Bioprogressive Simplified, Part 1: Diagnosis and Treatment Planning

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Translating orthodontic skills into a bona fide delivery system is one of the most difficult tasks faced by clinicians. With technology becoming ever more complex, it is impossible to create an efficient system without simplifying both technical and managerial procedures. The best orthodontic managers are able to identify the necessary information and leave out the extraneous.

After studying many treatment disciplines, I chose the Bioprogressive approach because it was the most flexible. In this series of articles, I will try to make a seemingly complex technique simpler.

Visual Treatment Objective

The VTO, as developed by Holdaway and modified by Ricketts, is a logical framework for organizing and simplifying individual treatment mechanics. The original approach was criticized because of the unpredictability of growth, but there are several reasons why the VTO remains useful.

First, orthodontic movements are more significant than growth changes during the two or three years of orthodontic treatment. Although the VTO is based on average growth increments, it is an educated guess that accurately represents the general direction of growth, if not the exact amount.

Second, the VTO leads the clinician toward a viable treatment plan by organizing factors such as growth direction, symmetry, arch length, and esthetics. The thought process is as important as the actual prediction in arriving at an achievable set of treatment objectives.

Many clinicians prepare a complete VTO with specific growth components, anticipated orthopedic and dentoalveolar movements, and esthetic results (Fig. 1). But the superimpositions that define the practical part of the mechanical procedures (anchorage loss, intrusion, torque control, and orthopedic change) can be used without including the often inaccurate growth predictions, because the amount of growth is not critical in evaluating specific mechanical requirements in individual cases (Fig. 2).

The technician can draw in the entire skeletal framework, up to the point of the convexity change, to provide a more lifelike tracing. The diagnostician then need add only those areas that require treatment decisions.

I generally reduce convexity whenever maxillary orthopedic change is needed, but I have not found that more than 3-4mm of orthopedic change can be expected on average. If a headgear or orthopedic appliance is used, patient cooperation--which can be unpredictable at the start of treatment--will play a major role.

The first step is to place the lower incisor in relation to the APo line. Anchorage and extraction decisions are made based on the amount of advancement or retraction of the lower incisor and an accurate arch-length analysis. The lower molar is then placed, depending on lower arch crowding or spacing, and the upper molar and finally the upper incisor are added.

Occlusal Paralleling Instrument

Arch-length deficiency is one of the most critical aspects of diagnosis, yet one of the most difficult to measure accurately. Most clinicians add extraneous criteria rather than simply measuring embrasure break.

One of the most accurate measuring devices is the mandibular occlusal x-ray. Unfortunately, the x-ray source is usually not perpendicular to the film, thus distorting the overlapping contact points.

An apparatus called an Occlusal Paralleling Instrument (Fig. 3) solves this problem. A plate holding the x-ray film is placed in the patient's mouth, and the tube head is fitted into a small plastic cylinder that holds the x-ray source perpendicular to the film. It has been found that bringing the x-ray source as close as possible to the underside of the mandible yields an average enlargement of 3% with this technique. In other words, the amount of embrasure break (or crowding) is magnified by 3%, an insignificant amount.

Arch-length deficiency or excess is then measured with a millimeter rule at each contact point in the arch (Fig. 4). The sum of the positive and negative values is the true arch-length deficiency.

This method automatically takes into account the amount of arch length necessary to level a deep curve of Spee. When the curve of Spee is made flat on the x-ray, embrasure breaks will be visible from the first molar to the cuspid region, even if no crowding is apparent on the model.

Available E space can also be determined accurately with this technique. Although a 2.4mm gain is considered average, it is not unusual to pick up 3-5mm in cases where there is a large size discrepancy between the deciduous second molars and the erupting second bicuspids.

An accurate measurement of arch-length deficiency--combined with the clinician's judgment of dental and facial changes required--is used in the simplified VTO to produce a reasonable treatment goal. In this first part of Bioprogressive Simplified, I will demonstrate how to organize and simplify the process of diagnosis and case presentation so that these elements are integrated into specific clinical procedures (Fig. 5).

