# A Dental Esthetic Checklist for Treatment Planning in Esthetic Dentistry

**Joseph R. Greenberg, DMD;[1] and Meredith C. Bogert, DMD[2]**

**Abstract: A dental esthetic checklist form has been introduced for use in the diagnostic work-up of a patient accepted for treatment in an Advanced Education in General Dentistry program. The checklist, divided into seven basic criteria, is not a complete list of all possible categories and nuances that an esthetic restorative assessment might include. The correct initial identification of these criteria does not limit the dentist from pursuing more detail; in fact, this checklist is an introductory organizer that invites further exploration. In the authors' experience, the use of this form prompts the student to broaden his or her vision from purely a dental/periodontal focus to one that encompasses lip, cheek, and tongue configurations; smile; facial features; and related planes of symmetry. This approach directs the dental treatment plan toward the important additional goal of dentofacial harmony.**

One objective of the Advanced Education in General Dentistry Program at the Kornberg School of Dentistry is to elevate the conceptual and technical treatment standards of its students. Fundamental to the residents' patient treatment experience is thorough examination, diagnosis, and treatment planning. Recent publications assert that the face is the first view requiring assessment by a dental practitioner,[1] thus this is the initial assessment made by the residents in performing a work-up in a patient for treatment.

A dental esthetic checklist form, divided into seven basic criteria, has been introduced for use in the diagnostic work-up of a patient accepted for treatment in the program. This checklist is not a complete list of all the possible categories and nuances that a dental esthetic restorative assessment

might include; another popular esthetic checklist includes 13 factors.[2] However, sources in the dental literature consistently describe these seven basic criteria as essential to successful treatment results. The correct initial identification of these items does not limit the practitioner from pursuing more detail; instead, this checklist is an introductory organizer that invites further exploration. In the authors' experience, use of this form has prompted students to broaden their visions from purely a dental/periodontal focus to ones that emcompass lip, cheek, and tongue configurations; smile; facial features; and related planes of symmetry. This approach directs the dental treatment plan toward the additional goal of dentofacial harmony.

The "Dental Esthetic Checklist for Treatment Planning" is displayed in Table 1. A previous article[3] defined and explained the facial and dental terminology used in the first three factors, but a discussion of supporting data is pertinent here.

## CHECK POINT 1: DM = FM

The value of aligning the maxillary dental midline (DM) to the patient's facial midline (FM) is cited with frequency in the removable prosthodontics literature.[4-6] The first text on dental esthetics[7] stated that "the midline should be perpendicular to the incisal and occlusal plane and parallel to the midline of the face." Chiche and Pinault[8] wrote, "Harmonious facial features are more symmetrical close to the facial midline and more asymmetrical away from it." Spear[9] reported that, in smile design, the starting point of the esthetic treatment plan is the facial midline. Morley and Eubank[10] state that a practical approach to locating the FM requires two reference points:

[1]Clinical Professor of Restorative Dentistry and Course Director, Advanced Restorative Dentistry, The Kornberg School of Dentistry at Temple University, Philadelphia, Pennsylvania; Clinical Professor of Periodontics, The University of Pennsylvania School of Dental Medicine, Philadelphia, Pennsylvania

[2]Associate Professor, Interim Chair of Restorative Dentistry, Director of the AEGD Program in the Department of Restorative Dentistry, The Kornberg School of Dentistry at Temple University, Philadelphia, Pennsylvania

## Table 1: Dental Esthetic Checklist for Treatment Planning

| Purpose: | To emphasize certain key factors in the comprehensive dentofacial examination, leading to diagnosis and treatment planning. Note: Facial symmetry should be a key driver of the dental esthetic treatment plan. | | |
|---|---|---|---|
| Terminology:* | FM = Facial Midline<br>DM = Dental Midline | FV = Facial Vertical Axis<br>DV = Dental Vertical Axis | FH = Facial Horizontal<br>DH = Dental Horizontal |

