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Facial Analysis: The Key to Successful Dental Treatment Planning

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Dr. Gunson is a 1997 graduate of the University of California at Los Angeles (UCLA) Dental School. He also received his medical degree and a Specialty Certificate in Oral and Maxillofacial Surgery from UCLA. Upon completion of his training, Dr. Gunson was invited to partner with Dr. G. William Arnett at The Center for Corrective Jaw Surgery in Santa Barbara, California. Since that time, his practice has been limited to orthognathic surgery. Dr. Gunson has lectured and published research on the surgical correction of sleep apnea, the medical treatment of mandibular condylar resorption, and the quantification of beauty.

The goal of this section is to provide insights into the minds of some of dentistry's premier educators. In this issue, Dr. G. William Arnett writes about the importance of facial analysis. The article is followed by an interview in which AACD Conference Advisory Co-Chair Dr. Brian LeSage (BL) speaks with Dr. Arnett (GWA). It is hoped that this section will provide a glimpse of what attendees can expect next spring when Dr. Arnett presents a course on comprehensive esthetics at the AACD's 22nd Annual Scientific Session in San Diego, California.

Abstract

Occlusal correction should produce precise function, but other goals must also be achieved. The dentition should be placed into a healthy periodontal position without sacrificing facial balance.

Facial diagnosis starts with general dentistry. The general dentist is often the first dental professional who can offer diagnosis and treatment planning for facial issues. The severity of the occlusal and facial problems should be evaluated and either treated by the general dentist or referred for multidisciplinary treatment with a prosthodontist, an orthodontist, and/or an oral and maxillofacial surgeon. When occlusal disharmony exists, the facial implications of occlusal treatment must be understood to help guide treatment planning. If facial esthetics are ignored, the dental and occlusal treatment results might be appropriate, but the dentist risks maintaining—or worsening—facial disharmony. However, if we understand facial esthetics, the overall treatment outcomes will be improved.

Dentistry has become the primary vehicle for facial esthetic enhancement for patients in their 20s through 40s. Facial enhancements may be as simple as cosmetic veneers or as complex as total facial reconstruction via orthognathic surgery. These two extremes of treatment must balance occlusal change, with its effects on facial esthetics. Examination of the patient's occlusion reveals the need for change, while facial examination dictates to the clinician how it is to be restored. Alteration of the occlusion should have as a goal the reversal of negative facial traits and maintenance or enhancement of positive traits. This goal cannot be achieved without a complete understanding of the patient's existing facial traits prior to treatment. This article presents the ideal face as a guide and goal for occlusal modification.

When occlusal disharmony exists, the facial implications of occlusal treatment must be understood to help guide treatment planning.

Introduction

Diagnosis, treatment planning, and execution are the steps involved in successful correction of dental problems. *Diagnosis* is defining the problem; *treatment planning* is based on diagnosis and is the process of determining which changes will eliminate the problem; *treatment* is executing the plan. The eradication of the patient's chief complaint is of paramount importance in guiding all phases of treatment.

The treatment planning of facial esthetic changes can be difficult, especially in terms of integration with bite correction. The assumption that bite correction leads to correct facial esthetics began with orthodontics. Unfortunately, correction of the bite does not always lead to correction, or even maintenance, of facial esthetics.[1-10] At times, in the zeal to correct occlusal and dental disharmony, facial decline occurs. The most common source of facial decline is the result of focusing solely on bite correction while ignoring the facial changes that treatment is causing. Decline also occurs because esthetic norms are not known by the practitioners to guide the choice of treatment.

Frequently, different procedures will achieve the same corrected occlusion. Avoiding unwanted facial changes and providing desired changes determines which treatment is used. An example of this would be correcting a Class II occlusion with one of the following: LeFort I impaction, mandibular advancement, upper first premolar extractions with headgear, and Class II elastics or prosthetic occlusal modification. All four treatments may correct the bite, but they also change the face in different ways. The procedure selected should balance the face optimally. Ideally, mounted models and/or clinical bite examination determine if bite correction is necessary and facial analysis determines if the proposed occlusal change can be tolerated facially.

