

Esthetic Crown Lengthening in Anterior Teeth

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Abstract

Introduction: Patients now days have a greater desire for esthetic treatments. In addition to the anterior teeth itself, the surrounding gingival tissue plays an important role in such treatments. Discrepancies in the symmetry, contour, or color of the gingiva can affect the harmonious appearance of natural or prosthetic teeth. Periodontal surgery comes in handy here. Crown lengthening is a procedure that is undertaken to increase the amount of supragingival tooth structure for esthetic or restorative purposes by apically repositioning the gingival margin, removing bone, or both. Although crown lengthening is primarily undertaken to increase the anatomic length of a tooth to preserve the biological width, esthetic crown lengthening may be undertaken to reduce asymmetry between adjacent anterior teeth, reduce excessive labial gingiva, and to expose anatomical crowns of the tooth for esthetic purposes.

Aim of the Study: The paper aims to discuss the different cases where esthetic crown lengthening may be used, biological width considerations that should be paid attention to while planning such a procedure and the various surgical techniques that can be used to carry out Esthetic Crown Lengthening.

Methodology: The article is a comprehensive research of PUBMED papers from 1961 to 2018.

Conclusion: Esthetic Crown lengthening has now become an integral part of the esthetic dentistry armamentarium and is used regularly to improve the form and retention of restorations that are placed within the esthetic zone.

Case selection and periodontal examinations are very important before planning the procedure. The complete periodontal condition of the patients and their oral hygiene habits should be assessed. It is successful in cases with excessive gingiva, short clinic crowns, and asymmetrical gingival margins. It is important to take into consideration the concept of biological width while planning esthetic crown lengthening. Various surgical treatment protocols are available for performing the procedure, depending on whether or not bone resection is required.

Keywords: Esthetic Crown Lengthening for Anterior Teeth; Periodontal Surgery; Biological Width; Esthetic Dentistry; Gingivectomy

Introduction

With the increase in demand for esthetic dental treatments these days, periodontal surgery has become an important tool to give patients the esthetic results they desire. In addition to the teeth itself, the surrounding gingival tissue plays an important role in such treatments. Discrepancies in the symmetry, contour, or color of the gingiva can affect the harmonious appearance of natural or prosthetic teeth. Periodontal surgery comes in hand here [1].

Crown lengthening is a procedure that is undertaken to increase the amount of supragingival tooth structure for esthetic or restorative purposes by apically repositioning the gingival margin, removing bone, or both. Although crown lengthening is primarily undertaken to increase the anatomic length of a tooth to preserve the biological width, esthetic crown lengthening may be undertaken to reduce asymmetry between adjacent anterior teeth, reduce excessive labial gingiva, and to expose anatomical crowns of the tooth for esthetic purposes [3].

Esthetic crown lengthening aims to improve the overall esthetics of the teeth and the gingiva. Such surgeries are undertaken to increase patient satisfaction and improve their quality of life. As with any other elective procedure, it is important that the gingiva be free of any inflammation or infection before any esthetic treatment is planned [1]. Indications for esthetic crown lengthening include teeth with short clinical crowns (Figure 1), fractured teeth, subgingival caries, or caries that cause extensive destruction of the tooth [2]. It is not usually indicated for teeth that are elongated due to periodontal diseases or gingival recession [1].



Figure 1: Esthetic crown lengthening used to remove asymmetry of gingival margin and improve esthetics [1].

Several surgical techniques have been recommended for esthetic crown lengthening, including gingivectomy, apically positioned flap with or without respective osseous surgery, undisplaced flap with or without osseous surgery and orthodontic forced eruption with or without fibrotomy. The selection of the right technique depends on various factors such as a crown to root ratio, root morphology, esthetics, and individual tooth position, smile line, and the ability to restore the teeth [1].

Crown lengthening procedures have now become an integral part of the esthetic dentistry armamentarium and are exploited regularly to improve the form and retention of restorations that are placed within the esthetic zone [1].

Common indications for esthetic crown lengthening in anterior teeth

Correctly identifying the underlying cause is the key to treatment planning for any procedure. Crown lengthening procedures for anterior teeth is indicated in three main scenarios [1]:

1. “Gummy Smile” appearance (Excessive gingival exposure).
2. Asymmetry of Gingival margin and tooth length.
3. “Short Teeth” appearance (Incomplete passive eruption).

