Identification and management of passive eruption

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Excessive gingival display can affect the total esthetics of a smile, becoming the focus instead of the frame of the smile. This can be the result of passive eruption of the gingival complex as the teeth erupt.1,2 The condition of delayed or altered passive eruption exists when the gingival complex remains positioned coronal to the cementoenamel junction with the attachment on the enamel instead of the cementum of the root, giving the appearance of short clinical crowns.3 Crown lengthening is critical to the success of creating a smile that is harmoniously balanced with its surrounding facial features.4 Patients who clinically display too much gingival tissue and short teeth require a thorough diagnosis and treatment plan to provide a predictable esthetic outcome.5 If a patient has altered passive eruption (APE) of the maxillary anterior teeth either secondarily to orthodontic treatment or without orthodontic treatment, but the patient has completed facial growth,6 then the practitioner must first correct the gingival levels with either a gingivectomy or esthetic crown lengthening procedure before the placement of veneers or crowns. Thus ensuring that the eventual gingival margins of the maxillary anterior teeth will be at their correct level relative to the adjacent anterior teeth.7

Understanding altered passive eruption

In a human mouth absent of periodontal disease, the osseous structure roughly follows the scalloped parabolic contour of the cementoenamel junction (CEJ), from facial to interproximal at an average distance of 2 to 3 mm.8 In addition, the average interproximal bone height is 5 mm coronal to the facial crest of bone.9,10 Because the soft-tissue topography is usually determined by the underlying hard tissue, this osseous “scallop” usually results in a gingival scallop of 5 mm.11

Examination of the peri-apical radiographs or periodontal vertical late-wings will allow the clinician to ascertain the position of the alveolar bone relative to the CEJ of the teeth to determine whether the crest of bone (COB) is 2 to 5 mm apical to the CEJ, allowing for biologic width.11 However, where the COB is coronal to the CEJ, a condition results that is referred to as APE.12

In this situation, the gingival margin will usually be located, on average, 5 mm coronal to the level of the crest of bone, being more coronal on the body of the tooth and creating the appearance of a short, clinical crown.13 Bone sounding involves using a periodontal probe to locate the CEJ and determine whether it can be felt within the gingival sulcus or only when the probe penetrates through the base of the sulcus.14 These visual findings are coupled with the clinical information obtained by “bone sounding.”

In addition to the gingival margin on the facial aspect of the teeth, in non-diseased dentition, the interproximal papilla between teeth with no bone loss due to periodontal disease is approximately 4.5 mm coronal to the interproximal crest of bone. The mid direct facial is about 1.5 mm more coronal to the COB. This additional 1.5 mm, with the 5 mm average osseous scallop from the CEJ, results in the tip of the papilla being an average of 4.5 mm coronal to the facial free gingival margin, where there is a “normal” periodontium, with no loss of bone or periodontal attachment due to periodontal disease.15

Anatomic considerations act as parameters when practitioners perform esthetic gingival re-contouring. A useful guide can be fabricated by modifying the mounted diagnostic casts so that the waxed modification reflects the ideal tooth proportions desired in the final result, based on the guidelines previously published by Chiche and Pinault.16 These guidelines suggest that the average length for esthetic gingival display and provide proper length-to-width ratios of the anterior teeth being treated. Note width of attached gingiva that will remain.

Fig. 1: Excessive gingival display with pigmented gingiva.

Fig. 2: Wide band of heavily pigmented attached gingiva with passive eruption of the anterior teeth.

Fig. 3: Vaccum stent that has been scalloped at the desired gingival height to act as a surgical template.

Fig. 4: Section made at the desired gingival height to provide proper length-to-width ratios of the anterior teeth being treated. Note width of attached gingiva that will remain.

Fig. 5: The right half of the anterior has been treated with a gingivectomy to serve as a comparison of the length-to-width ratios that were present before and after treatment.

Fig. 6: Immediately following gingivectomy of the anterior maxillary teeth to correct the passive eruption and provide better length-to-width ratios.

Fig. 7: Patient smiling immediately following gingivectomy showing less gingival display and better length-to-width ratios.