Isolated cosmetic dentistry (veneers), which may not affect the occlusion, requires precise integration with existing esthetic factors. This article presents analyses of facial traits as an adjunctive treatment planning tool used to guide esthetic changes with or without occlusal correction. Comprehensive facial trait analysis should be used to enhance diagnosis, treatment planning, and the quality of results in all fields of dentistry. This method provides a

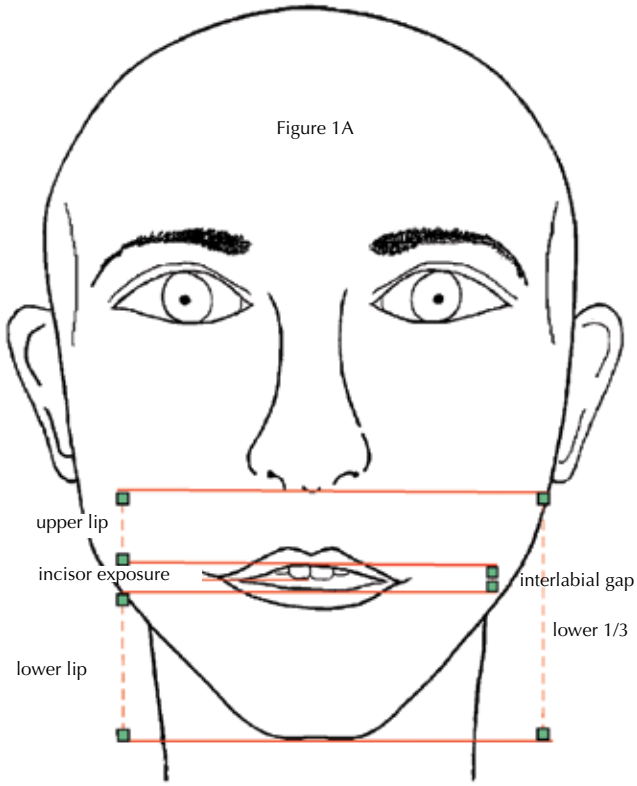

Figure 1A: Six essential vertical traits are assessed: 1) lower one-third height, 2) upper lip length, 3) lower lip length, 4) interlabial gap, 5) upper incisor to lip—relaxed and 6) upper incisor to lip—smile.

tool for understanding, organization, and communication between the general dentist, the orthodontist, the maxillofacial surgeon, the prosthodontist, and the patient. Using this analysis, cosmetic problems can be optimally corrected and occlusal corrections producing esthetic decline can be avoided. It identifies cosmetic skeletal disharmonies that preclude successful facial prosthetic or orthodontic correction. If the skeletal problem is significant enough to alter facial balance, it may be too severe to correct successfully with orthodontic tooth movement and/or prosthetic dentistry alone.

When attention is directed only to bite correction, facial balance may deteriorate rather than improve. It is then the responsibility of the dental professional to achieve a correct occlusion and dental esthetic without overlooking the other treatment goals: facial balance, periodontal health, long-term stability, temporomandibular joint (TMJ) function, and airway patency.

Unfortunately, correction of the bite does not always lead to correction, or even maintenance, of facial esthetics.

Facial Analysis: Head Posture and Facial Muscle Tone

An analysis of facial esthetics was devised based on important facial characteristics which can guide dental-occlusal treatment. Areas of examination were used for diagnosis and treatment planning.

The most important point in proper analysis of facial esthetics is examining the patient clinically. Examination should not be based on static photographic representation of the patient. Photographs are sometimes taken with improper head orientation, condyle position and lip posture; this can lead to inaccurate diagnosis, treatment planning, treatment, and esthetic results.

Natural head posture, centric relation (CR), and relaxed lip posture can be controlled in the office setting so that valid examination data can be collected.

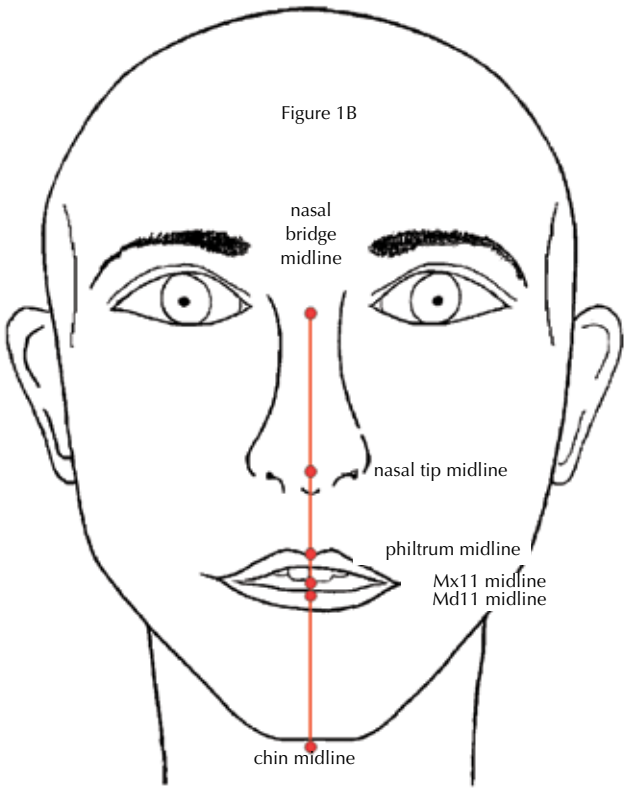

Figure 1B: Midline structures of importance in facial examination. The facial vertical axis is determined by a line through the nasal bridge midline and the philtrum midline. The nasal tip, upper incisor midline, lower incisor midline, and chin midline are assessed relative to the facial vertical axis.

