# MANAGEMENT OF EXCESSIVE GINGIVAL DISPLAY FOLLOWING ADULT ORTHODONTIC TREATMENT: A CASE REPORT

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***A common cause for the condition described as excessive gingival display is the phenomenon known as altered passive eruption, a coronally situated gingival complex that failed to recede normally during eruption of an otherwise healthy and normal dentition. Orthodontic movement in such conditions may set the stage for additional coronal growth of hyperplastic gingival complex. The objective of this article is to describe, through a detailed case presentation, the surgical methods used to achieve healthy and aesthetic gingival contours in such conditions.***

**Learning Objectives:**
This article discusses the management of excessive gingival display that was caused by altered passive eruption and exacerbated by orthodontic therapy. Upon reading this article, the reader should:

- Understand what treatment plans the clinician can undertake to correct the "gummy smile."
- Learn how to determine which surgical procedure should be performed based on radiographs and local anatomy.

*Key Words: excessive gingival display, altered passive eruption, ostectomy, biologic width*

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The surgical management of excessive gingival display has been given increasing attention in recent years.[1-12] Excessive gingival display is a condition characterized by excessive exposure of the maxillary gingivae while smiling, commonly called a "gummy smile."[13-15] This is caused primarily by a skeletal deformity in which there is vertical excess of the maxillary tissue or a soft tissue deformity in which there is a short upper lip, or a combination thereof.[13-14] Another cause is insufficient clinical crown length.[16,17] Common causes include coronal destruction resulting from traumatic injury, caries, or incisal attrition, and also coronally situated gingival complex resulting from tissue hypertrophy, or a phenomenon known as altered passive eruption.[5,9]

In healthy dentition, the teeth and alveoli actively erupt from their crypt through the gingivae until occlusal contact with the opposing arch is established. This is usually followed by passive eruption, the apical migration of the dentogingival unit to the cementoenamel junction (CEJ). Altered passive eruption occurs when the alveolar bone and the dentogingival unit fail to recede. As a result, the alveolar bone remains near, or even at, the level of the CEJ.[18,19]

The incidence of altered passive eruption in the general population is approximately 12 percent.[20] This condition is generally manifested as a normal "healthy" clinical situation and is left untouched, unless crown lengthening procedures for aesthetic or prosthetic reasons are indicated.

## Surgical Options

The type of periodontal surgery a patient can undergo to achieve an aesthetic gingival display depends on several factors.[21,22] Gingivectomy is indicated if the osseous level is within the normal range (ie, 1.5 mm to 3 mm from the CEJ), if there is more than 3 mm of tissue from bone to gingival crest, or if it is determined that an adequate zone of attached gingiva will remain after the surgical procedure.[8] The initial incision should be lightly scored at the diagnosed level of the CEJ. Care should be taken to be sure not to overthin the marginal tissue. The initial incision should reflect the normal gingival architecture, so that the highest point of the gingival margin is slightly distal to the center of the tooth. To help in outlining the initial incisions, a symmetric template made of acrylic may be used as a surgical guide.[8,15,23,24] A full-thickness, minimally beveled incision, accompanied by removal of tissue from the facial surface with the papillary tissue left undisturbed, completes the gingivectomy.

If the diagnostic procedures reveal osseous levels approximating the CEJ, a gingival flap with ostectomy is then indicated.[7,8,14-17,25]

**Figure 1. View of the patient at presentation. The shy smile reveals short, square-shaped teeth with a wide central diastema.**

**Figure 2. Preoperative retracted view of short teeth with diastema and nonstippled glossy gingiva. Note that there is 40% overbite.**

The initial incision can be similar to that for gingivectomy or it can be sulcular. If the gingival heights of the anterior teeth are asymmetric and the width of keratinized tissue is adequate, the initial incision should be a gingivectomy-type incision so that the final tissue contour will be symmetrical. If the preoperative tissue contours are symmetrical and the width of the keratinized gingiva is limited, a sulcular incision can be made and the flap apically positioned. If possible, the interproximal papillae are left intact.[26] A full-thickness flap is reflected beyond the mucogingival junction, and the positions of the CEJ and crestal bone are verified visually.

