

The Diagnosis and Treatment of the Gummy Smile

CE 1

Abstract: *The diagnosis and treatment of the “gummy smile” (altered passive eruption, excessive gingival display) help the periodontist to provide the most beautiful smiles possible for patients. This article describes diagnosis, surgical planning, and case reports that show the benefits of treatment of this common clinical problem for the patient and restorative dentist who can now provide ideal cosmetic results for their patients.*

The “gummy smile” is referred to in the literature by a number of clinical descriptors. Allen¹ notes that “excessive gingival display” is caused by a skeletal deformity that involves vertical maxillary excess, a short upper lip, insufficient clinical crown length, or a combination of the above. The term “altered passive eruption,” coined by Goldman and Cohen,² describes a condition during tooth eruption in which the gingival margin fails to recede to a level at or near the cementoenamel junction (CEJ). Volchansky and Cleaton-Jones^{3,4} use the term “delayed passive eruption” to describe the condition in which the margin of the gingiva is positioned incisally or occlusally on the anatomic crown in adulthood and does not approximate the CEJ. A total of 12.1% of the 1,025 patients they studied exhibited delayed passive eruption.

Classification of Altered Passive Eruption

To accurately diagnose and treat the gummy smile, the clinician must be able to recognize the different clinical presentations of altered passive eruption. Coslet et al⁵ proposed the following classification system, which serves as a useful guideline when developing a treatment plan (Figure 1 and Table 1).

Gingival/Anatomic Crown Relationships

Type 1—The gingival margin is incisal or occlusal to the CEJ with a wider gingival dimension from the free margin to the mucogingival junction than the generally accepted mean. The mucogingival junction is usually apical to the alveolar crest.

Type 2—The dimension from the free gingival margin to the mucogingival junction falls within the normal range as described by Loe and Ainamo.⁶ In this type, all of the gingiva is located on the anatomic crown, with the mucogingival junction located at the level of the CEJ.

Alveolar Crest—CEJ Relationships

Subgroup A—The alveolar crest—CEJ relationship corresponds to the 1.5-mm distance accepted as normal. This distance allows for normal insertion of the gingival fiber apparatus into the cementum.

Subgroup B—The alveolar crest is almost at the level of the CEJ. This relationship is often observed during the transitional dentition's phase of active eruption.

According to Rosenberg et al,⁷ cases in subgroup B require more than mere soft-tissue therapy to increase the available crown length. In these cases, osteotomy procedures are necessary to create space for the biologic width. Nevins

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Learning Objectives:

After reading this article, the reader should be able to:

- discuss the classification system of altered passive eruption.
- explain the diagnosis and specific treatment for the different types and subgroups of altered passive eruption and how they differ.
- describe potential problems associated with the surgical mismanagement of the various types and subgroups of altered passive eruption.

Table 1—Classification of Altered Passive Eruption

Type 1: Excessive gingiva

- A. Normal crest-to-CEJ relationship
- B. Osseous crest at CEJ

Type 2: Normal amount of gingiva

- A. Normal crest-to-CEJ relationship
- B. Osseous crest at CEJ

and Skurow⁸ define the biologic width as the combined sum of the supercrestal fibers, the junctional epithelium, and the sulcus. A minimum of 3 mm from the osseous crest to the free gingival margin is required for the insertion of the attachment apparatus. If this space is not provided, thick periodontal biotypes may rebound, and thin periodontal biotypes may demonstrate recession over time. In either

instance, this lack of dimensional stability is unwanted.

To differentiate among the types of altered passive eruption, one must examine the patient carefully. In altered passive eruption type 1, the wide expanse of keratinized gingival tissue coronal to the CEJ can be treated with a gingivectomy. In type 2A eruption, the width of the gingiva is relatively normal, but much of it is coronal to the CEJ. A conventional gingivectomy performed on a type 2A eruption might eliminate much of the keratinized gingiva, leaving the patient with alveolar mucosa at the crown margin. Proper treatment of type 2 eruption cases involves apically repositioning the small band of attached gingiva to a point at or near the CEJ.

