

Abstract
When restoring a tooth, the recognition and maintenance of the biologic width must be considered. Surgical crown lengthening is most often the treatment of choice when restoring a tooth whose biologic width has been, or will be, impinged upon. With proper case selection, the restorative dentist can often perform this surgical procedure with numerous benefits for both patient and dentist. A clinical case, diagnosed and treated by the restorative dentist, is presented.

Biologic Width Discussion
In 1961, Gargiulo measured and described the biologic width as a relatively constant and predictable distance extending from the superior portion of the alveolar crestal bone, through the connective tissue attachment and the junctional epithelium, to the base of the histological sulcus (Figure 1). Gargiulo found the combined dimensions of the junctional epithelium and connective tissue attachment to average 2.04 mm. This biologic width is fairly constant in each individual, but may vary between individuals.

If the biologic width is violated, potential sequelae may include chronic inflammation leading to pocketing and uneven, unpredictable bone loss. Additionally, recurrent caries may form around deep, uncleanable margins, while the gingivae may appear purplish, edematous, and unaesthetic around the impinging restoration.

In order to assure that the margins will be readily cleanable and that there will be no impingement on the biologic width, restoration margins should be placed no greater than 0.5 mm into the gingival sulcus. Ideally, the margins of posterior restorations should be supragingival, while the aesthetic requirement of an anterior restoration usually necessitates placing the margin 0.5 mm subgingival.

From 3-5.5 mm of clinical crown should be exposed above the alveolar crest after the ostectomy, with 3-4 mm being the general rule. This distance will adequately provide the biologic width, as well as allow tooth structure for necessary crown retention.

Indications for Crown Lengthening
Biologic width may be violated due to the presence of caries, defective restorations or fractures. The restorative dentist must be aware of the concept of biologic width. Crown lengthening may be necessary prior to further restorative treatment.

Indications for crown lengthening include the following:

- Improving the aesthetics of a "gummy" smile.
- Planning veneers or crowns on teeth with the gingival margin coronal to the CEJ (delayed passive eruption).
- Caries at or below the gingival margin.
- Tooth fracture, root perforation, or root resorption within the cervical 1/3 of the root in teeth with adequate periodontal attachment.
- Teeth with excessive occlusal or incisal wear.
- Teeth with inadequate interocclusal space for proper restorative procedures due to supereruption.
- Restorations which violate the biologic width.
- In conjunction with teeth requiring hemisection or root resection.
- Assist with impression accuracy by placing crown margins more supragingivally.

Figure 1: (a) histological sulcus (0.69 mm), (b) epithelial attachment (0.97 mm), (c) connective tissue attachment (1.07), (d) biologic width (b + c).

Considerations
When selecting the proper case for crown lengthening, several points should be considered:

- What is the benefit, to the patient, of proceeding with the surgery? (This pertains to quality of life issues.)
- Does the patient’s medical history allow a minor surgical procedure?
Is the patient motivated and compliant with the treatment? There must be a team effort; if not, the prognosis is poor from the beginning.

Does the patient display adequate plaque control? If not, then the patient will usually have a poor healing response.

Does the patient have an infection present which may delay the healing or change the prognosis of the tooth? If so, treat the infection with antibiotics, scaling and root planing or endodontic therapy first.

Is the tooth restorable?

After surgery, can a lasting, functionally and aesthetically adequate restoration be placed?

What are the anatomic considerations? These may complicate or even contraindicate the procedure.

Is there a risk of furcation involvement? Root trunk length determines the amount of bone that may be removed without exposing furcations.

How will vital anatomic landmarks such as sinuses, muscle attachment, nerves, or major blood vessels affect the surgery?

Will local osseous structures such as tori, exostoses, the ramus or external oblique ridges complicate matters?

Will esthetics be unreasonably compromised post-surgically?

Will adjacent tooth support be unreasonably compromised after removal of the necessary alveolar bone?

Does the tooth have acceptable root form and bone support? (a 2:1 root to crown ratio is preferred.)

Will the tooth have at least a 1:1 ratio after the ostectomy is performed?