Ostectomy is then performed so that the crestal bone is approximately 2.5 mm to 3 mm from the CEJ, which provides a biologic width that is physiologically adequate. The facial bone is first thinned with a round diamond bur; the remaining bone adjacent to the root surface is removed with an Oschenbein-type chisel or a Prichard-type periosteal elevator. Bone contours should mimic the anticipated

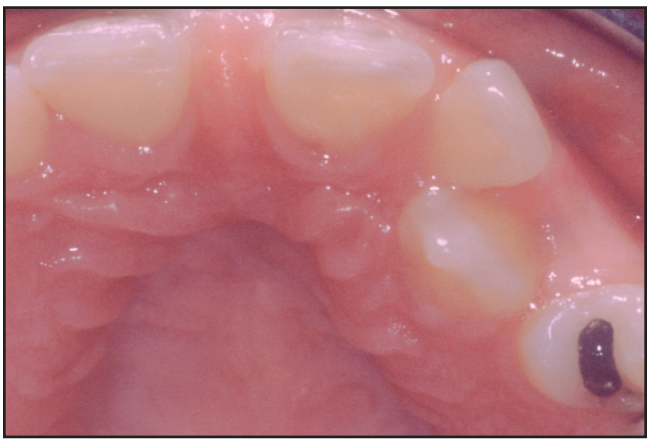

**Figure 3. Occlusal view showing tooth #6(13) in full palatal position.**

**Figure 4. Lateral view showing tooth #6 in complete crossbite. Note a 3-mm overjet.**

marginal gingival contours; hence, the highest point of the osseous crest is usually slightly distal to the center of the tooth. Minor final corrections can be made by a periodontal curette utilized in a paintbrush scalloping motion. Depending on the "clinical school of philosophy," the mucoperiosteal flap is then positioned and sutured either apically at the crestal level or coronally at the CEJ level.[7,8,14-17,25,27,28] Dressings, if used, and sutures are removed in 7 days, and patients are instructed in personal oral hygiene. If the flap margin becomes coronally displaced, or if there is slight gingival rebound, a gingivoplasty can be performed to correct minor inconsistencies.[29]

## Case Presentation

A 30-year-old female presented with a chief complaint that her teeth were too small and that she had diastemata in the maxillary arch. The general medical history of the patient was insignificant, and there was no family history of oral or dental anomalies. Extraoral evaluation revealed good facial aesthetics and a straight facial profile. In full smile, the patient presented 6 mm to 8 mm of gingival display.

There was minor lip incompetence at rest and a slightly prominent soft tissue pogonion. Intraoral examination revealed an Angle Class I relationship on both sides and a large, 4-mm, maxillary midline diastema. The labial frenum adjacent to the diastema was wide, inserted low, and connected to the palatal area near the incisive papillae (Figures 1 and 2).

The arch was wide and two permanent teeth were missing (ie, maxillary right first molar, maxillary left second premolar). The patient reported that these teeth had been extracted in her childhood because of deep carious lesions. The maxillary right canine was in full palatal position and was in complete crossbite. Wear facets were presented on the lateral aspect of that canine. The teeth adjacent to the extraction sites were tilted toward the void. There was space of approximately 9 mm available in the maxillary arch overall.

The intermaxillary relationship examination revealed an overjet and overbite of 3 mm (Figures 3 and 4). The anterior-posterior relationship in the premolar area was Class I. There was a flat curve of Spee and no evidence of shift from centric relation to centric occlusion. Radiographs revealed no pathology, nor neural or bony abnormalities. Interproximal bone levels were close to or at the CEJ of all anterior teeth. Root proximity between teeth #9(21) and #7(12), #8(11) and #12, and #6(13) and #5(14) was evident (Figure 5).

A treatment plan was established that would:

1. Initiate a disciplined oral hygiene program;
2. Normalize overbite and overjet;
3. Eliminate the crossbite;
4. Create adequate tooth space for one premolar in the maxillary left quadrant;
5. Redistribute the maxillary teeth and diminish all other spaces;
6. Recontour the gingival line; and
7. Place and restore a single implant in the maxillary left quadrant.

### *Treatment Progress*

Preadjusted 0.018″ slot brackets and tubes were bonded, without using bands. After initial leveling and alignment with a 0.014" nickel-titanium (NiTi) wire, a 0.016″ - 0.022″ stainless steel (SS) wire was used as a working archwire (AW). A space opened between the first maxillary left premolar and the first molar; accordingly, the adjacent roots were uprighted to develop an implant site.