The treatment of altered passive eruption type 1B and type 2B is more complex, requiring resective osseous surgery to provide the 3 mm necessary for the insertion of the attachment apparatus between the newly created free gingival margin and the osseous crest. Based on the surgical skills needed and the complexity of the procedures involved to correct the gummy smile in eruption types 1B, 2A, and 2B, the clinician may consider referring these more complex cases to a periodontist.

Figure 1—The classification of altered passive eruption (reprinted with permission from reference 5, p 28).

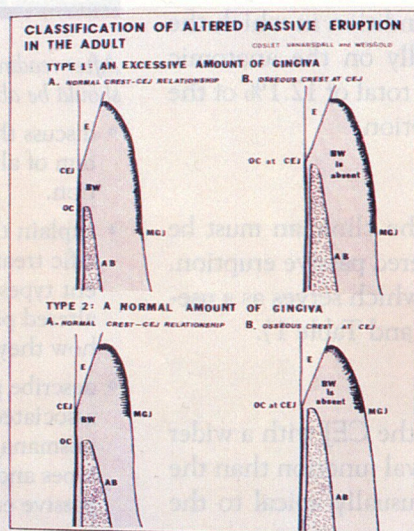


Fig. 13. Classification Chart.

Clinical Diagnosis

The clinical examination should include the determination of the following: clinical crown length (gingival margin to incisal edge), anatomic crown length (CEJ to incisal edge), width of keratinized gingiva (mucogingival junction to free gingival margin), location of alveolar crest, tooth position, and frenum involvement. Periapical radiographs of the teeth involved in the treatment are necessary.

Figure 2A—A 15-year-old boy presented at the completion of his orthodontic work concerned with the cosmetics of his short teeth and gummy smile. A predisposition to gingival hyperplasia is seen when orthodontic appliances are placed in an altered passive eruption case.

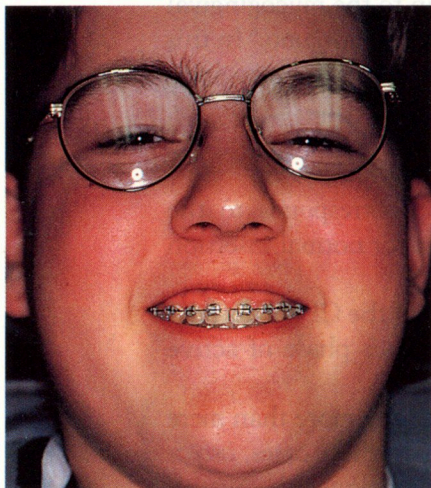
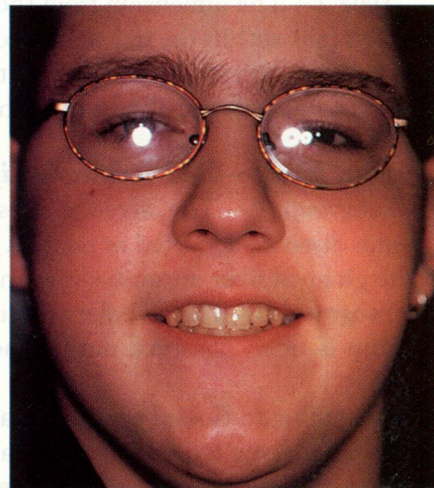


Figure 2B—The 6-month postoperative visit of maxillary gingivectomy with a buccal approach from teeth Nos. 5 through 13. The orthodontic appliances were removed and retainers placed approximately 6 weeks postsurgery. (Orthodontic therapy by Dr. Vincent Cullen, Huntingdon Valley, Pa; surgical treatment by Dr. Robert Levine, Philadelphia, Pa.)



