal plane.
27. Move prediction "back" 1mm per year (therefore, 2mm in this case) along the palatal plane. Trace tip of nose fading into bridge.

VTO -- Soft Tissue -- Point A and Upper Lip

Return to tracing on page 745.

28. Superimpose along the facial plane at the occlusal plane. Using the same technique as for marking the symphysis, divide the horizontal distance between the "original" and "new" upper incisor tips into thirds by using two marks.



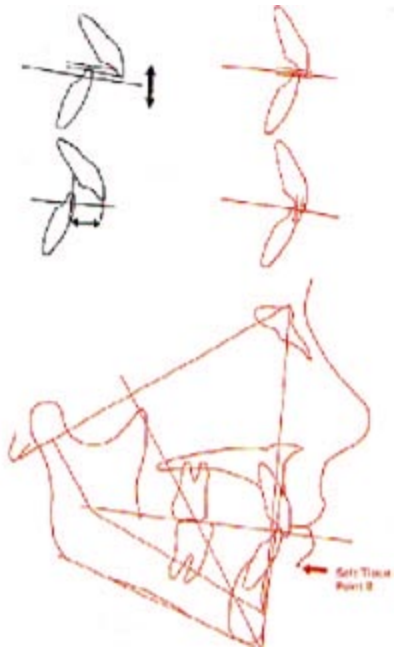
29. Soft tissue Point A remains in the same relation to Point A as in the original tracing. Superimpose new and old bony Point A, and make a mark at soft tissue Point A.
30. Keeping the occlusal planes parallel, superimpose mark # 1 (posterior mark) on the tip of the original incisor (slide forward 2/3rds).

Trace upper lip connecting with soft tissue Point A.

VTO -- Soft Tissue -- Lower Lip, Point B, and Soft Tissue Chin

In constructing the lower lip, we bisect the overjet and overbite of the original tracing and mark the point. We then bisect the overjet and overbite of the VTO and mark the point.

OVERBITE, ORIGINAL , VTO , OVERJET



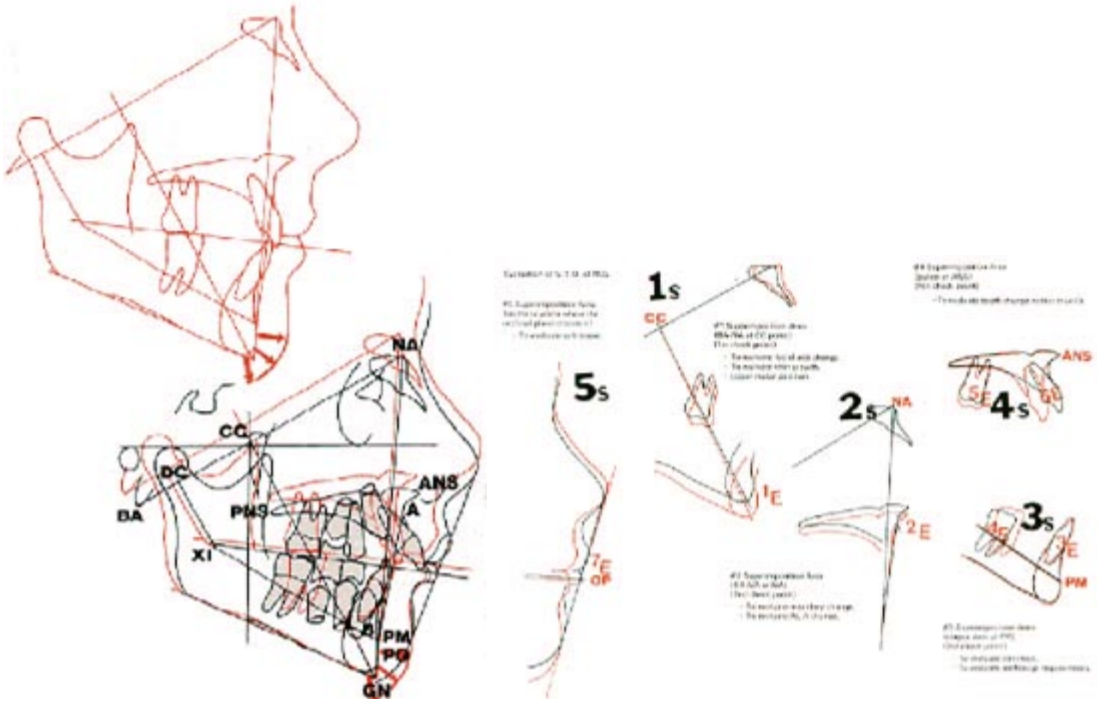
Return to tracing on page 745.

31.Superimpose interincisal points, keeping occlusal planes parallel.Trace lower lip and soft tissue B point. The soft tissue below the lower lip remains in the same relation to point B as in the original tracing. Soft tissue point B drops down as the lower lip recontours.

VTO -- Completed Visual Treatment Objective

Return to tracing on page 745.

32. Superimpose on the symphyses,and arrange the soft tissue of the chin. It "drops down" and should I be evenly distributed over the symphysis taking into consideration reduction of strain and bite opening.



If you have completed the steps, you now have your Visual Treatment Objective. Take your

VTO and superimpose it in the five superimposition areas to establish your individual objectives for this case.

In Superimposition Area 1 (Basion-Nasion at CC), Evaluation 1 is chin change. In this case, our objective is to allow 2° of opening of the facial axis, to expect the amount of chin growth shown, and to expect that the upper molar will grow down the facial axis.

In Superimposition Area 2 (Basion-Nasion at Nasion), Evaluation 2 is maxillary change. One of our objectives is to reduce point A only 2mm in this case.

In Superimposition Area 3 (Corpus Axis at PM), Evaluation 3 is the lower incisors. In this case, we are just tipping the lower incisors slightly. In Superimposition Area 3 we also have Evaluation 4, the lower molars. In this case, we are advancing the lower molars approximately 4mm.

In Superimposition Area 4 (Palate at ANS), we have Evaluation 5, the upper molars. In this case, all we have to do is hold the upper molars, even though this is a Class II division 1 malocclusion. Superimposition Area 4 also includes Evaluation 6, the upper incisors, and we see that we are going to have to distalize the upper incisors.

In Superimposition Area 5 (Esthetic Plane at the intersection with Occlusal Plane), we have Evaluation 7, the soft tissue, and we see that we are going to have a great amount of soft tissue reduction in this case.

In our next article, we will show the use of the superimposition areas and evaluation areas to establish treatment design.

(TO BE CONTINUED IN NEXT ISSUE)

Footnotes

1. PART 1 The Management UmbrellaPART 2 Principles of the Bio-Progressive TherapyPART 3 VISUAL TREATMENT OBJECTIVE OR V.T.O.PART 4 The Use of Superimposition Areas to Establish Treatment DesignPART 5 Orthopedics in Bio-Progressive TherapyPART 6 Forces Used in Bio-Progressive TherapyPART 7 The Utility and Sectional Arches in Bio-Progressive Therapy MechanicsPART 8 Bio-Progressive Mixed Dentition TreatmentPART 9 Mechanics Sequence for Class II Division I CasesPART 10 Mechanics Sequence for Class II Division II CasesPART 11 Mechanics Sequence for Extraction CasesPART 12 Finishing Procedures and Retention