**1. DM = FM?** ☐ Y ☐ N (Measure and record/sketch discrepancy) _____

**2. DV = FV?** ☐ Y ☐ N (Measure and record/sketch discrepancy) _____

**3. DH = FH?** ☐ Y ☐ N (Measure and record/sketch discrepancy) _____

**4. Are both maxillary central incisors equal in position, symmetry, color/shade; and are they located at: FM/FV/FH?** ☐ Y ☐ N
**Do the tooth proportions and composition follow the rules of biometrics?[†]** ☐ Y ☐ N

**5. Does the incisal edge line of the maxillary anterior teeth follow the superior contour edge of the lower lip?**
**If not, please describe or sketch.**

**6. Does the incisal edge line form an "attractive" (convex, "gull-wing," or straight) edge pattern?**
Describe the relationship of lip aperture to the dental composition in "wide smile;" have patient bite tightly and say "E." (Check one.)
☐ High lip line smile (> 4 mm of gingival display apical to cervical gingival margins).
☐ Normal lip line smile (0 to 3 mm to 4 mm of gingival display).
☐ Low lip line smile (lip covers all gingiva and/or maxillary anterior).

**7. Profile and Phonetic/Speech Evaluation:**
a. Examine relationship of anterior teeth to the patient's facial outline from a profile perspective. Record your observations.
b. Have the patient repeat the "F" and then "V" sounds to test proper positioning of the maxillary incisal edges. Note your findings.
c. Have the patient say the "S" sound (can use words such as "Mississippi") while seated upright to evaluate occlusal vertical dimension and freeway space. Note your findings.

*Greenberg and Ho[3]    †Chu[24]



**Figure 1 and Figure 2** This patient's smile view showed complete fixed upper porcelain-fused-to-metal (PFM) dental restorations with DM approximately centered to Cupid's Bow. The full-face smile view revealed a significant discrepancy between DM and FM. In this case, Cupid's Bow was not a reliable reference to FM. This aspect of the treatment result was approved in advance by the patient during the provisional restoration phase.

the nasion (a point between the eyebrows) and the base of the philtrum (also referred to as Cupid's Bow). A line connecting these two landmarks should locate the FM and also determine the direction of the midline; this factor is referred to as facial vertical axis (FV) on this dental esthetic checklist.

The maxillary DM is the important visual dental landmark. It coincides with the labial frenum and the FM in 70% of the population.[11] The mandibular DM is either in motion during function or covered by the maxillary teeth at rest or in smile. In 75% of the population, it does not coincide with the maxillary midline,[12] thus the mandibular dental midline is not usually visually important in esthetic dentistry.[13]

The importance of aligning DM and FM in dental esthetic endeavors has been questioned by Kokich et al.[14] Their findings

**Figure 3** This patient had dental crowns on her maxillary central and lateral incisors that were located at DM = FM but displayed a vertical axis discrepancy such that DV was not congruent with FV. Root caries was found around the margins of these crowns, necessitating their replacement.



**Figure 4** New zirconia-based, all-ceramic, full-coverage crowns on the patient in Figure 3 with corrected vertical axes.



**Figure 5** This patient's dental restorations revealed a marked discrepancy between DH and FH.



**Figure 6** Smile view of the patient in Figure 5.



**Figure 7** New complete upper and lower fixed composite-fused-to-gold dental restorations for this patient with DH in harmony with FH.



**Figure 8** Smile view of the completed restorations.

suggested that neither dentists nor laypersons notice a difference in DM to FM deviations of up to 4 mm. This study of altered photographic images of natural smiles used only one reference point—Cupid's Bow—and displayed no facial structures beyond the upper and lower lips. The patient used for this section of the article did not seem to have a sharply defined Cupid's Bow. This does not seem to satisfy the requirements for a facial

reference point as previously described. By contrast, a more recent Web-based study[15] with a larger sample size (2185 valid responses) used altered images of natural dentitions with full faces side by side. This study found strong preferences against midline shifts at 3 mm. Without a full-face reference, one may not be truly be assessing the impact of dental composition variations from the patient's point of view (Figure 1 and Figure 2).

