

inside Periodontics

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Periodontal Plastic Surgery II: Esthetic Crown Lengthening

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The dramatic appeal of a face, especially caught in a smile or laugh, lies in the interplay between the lips, teeth, and periodontium. Any deviation from the ideal form alters perceived attractiveness, particularly if the change involves an overexuberant gingival display. Indeed, a well-known survey discovered that laypeople found a show of 3 mm to 4 mm of gingiva above the dental margin upon smiling to be less esthetic than 0 mm.^{1,2} Symmetry, specific anatomic positions, and harmonious proportions matter.

THE IDEAL ARCHITECTURE

What is normal? There are no unwavering guidelines, but in general, the dental

profession establishes the following relationships and dimensions as standard, based on observational studies and expert opinion.

Lip Line

The position of the lip at rest and upon smiling determines the amount of dental and periodontal display. Highly inconsistent labial movement from rest to full smile averages 7 mm to 8 mm, though it ranges from 2 mm to 12 mm.³ As studied by Tjan and colleagues in dental and hygiene students, three smile line classifications exist, based on the location of the upper lip relative to the upper anterior teeth (Table 1).⁴

The analysis appraised only patients up to age 30. With time, the lips become less everted and less elastic. In other words, the lip line changes. Older patients show less of the maxillary teeth and more of the mandibular. Fifteen-year-old subjects reveal 10 mm of maxillary central incisal length during smiling and 5 mm at rest.⁵ Vig and Brundo confirmed age-correlated changes and discovered that women tended to exhibit twice as much maxillary incisor length compared to men (Table 2).⁶ Notice that with time, the total level of tooth exposure at rest drops from 5 mm at age 15 years to 3 mm starting at age 40.

Tooth Morphology

Teeth fall into one of three shapes: square, ovoid, and triangular.⁷ The widest of all, a square tooth, possesses the longest proximal contact and leaves the least room in the interdental area, which creates short, blunt papilla. The triangular tooth, in contrast, presents the shortest contact area and widest interdental space, allowing for a tapered and long papilla. Papillary morphology mimics that of the underlying interproximal bone.

The maxillary central incisors are key to symmetry; if they match, the observer is able to accept small irregularities in adjacent teeth. Contralateral teeth should be equivalent in length and width on either side of the midline. In theory, the length of the maxillary central incisors should exceed that of the lateral incisors but equal that of the canines.⁸ The cusp tips of maxillary centrals and canines also must be at the same level. The incisal edge of the lateral incisor is 1 mm coronal to the canine tip.

As useful to the practitioner is the width-to-length ratio of the anterior teeth. The restoration of proper crown proportions is a major part of esthetic dentistry. These ratios remain more or less constant from person to person; knowledge of one measurement may be used to predict the other. The width-to-length ratio of maxillary central incisors is 0.8 mm and those of other anterior teeth lies between 0.7 and 0.8 mm.⁹ The width and length of incisors and canines were greater in men than women, but the canine width-to-length ratio in women surpassed that of men.⁹ Furthermore, the mean incisors diameter of African-Americans exceeds those of Caucasians.¹⁰

Gingival Margin and Contour

Recall that a person with an average smile line demonstrates no soft tissue above the maxillary central incisors and canines. The gingival margins of these teeth exist at the same level. On the other hand, the margin of the lateral incisor falls 1 mm coronal to its adjacent counterparts.¹¹

In a similar vein, the heights of contour of maxillary central incisors and canines match and peak at the distal line angle, as they follow the curve of the cementoenamel junction (CEJ); the lateral incisor's height of contour, alternatively, exists at the mesiodistal center (Figure 1).⁸ The degree of this gingival scallop relies on tooth morphology as well as tissue thickness. A flatter contour, considered more masculine, stems from thick—and thus less pliable—gingiva and a square-shaped tooth. A highly scalloped margin appears



Figure 1 Ideal gingival contour.



Figure 2 “Gummy smile” seen in altered passive eruption.