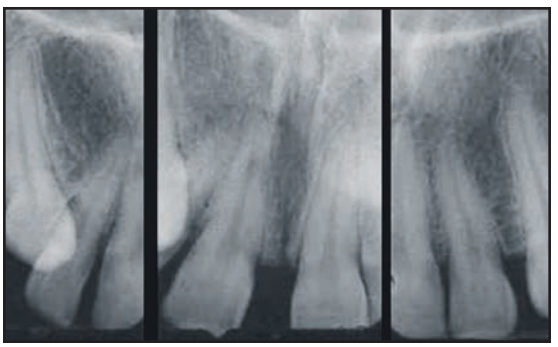

**Figure 5. Interproximal bone is near, or at, the CEJ of all maxillary anterior teeth. Note the interdental spaces and misaligned teeth.**

**Figure 6. At the termination of orthodontic alignment, gingival hyperplasia has progressed further coronally.**

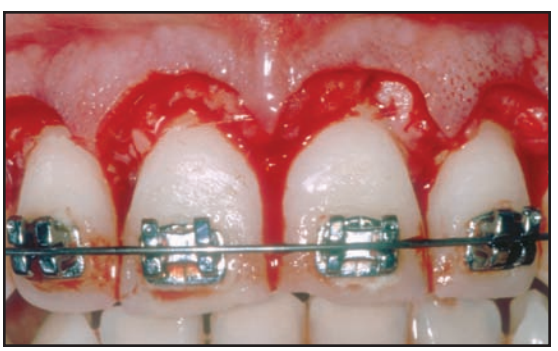

**Figure 7. Retraction of mucoperosteal flap reveals crestal bone is near, or at, the CEJ of all anterior teeth. Note the fragile, hypervascularized cancellous-type bone.**

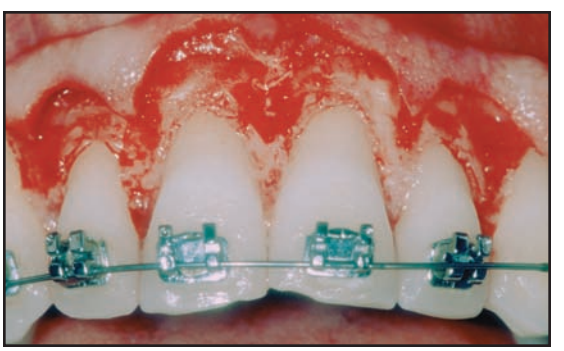

**Figure 8. Biologic width and physiologic bone architecture has been established.**

The maxillary right canine was brought from its initial palatal position to the arch using a two AW system with the main AW acting as a base arch and a secondary 0.014" NiTi "piggy-backing" the AW. The bite was raised vertically in a temporary mode, utilizing posterior bite blocks bonded on the first molars. The anterior space was closed using Class I mechanics, slightly retroclining the maxillary anterior teeth. As a final AW, a 0.017" - 0.025" SS AW was chosen to deliver the proper third order adjustments according to the bracket system prescription. Upon completion of the active phase of treatment, a fixed bonded retainer was fabricated and bonded to the palatal aspect of the maxillary six anterior teeth.

All orthodontic treatment objectives, including the patient's aesthetic demands, except for the excessive gingival display, were achieved. Now, all of the initially presented spaces—between the maxillary right second premolar and the left first one—were closed, and intact contact points were established. An 8-mm space was created to house a future fixture in the maxillary second premolar area.

***Periodontal Assessment and Management***

After completion of the orthodontic treatment, the patient was referred for periodontal management of the smile line and for implant placement at the site of the maxillary left second premolar. Diagnostic records, including study models and photographs, were provided. Clinical analysis indicated that during orthodontic treatment, the gingival hyperplasia had progressed further coronally to cover more than two thirds of the crowns in the anterior region. A severe case of altered passive eruption was diagnosed (Figure 6).

Surgical exposure of the crown and gingival recontouring were initiated by a gingivectomy-type incision and were completed by lifting a full-thickness mucoperiostal flap from tooth #5(14) to tooth #12(24). The alveolar crest was relatively thick and less than 1 mm from the CEJ, having a soft, loose, cancellous-type consistency with high vascularity (Figure 7). Osteoplasty with a surgical fine, round diamond bur was carefully performed with constant saline irrigation. The ostectomy was initiated with a sharp #3 Prichard Periosteal elevator and completed by a # 1-2 Gracey periodontal curette (Figure 8).