Flores-Mir et al[16] suggested that laypersons naturally see dental esthetics as part of overall facial esthetics unless intentionally directed to a close-up view of the dentition. Pattoff and Ozar[17] wrote that although the expertise of the professional alone is considered sufficient to determine if an oral health need has been met, in esthetic dentistry it is the patient's judgment alone that is sufficient to determine if a result is appropriate. If the dental profession accepts these two articles as evidence based, it may wish to consider inclusion of the dentofacial examination as a component of diagnosis and treatment planning in the dental school curriculum. Similarly, if patients naturally see the full face and view their teeth and smile esthetics as part of this whole, then full-face images should become standard in professional presentations and publications on esthetic dentistry.

## CHECK POINT 2: DV = FV

DM should coincide with FM whenever possible. When DM = FM cannot be achieved, it is still highly desirable for the dental vertical axis (DV) to parallel the facial vertical axis (FV).[12,18] This is referred to as DV = FV. It is possible but undesirable to have a correctly located DM with an incorrect DV. Any canted DV in either a restored or natural dentition is considered unattractive[10] (Figure 3 and Figure 4).

## CHECK POINT 3: DH = FH

The interpupillary line, ophraic line (eyebrows), and commissural line impart an overall sense of harmony and horizontal perspective to the esthetically pleasing face.[19] None of these three anatomic landmarks absolutely defines the facial horizontal 100% of the time, but it is recommended to use them as general reference planes and then finalize the facial horizontal (FH) determination as perpendicular to the already determined FV. The incisal edge line (incisal plane) of the maxillary anterior dental composition and the buccal cusp tips of any posterior teeth on display in wide smile should be symmetrical to the FH plane (Figure 5 through Figure 8).

There is considerable agreement for the esthetic importance of dental horizontal (DH = FH) among patients and dentists,[2,3,7,8,14-16,19,20] yet it is often difficult to record the visually apparent FH using functionally oriented dental articulators.[20] Supplementary devices now are available to dentists to transfer FH position to the dental laboratory technician accurately.[3]

## CHECK POINT 4:
### Are both maxillary central incisors equal in position, symmetry, color/shade; and are they located at FM/FV/FH? Do the relative tooth proportions and specifications follow the rules of biometrics?

Although naturally occurring maxillary central incisors do not always measure the same in width and length, it is still recommended to strive for a matched pair of central incisors at FM = DM, FV = DV, and FH = DH when fabricating maxillary anterior dental restorations.[8] These pairs anchor the central symmetry of the face to the dental composition, which is a universally recognized feature of physical attractiveness.[21,22] Kokich et al concluded that asymmetric alterations make teeth more unattractive not only to dental professionals but also to laypersons.[23]



**Figure 9** This patient sought treatment for color correction of her maxillary lateral incisors. The right lateral incisor was a porcelain veneer and the left one was the pontic of an all-ceramic, resin-bonded bridge, which had debonded on numerous occasions and would be replaced with an etched PFM resin-bonded prosthesis.[25]



**Figure 10** Closer evaluation using the dental esthetic checklist also revealed unequal gingival margins and unattractive overall composition. The patient desired treatment of those conditions.

**Figure 11** The Proportion Gauge was used to analyze tooth proportion, revealing the need for crown lengthening of the right central incisor to achieve a naturally attractive proportion of 78% width to length. It was decided that treatment would be accomplished by apical repositioning of the gingival margin.



**Figure 12** The Proportion Gauge showed a need to lengthen the crown of the left central incisor also. Lengthening this crown in an incisal direction fulfilled the 78% width-to-length proportion and satisfied Check Points 3, 4, 5, and 6, as well. The method chosen to lengthen this tooth was direct composite resin bonding. There were other possible treatment modalities but only one correct treatment plan.



**Figure 13** The same patient after apical repositioning of the gingival margins for the right lateral and central incisors and incisal lengthening of the left central incisor.



**Figure 14** A 6-month postoperative view of the gingival surgery. It also shows the appearance of the right lateral incisor porcelain veneer and the left lateral incisor pontic of the etched PFM resin-bonded retainer. Note that the apical third of the pontic was fabricated to harmonize with the length of the right lateral incisor.