Table 1: Smile Line Classification

CLASSIFICATION	DEFINITION	PREVALENCE	GENDER BIAS
High	Total cervicoincisal length of the maxillary anterior teeth and a contiguous band of gingival exposed.	11%	Female
Average	75% to 100% cervicoincisal length of maxillary anterior teeth and interproximal gingival exposed.	69%	
Low	< 75% cervicoincisal length of maxillary anterior teeth exposed.	20%	Male



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PRIMARY FACTORS

- Width of attached gingival
- Level of alveolar crest

SECONDARY FACTORS

- Color of gingival (eg, racial pigmentation)
- Soft tissue thickness
- Bone thickness

Figure 3 Crown-lengthening technique determinants.

- 1. Evaluate amount of attached gingiva**
 - a. Enough after anticipated resection?
 - b. Does deep pocketing exist?
- 2. Evaluate level of alveolar crest.**
 - a. More coronal than normal?
 - b. Any exostoses?
- 3. Consider restorative needs.**
 - a. Will there be a violation of the biologic width?
 - b. Is there enough retentive tooth structure exposed?

Figure 4 Step-by-step analysis for crown-lengthening design.

feminine and occurs with a thin tissue and a triangular dental form.⁷

CORRECTION OF THE IMPERFECT: THE GUMMY SMILE

In the end, objective beauty fails to exist. Dentists, however, should not underestimate the utility of the lip–tooth–gingiva relationships outlined above. These rules, applied broadly, help to equilibrate uneven smiles. It is important to remark that the periodontal drape influences the shape of teeth. Excessive marginal or papillary soft tissue because of inflammation, altered passive eruption, and a myriad of other pathologies distorts dental silhouettes. Modification of the gingiva, then, instead of tooth structure, often resolves cosmetic deformities.

As mentioned earlier, the typical patient may not judge his or her smile as gummy until at least 3 mm to 4 mm of soft tissue shows above the tooth margins. The level of discernment, of course, varies, and a patient may complain about an unsightly smile but be unable to pinpoint the features that make it so. The role of the dentist is to address these grievances by identification of non-ideal situations, such as a gummy smile. Correction of gingival excess enhances appearance, often radically.

Definition of a Gummy Smile

The dental profession considers more than 2 mm of gingival display above the tooth margin upon smiling to be excessive.¹² Any band of gingiva, other than the papillary tips, that appears at rest is unnecessary in the adult. A patient may grumble about “short teeth” or “too much gum showing.” The papilla may be bulbous and misshapen.

Etiology

A number of scenarios manifest in gingival excess. Proper treatment tackles these underlying problems.

Excessive Maxillary Growth. In patients with vertical maxillary excess, ones observes

longer facial heights, shorter or hypermobile lips, maxillary anterior supra-eruption, or large alveolar processes.^{12,13} In an ideal situation, the face may be divided into three equal proportions from the hairline to the eyebrow, from the eyebrow to the base of the nose, and from the base of the nose to the chin. If the lower third appears longer than the other segments and if the maxillary lip is of regular vertical length (18 mm to 21 mm), the patient requires orthognathic surgery.¹¹

According to Garber and Salama, bilateral excessive gingival display of roughly 8 mm in a patient with coincident incisal and posterior occlusal planes designates the need for a LeFort I procedure.¹⁴ In the case of a 4-mm to 8-mm surplus, orthognathic treatment may be indicated if traditional periodontal crown lengthening unacceptably elevates the crown-to-root ratio or exposes so much radicular structure

that it impedes prosthetic achievement of a natural-looking emergence profile.¹⁴

Tooth Malposition. Orthodontic movement corrects gummy smiles caused by malpositioned teeth. In this scenario, there is usually an excessive display of 2 mm to 4 mm.¹⁴ Specifically, if there is a step between the incisal and occlusal planes, a deep overbite exists, resulting in excessive gingival display.¹² Here, in the presence of shallow probing depths, orthodontic intrusion alone of the maxillary incisors moves the gingival margins apically. Deep probing depths call for additional gingival resection.