Along with ensuring that there is adequate root length and bony support, the radiographs can also serve as a guide to locate the CEJ, an important landmark in any crown-lengthening procedure. Needle-probing under local anesthetic is often necessary to confirm the position of the CEJ and its relationship to the alveolar crest.

The vertical and horizontal limits of the smile should also be evaluated. In ideal vertical dimensions, the gingival margin of the central incisors and canines should touch the vermilion border of the maxillary lip in full smile. The horizontal limits of the smile dictate how far posteriorly the procedure should be taken. In most situations, crown lengthening should extend to the maxillary first molars to create the proper depth and harmony of the smile.

Symmetry of the gingival margins on contralateral teeth is an important ingredient in the final cosmetic result. Ideally, the clinical crown length of maxillary central incisors and canines should be equal. The gingival margin of lateral incisors is generally 1 mm to 2 mm coronal to the adjacent teeth. The gingival height of contour of the central incisors and the canines should be at the distofacial line angle, and the gingival height of contour of the lateral incisors should be centered mesiodistally.

Case Reports

The following case reports demonstrate how these diagnostic guidelines are used in clinical practice.

Case 1

After orthodontic treatment, a healthy 15-year-old boy presented for correction of his gummy smile. The excessive gingival display was exacerbated as a result of gingival proliferation during the active phase of orthodontics (Figure 2A). Clinical examination revealed that the maxillary anterior teeth had midbuccal probing depths of 3 mm and that the osseous crest was at a normal relationship to his CEJ. A diagnosis of type 1A altered passive eruption was made. Surgical correction consisted of a conventional gingivectomy on the facial aspect of teeth Nos. 5 through 13 (Figure 2B).

Case 2

A healthy 68-year-old woman under periodontal maintenance care wished to restore

teeth Nos. 6 through 9 with a combination of crowns (teeth Nos. 6 and 7) and bonding (teeth Nos. 8 and 9) (Figure 3A). Clinical and radiographic examination revealed localized excessive gingival display (altered passive eruption type 1A) from teeth Nos. 6 through 9, which created a gingival asymmetry that was very disturbing to the patient. After an appropriate tooth length analysis, a conventional gingivectomy was performed from teeth Nos. 6 through 9, resolving the esthetic dilemma. A 3-year follow-up shows a natural smile with symmetrical gingival margins adapting well to the final restorations (Figure 3B). The patient was so pleased with the esthetic results obtained in the maxillary arch that she decided to replace her lower removable partial denture with an implant-supported bridge placed on implants in teeth Nos. 28, 29, and 31.

Case 3

A healthy 35-year-old woman presented to Albert Einstein Medical Center Department of Dental Medicine with the chief complaint of "wanting a prettier smile." She conveyed that she "would like to have surgery on her gums, like her mom, so that she would have less of a gummy smile" (Figure 4A). (The authors have noted a tendency for genetic transmission of altered passive eruption.)

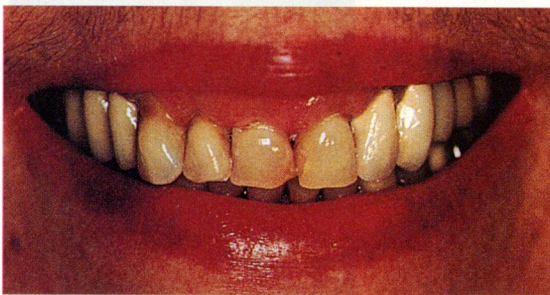


Figure 3A—After years in periodontal maintenance with an asymmetrical gingival marginal relationship, a 68-year-old woman desired to replace teeth Nos. 6 through 9 with cosmetic restorations.



Figure 3B—The 3-year postsurgical visit showed the patient's completed crowns for teeth Nos. 6 and 7 and adhesive bonding of teeth Nos. 8 and 9. Note a more natural and symmetrical smile. (Restorative dentistry by Dr. Stephen Band, Philadelphia, Pa; surgical treatment by Dr. Robert Levine, Philadelphia, Pa.)