Diagnostic Procedures

In my opinion, the process of setting up the jaw framework, placing the teeth in appropriate positions, and setting treatment goals requires that the orthodontist perform the VTO. This process should take no more than 10 minutes per case. Other diagnostic tasks can be delegated to staff members.

There are two consultations every working day in my office. I do the diagnosis and write-up for these cases between 9 and 9:20 a.m., while the staff is preparing for the first of our long appointments. The records are placed on a large tracing box in the consultation room.

I usually follow the same sequence in making each diagnosis.

1. First, I study the facial photographs to evaluate muscle balance and esthetics, and to help recall the patient from the initial examination.

2. I refer to my notes, which typically include:
The patient's enthusiasm for orthodontic treatment. I grade patients as "A" for enthusiastic, "B" for average, or "C" for resistant. It makes no sense to do a complex diagnostic workup if the patient is incapable of cooperating. For example, if a patient assures me that he or she will not wear headgear, it could contraindicate nonextraction treatment.
Responsible parties' financial condition, schedule considerations, and attitudes toward dental health and esthetics. It would be wrong for an orthodontist to force an esthetic ideal on a patient who is looking for something else. The clinician might want a full facial profile, but the patient or family might want the profile reduced. An astute clinician considers other factors besides mechanical or cephalometric ones.

3. Next, I review the panorex and bite wing x-rays to appraise overall tooth position, bone condition, and dental health (including caries). I carefully study the laminagraphs of the temporomandibular joints. A diagnosis can prove impossible to achieve if joint disorders or discrepancies in centric relation and occlusion are overlooked.

I prefer to study all these x-rays and photographs before looking at the study models and lateral headfilm. Although a good chairside clinician usually knows the final diagnosis after the initial examination, it is best not to make up one's mind before ail the facts are considered. The unusual cases are the ones that become orthodontic nightmares.

A common tendency to be avoided is to begin considering mechanotherapy factors at this point. A better diagnosis is achieved by studying all the facts, without preconceived notions, and then using these facts to create an accurate VTO. The clinician's intuitive judgment of the case is important, but it should be used at the appropriate time--after all the diagnostic facts have been taken into account.

4. The measurement of arch-length deficiency comes next.

5. Interpretation of the information begins to suggest possible solutions when analyzing the study models. Alternative VTOs can be weighed by considering arch form, rotations, inclinations, tooth-size discrepancies, and other factors.

6. Finally, I consider the cephalometric x-ray. I first "eyeball" the headfilm to get an overall impression. I start in the cervical area and move up through the cranial base, down through the maxilla, into the mandible, and out over the profile (Fig. 6). This process of finding disparities between one area and another could be called a "visual norm analysis".

Such analysis can be accurate, but it can't be communicated without angular and millimetric measurements. I recommend using only those required to define the problem and to describe areas that can be changed.

7. My next step is to write a summary description like this: "Class II, division 1 dolichofacial type with severe maxillary and dental protrusion, retruded lower arch, moderate crowding, and congenitally missing upper left lateral incisor" (Fig. 7).

8. I begin the VTO by setting a reasonable goal for the lower incisor. Influential factors include the esthetic impact on the facial profile, the patient's opinion of fullness in the profile, the integrity of the labial palate, and the size and shape of anterior teeth. Here, the clinician's diagnostic skills and all the principles of good orthodontic treatment come together.

Today's patients are careful consumers who are not amenable to an autocratic treatment plan. For instance, I will often discuss potential extraction vs. nonextraction results at length with patient and parents before starting treatment.

It is helpful for patients and parents if the clinician draws the entire dentition and the facial profile in the VTO as artistically as possible. This drawing is used to explain the problem, and it later becomes a reminder of treatment goals.

9. After completing the VTO, I write the detailed treatment plan.

Consultation

There are two parts to our typical consultation. The first, given by the treatment coordinator, explains the diagnostic procedure. This takes about five minutes.