When incisor supra-eruption occurs in response to protrusive bruxism, a gummy smile with short, abraded incisors develops. Again, treatment entails orthodontic intrusion with restoration of the incisal edges.

Gingival Enlargement. Inflammation (ie, periodontal disease), hereditary gingivofibromatosis, and certain medications cause enlarged gingiva. Treatment for inflammation involves oral hygiene instruction, scaling and root planing, and/or periodontal surgery. If poor plaque control in the presence of orthodontic appliances triggers enlargement, therapy may include the removal of brackets and bands.

Treatment of gingival overgrowth caused by drugs (ie, anticonvulsants, immunosuppressants, and antihypertensives) and gingivofibromatosis requires not only plaque control and dosage modifications but possibly resective periodontal surgery.

Altered Passive Eruption. As teeth erupt from their crypts, the gingival margin migrates apically to a level at or 1 mm coronal to the CEJ.¹¹ This is passive eruption.

The four stages of passive eruption concern the relationship between the junctional epithelium and the CEJ. In stage 1, the epithelial attachment rests on the enamel surface. In stage 2, the attachment lies on the enamel and cemental surface apical to the CEJ. In stage 3, the junctional epithelium is completely on cementum. Stage 4 occurs pathologically—inflammation causes the attachment to migrate further apically.

Roughly 12% of patients fail to progress past stage 1 or 2, and they appear to have short clinical crowns and gingival surplus (Figure 2). This is known as altered passive eruption. Such patients may or may not have a high osseous crest. Boyle and coworkers measured the radiographic interproximal bone levels in a wide age range of subjects (ages 11 to 70).¹⁵ They saw that the distance from the CEJ to the osseous crest increased as patients aged and insinuated that the crest position was not static. Coslet and associates proposed a classification system for adult delayed passive eruption based on amount of gingiva and level crestal bone (Table 3A and Table 3B).¹⁶

Altered passive eruption treatment always involves some kind of periodontal resection (ie, crown lengthening), at least of gingiva if not also of underlying bone.

Treatment Considerations for the Gummy Smile

Elimination of a gummy smile rests on appropriate diagnosis of its etiology. Gingival surgery alone is not a panacea. It must be realized that the monotherapeutic use of crown lengthening does not succeed in all circumstances. Periodontal surgery in some instances functions as an adjunct to orthognathic, orthodontic, or

