



Esthetic Crown Lengthening: Appropriate Diagnosis for Achieving Gingival Balance

RICHARD T. KAO, DDS, PHD; SCOTT DAULT; KENNETH FRANGADAKIS, DDS;
AND J.J. SALEHIEH, DDS

ABSTRACT A gummy smile poses a restorative challenge for dentists attempting to achieve ideal esthetics. Many have advocated the use of a gingivectomy or laser-assisted gingival contouring procedure. However, this simplistic approach can potentially create a mucogingival defect or a biological width violation. To avoid these periodontal-restorative complications, it is important during treatment planning to assess the anatomical relationship that resulted in the gummy smile and choose the appropriate surgical treatment to eliminate this condition.

AUTHORS

Richard T. Kao, DDS, PhD, is in private practice in Cupertino, Calif. He also is associate clinical professor at the University of California, San Francisco, School of Dentistry, and the University of the Pacific Arthur A. Dugoni School of Dentistry.

Scott Dault is a research associate and currently a third-year student at the University of the Pacific Arthur A. Dugoni School of Dentistry.

Kenneth Frangadakis, DDS, is in private practice in Cupertino, Calif.

J.J. Salehieh, DDS, is in private practice in Cupertino, Calif.

Elements of the esthetically pleasing, well-balanced smile have been extensively reviewed.¹⁻⁴ It is commonly accepted that the maxillary anterior teeth should be completely displayed during a full smile, with a maximum of 2 mm of gingiva revealed above the central incisors. The gingival crest of the maxillary central incisors and cuspids should be at the same level and create a line parallel to the interpupillary line. The lateral incisors should be slightly coronal to this line (<1 mm) (FIGURE 1A). The displayed teeth should be symmetrical with the proximal of the central incisors aligned with the facial midline. The teeth should fit the rule of “golden proportion” with the incisive edges of the maxillary teeth parallel to the lower lip.⁵

In anterior esthetic cases, surgical modification of the dentogingival complex is often needed to improve the alignment of the gingival crest and provide the proper framework to achieve esthetic success. This is especially true in the situation of the gummy smile where the patient displays excessive gingiva when smiling (FIGURES 1B-C). Elimination of a gummy smile and sometimes the use of veneers can dramatically enhance a patient's appearance. However, the gummy smile can only be resolved with esthetic crown lengthening. If veneers are placed and no surgical alteration is made, they may be long in appearance with the incisive edge too severe, risking fracture of the veneer (FIGURE 2). Additionally, excessive subgingival placement may result in chronically inflamed gingival tissue.



FIGURE 1A. The ideal smile with the central incisors and cuspids aligned and the lateral incisor either at or slightly apical to this line.



1B.



1C.

FIGURES 1B-C. Two examples of gummy smiles with excessive gingival display.



FIGURE 2. Esthetic crown lengthening was not performed prior to the placement of these veneers. In an attempt to increase coronal height, the incisive edge was extended. This resulted in the fracture of the veneer on tooth No. 9. Also note the inflamed gingival tissue with the subgingival extension of the veneer on tooth No. 8.

Many courses in esthetic dentistry and laser surgery recommend gingivectomy procedures for a gummy smile. However, this can be problematic. It is important for the restorative dentist to recognize that the coronally positioned gingival crest associated with the gummy smile is sometimes associated with a similarly positioned alveolar crest. Also, if the zone of attached gingiva is minimal (2 to 3 mm), a gingivectomy procedure can result in a mucogingival defect.

Therefore, it is essential that the dentist properly diagnose the anatomical relationship that caused the gummy smile and select the appropriate surgical treatment for esthetic crown lengthening.

The topic of crown lengthening in the esthetic zone has been recently reviewed; therefore, this paper will elaborate on the anatomical basis for a gummy smile, the surgical options for its correction, and the selection of appropriate treatment.⁶

Delayed Passive Eruption: Diagnosis of the Anatomical Relationship

Tooth eruption consists of an active and a passive phase. Active erup-

tion is the movement of the teeth in the occlusal direction, whereas passive eruption is the exposure of the teeth by apical migration of the gingiva. Delayed passive eruption or altered passive eruption is the failure of the gingival tissue to adequately recede to the proper level relative to the cemento-enamel junction. The consequence of this is short crowns and gingival excess.⁷ Though both terms are used, the term delayed passive eruption will be used in this paper. In limited population studies, this clinical condition occurs 12.1 percent of the time with a distribution of 7 percent in men and 14 percent in women.^{8,9}

Delayed passive eruption conditions are classified into two categories for differential diagnosis and appropriate treatment:²⁻¹⁰

ATTACHED GINGIVA — CROWN RELATIONSHIP

Type I. The gingival margin is incisive to the CEJ with a wider zone of attached gingiva. Since there is an excess of attached gingiva, crown lengthening can be achieved via gingivectomy as long as 3 to 5 mm of attached gingiva are preserved.

Type II. The gingival margin is incisive to the CEJ, but the width of attached gingiva is normal. In this situation, the attached gingival width must be preserved and crown lengthening is achieved by apical positioning of the gingiva.

ALVEOLAR CREST — CEJ RELATIONSHIP

Subgroup A. The underlying alveolar crest is located 1.5 to 2.0 mm apical to the CEJ. In this case, esthetic crown lengthening can be performed without osseous resection.