A series of backlighted prints is displayed (Fig. 8). The treatment coordinator might say, "A tracing of this x-ray is completed to describe what the problem truly is. As you can see, there are specific measurements taken on the head x-ray that define the problem for the doctor. Next, we use this static picture of the problem to do a projection of where we would like to see the individual teeth and jaws placed in your case. When we are all through with the orthodontic treatment, we will take another x-ray to evaluate the quality of the result and to determine specific needs for retention and follow-up."

Patients who are reluctant to ask questions of the doctor are often more comfortable asking an assistant. It is important that the treatment coordinator be an enthusiastic salesperson. Also, the staff member can say positive things about the doctor and the office that might appear boastful coming from the doctor.

The second portion of the consultation, which can take from five to 10 minutes, is handled by the orthodontist. As the treatment coordinator leaves the room, I ask her whether there were any concerns or problems that warrant further discussion. I can then tie up any loose ends and boost the confidence of patient and parents in particular areas.

Some orthodontists express concern over part of the consultation being given by a staff member. Although I do not feel the entire consultation should be delegated, I do believe that with proper teamwork the consultation enhances the patient's understanding of the problem, creates confidence in the office, and frees the doctor from some of the more mundane tasks.

We use the concept of "like and similar cases" to explain treatment mechanics. Photographs of all procedures used in the office are mounted in small plastic frames so they can be viewed on a light box (Figs. 9,10). These procedures range from separator placement to bonding to functional appliances.

If the case is presented in a logical sequence with visual aids, the patient will be convinced that the diagnosis was detailed and thoughtful. An understandable case presentation is a great motivational tool.

A Summary of Recommended Treatment (Fig. 11) is given to each patient after the consultation. It describes in layman's terms what the patient needs to know about the proposed orthodontic therapy.

Treatment Chart

After the consultation, all the diagnostic material is placed on the treatment chart. The top of the chart has a 4" x 6" summary area with the following information (Fig. 12):

Patient's name, address, and phone number.
A "nutshell" description of the problem.
The treatment plan, including a detailed sequence of mechanics and time estimates, plus any factors such as missing teeth or growth problems that might complicate the mechanics.
A synopsis of the VTO including major movements envisioned in the upper-lower incisor, upper-lower molar, and convexity areas.
The summary analysis and the seven measurements I use for my cephalometric synopsis.
Financial information including estimated treatment time, fee, and phase breakdown.

Reducing relevant information to this small area on the chart focuses attention on the bull's eye, the essence of treatment. This allows me to refresh my memory of the case quickly and prevents needless paperwork.

The proposed areas of change, as defined by the VTO, are entered on the chart by superimposing the static tooth tracing over the visualized objectives. These areas are critical in determining chairside mechanics at each appointment. Specific archwire sequences can be determined from the patient's current condition and related to overall treatment goals.

In this way, the VTO becomes a concrete diagnostic device for each individual patient. It describes visually what would take countless written words, and it further instills the concept of goal-oriented orthodontic therapy.

(TO BE CONTINUED)

Figures

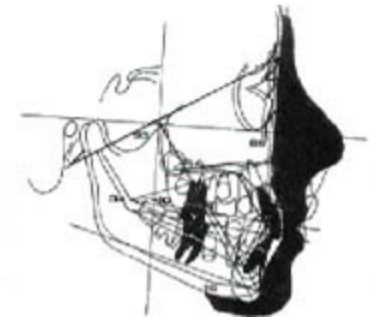

Fig. 1 Traditional VTO, based on average growth increments, includes estimated growth changes along with changes induced by orthodontic mechanics.