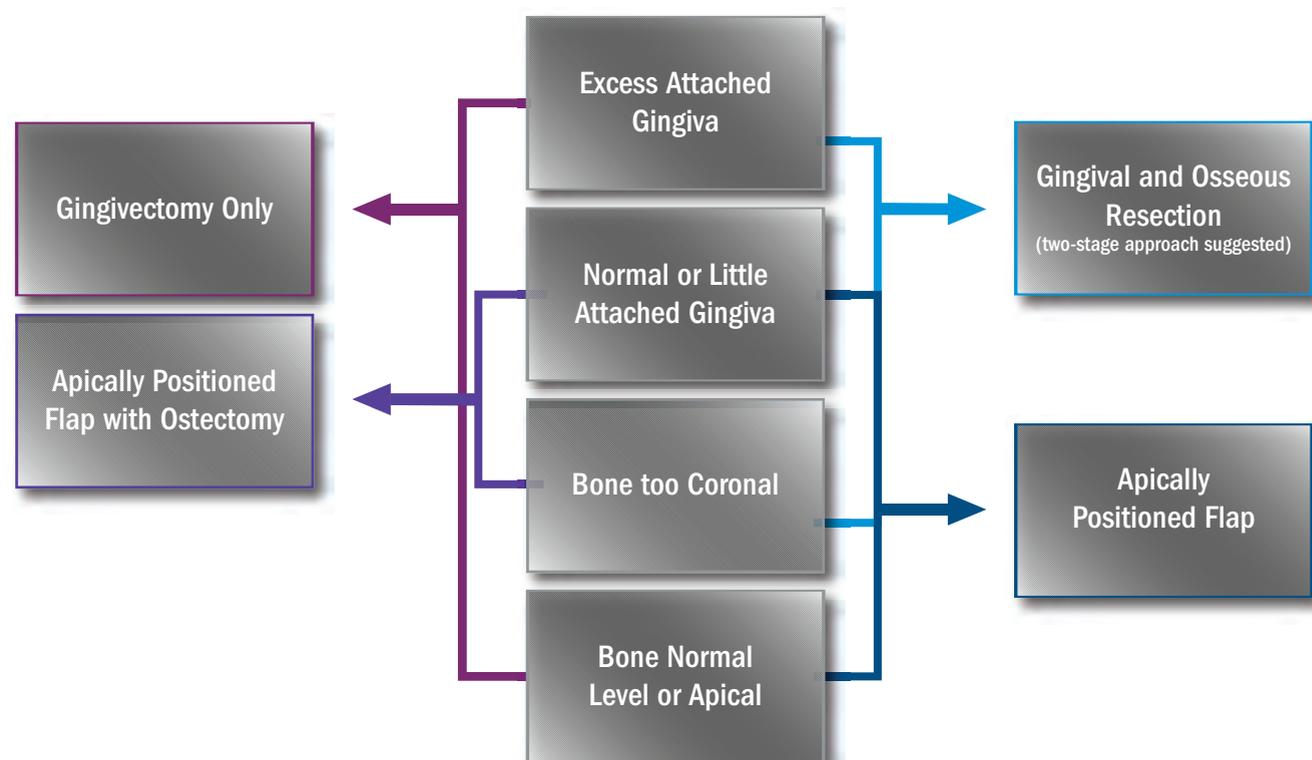


Figure 5 Crown-lengthening design decision tree.

prosthetic treatment. For example, orthodontic intrusion ideally moves the dentogingival complex apically, but use of more forceful mechanics leaves the attachment apparatus at its original position, which results in a short clinical crown, a low crown-to-root ratio, and an even “gum-mier” appearance.¹⁷⁻¹⁹ Gingival and osseous resection easily remedies this issue.

To maintain periodontal stability around teeth with cosmetic veneer and full-coverage reconstructions, there must be no biologic-width invasion. Otherwise, inflammation, attachment loss, and recession initiate.²⁰⁻²² Inflamed gingiva, of course, contributes to a gummy smile. The prosthetic margin should lie at least 3 mm from the alveolar crest, as the junctional epithelial and connective tissue attachment averages 2 mm and the sulcus comprises 1 mm.²³⁻²⁵ Osseous crown lengthening resolves both restorative and esthetic concerns.

As alluded to before, relative contraindications to crown lengthening exist and include patients with:

- vertical maxillary excess;

- malpositioned teeth with shallow probing depths;
- an anticipated poor crown-to-root ratio postsurgery;
- an anticipated poor restorative emergence profile postsurgery;
- active inflammation; and
- unrestorable teeth.

Barring these limiting factors, the operator may employ esthetic crown lengthening to treat cases with approximately 2 mm to 7 mm of gingival excess (seen upon full smile); if excess tissue ranges from 2 mm to 4 mm, crown lengthening alone may be the solution.

ESTHETIC CROWN-LENGTHENING METHODS

Once the clinician selects periodontal resection as his or her treatment-of-choice, the Coslet system allows the dentist to determine the most suitable crown-lengthening approach for each patient. Not every scenario necessitates the removal of soft tissue; this holds true for osseous resection as well. Two major factors govern the surgical design: width of the attached

Table 2: Age-Related Alterations in Resting Lip Line^{5,6}

AGE (YEARS)	AMOUNT OF MAXILLARY CENTRAL INCISOR EXPOSED (MM)	AMOUNT OF MANDIBULAR CENTRAL INCISOREXPOSED (MM)
15	5	-
< 30	3.4	0.5
30-40	1.6	0.8
40-50	1.0	2
50-60	0.5	2.5
> 60	0	3