The Restorative Dentist as Surgeon:

Heeding the above considerations, the restorative dentist may opt to provide surgical crown lengthening as a service, with several benefits to the patient. The restorative dentist may perform the surgery on a shorter notice than the specialist. The restorative dentist is intimately aware of requirements for margin finalization, thereby negating the importance of accurate communication between the specialist and the restorative dentist. Reducing the number of care providers involved simplifies the communication factors as well as assuring access, continuity of care, and easy follow up. Additionally, in areas where access to a specialist is limited, it is important for the general dentist to be able to provide crown lengthening as a standard of care.

Practices to Avoid

Crown lengthening by other less precise, less predictable means should be avoided. One mode of compromised treatment includes "ditching" the alveolar bone near the subgingival margin of a restoration using a rotary bur without raising a flap. This is often deleterious due to obliteration of papillary tissues. There is less predictable healing and poor bony contours are created. Also damaging to the periodontium is inappropriate use of electrosurgical equipment and retraction cord.

How Crown Lengthening May be Overlooked

In mechanical considerations of full crown restorations, it is possible for the dentist to overlook restorative requirements such as biologic width and emergence profile for periodontal health. Additionally, as the adhesive properties of cements improve, it becomes easier to rely on these properties rather than the ideal preparation design for the retention of a restoration.

In the dentist-patient relationship, the desire to simplify treatment to prevent referral, time, and money inconveniences may allow the need for crown lengthening to be overlooked. Therefore, it is important for the restorative dentist to have an understanding and awareness of the demands of the biologic width to prevent less than ideal treatment.

Figure 2

Case Report

A 30-year-old male complained of sensitivity on tooth #30. A porcelain fused to metal crown was present. A 5 mm pseudo pocket was present on the lingual, with the lingual gingiva appearing moderately edematous. Upon removal of the crown, it was noted that the preparation was over tapered from the lingual, with a feather-edged margin extending to 0.5 mm from the alveolar bone. Figure 2 shows the lingual view of tooth #30 with the acrylic temporary crown.

After discussion, the patient agreed to be appointed for surgical crown lengthening. Because the tooth had a sound root form and good bone support, the tooth was given a good prognosis.

At the surgical appointment, the patient was anesthetized with 2% lidocaine with 1:100,000 epinephrine. The temporary crown was removed (Figure 3). An intrasulcular incision was made on the buccal and an inverse bevel incision for an apically positioned flap was made on the lingual, extending from the mesial of #29 to the distal of #31. Full thickness flaps were elevated and the collar of excess tissue was removed from the lingual (Figure 4). Ostectomy and osteoplasty were performed using osseous burs and chisels to remove bone at the lingual and mesial of #30 to a distance of at least 3 mm from the future crown margin position (Figure 5). Care was taken not to involve the furcation area of the tooth during the ostectomy. Osteoplasty, at both the mesial and distal of tooth #30, was performed to assure a smooth architectural transition to the adjacent teeth.

After scaling and root planing, the flaps were replaced with apical positioning at the lingual, and two 4.0 silk interrupted sutures were placed. After remounting the temporary crown, a
periodontal dressing was placed. The patient was given postopera
tive instructions, over-the-counter medication for pain con
trol, chlorhexidine gluconate 0.12% oral rinse, and was appointed 
for a one-week suture removal. The patient was also seen during 
subsequent restorative dental appointments at two-, four-, and six-
weeks post-operatively.

At the one week suture removal appointment, slight mobility 
(class I) was clinically detected. At six weeks the area healed
uneventfully enough to refine the crown preparation and make the
impression. Reduction in mobility was noted. Special care was
taken to ensure the margins were left supragingival, considering that
esthetics was not relevant in this case. Crown delivery was com-
pleted at eight weeks postoperatively (Figure 6).

Discussion
Proper placement of tooth restorations requires an awareness of the
biologic width and the implications of not violating it. Crown
lengthening is a valuable means of re-establishing the biologic
width when it has been violated. With the properly selected case,
surgical crown lengthening is a procedure that can be performed
routinely by the restorative dentist.

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