Natural head posture[11] is the head orientation the patient assumes when looking toward the horizon. When skeletal and dental changes are made relative to natural head position, success is ensured in the resulting soft tissue profile.[12]

All examination data should be recorded in CR, as occlusal changes must be in this position to produce precise function. (CR, as discussed in this article, is the uppermost condyle position described by Dawson.)[13]

The patient should be in the relaxed lip position because it demonstrates the soft tissue relative to hard tissue without muscular compensation for dentoskeletal abnormalities. Vertical disharmony between lip lengths and skeletal height *cannot* be assessed without the relaxed lip posture. Closed lip position may be adequate for Class I skeletal cases, but is inadequate for skeletal disharmony assessment.[1,2] It should be noted that when the teeth are occluded, the lips are normally separated when relaxed (in females more than in males).

Hundreds of facial soft tissue traits have been studied; the examination[1,2,19] described in this article addresses a small number of those traits. Inclusion of a trait within the study was dependent on the significance of the trait to a successful facial outcome with occlusal correction, or for cosmetic dentistry.

The ideal treatment affects facial traits in the most positive fashion while correcting the bite. The treatment plan should be guided by the facial examination. Four possible treatment options exist for each patient: dental correction alone (orthodontic or prosthetic), dental correction plus lower jaw surgery, dental correction plus upper jaw surgery, and dental correction plus upper and lower jaw surgery. If a treatment option does not correct the bite, produce facial balance, periodontal health, long-term stability, TMJ function, and airway patency, it should not be rendered.

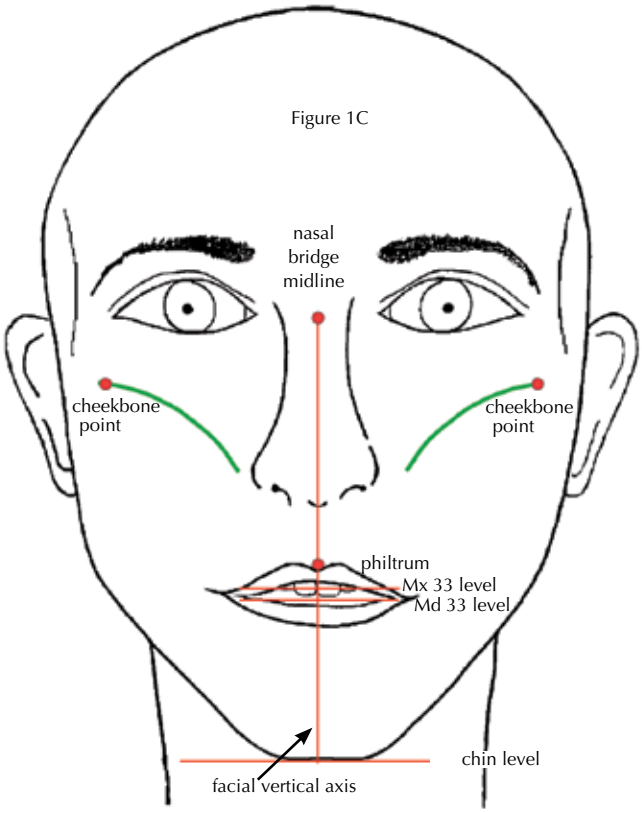

Figure 1C: The cheekbone contour is examined from the frontal view. The cheekbones should be rounded with a definite cheekbone point height of contour. The level of the upper canines, lower canines, and chin should be perpendicular to the facial vertical axis.

Facial Analysis: The Examination

Natural head posture, CR, and relaxed lip posture are used to accurately assess the frontal and profile views (Figs 1A–1D).

Midline Alignments

Midlines (Fig 1B) are assessed with uppermost condyle position and first tooth contact. If occlusal slides alter joint position, no reliable midline assessment can be made. The relative positions of soft tissue landmarks (nasal bridge midline, nasal tip midline, philtrum midline, chin point midline) and dental midline landmarks (upper incisor midline, lower incisor midline) are noted. Needed changes are incorporated into the dental treatment plan, when feasible, to position these structures on the vertical midline of the face while establishing function. Most importantly, philtrum and nasal tip must harmonize with the dental midlines.

Facial Levels

To examine facial levels (Fig 1C), the long axis of the face must be determined. This line is constructed through the mid nasal bridge midline and the midline of the philtrum of the upper lip. The upper canines, lower canines, and chin should be perpendicular to the long axis of the face.

Mandibular deviations commonly have upper and lower occlusal cants with chin canting associated. Deviations from level should be noted and correction integrated into the overall bite treatment plan when cants are easily visualized. If bimaxillary surgery is contemplated, occlusal cant is corrected routinely at surgery.