TABLE 1

Treatment of Gummy Smile

Gingival Width Alveolar Crest Location	Category	Treatment
Wide zone of AG >1.5-2.0 mm apical to CEJ	Type I-A	Gingivectomy with gingivoplasty as needed
Wide zone of AG At CEJ	Type I-B	Gingivectomy with gingivoplasty to ideal gingival position Osseous resection to establish biological width in relationship to the newly positioned gingival crest
Normal zone of AG >1.5-2.0 mm apical to CEJ	Type II-A	Apically positioned gingival tissue
Normal zone of AG At CEJ	Type II-B	Flap and osseous resection to establish biological width in relation to the proposed gingival tissue positioning Apically position gingival tissue

* Modification of table by Cohen.²



3A.

FIGURES 3A-B. Pretreatment presentation showing gingival excess and extrusion of teeth Nos. 8 and 9.



3B.



FIGURE 3C. Esthetic crown lengthening was performed in conjunction with incisive odontoplasty.



FIGURE 3D. Post-treatment appearance with the patient opting not to have veneers placed.

Subgroup B. The alveolar crest is at the CEJ. For this group of defects, esthetic crown lengthening requires 2 to 3 mm of osseous resection to establish the ideal biological width. If resection is not performed, usually there will be a rebound effect where the gingival tissue will heal incisively to the osseous crest. Sometimes the gingival crest may return to its pre-surgical position. The healing process may take up to two to three months. In situations where complete healing is not permitted and veneers are placed too early, violation of the biological width is possible, potentially resulting in chronically inflamed gingival tissue.

Given that there are two types of gingival width and alveolar crest relationships, four combinations can result in a gummy smile (**TABLE 1**). The dentist must properly diagnose the type of anatomical relationship in order to select the appropriate surgical approach.

Differential diagnosis of the four possible types of anatomical relationships associated with delayed passive eruption is accomplished primarily by measuring the zone of attached gingiva and by sounding or transgingival probing of the alveolar crest through the gingival sulcus under local anesthesia. Measuring the zone of attached gingiva determines the type of attached gingiva-anatomic crown

relationship. Transgingival sounding of the alveolar crest determines its relationship to the gingival crest, the CEJ, and the mucogingival junction. The location of these anatomical landmarks will indicate whether there is gingival excess (Type I) or normal gingival width (Type II) and the location of alveolar crest in relationship to the CEJ. The surgical treatments to correct these defects are based on this differential diagnosis.

Treatment of the Gummy Smile

Esthetic crown lengthening approaches for the four types of delayed passive eruption are significantly different (**TABLE 1**). In the authors' experience, the most prevalent type of attached gingiva-anatomical crown relationship is Type I (both Subgroup A and B) with a wide zone of attached gingiva. Treatment for Type I-A delayed passive eruption is primarily a gingivectomy procedure (**FIGURES 3A-D**). When the gingival thickness is relatively thin, this may be all that is required to establish the ideal gingival framework. However, when the gingiva is thick, additional gingivoplasty may be necessary to blend the newly created buttressing gingival margin. These cases can also be esthetically enhanced with orthodontic/restorative treatment in conjunction with an esthetic crown lengthening procedure (**FIGURES 4A-C**). For Type I-B cases, a



FIGURE 4A. Gingival excess (Type I-A) displayed.



FIGURE 4B. Gingivectomy was performed toward the end of orthodontic treatment.



FIGURE 4C. Final appearance after veneers were placed.

gingivectomy is performed to establish the ideal gingival crest position. This is followed by reflection of the gingival flap and osseous resection to establish the 2 to 3 mm apical to the newly established gingival crest (FIGURES 5A-D).

Examples of this type of treatment can be seen in FIGURES 6A-D. The management of Type II-B differs in that the gingivectomy procedure should be omitted and the preserved attached gingiva should be apically positioned.

The ability for esthetic crown lengthening to correct a gummy smile can be limited in the case of skeletal maxillary excess. In these cases, clinical crown length can be increased and the amount of gingiva displayed decreased, but there will usually still be some excessive gingiva. These cases can only be managed with orthognathic surgical treatment. The leveling of the CEJs of anterior teeth may also necessitate the use of orthodontic extrusion or intrusion. These are augmentative procedures that may need to be considered and these options should be reviewed with the patient during the treatment planning process.

Summary

Esthetic dentistry is an art. In mastering this art, the clinician must think about strategies to ensure the optimal esthetic result. In the situation of the gummy smile, excessive gingival display and short teeth compromise dental esthetics. Though some have advocated gingivectomy for the management of this problem, this paper emphasized that the width of attached gingiva and the location of the underlying alveolar crest need to be considered.

Restorative dentists must evaluate cases on an individual basis to discern the anatomical reason for the gummy smile. Depending on the combination of the



FIGURE 5A. Technique for esthetic crown lengthening for Type I-B gingival excess cases. Bleeding points are placed at the ideal gingival crest position.



FIGURE 5B. Gingivectomy is performed and the underlying osseous crest determined.



FIGURE 5C. The flap is reflected and osseous resection is performed to achieve adequate distance for biological width.



FIGURE 5D. The flap is sutured back to the ideal position.



6A.



6B.

FIGURES 6A-B. Pre- and post-treatment of esthetic crown lengthening to eliminate gummy smile and veneers placed to close space from papilla loss.



6C.



6D.

FIGURES 6C-D. Pre- and post-treatment esthetic crown lengthening may need to go back to the second bicuspid area in order to achieve the necessary esthetic appearance along the posterior corridor.

width of attached gingiva and location of the alveolar crest, the category of delayed passive eruption can be correctly diagnosed. It is this diagnosis that will define the surgical approach for the esthetic crown lengthening procedure. ■■■■

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