Table 3A: Classification of Altered Passive Eruption Based on Gingiva¹⁶

TYPE	DEFINITION
I	• Noticeably wider gingival dimension from FGM to MGJ than generally accepted mean
	• Gingival margin is incisal or occlusal to the CEJ
	• MGJ is usually apical to the alveolar crest
II	• Gingival dimension from FGM to MGJ falls within normal mean
	• All gingival is located on the anatomic crown
	• MGJ is located at the level of the CEJ

Table 3B: Classification of Altered Passive Eruption Based on Alveolar¹⁶

SUBGROUP	DEFINITION
A	Alveolar crest is 1.5 mm apical to the CEJ (normal position)
B	Alveolar crest is at the level of the CEJ

Table 4: Two-Stage Crown-Lengthening Technique**FIRST STAGE: OSTECTOMY****1. Choose flap design.**

- An envelope flap (no vertical incisions, only sulcular extension one or two teeth anterior and posterior to the area of interest) may be created.
- For more access, a flap with one or two vertical incisions is acceptable.
- Do not remove any gingiva.

2. Reflection.

- Reflect a full-thickness flap (down to bone) with periosteal elevators (Figure 7).

3. Perform osseous resection.

- If the alveolar crest is too coronal with respect to the CEJ or restoration, remove supporting bone (ostectomy) until it is 1 mm to 2 mm apical to the CEJ or a minimum of 3 mm from the existing or anticipated restorative margin (Figure 8). In natural virgin dentition, the distance from the gingival margin to the alveolar crest at the mid-buccal site should be about 3 mm, so use this measurement as a guide.
- Perform the ostectomy by creating a trough around the tooth with a football-shaped Neumeier bur. Remove the remaining bony ledges using a 12-fluted finishing bur. This method prevents bur damage to the tooth.
- Be aware that minimal to no interproximal reduction may be needed. In most cases, the level of facial tissue, not interdental, compromises esthetics. Alternately, prosthetic requisites (ie, ferrule retention, biologic width reformation) may force ostectomy in the papillary area.
- Gradualize the bone so that no sharp edges or bulbous areas exist with hand instruments. If the flap does not lie smoothly over the bone, then eradicate any osseous convexities (osteoplasty).
- Preserve the positive architecture, in which the bone follows the CEJ (interproximal bone more coronal to facial). A flat or negative architecture reverses a natural gingival profile and encourages pocket formation.

4. Suture.

- Use either absorbable or non-absorbable material (Figure 9). The gut may be less visible.
- A simple interrupted or sling suture is adequate, but for better flap adaptation in tight spaces, employ a vertical mattress.
- The gingival height and shape should mimic the pretreatment level as no soft tissue resection occurred.

5. Dressing (optional).

- Apply noneugenol dressing to the buccal aspect.

6. Healing period.

- The healing period lasts from 4 to 6 weeks (Figure 10).

SECOND STAGE: GINGIVECTOMY

1. A model made from a diagnostic wax-up, calipers, and/or surgical template may be very helpful in outlining the desired shape of the teeth and mucosa (Figure 11). Create bleeding points or a scalpel line to delineate the new gingival margins.
 2. Finalize the gingivectomy by creating an external bevel dissection with a scalpel blade, which should begin superficially, just below the epithelium, but penetrate through connective tissue and end at hard tissue in the coronal-most aspect (Figure 12). In the case of pigment removal, the external bevel should be started further apically.
- Blend the gingival margin into the adjacent tissue with a 12-fluted finishing bur. Thin down thick tissue, as it tends to regrow.
 - Create new mesial and distal papillary contours as desired. Leave the tip of the papilla intact to retain blood supply and papillary loss.
3. Decide if gingivoplasty is needed. If superfluous pigment remains or the mucosa is too thick or bulky, use a diamond bur to obtain the desired color and dimension.