Lower One-Third Evaluation

This area of facial analysis (Fig 1A) is extremely important in dental diagnosis and treatment planning. The importance of relaxed

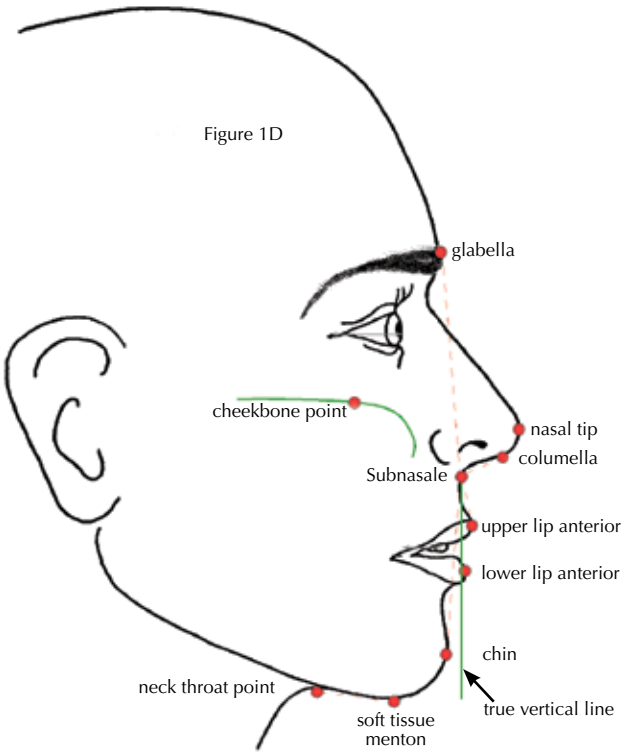

Figure 1D: Seven anterior-posterior traits are assessed: 1) facial angle (glabella-subnasale-chin), 2) nasolabial angle (columella-subnasale-upper lip anterior), 3) cheekbone contour and projection, 4) nasal projection (subnasale-nasal tip), 5) throat length (neck-throat point-soft tissue menton), 6) upper lip projection to TVL and 7) lower lip projection to TVL. The cheekbone contour is again observed, this time in the profile view.

lip position for these measurements cannot be over-emphasized. The lower one-third of the face (subnasale to soft tissue menton) is normally 55 to 65 mm long.[1,2]

Upper Lip Length

The lips are measured independently in a relaxed position (Fig 1A). The normal length from subnasale to upper lip inferior is 19 to 22 mm.[1,2]

Lower Lip Length

The lower lip is measured from lower lip superior to soft tissue menton (Fig 1A) and normally measures in a range of 38 to 44 mm.[1,2]

Lip measurements identify normal or abnormal soft tissue length, which can be related to dentoskeletal length normalcy, excess, or deficiency.

If a treatment option does not correct the bite, produce facial balance, periodontal health, long-term stability, TMJ function, and airway patency, it should not be rendered.

Interlabial Gap

With the lips *relaxed*, a space of 1 to 5 mm[1,2] between upper lip inferior and lower lip superior is present (Fig 1A). Females show a larger gap within the normal range. It is normal for the lips to close from the relaxed position to the closed position.

Upper Incisor to Lip—Relaxed

The distance from upper lip inferior to maxillary incisal edge is measured (Fig 1A). The normal range is 1 to 5 mm.[1,2] Women show more within this range when they are younger (and more than men at any age). During occlusal or esthetic correction the incisor exposure should ideally fall into this range.

Figure 2: Facial photo; frontal in repose with wax-bite. Note the excessive interlabial gap and the excessive incisor exposure. The small canine cant can also be appreciated. (Before-and-after treatment simulation, Dolphin Imaging and Management Systems; Chatsworth, CA.)

Figure 3: Facial photo; profile closed lip with wax-bite. Note the lip and mentalis strain. (Before-and-after treatment simulation, Dolphin Imaging and Management Systems; Chatsworth, CA.)

Conditions of incisor exposure disharmony are produced by three variables:

- Increased or decreased anatomic upper lip length.
- Increased or decreased maxillary skeletal length.
- Maxillary incisor wear with reduced clinical crown height.

To produce ideal esthetics, the source of the imbalance should be addressed. Over-shortening of upper incisor teeth leads to the appearance of premature aging, especially in conjunction with incisor retraction. This type of dental movement is rarely indicated for cosmetic reasons.

Upper Incisor to Lip—Smile

When examining the smile posture, different lip elevations are observed in normal and abnormal skeletal patterns. Ideal tooth and/or gum exposure with smile is three-fourths of the crown height to 2 mm of gingiva, females more than males.[1,2] Variability in gingival exposure is related to

- lip length
- vertical maxillary length
- maxillary incisor crown length
- magnitude of lip elevation with smile.