Fig. 8: The patient two weeks post treatment showing better esthetics with less gingival display and a reduction in the gingival pigmentation.

Fig. 9: The patient four weeks post treatment showing a more natural esthetic smile.

Fig. 10: Patient presenting with old composite on the anterior teeth to mask discoloration, spacing issues and excessive gingival display.

Fig. 11: Thickness of old composite placed in an attempt to mask the underlying discolored tooth structure. Note the banded discoloration of the lower anterior teeth.

Fig. 12: Smile of the patient presented (left) compared with the wax-up (right) from an orthodontic view.
tional mockup.

Fig. 19a, b: Comparison of before and after gingivectomy and placement of functional mockup.

Finally, the gingival tissues of the adjacent teeth (centrals and cuspids).

The zenith for the lateral incisors should be manipulated to have the proper tooth size. This is be- cause the gingival margin can move with erosion or recession.

It is also paramount when establishing the proper position of the maxillary anterior teeth for an optimal cosmetic outcome to assess the levels of the interdental papillary tissues and their position relative to the crown length of the maxillary incisors.

Gingivectomy and gingival plasticity for esthetic soft-tissue correction.

Traditionally, scalpels and periosteal knives (Orban and Kirkland) were utilized to sculpt soft tissue when gingivectomy was the treatment being used to improve esthetics.7,8 These provided precise incisions, but the resulting raw, bleeding surfaces complicated postoperative healing. Monopolar electrosurgery, another option, requires a dry field during treatment and this may increase tissue inflammation during the initial healing period and subsequent tissue shrinkage.

“Charring” of the tissue margins at surgery has also been report- ed with monopolar electrosurgery and may be a result of the need for operating in a dry field and the high wattage needed to overcome resistance between the cutting tip located intraradicularly and the grounding plate located a distance away on the body.25,26 Bipolar electrosurgery was de- veloped to overcome the obsta- cles associated with monopolar electrosurgery. True bipolar electrosurgery as used today in dentistry is a cross over from neurosurgery, which requires delicate incisions in wet fields with no lateral heat generation. The earliest Bipolar surgical unit (Synergistics, King of Prussia, Pa.) transfers those neurosurgical requirements to the dental environment, allowing intraoral soft-tissue surgery in wet fields with carefree, non-bleeding incision margins.27 This eliminates marginal shrinkage related to tissue inflammation and provides a more comfort- able postoperative period for the patient.

When using the bipolar surgi- cal unit, because the tips have two electrodes that are straight wires or loops, one must remember that the first elec- trode to touch the tissue acts as the return and the second elec- trode does the cutting or coagul- ation, depending on which foot pedal is depressed. Because the bipolar surgical unit is fully iso- lated from ground, unlike mo- noral electrosurgical units, a ground is not required. Addi- tionally, as no grounding plate is required and resistance through the body is not an obstacle to be overcome, wattage is one-quar- ter of that used with monopolar electrosurgery.

It is also advised by the author that when you are cutting tis- sue, your assistant is constantly spraying water from the air/wa- ter syringe to keep the field wet while using the high-volume evacuation. This improves effi- ciency with the handpiece and prevents charring.

Another benefit of the bipolar surgical unit is that even during cutting there is some coagula- tion that occurs, so the wound edges that result do not require any restorative procedures being performed during the same appointment.28

Case No. 1: Passive eruption

A 28-year-old female patient presented for treatment of ex- cessive gingival display in the anterior region upon request because of a reduction of the gummy smile (Fig. 1).

Initial clinical examination revealed a wide band of at- tached gingiva in the maxillary and mandibular anterior with associated passive eruption (Fig. 2).

Periodontal probing indicated that the depth of the sulcus on the facial of the maxillary anterior teeth was equal or apical to the CEJ, and the presence of passive eruption.

Also noted was the presence of peg-shaped laterals bilaterally, which were tipped both mesially as well as palatally.