Clinical probing depths of 5 mm were recorded on teeth Nos. 6 and 8 (Figures 4B and 4C). She was diagnosed as having altered passive eruption type 1B, based on clinical and radiographic findings. Bicuspid to bicuspid could be seen in full smile (Figure 4D). The surgical treatment plan was sequenced over 5 visits with the objective of pocket elimina-

Figure 4A—A 35-year-old woman presented with altered passive eruption type 1B.



Figure 4B—A clinical examination revealed midbuccal depths of 5 mm to the CEJ with the osseous crest located at the CEJ.

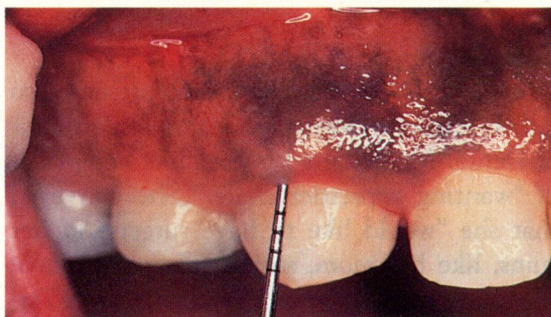


Figure 4C—A typical maxillary anterior radiographic view of the osseous crest located at the CEJ between teeth Nos. 6 and 7 with no room for the normal biologic width relationship.



Figure 4D—The patient wanted her gummy smile "corrected" in the same way that her mother had it done when she was younger.



tion/reduction in the molar regions to treat the 4-mm to 8-mm probing depths and anteriorly to reduce the gummy smile. Appropriate tooth length was achieved by eliminating the excess tissue through a gingivectomy. Each tooth involved in the procedure was then probed from the newly created free gingival margin to the alveolar crest. Probing depths ranged from 0 mm to 0.5 mm, confirming the diagnosis of subgroup B. To create room for the biologic width, a full-thickness flap was elevated, and osseous resection was accomplished to ensure that there was at least 3 mm between the osseous crest and the newly created free gingival margin (Figures 4E and 4F). The flaps were sutured and the patient was placed on appropriate postoperative medications. The patient was seen for postoperative visits at 2 days and 3, 6, and 8 weeks for plaque control reinforcement and reevaluation (Figures 4G and 4H).

Case 4

A healthy 16-year-old girl who desired an improved smile for her graduation pictures was seen 6 months before her high school graduation (Figure 5A). Clinical examination revealed excessive maxillary jaw growth and an asymmetrical upper lip on smiling. It was concluded that orthognathic surgery would be the treatment of choice, but the patient was not interested in pursuing this because of the time and cost involved. In addition to the skeletal problem, probing depths ranged up to 4 mm on the facial aspect of her maxillary central incisors. A frenum was charted between teeth Nos. 8 and 9 approximately 5 mm below the papilla (Figure 5B), and the left and right maxillary first molars could be seen in full smile. The excess gingiva was removed through a reverse bevel incision and a full-thickness flap from teeth Nos. 2 through 15. Osteoplasty of the facial alveolar crest was accomplished to reduce the ledges and to produce more of a thin-scalloped periodontium. A 4-year postoperative photograph shows a healthy periodontium, a reduction in her gummy smile, teeth with an ideal clinical crown length, and a happy patient (Figures 5C and 5D).

Case 5

A healthy 35-year-old woman presented with the chief complaint of wanting to correct her gummy smile before replacing an old and failing maxillary reconstruction. Clinical and

radiographic examinations revealed maxillary jaw excess with a wide display of excessive gingiva. Pocket probing measurements ranged up to 5 mm posteriorly and up to 6 mm anteriorly in the upper jaw with generalized beginning-to-moderate periodontitis partially associated with her failing reconstruction and the poor marginal fit of her fixed bridgework (Figure 6A). Tooth No. 6 was extracted when

Figure 4E—Full-thickness flaps raised from teeth Nos. 5 through 12, showing a very thick osseous profile with the coronal extension to the CEJ. A similar finding was seen in her lower anterior sextant.