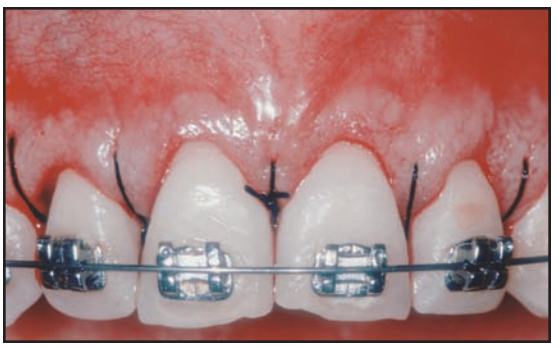

**Figure 9. The mucoperiosteal flap is apically positioned and sutured at the level of the CEJ.**

**Figure 10. Facial view postoperation. Note the healthy stippled gingiva with physiological contours.**

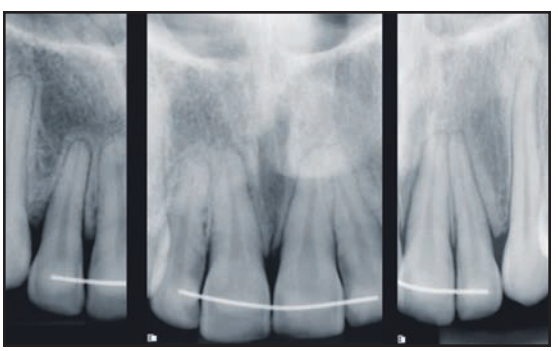

**Figure 11. Postoperative radiograph.**

**Figure 12. Postoperative view of the patient. Note the pleasant smile and improved facial expression.**

To minimize interdental tissue recession, a palatal flap and the interdental papillary tissue were not raised during the procedure. The facial mucoperiosteal flap was closed with 4-0 silk and a CE-2 needle; vertical mattress periosteal sutures were not necessary (Figure 9). The sutures were removed 7 days after the procedure, and the patient was followed at 1-week intervals for the following month and 4-week intervals for the subsequent 5 months. A symmetric marginal gingival line with full exposition of the natural teeth was achieved. The biologic width appeared to have been fully re-established as reflected by the stippled, keratinized, healthy appearance of the gingivae. An aesthetic smile was achieved and the overall treatment outcome was reasonably successful (Figures 10 through 12).

## Discussion

The first step in diagnosing excessive gingival display is to observe the patient in both repose and smiling naturally.[6-8,30] It is assumed, however, that most patients will not show their full smile line in the dental chair. To achieve the best aesthetic perception of the face, it is also suggested to "catch" the patient's free laughing expression. A spontaneous joke will usually extract this expression. Some degree of gingival display may be aesthetically pleasing and, according to Sarver, might be considered youthful. One characteristic of aging is to show less of the maxillary incisors; a greater incisal display may indicate youth.[30]

With the lips in repose, females typically show more of the maxillary incisors and less of the mandibular incisors than males.[1,30] If there is excessive gingival display while one is smiling or laughing, further diagnostic data are required. First, the length and activity of the upper lip must be evaluated. If the gummy smile is due solely to inadequate lip length or hyperactivity, no treatment is indicated. There is no predictable procedure available to correct a short or hyperactive lip; therefore, communicating this diagnosis to the patient allows for realistic treatment expectations.[8]

The clinician should then attempt to locate the CEJ to determine the presence or absence of altered passive eruption.[7,8] If the CEJ is located in a normal position

in the gingival sulcus, then the patient does not have altered passive eruption. The short teeth here are due to incisal wear or a variation of normal anatomy.[3,4]

Periapical radiographs will provide evidence of adequate root length and bony support and may serve as a guide for locating the CEJ.[9] To aid in this task, Sterrett et al published data on averaged correlations between width and length of normal clinical crowns in different patient populations.[31] For example, if a white male patient with altered passive eruption had central incisors that measured 8.5-mm wide, the calculated working approximation of the tooth length after surgery would be 8.5 mm/0.85 = 10 mm.[31] Similar calculations could apply in conjunction with other clinical parameters to determine the final position of the gingival margins.

Ideally, the smile should expose a minimal amount of gingiva, and the gingival contour should be symmetric and harmonious with the upper lip; the anterior and posterior segments should be in harmony, and the teeth should be of normal length.[13] Because of the diverse factors involved, a multidisciplinary approach is essential for successful treatment of excessive gingival display.