A gingivoplasty was scheduled to move the gingival margin to be equal or apical to the CEJ, and perform restorative correc-
tion of the lateral incisors. To aid in the treatment plan-
ing, the gingivoplasty image was modified using Adobe Photoshop (Adobe, San Jose, Calif.) to indicate the proposed gingival margin and the return and the second elec- trode to touch the tissue acts as the grounding plate located a distance away on the body.25,26

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The patient, a 40-year-old woman, presented with a history of previous direct bonding to correct moderate tetracycline discoloration of the teeth and generalized diastemas. Examination revealed an excess display of gingiva when the patient smiled, as well as a wide band of attached gingiva was present. Examination of the radiographs, taken and a periodontal examination was performed. It was noted that removal of 2 mm to 3 mm of gingival tissue and discolored direct-resin restorations on the maxillary anterior teeth (Figs. 10, 11). The patient expressed a desire for a more normal positioning of the anterior maxillary teeth and position the incisal edge where it would be had the initial incisal not occurred.

Case No. 2: Passive eruption with spacing issues

The patient following gingivectomy and placement of immediate direct resin to length of the anterior maxillary teeth and position the incisal edge where it would be had the initial incisal not occurred. The gingiva was present and with the wide band of attached gingiva was present. To aid in visualization during surgery, a gingival retraction cord was used as an intraoral form to fabricate the functional mock-up. The modified cast was inserted tooth side down into denstply raintree material (denstply raintree, Metarie, La.). The functional mock-up stent was tried in, and the gingival prosthesis.

The information gathered indicated that some passive eruption issues were present and with the wide band of attached gingiva present would allow removal of 5 mm of gingival tissue and still provide a normal sulcular depth after healing. The restoration margins were placed at the new gingival margin position. The functional mock-up stent was inserted tooth side down into denstply raintree material (denstply raintree, Metarie, La.). The functional mock-up stent was tried in, and the gingival prosthesis.

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be made. The teeth would be between ceramic veneers and planned and a determination was not causing any chipping or damage to the functional mock-up. A thin layer of Bleach enamel shade was painted onto the teeth, and additional light was used to cure the tissue was observed, but a slight sloughing gingivally where tissue was noted coronal to the CEJ and no bone was evident. Local anesthesia was infiltrated into the buccal vestibule from the second premolar to second premolar. A peri os probe was introduced into the facial sulcus to verify the osseous crest in relation to the CEJ and no bone was noted coronal to the CEJ on the second premolar. The instrument for determining width-to-length proportions (Hu-Friedy, Ill.) was used to discern a high-arched palate incisal length, artiste nano composite (pentron clinical, orange, Calif.), the length was built using Fini™ polishing paste and a cloth buffer (Protoclean Clinical Technologies) (Fig. 17).

The patient was recalled 24 hours post surgery to check soft-tissue healing and assess the occlusion. At this time, minor refinement of the contours was accomplished and the patient indicated no irritation gingivally where tissue had been treated with the bipolar surgical unit. Slight sloughing of the keratinized layers of the gum was observed, but a lack of inflammation was noted (Fig. 18). The papilla following a gingivectomy is more esthetic with better gingival and incisal contours of Artiste nano composite. Following finishing and polishing of the direct resin restorations, occlusion was checked and adjusted to maintain the anterior guidance that was present before treatment (Fig. 25). The patient was dismissed and instructed to avoid any alcohol or peroxide containing mouthrinses for the first week and to rinse with warm salt water three to four times daily for the first three days. Additionally, the patient was instructed to continue oral hygiene including brushing the area with a toothbrush and her regular toothpaste. At 24 weeks post, the patient was called to check on her comfort level, and she indicated no postoperative discomfort nor irritation during normal daily activities.

At one-week post surgery the patient reported no discomfort for a postoperative examination where a lack of inflammation was noted (Fig. 24). A four-week postoperative examination demonstrated a more esthetic smile with better width-to-length proportions with elimination of excess gingival display.

Conclusions

The authors frequently tend to ignore the gingival tissues’ positional relative to the tooth’s incisal edge, and also in relation to the adjacent teeth, when evaluating the cosmetic aspects of patients.

Passive eruption appears to be infrequently recognized and can affect the final cosmetic result when inadequate eruption is as part of the overall treatment.

About the Author

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