APICALLY POSITIONED FLAP METHOD

The two-stage crown-lengthening procedure cannot be used if gingival resection compromises the amount of keratinized tissue. Deficient attached gingiva necessitates an apically positioned flap, which entails the following:

1. Two parallel vertical incisions are made at the line angles of the anterior- and posterior-most teeth of the surgical site. The vertical incisions must extend past the mucogingival junction to facilitate flap mobility and subsequent apical positioning.
2. Follow steps 2 and 3 in the “First Stage: Ostectomy” section. Ensure that reflection occurs past the mucogingival junction to achieve apical positioning.
3. Position the flap apically at the ideal level and secure the vertical incisions first with suture, using either a continuous or simple interrupted style.
4. Suture the papillary tissue.
5. Apply noneugenol dressing as desired.

gingiva and the level of the alveolar crest in relation to the CEJ (Figure 3).¹⁶ Excessive gingiva calls for resection, as does a too-coronally positioned alveolar crest, one at the level of the CEJ or less than 3 mm from an existing or expected restorative margin (ie, Coslet Subgroup A altered passive eruption or biologic width invasion, respectively).

Secondary factors influence resection as well (Figure 3). Some patients desire to lessen gingival pigmentation, whether racial, tattooed, or from another cause. For them, an externally beveled gingivectomy removes the undesired color and creates pink tissue upon initial healing. The clinician must extend the incision along the entire anterior esthetic zone to avoid color mismatch upon smiling. The hue change is not always permanent, however, and pigment may return in a few months. If a patient decides to maintain pigment, an internally beveled gingivectomy will suffice.

Large quantities of bone and redundant mucosa require flap surgery, as thick tissue rebounds. When more than 4 mm of tissue is removed in a gingivectomy, healing proceeds at a slower pace, associated with undue discomfort and potential regrowth. In comparison, a flap approach may produce fewer complications in the long term.

Essentially, a crown lengthening encompasses one or a combination of the following:

- gingival repositioning (ie, apically positioned flap);
- gingival resection; and/or
- osseous resection.

The clinician must systematically determine the best surgical design in accordance with the Coslet classification (Figure 4). The type of altered passive eruption, overgrowth, or other situation seen dictates the crown-lengthening strategy. The clinician must first assess the amount of attached gingiva. If soft tissue resection would lead to deficient attached mucosa, then an apically positioned flap is the plan of choice, as it preserves keratinized gingiva. Deep pocket depths (ie, greater than 3 mm) do not mandate a resective technique, as apically positioned flaps reduce pocketing as well. Likewise, shallow pocket depths do not compel any particular surgical design. Deep probing, however, may indicate periodontitis, and the patient must receive infection control before cosmetic work.

Next, analyze the level where the alveolar crest takes place. Customarily, the interproximal bone lies 1 mm to 2 mm away from the CEJ radiographically, and the distance from the contact point to the alveolar crest is roughly 4 mm to 4.5 mm.²⁶⁻²⁸ Facially, the dentogingival complex—measured from the gingival margin to the bone—probes 3 mm.²⁹ If a normal bony relationship exists and if there is no expectation of biologic width compromise

by future prostheses, then ostectomy is unwarranted. Bone removal occurs in some types of altered passive eruption, in which the crest lies coronally to the norm, and for restorative purposes (biologic width health and retention). Exostoses should be excised.

Esthetic crown-lengthening procedures relocate or remove buccal tissue only, as palatal contours are not noticeable. On the other hand, a treatment plan that includes full-coverage restorations may call for surgery on the lingual as well, depending on the available tooth structure and margin-to-alveolar crest proximity.

The decision tree outlined in Figure 5 summarizes this methodical approach to operative design.

SURGICAL HOW-TO GUIDE: THE TWO-STAGE TECHNIQUE

Again, it is imperative to measure the following parameters before surgery to identify the right crown-lengthening tactic: probing depths, width of the attached gingiva, CEJ location, and bone levels. Bone sounding with a probe under local anesthesia aids in assessment.

A major component of the diagnostic workup consists of surgical guide fabrication. Use of a template relieves operative guesswork and allows for better reproducibility of the desired lip-teeth-gingiva proportions upon full smile. After appraisal of the patient at chairside, from photographs, radiographs, and casts, the practitioner creates a guide from a diagnostic wax-up or model, following the tenets of ideal orofacial esthetics, listed in a previous section. A simple vacuform appliance will suffice. He or she must keep in mind several factors:

- gingival display at rest and upon smiling;
- proper width-to-length tooth ratios;
- heights of contour;
- gingival margin level differences between teeth;
- symmetry; and
- dental crowding.