In this case, the clinical and radiographic findings indicated that the excessive gingival display was a result of a severe expression of altered passive eruption. In such cases, it seems that orthodontic movement, where normal connective tissue attachment to the root cementum is minimal, if at all, sets the stage for an additional growth of hyperplasic, edematous soft and hard tissue components of the coronal part of the attachment apparatus. Although a comprehensive hygiene regimen is delivered prior to surgery, the clinician should be alert to a hypervascularized surgical field with reduced visibility and sometimes extremely fragile soft, as well as hard, tissues. Care should be taken, therefore, not to overthin the crestal bone and the keratinized gingiva to protect against accidental tissue recession with root exposure.

## Conclusion

A periodontal state of altered passive eruption plays a significant role in the exacerbation of gingival hypertrophy during orthodontic therapy. At the termination of active orthodontic therapy, the correct surgical establishment of the biological width is imperative if the goal is to achieve stabilized dentogingival relationships with long-lasting aesthetic results.

## References


1. Miller CJ. The smile line as a guide to anterior esthetics. Dent Clin North Am 1989;33(2):157-164.
2. Dzierzak J. Achieving the optimal perio-esthetic results: The team approach. J Am Dent Assoc 1992;123(5):41-48.
3. Kokich V. Esthetics and anterior tooth position: An orthodontic perspective. Part I: Crown length. J Esthet Dent 1993;5(1):19-23.
4. Kokich V. Esthetics and anterior tooth position: An orthodontic perspective. Part II: Vertical position. J Esthet Dent 1993;5(4): 174-178.
5. Evian CI, Cutler SA, Rosenberg ES, Shah RK. Altered passive eruption: The undiagnosed entity. J Am Dent Assoc 1993;124(10): 107-110.
6. Kokich VG. Esthetics: The orthodontic-periodontic restorative connection. Semin Orthodont 1996;2(1):21-30.
7. Garber DA, Salama MA. The aesthetic smile: Diagnosis and treatment. Periodontal 2000 1996;11:18-28.
8. Dolt AH 3rd, Robbins JW. Altered passive eruption: An etiology of short clinical crowns. Quintessence Int 1997;28(6): 363-372.
9. Levine RA, McGuire M. The diagnosis and treatment of the gummy smile. Compend Contin Educ Dent 1997;18(8):757-764.
10. McGuire MK. Periodontal plastic surgery. Dent Clin North Am 1998;42(3):411-465.
11. Redlich M, Mazor Z, Brezniak N. Severe high angle class II division 1 malocclusion with vertical maxillary excess and gummy smile: A case report. Am J Orthod Dentofacial Orthop 1999;116:317-320.
12. Foley TF, Sandhu HS, Athanasopoulos C. Esthetic periodontal considerations in orthodontic treatment: The management of excessive gingival display. J Can Dent Assoc 2003;69(6): 368-372.
13. Allen EP. Use of mucogingival surgical procedures to enhance esthetics. Dent Clin North Am 1988;32(2):307-330.
14. Allen EP. Surgical crown lengthening for function and esthetics. Dent Clin North Am 1993;37(2):163-179.
15. Townsend CL. Resective surgery: An esthetic application. Quintessence Int 1993;24(8):535-542.
16. Wolffe GN, van der Weijden FA, Spanauf AJ, de Quincey GN. Lengthening clinical crowns–A solution for specific periodontal, restorative, and esthetic problems. Quintessence Int 1994; 25(2):81-88.
17. Miller PD Jr, Allen EP. The development of periodontal plastic surgery. Periodontol 2000 1996;11:7-17.
18. Schroeder HE, Listgarten MA. Fine structure of the developing epithelial attachment of human teeth. Monogr Dev Biol 1971;2:1-134.
19. Coslet JG, Vanarsdall R, Weisgold A. Diagnosis and classification of delayed passive eruption of the dentogingival junction in the adult. Alpha Omegan 1977;70(3):24-28.
20. Volchansky A, Cleaton-Jones P. The position of the gingival margin as expressed by clinical crown height in children ages 6-16 years. J Dent 1976;4:116-122.
21. Nasr HF. Crown lengthening in the esthetic zone. Atlas Oral Maxillofacial Surg Clin North Am 1999;7(2):1-10.
22. Smukler H, Chaibi M. Periodontal and dental considerations in clinical crown extension: A rational basis for treatment. Int J Periodont Rest Dent 1997;17(5):464-477.
23. Walker M, Hansen P. Template for surgical crown lengthening: Fabrication technique. J Prosthodont 1998;7(4):265-267.
24. Scutella F, Landi L, Stellino G, Morgano SM. Surgical template for crown lengthening: A clinical report. J Prosthet Dent 2001; 85(1):96-98.
25. Rosenberg ES, Cho SC, Garber DA. Crown lengthening revisited. Compend Contin Educ Dent 1999;20(6):527-534.
26. Nemcovsky CE, Artzi Z, Moses O. Preprosthetic clinical crown lengthening procedures in the anterior maxilla. Pract Proced Aesthet Dent 2001;13(7):581-589.
27. Kois JC. The restorative-periodontal interface: Biological parameters. J Periodontol 1996;11:29-38.
28. Pontoriero R, Carnevale G. Surgical crown lengthening: A 12-month clinical wound healing study. J Periodontol 2001;72(7): 841-848.
29. Becker W, Ochsenbein C, Becker BE. Crown lengthening: The periodontal-restorative connection. Compend Contin Educ Dent 1998;19(3):239-242.
30. Sarver DM. The importance of incisor positioning in the esthetic smile: The smile arc. Am J Orthod Dentofacial Orthop 2001; 120(2):98-111.
31. Sterrett JD, Oliver T, Robinson F, et al. Width/length ratios of normal clinical crowns of the maxillary anterior dentition in man. J Clin Periodontol 1999;26(3):153-157.