Particular care should be taken with short clinical crowns (less than 9 mm). A 3- to 4-mm repose incisor exposure may expose unacceptable amounts of gingiva when smiling because of short maxillary incisor crowns. This situation is properly treated by placing normal length crowns (veneers) on the maxillary incisors and then treatment planning from repose and smile perspectives. The "gingival smile" is never treated to ideal at the expense of under-exposing the incisors in the relaxed lip position.

Even though an understanding of relaxed lip position is essential, an understanding of closed lip position adds support to diagnostic patterns.[1,2] The closed lip position also reveals disharmony between skeletal and soft tissue lengths. The lips should gently touch, without strain from the relaxed to closed lip position. Lip incompetence is strained closure from relaxed to closed position. Three signs of strain are: chin flattening, lip flattening, and nasal base narrowing.

Mentalis and lip strain with lip closure indicates either a long skeletal height or short lips (usually upper lip). When the lips are redundant in the relaxed position, either the bite is deep and/or the skeletal length is short.

Profile Angle

This angle (Fig 1D) is formed by connecting soft tissue glabella, subnasale, and soft tissue pogonion.[13–15] Class I occlusion presents a total facial angle range of 165° to 175°.[1,2] Class II angles are less than 165° and Class III are greater than 175°.

Dental procedures should generally address the cosmetic imbalance established with this measurement. The profile angle is the most important key to the need for anterior-posterior skeletal correction. When values are below 165° or above 175°, skeletal malocclusions needing surgery are probably the cause.

Figure 4: Facial photo, profile in repose with wax-bite. Note the acute profile angle before surgery; the short throat length; and a mild amount of submental sag. These all indicate a skeletal Class II relationship with mandibular hypoplasia. (Before-and-after treatment simulation, Dolphin Imaging and Management Systems; Chatsworth, CA.)

Nasolabial Angle

This angle (Fig 1D) is formed by the intersection of the upper lip anterior and columella at subnasale. This dimension can change noticeably with prosthetic, orthodontic, and surgical procedures, which alter the anterior-posterior position or inclination of the maxillary anterior teeth.[7,16,17] All procedures should attempt to place this angle in the cosmetically desirable range of 85° to 105°.[1,2] Female patients will usually be more obtuse within this range. Factors to be considered in treatment planning to correctly achieve this angle include the following:

- Existing nasolabial angle.
- Change in the crown position necessary to produce the correct overbite and overjet.
- How the crown position change will affect the upper lip position. Tense lips may move more posteriorly with tooth movement, and less anteriorly. Flaccid lips may move less with anterior and posterior tooth movement.[3,9,18]
- Anterior-posterior lip thickness. Thin lips (6 to 10 mm)[3,9,10] may move more with tooth retraction than thick lips (12 to 20 mm).[3,9,18]
- The larger the overjet distance, the more retraction of the maxillary incisors will be necessary, opening the nasolabial angle.[10,16,17]

If the nasolabial angle is open (near 105°), retraction of anterior teeth should be avoided in treatment planning. Likewise, a strong nose will become adversely prominent with lip retraction. Present limited knowledge of how lips respond to anterior-posterior movement of the teeth dictates a conservative approach when large movements are contemplated.

Cheekbone Contour

A normal cheekbone is an anterior-facing curve[1,2] that starts at the zygomatic arch going forward and down, ending just behind the base of the nose (Figs 1C & 1D). The cheekbone point is a distinct height of contour of the cheekbone.

Cheekbone assessment requires both frontal and profile examination. Cheekbone examination helps diagnose the different types of Class III. Deficient cheekbones may correlate with a retruded maxilla because the osseous structures are often deficient as groups, rather than in isolation. Cheekbone contour is used as one of the main indicators of maxillary retrusion.

Nasal Projection

The nasal projection (Fig 1D) measured horizontally from subnasale to nasal tip is normally 14 to 17 mm.[1,2] Nasal projection is an indicator of maxillary anterior-posterior position. Maxillary retrusion is associated with a long nasal projection.

Throat Length and Contour

The throat length (Fig 1D) from neck-throat point to the soft tissue menton should be characterized as being long, short, or normal length; and as straight or sagging.[1,2] This is an indicator of lower jaw anterior-posterior position. A long throat length found with Class III occlusion indi-