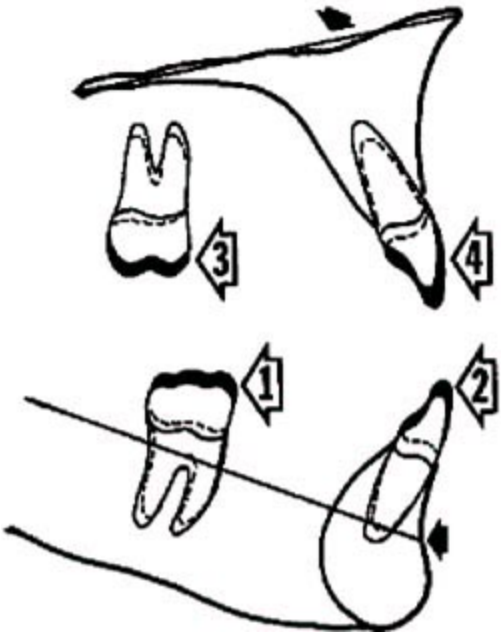

Fig. 2 From a practical standpoint, superimposition of the upper and lower jaws in a VTO without growth estimates yields virtually the same changes in the upper molar (1), upper incisor (2), lower molar (3), and lower incisor (4) regions.

Fig. 3 Placement of Occlusal Paralleling Instrument in patient's mouth to bring x-ray source perpendicular to occlusal x-ray film.

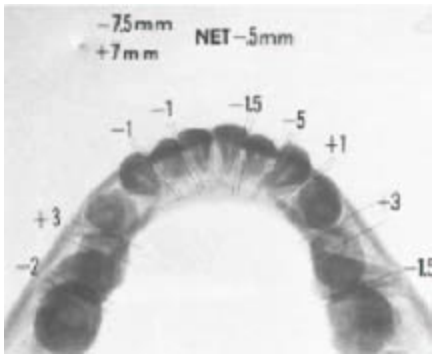

Fig. 4 Marking amount of actual embrasure break (negative numbers) or excess space (positive numbers) yields net arch-length discrepancy. This is normally done on tracing paper over mandibular occlusal film.

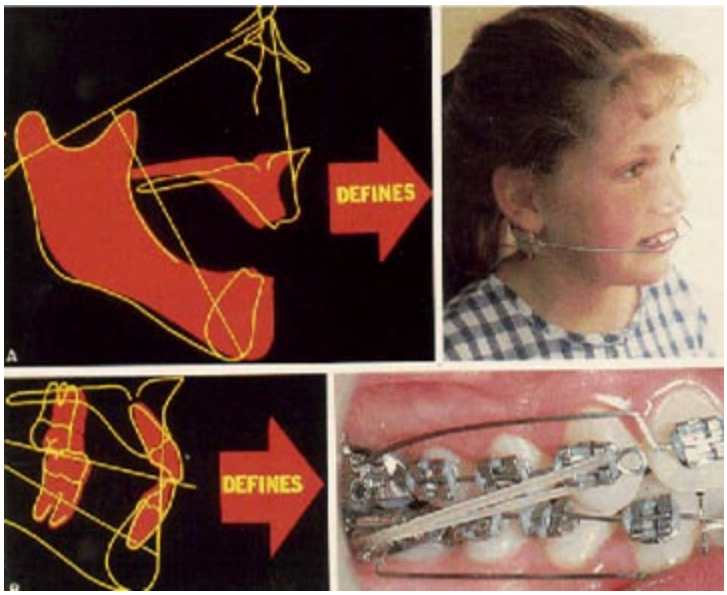

Fig. 5 A. Superimposition on cranial landmarks (Ba-Na in maxilla and Ba-Na at intersection with facial axis) determines type, duration, direction, and force of specific orthopedic appliances. B. Superimposition on maxilla (ANS-PNS at incisive canal) or mandible (corpus axis at Po) indicates type, duration, direction, and force of specific orthodontic appliances.

Fig. 6 Technique for visually analyzing lateral headfilm. Structural symmetry can be checked by organized, sequential study of (1) cervical region, (2) posterior cranial base and temporal complex, (3) anterior cranial base, (4) maxillary complex, (5) mandibular complex, and (6) soft-tissue profile.