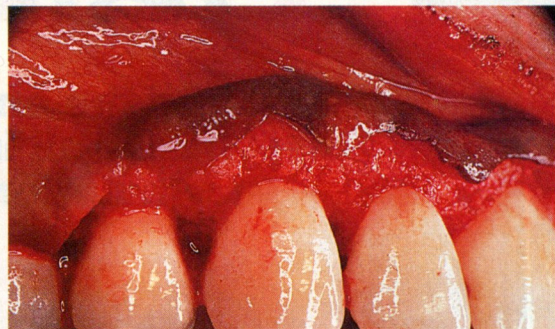


Figure 4F—Postosteoplasty and ostectomy created 1 mm to 1.5 mm of room on the cementum for the connective-tissue attachment.

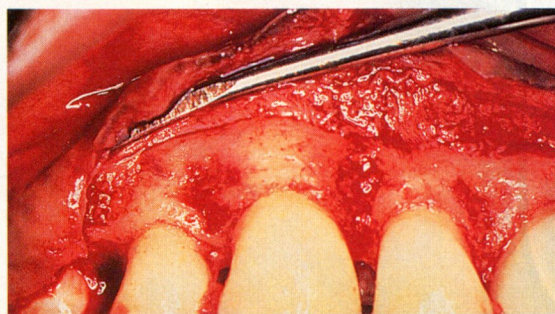
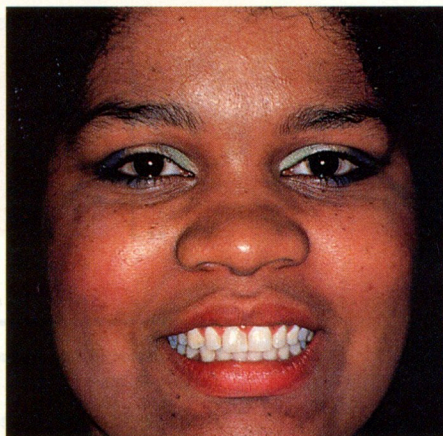


Figure 4G—The postoperative facial view at 8 weeks in the lower jaw and at 6 months in the upper jaw. Her case was completed in 5 surgical appointments that treated the maxillae in sextants and the mandible in 2 visits (teeth Nos. 18 through 27 and teeth Nos. 28 through 31).



Figure 4H—The 1-year postoperative view. (Surgical treatment by Dr. Robert Levine and general practice dental resident Dr. John Boeker, both of Philadelphia, Pa.)



she was a child, which had created a midline shift to the patient's right of 3 mm. Tooth No. 5 acted prosthetically as her cuspid. Her case was provisionalized from teeth Nos. 2 through 15 in one piece, and her surgical correction was completed in one visit via full-thickness flaps with osseous recontouring for pocket elimination. The 1-year postoperative visit shows a more natural smile with longer teeth and shorter gums. The final treatment involved the placement of porcelain veneers (on teeth Nos. 4, 5, 11, 12, and 13) and porcelain crowns (on teeth Nos. 7 through 10) (Figure 6B).

Conclusion

The preceding case reports demonstrate that crown lengthening for esthetic reasons—primarily to reduce the gummy smile—is a powerful procedure. Patients who choose to have this procedure are sometimes left untreated because many in the dental professions are unfamiliar with this treatment regimen. If we hope to have widespread use of this procedure, our first challenge is to communicate the benefits of esthetic crown lengthening to our patients and professional colleagues.