Examination	Normal Values	Patient, Preoperative	Patient, Postoperative
Nasal bridge midline	midline	midline	unchanged
Nasal tip midline	midline	midline	unchanged
Philtrum midline	midline	midline	unchanged
Upper incisor midline	midline	midline	unchanged
Lower incisor midline	midline	0.5 mm left*	midline
Chin midline	midline	0.5 mm left*	midline
Maxillary canine level	level	0.5 mm down on right	level
Mandibular canine level	level	0.5 mm down on right	level
Chin level	level	0.5 mm down on right	level
Lower 1/3	60 - 68 mm	68 mm	68 mm
Upper lip length	19 - 22 mm	20 mm	20 mm
Lower lip length	42 - 48 mm	42 mm	45 mm
Interlabial gap	1 - 5 mm, female > male	9 mm*	3 mm
Upper incisor to lip—relaxed	1 - 5 mm, female > male	7.5 mm*	3.5 mm
Upper incisor to lip—smile	3/4 crown to 1 - 2 mm gingiva	2.5 mm gingiva*	1 mm gingiva
Closed lip	no strain	strain*	no strain
Upper incisor crown height	9.5 – 11.5 mm	9.5 mm	unchanged
Profile angle	**Female** 166 - 172° **Male** 165 - 175°	158°*	168°
Nasolabial angle	**Female** 97 - 111° **Male** 85 - 105	102°	100°
Cheekbone contour	rounded with distinct height of contour	rounded with distinct height of contour	unchanged
Nasal projection	15 - 17 mm	17 mm	16 mm
Throat length / contour	52 - 64 mm without sag	47 mm* mild sag*	55 mm no sag
True Vertical Line	**Female** upper lip 2.5-5 mm lower lip 1-3 mm chin -4.5- -0.7 mm **Male** upper lip 1.6-5 mm lower lip -1.2-3.2 mm chin -5.3- -1.7 mm	5 mm -3 mm* -16 mm*	5 mm 2 mm -4mm

Table 1: Facial examination norms and preoperative and postoperative values for patient (* denotes abnormal values).

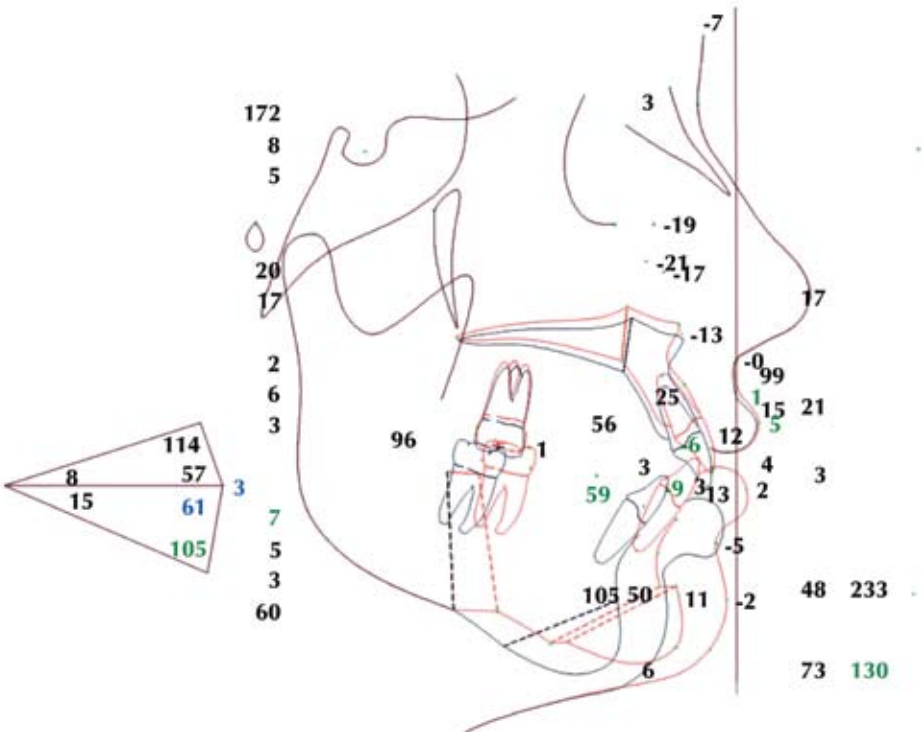

Figure 5: Cephalometric treatment plan. Changes are based on optimizing facial appearance while correcting the bite. The original tracing is in black and the desired skeletal and facial changes are in red. The bite indicates treatment is necessary, the face indicates how the bite is corrected.
(Dolphin Imaging and Management Systems; Chatsworth, CA.)

cates mandibular protrusion rather than maxillary retrusion.

True Vertical Line

True vertical line (TVL) measurements[19,20] are upper lip, lower lip, and chin projections (Fig 1D). They represent the sum of the dental or skeletal position plus the thickness of the overlying soft tissue. The TVL is drawn through subnasale perpendicular to natural head position. Although subnasale frequently will be coincident with anteroposterior positioning of the TVL, they are not synonymous. The TVL must be moved forward in cases of maxillary retrusion. Midface retrusion is defined by a long-appearing nose; and depressed or flat orbital rims, cheek bones, subpupils, and alar bases. Additional features of midface retrusion may include poor incisor support for the upper lip, an upright upper lip, a thick upper lip, and retruded upper incisors. When midface retrusion is diagnosed, the TVL is moved 1 to 3 mm anteriorly. The upper lip is anterior to the TVL by +2.5 to +5.0 mm for females and +1.6 to +5.0 mm for males. The lower lip is +.5 to +3.3 mm to the TVL for females and -1.2 to +3.2 for males. The chin (soft tissue pogonion) is posterior to the TVL by -4.5 to -.7 for females and -5.3 to -1.7 for males.