# Continuing Education (CE) Exercise No. 4

4 CE CONTINUING EDUCATION

***To submit your CE Exercise answers, please use the answer sheet found within the CE Editorial Section of this issue and complete as follows: 1) Identify the article; 2) Place an X in the appropriate box for each question of each exercise; 3) Clip answer sheet from the page and mail it to the CE Department at Montage Media Corporation. For further instructions, please refer to the CE Editorial Section.***

***The 10 multiple-choice questions for this Continuing Education (CE) exercise are based on the article "Management of Excessive Gingival Display Following Adult Orthodontic Treatment: A Case Report" by Cobi J. Landsberg, DDS, and Ofer Sarne, DMD. This article is on Pages 89-94.***

**1. If the gingival heights of the anterior teeth are asymmetric and the width of keratinized tissue is adequate, what type of initial incision should be made so that the final tissue contour will be symmetrical?**
a. Prichard-type.
b. Sulcular incision.
c. Oschenbein-type.
d. Gingivectomy-type.

**2. When does altered passive eruption occur?**
a. When passive eruption occurs.
b. When the alveolar bone and the dentogingival unit fail to recede.
c. When occlusal contact with the opposing arch is established.
d. When the alveolar bone and the dentogingival unit recede.

**3. Which is NOT an indication of gingivectomy?**
a. The osseous level is not within 1.5 mm to 3 mm from the CEJ.
b. The osseous level is within 1.5 mm to 3 mm from the CEJ.
c. There is more than 3 mm of tissue from bone to gingival crest.
d. An adequate zone of attached gingiva will remain after surgery.

**4. After how many days should dressings, if used, and sutures be removed?**
a. After 2 days.
b. After 7 days.
c. After 10 days.
d. After 14 days.

**5. Which is a cause of excessive gingival display?**
a. Vertical excess of the maxillary tissue.
b. A soft tissue deformity in which there is a short upper lip.
c. Insufficient clinical crown growth.
d. All of the above.

**6. Which is NOT a common cause of short clinical crowns?**
a. Altered passive eruption.
b. Coronally situated gingival complex resulting from tissue hypertrophy.
c. When the teeth and alveoli erupt from their crypt through the gingivae until occlusal contact with the opposing arch is established.
d. Coronal destruction resulting from traumatic injury, caries, or incisal attrition.

**7. Which of the following should be used when performing an osteoplasty?**
a. A surgical, fine round diamond bur.
b. A digital radiograph.
c. Both a and b.
d. Neither a nor b.

**8. What is the first step in diagnosing excessive gingival display?**
a. Observing the patient in repose and smiling naturally.
b. Asking the patient to pose a smile.
c. Attempting to locate the CEJ to determine the presence or absence of altered passive eruption.
d. None of the above.

**9. What is a characteristic of an ideal smile?**
a. A minimal amount of gingival exposure.
b. The anterior and posterior segments are in harmony.
c. The gingival contour should be symmetric and harmonious with the upper lip.
d. All of the above.

**10. What should be done to not overthin the crestal bone and the keratinized gingival?**
a. The clinician should be alert to a hypervascularized surgical field with reduced visibility.
b. The clinicial should be alert to a hypervascularized surgical field with extremely fragile soft and hard tissues.
c. Both a and b.
d. Neither a nor b.