Multidisciplinary teamwork is essential for the successful treatment of many of the cases requiring correction of the gummy smile. For example, because the incisal edge is the constant from which all measurements are made, the restorative dentist ideally should establish the final incisal edge position before referring the patient to the periodontist. The restorative dentist should also indicate whether the crown lengthening is being accomplished strictly for esthetic reasons on the facial surfaces of the teeth or if it is indicated 360 degrees around each tooth to increase retention for restoration. This information is important because the surgeon should leave the interproximal papillae intact, flapping only the facial aspect of the teeth unless crown lengthening for retention is necessary. In these cases, special care should be taken to preserve as much of the interproximal papillae as possible, preventing the blunting of or the devastating loss of the interproximal papillae, which can create an esthetic dilemma far worse than the original gummy smile.

When these cases are properly diagnosed and treated, the newly created gingival margin remains at the position established at the time

of surgery and is dimensionally stable enough to receive restorations at 3 months. The surgery involved in these procedures is rather innocuous, but the results can be spectacular, improving the patient's self-image as well as his or her smile.

References

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Figure 5A—A 16-year-old high school student presented for surgical correction of her gummy smile. Note maxillary jaw excess, and a short asymmetrical upper lip.



Figure 5B—The clinical buccal view. A diagnosis of altered passive eruption type 1A was made. Surgical correction using submarginal incisions buccal and lingual full-thickness flaps with osteoplasty was completed from teeth Nos. 2 through 15 in 1 visit.

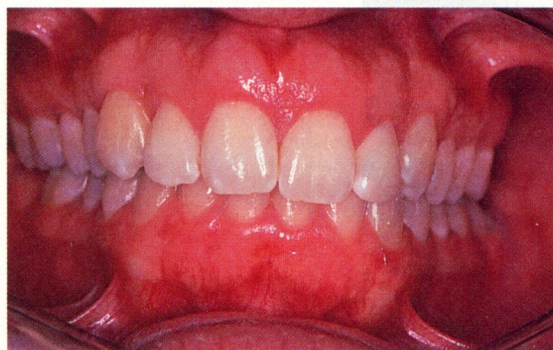


Figure 5C—The 4-year postoperative view of the case. Note the new location of the frenum because of the frenectomy performed at the time of surgery. Surgical attention to this detail is important to maximize the esthetic result.



Figure 5D—The full-face view 4 years after surgery. (Surgical treatment by Dr. Robert Levine, Philadelphia, Pa.)

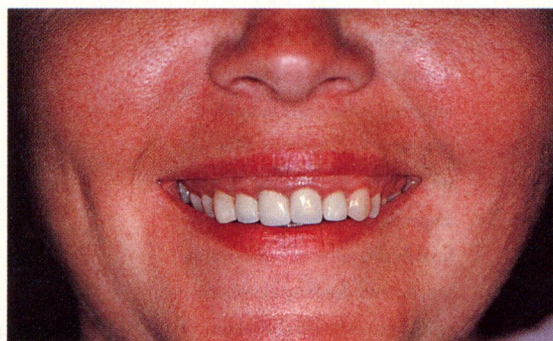


Figure 6A—A 35-year-old woman presented with a diagnosis of altered passive eruption type 1A and a maxillary jaw excess. Her desire was to replace an old, failing, full-arch fixed restoration in the maxillary jaw with a gummy-smile correction. Note midline discrepancy because of early loss of tooth No. 6.

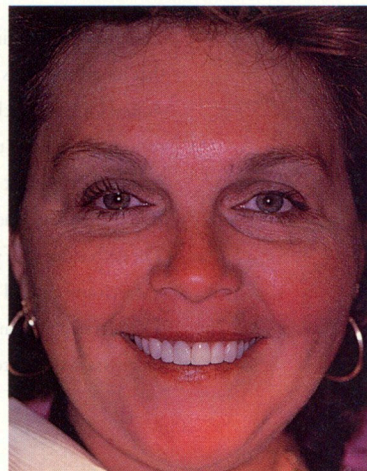


Figure 6B—The completed case 1 year postoperatively. (Restorative therapy by Dr. Paul Greenwald, Warminster, Pa; surgical treatment by Dr. Robert Levine, Philadelphia, Pa.) (Posey Dental Lab, Langhorne, Pa.)