A case report is provided below. Facial diagnosis was used to establish the overall treatment plan.

Case Report

The patient presented to our offices for consultation at age 20. Her surgical consultation included a wax-bite in CR, which was used to take photographs; a lateral cephalometric radiograph; TMJ tomographs; and all facial measurements (Table 1). Goal-directed treatment planning was followed in order to

- correct the bite
- produce facial balance
- place the teeth in a healthy periodontal position
- ensure long-term stability
- improve and protect TMJ function
- protect the airway.

No attempt was made to correct the patient's skeletal discrepancies with orthodontic tooth movements in any plane of space. Orthodontic preparation was directed only toward tooth alignment and segmental arch preparation, so as to accomplish the

goals of healthy periodontal positioning and maximum dental interdigitation at surgery.

The TMJs were symptomatic for painful clicking and the patient complained of masseter and temporalis pain. Three months prior to surgery, she was placed on medications and splint therapy in order to prevent condylar changes. Medications included Doxycycline 100mg, Feldene 20mg, amitriptyline 10mg, vitamin C 500mg, and vitamin E 400IU.

After orthodontic preparation, presurgical records were obtained. A new CR wax-bite was used for the lateral cephalometric radiograph, the TMJ tomographs, the facial examination, and the model mounting. The wax-bite ensures the consistency and accuracy of all records. TMJ tomographs revealed small condylar heads with some anterior flattening but a nice cortical outline.

Occlusal Examination

Occlusal examination revealed a transverse constriction from canine to second molar when placed into a Class I relationship (3.3 mm to 1.7 mm, respectively). The patient also had a two-plane occlusion with breaks between the lateral incisors and the canines. CR models and headfilm measurements revealed a significant Class II malocclusion with 9 mm of overjet and 2 mm of overbite.

Facial Examination

On frontal facial examination, the nasal tip and the upper incisor midlines were on the facial vertical axis as defined by a line through nasal bridge midline and the philtrum of the upper lip. The mandibular and chin midlines were .5 mm to the left of the facial vertical axis line. The maxillary and mandibular canines were canted down on the right by 0.5 mm (Fig 2).

The lip lengths were measured as normal. The incisor to lip—relaxed (Fig 2) and incisor to lip—smile measurements were long at 7.5 mm and 2.5 of gingiva, respectively.

The cheekbone contour was excellent with a rounded, distinct height of contour (Figs 2–4).

At closed lip position there was visible mentalis and lip strain (Fig 3).

In profile, she had a short throat length with mild submental sag. Her profile angle was 158° and her lower lip and chin excessively retruded from the true vertical line (-3 mm and -16 mm, respectively).

Goal-Directed Treatment Plan

After occlusal and facial analysis, the goal-directed treatment plan included a multisegment LeFort I osteotomy, bilateral sagittal split osteotomies, and a sliding genioplasty.

The segmentation of the maxilla provided adequate width and arch form correction. Bimaxillary surgery permitted correction of the canine cants. It also allowed counter-clockwise rotation of the occlusal plane, which provided chin projection without disturbing her nasal base. The excessive incisor and gingival show was corrected by anterior maxillary impaction. Overbite, overjet, and midlines were corrected and the remaining chin deficiency was overcome with a genioplasty (Figs 2–5, right-hand photos).

The patient was maintained on the TMJ medications for a full year after surgery to prevent condylar changes. Eighteen months after surgery, her occlusion remains stable and her facial esthetic result is excellent (Figs 2–5, right-hand photos).

Conclusion

Dentists generally use occlusal factors to diagnose and treat malocclusions. These occlusal factors include overjet, canine occlusion, and molar occlusion. Many dentists, however, do not consider facial balance in their treatment planning.

This article presents an organized, comprehensive approach to facial analysis for the general dentist. Facial diagnosis, as described, is used to guide pure cosmetic changes or to evaluate the facial changes that occur with dental occlusal changes.

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Interview with G. William Arnett, D.D.S., F.A.C.D.

by Brian LeSage, D.D.S

Dr. LeSage graduated magna cum laude and received the Omicron Kappa Upsilon Honor Dental Society Award from the University of Maryland Dental School in 1983. The founder and director of the UCLA Aesthetic Continuum and an ADA Seminar Series speaker, he practices esthetic and reconstructive dentistry in Beverly Hills, California.