If crown lengthening fails to rectify all defects, prosthetic work may compensate for the rest. Ultimately, most cases include reshaping both teeth and gums.

Two-Stage Crown Lengthening

To combat gingival shifts that occur after conventional crown lengthening and to speed the temporization process, Sonick proposed a biphasic crown-lengthening method in which only ostectomy occurs, without any preliminary gingival resection, followed by gingivectomy several weeks later.³⁰ The flap is repositioned to its original level at the first surgical stage, and it appears as though no lengthening transpired. Four to 6 weeks later, after initial attachment and bone healing, gingivectomy takes place. As this short waiting period allowed for biologic-width



Figure 6 Preoperative gingival display.



Figure 7 Full-thickness reflection. Note the coronal level of the alveolar crest.



Figure 8 Ostectomy performed. Note that there is enough biologic width space created for new anterior restorations. Positive architecture is maintained.



Figure 9 Replacement of flap to original position.

reestablishment, which gingival removal should not disturb, the author suggested that provisionalization may begin 2 weeks after gingival resection. Finalization occurs at 3 to 6 months, as stated above. This two-step method has particular use next to dental implants. Contraindications include gingivectomy-only cases and inadequate attached gingiva pre- or post-gingival resection.

With diagnostics and guides completed and with the exception of insufficient attached gingiva or gingivectomy-only scenarios, osseous surgery proceeds in the two-stage manner suggested here (Table 4 and Figure 6 through Figure 15).

HEALING AND PROSTHETIC FINALIZATION

Gingivectomy

After gingivectomy, the gingiva returns to normal function, including surface epithelialization, in about 1 month (3 to 5 weeks); total remodeling of the attachment apparatus completes at 3 months (12 weeks).^{31,32} Any restorative finalization then may take place beginning 1 to 3 months postsurgery.³³ The longer the delay, the less the tissue instability.

Osseous Crown Lengthening

Even after careful consideration of patient factors and adequate surgical technique,



Figure 10 Gingival level after 4 weeks of healing. Minor apical pullback of tissue occurred postostectomy, but the level still approximates the initial presentation.

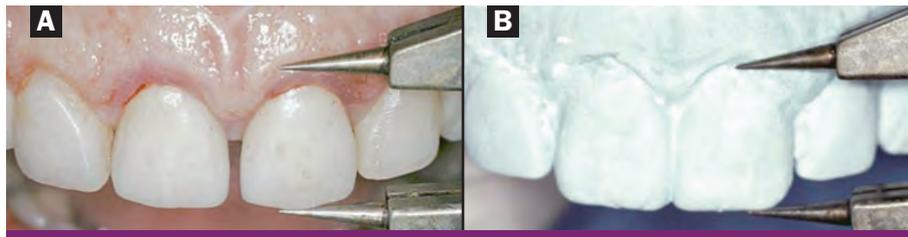


Figure 11 Model of diagnostic wax-up (left) and clinical recapitulation of desired tooth dimensions using calipers (right).

it is difficult to predict where the gingival margin will be in the long term. A number of articles on osseous crown lengthening demonstrate a 1-mm to 3-mm coronal rebound of the free gingival margin 6 months to 1 year postsurgery.^{34,35} Attributed to thick tissue biotype and inadequate bone removal, this coronal shift may be avoided by adequate gingivectomy and ostectomy, and stable results may be detected at 3 months.³⁶ Final prosthetic impressions may begin at least 3 months after crown lengthening, though to be safe, wait 6 months, when the remodeling finishes.³⁴

Advantages of the Two-Stage Approach

In the majority of cases, the tissue level at 6 weeks predicts the level at 6 months after osseous crown lengthening.³⁴ Two-stage crown lengthening lets the tissue settle and the attachment remodel post-ostectomy, making the mucosal level post-gingivectomy more predictable, important particularly in the esthetic area. Remember that the gingiva follows the alveolar crest; initial bone maturation, then, forecasts gingival maturation. Ultimately, this

two-stage approach speeds the prosthetic completion time because it achieves marginal stability faster (Figure 13 through Figure 15). Traditional lengthening technique (ie, concomitant soft and hard tissue resection) may require several “touch-up” procedures to attain proper length or contour, thus slowing the restorative process. The two-stage method precludes these unplanned touch-ups.