**Figure 15** The completed smile for this patient.



**Figure 16** A full-face smile view of the patient.

**Figure 17** This patient displayed lower lip asymmetry. The recommendation of Check Point 5 is to follow the FH in such a situation, as presented here. A dental composition that follows a symmetrical lower lip contour can be seen again in Figure 15.



**Figure 18** The incisal edge line of this patient indicates an unattractive, concave pattern. There are also discrepancies of DM to FM, DV to FV, and DH to FH. Although the maxillary central incisors seem equal in size to each other, they were not centered in the patient's face.



**Figure 19** The final tooth and dental implant-supported maxillary fixed prosthesis achieved a more convex incisal edge line. Corrections of DM to FM, DV to FV, and DH to FH also were achieved and the maxillary central incisors were centered in the face as a result. The patient's lower lip was asymmetrical to FH so, as in Figure 17, the restoration abided by Check Point 5.

The Proportion Gauge (Hu-Friedy, www.hu-friedy.com) can be used to establish the 78% width/length proportion of maxillary central incisors as described by Chu.[24] This gauge reliably produces visually attractive teeth based on data compiled from natural anatomic measurements. Biometrics[24] is a recommended methodology to achieve pleasing upper and lower anterior tooth compositions true to natural dental anatomic specifications (Figure 9 through Figure 16).

## CHECK POINT 5:
### Does the incisal edge line of the maxillary anterior teeth follow the superior contour edge of the lower lip?

There is general agreement that the incisal edge line of the maxillary anterior teeth (an imaginary line scribing through the incisal edges) should have an equidistant consistency to the superior contour edge of the lower lip.[8] In cases in which the lower lip exhibits asymmetry, the recommendation is to follow the facial horizontal axis as previously determined and disregard the lower lip (Figure 17).

## CHECK POINT 6:
### Does the incisal edge line form an "attractive" (convex, "gull-wing," or straight) edge pattern?

Attractive incisal edge lines can be convex, "gull-wing," straight, or some combination of these—but never concave in a downward direction[8] (Figure 18 and Figure 19). While examining the incisal edge line and its relationship to the lips, it is a good time to note the relationship of the lip aperture to the dental display in "wide smile" and repose. The patient usually will give his or her widest smile when asked to bite tightly and say "E."

## CHECK POINT 7:
### Profile and Phonetic/Speech Evaluation

Spontaneous clear speech is extremely important to the patient. The "F" and "V" sounds can be used to determine correct maxillary incisal edge position. The "S" sound has been described to test for adequate freeway space when an alteration in occlusal vertical dimension is being considered.[4,8]

Current writings question the emphasis that orthodontists traditionally have placed on profile view and lateral cephalometric analyses, but it is still important for the dentist to examine, relate, and document the profile view of the teeth, lips, and visible periodontium to the facial complex.[26] Ackerman wrote that the future of dentofacial esthetic treatment planning lies in the clinician's ability to envision the patient's desired 3-dimensional soft-tissue outcome and then engineer the dental and skeletal

hard tissues to produce this desired result. This science quickly is evolving with the aid of new technology that produces 3-dimensional images. As dentists learn to acquire, interpret, and share these images with their patients, new standards for dentofacial esthetic examination, diagnosis, and treatment planning may be established by the dental profession.

## CONCLUSION

The dental literature now states that ideally, a dentist's work should conform to the dental profession's standards for teeth that are properly shaped and colored within an individual patient's complete dentition and balanced with the patient's gingival and facial features.[27]

A seven-point dental esthetic checklist that was developed for dentofacial examination, diagnosis, and treatment planning in an Advanced Education in General Dentistry program was presented. Its purpose is to guide the clinician, via the identification of an organized sequence of physical parameters recognizing major elements of dental composition and function and placing these elements in a symmetrical relationship within the facial complex, to a desired end point. This result should be a harmonious integration of displayed dental components with facial structures that patients and dentists will recognize as pleasing and attractive and that will fulfill the professional obligations of the dentist to these newly published ethical standards.

## ACKNOWLEDGMENTS

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