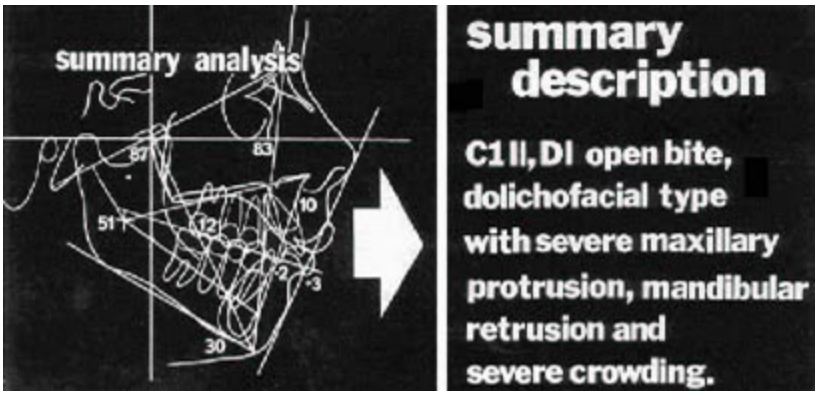

Fig. 7 Analysis of all available diagnostic material produces "nutshell" description of essential problem.

Fig. 8 Backlighted viewbox showing patient how VTO is used: beginning tracing determines problem, VTO determines solution, final tracing determines result.

Fig. 9 Case presentation materials including beginning cephalometric tracing and VTO, pertinent diagnostic materials, and photographs of "like and similar" cases that demonstrate different treatment modes.

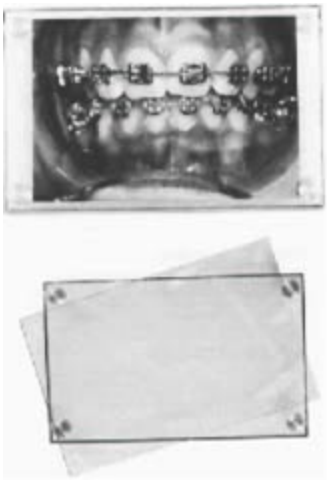

Fig. 10 Slides enlarged to 3" x 5" and enclosed In plastic plates are used in both consultation room and operatory to show specific procedures to patient.

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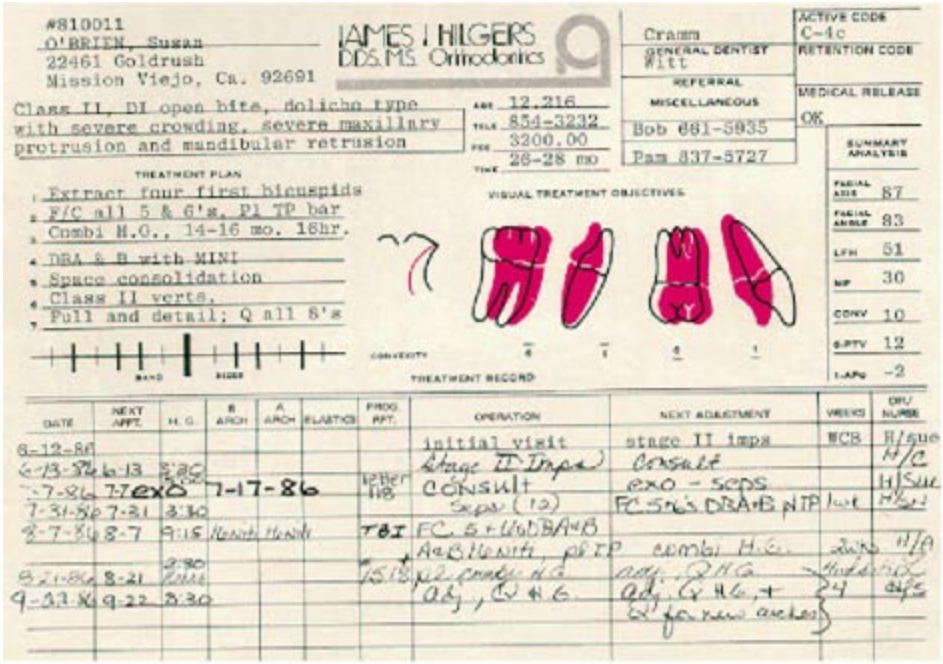

Fig. 12 Synopsis of realistic cephalometric goals (VTO) rendered on treatment chart by superimposition. Chart also includes patient information and summaries of problem and treatment plan.

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