A WORD ON LASERS

A recent trend, laser-driven esthetic crown lengthening, has risen in popularity. Is there value to such use? In theory, lasers improve hemostasis, disinfect tissue, lessen edema and scarring, attenuate post-operative discomfort, and hasten healing.^{37,38} Based on wavelength and waveform, they cut soft and/or hard tissue.

Soft Tissue Lasers

Carbon dioxide, Nd:YAG, diode, Ho:YA, Nd:YAP, and argon lasers incise and ablate soft tissue for gingivectomy, gingivoplasty, and de-pigmentation, among other operations. The first three types have the most studies published on them, but with respect to accelerated healing, none best the

scalpel standard.³⁹ In fact, some investigations report slower initial and overall healing in laser-made wounds, including gingivectomy and periodontal flap surgery, compared to scalpel-formed.⁴⁰⁻⁴⁴ Lasers enhance coagulation, however, and this boosts visualization and patient acceptance.

Hard Tissue Lasers

Er:YAG and Er,Cr:YSGG lasers cut both soft and hard tissue and perform ostectomy and osteoplasty. Soft tissue-only devices tend to char, melt, sequester, and delay healing of bone, but at specific energies and pulses, the Er:YAG and Er,Cr:YSGG incise bone with relative safety. These instruments work on dentin and enamel as well; in fact, some companies tout ostectomy efficacy based on evidence and settings culled from use on dentin and enamel.³⁹ As with their soft tissue counterparts, the literature support behind hard tissue lasers remains heavy on anecdotal observations and light on scientific studies.^{45,46}

Flapless Laser Crown Lengthening

Case reports cite use of the Er,Cr:YSGG to crown lengthen teeth that require os-

tectomy without raising a flap.⁴⁵⁻⁴⁸ No re-entry investigations exist to confirm or deny incision of bone vs enamel or dentin or presence of charring, cratering, ditching, or root gouging with this method. Because of a lack of visualization and tactile sensation, precise ostectomy cannot be guaranteed. Cases of altered passive eruption with coronally located bone or biologic width concerns demand measurement accuracy. It is a characteristic not well-documented in the flapless approach.

In short, there is a scarcity of controlled studies on laser-guided crown lengthening. Its major advantage over traditional scalpel methods is hemostasis. Clinical results for gingival resection using lasers match but do not surpass those for conventional techniques. With respect to hard tissue applications, less proof exists. The value of laser therapy rests in its appeal to patients, who consider such treatment novel. It remains to be seen whether novelty will shift to practicality.

A GUMMY SMILE NO LONGER

Patients who consider their smiles unattractive may blame “gummy smile.” Skeletal deformities, labial musculature, oral pathology, periodontitis, genetic predisposition, and dental issues contribute in varying degrees to excessive gingival display. Scrupulous diagnosis yields treatment that involves a multitude of specialties or perhaps just one. Sometimes a simple gingivectomy resolves the chief complaint. More rarely, the patient must tolerate orthognathic and facial surgery, orthodontics as well as periodontal and restorative remedies to meet his or her standard of beauty and function. Therapeutic complexity notwithstanding, any treatment plan that restores a person’s dignity has merit. In this regard, one cannot underestimate the worth of esthetic crown lengthening.

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Figure 12 External bevel gingivectomy outline.



Figure 13 Final periodontal and restorative result after two-stage crown lengthening and porcelain veneer placement.



Figure 14 The patient's smile before treatment.



Figure 15 The patient's smile after treatment.

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