Dr. LeSage lectures and gives hands-on programs in all areas of cosmetic dentistry both nationally and internationally. He is an Accredited member and Fellow of the AACD and a Fellow of the AGD. Since 1995 he has been an Accreditation examiner and currently is Chair of the Fellowship Committee.

BL: *As cosmetic dentists, we all too often limit our diagnosis and treatment to the teeth, lips, and smile. But as we are all aware, the success of these smile makeovers depends on the effect these procedures have on potentially altering the occlusion. And can stability be built into the restorative scheme? Furthermore as you so thoroughly analyzed, how will these occlusal changes affect the patient's face? I think we will all be seeing more on facial analysis and its significance in successful smile makeover procedures. You addressed comprehensive facial trait analysis—where can the Journal's readers find a flowsheet or a systematic way to analyze facial traits? What other books or articles might readers explore further to gain more knowledge on this interrelationship of facial esthetics, occlusion, and patient satisfaction?*

GWA: Figures 1A–1D in the preceding article can be utilized to guide facial analysis. Additionally, we have published comprehensive papers and a textbook on all aspects of facial analysis.[1-4]

BL: *You mentioned that all examinations should be recorded in centric relation (CR). Could you elaborate on why CR is so crucial in your analysis? The true profile (chin position and vertical height) is revealed when the joints are seated. As a surgeon, doesn't that have to be the starting position for facial analysis?*

GWA: Surgeons, in effect, do full-mouth reconstruction by operating on the jaws. CR must be the starting point for that process, to provide accurate diagnosis and stable TMJ function.

BL: *You stated the treatment plan should be guided by the facial examination. Does that mean esthetic parameters should first be analyzed and accounted for in your treatment planning process?*

GWA: Bite examination reveals a malocclusion. The face reveals how to correct the malocclusion. An example of this is a Class II malocclusion. The upper arch can be retracted or the lower arch can be advanced to correct the occlusion, but the facial results will be very different. The facial examination reveals which treatment is correct.

BL: *I am curious about your choice of true vertical line (TVL) to measure the projection of the lips and chin. Other choices would be Rickett's line, Burstone's line, or Steiner's line. Why do you prefer the TVL?*

GWA: These other lines are subject to tremendous variability. These lines are set by the size of the nose and the projection of the mandible. Decisions regarding incisor and lip positions based on mandibular and nasal variables may be misleading. The TVL is reliable without the inherent variability introduced by the nose and chin. In fact, the TVL accurately measures the variable position of the chin.

BL: *Most cosmetic dentists believe that photography is the only way to precisely evaluate a patient's pretreatment condition. You mentioned the importance of the natural horizon head position on the photographic views to aid in proper diagnosis. Isn't photography more important, especially to the general dentist, than a cephalometric analysis?*

GWA: For a general dentist, photography may be adequate based upon the size of the problems being treated—general dental treatment does not alter the antero-posterior positions of the maxilla and mandible. Photographs can't be controlled well enough in the surgical setting to be reliable. The joints must be seated, the lips must be relaxed, the teeth must be in first tooth contact, and the head has to have a natural orientation. The surgical result depends on control of these variables, whereas the general dental treatment usually is not affected by these variables.

BL: *You referenced the ideal face as a guide and goal for occlusal modification. Where did these guidelines come from and do they become altered over time as fashion and our perception of beauty evolve?*

GWA: Perceptions of fashion and beauty change over limited ranges over time. The guidelines in the preceding article will be applicable over our lifetime. The normal values are based on study measurements of individuals who have Class I occlusions and attractive position of parts. What changes over time is not the perception of normal position of facial parts, but facial qualities that are influenced by makeup trends.

BL: *We all agree the patient's desires come first, which led to your statement, "The eradication of the patient's chief complaint is of paramount importance in guiding all phases of treatment." Has this changed somewhat today with patients having unrealistic expectations and how do you handle this or account for this in your treatment plans?*

GWA: I don't think there is an increase in unrealistic expectations. I do think that more people are becoming cosmetic patients because of our increased ability to provide new and better treatments, as well as the patient population's greater awareness of such treatments. The occasional patient with unrealistic expectations should not be treated.

BL: *As general dentists, we often need better verbal skills to open discussions with our patients to get them to consider orthognathic surgery. Can you suggest any methods that our readers can use that would not scare off—or more importantly, would encourage—our patients to consider these procedures as viable treatment options?*

GWA: The best way to encourage needed treatment is education. Educate the patient about the problems that exist, and explain the treatment and outcomes.

BL: *Thank you, Dr. Arnett, for sharing your expertise in facial analysis and its relationship to occlusion and our smile makeover procedures. We look forward to learning more at your presentation at the AACD's Annual Scientific Session in San Diego in May 2006.*

References

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