“Gummy Smile” appearance (Excessive gingival exposure)

A gummy smile can be evaluated during an extraoral examination by asking the patient to smile. The amount of gingival exposure is relative to the position of the upper anterior teeth in relation to the upper lip movement while smiling. Gingival exposure of more than 3 mm apical to the cervical gingival margin of the upper teeth can cause a ‘gummy smile’ appearance (Figure 2) [4].



Figure 2: High lip line with excessive gingival exposure before and after crown lengthening [1].

Asymmetry of gingival margin and tooth length

The asymmetry between contralateral teeth and their gingival margins has a negative effect on the esthetic appearance of the smile. This relation can be evaluated during the intraoral examination. The following criteria have been suggested to achieve the ideal relationship between anterior maxillary teeth (Figure 1) [5]:

1. The gingival margins of the central incisors should be symmetrical and either at the same level or within 1 mm apically of the margins of the lateral incisors.
2. The gingival margins of the canines should ideally be 1 mm apical to the margins of the lateral incisors.
3. A line drawn at the level of the gingival margins of the canine should be parallel to the interpupillary line.
4. A minimal amount of gingival should be exposed apical to the central incisors and canines.
5. The lateral incisors should be seen about 1.5 mm less than the central incisors [5].

“Short Teeth” appearance (Incomplete passive eruption)

Some Upper Anterior teeth may show altered passive eruption. This may result in the “Short Teeth” appearance. The average length of the Central Incisor is 11 mm and lateral incisor 9 mm and 10.5 mm for the canine. During Intra Oral examination, a periodontal probe or a ruler can be used to check for the deficiency for length [5]. To plan a crown lengthening surgery in these teeth, a line parallel to the interpupillary line should be drawn, connecting the planned gingival margin levels of the Central Incisors and Canines. This line should be no more than 12 mm from the incisal edge of the Central Incisor and no more than 11 mm from the cusp tip of the canine [5].

Biological width considerations

The gingival unit is composed of two parts, the epithelial attachment, and the junctional epithelium [6]. Biological width is defined as the combined physiological dimension of the junctional epithelium and the connective tissue attachment. It was found to be about 2.04 mm on an average and included 1.07 mm average connective tissue attachment above the alveolar bone and 0.97 mm average length of the epithelial attachment. The average depth of the gingival sulcus was found to be 0.69 mm (Figure 3) [7].

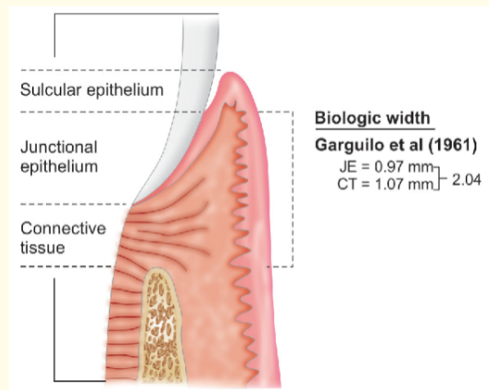


Figure 3: Biological width [7].

Numerous papers have emphasized on the need to preserve the biological width [8,9]. A minimum of 2 mm of biological width should be preserved apical to the margins of the restoration [9]. Violation of the Biological width can have either of two consequences. One pos-

sibility is the occurrence of bone loss of unpredictable nature, leading to gingival recession. The other consequence may be persistent gingival inflammation without any bone loss [10]. In either case, the violation of the biological width can hamper the treatment outcome, causing more harm than good to the esthetic outcome [11].

If the crown lengthening procedure involves soft tissue resection that can damage the biological width, bone resection may be required in addition to soft tissue removal. If restorative rehabilitation is not planned, 2 mm of the bone from the CEJ should be removed to expose the maximum amount of clinical crown while preserving the biological width. The Biological width was found to reestablish itself in 6 months after crown lengthening procedures [11].

Surgical procedures

The surgical procedure for esthetic crown lengthening can be classified into two broad categories [12]:

1. Gingival reduction only (without bone resection)
 - a) Gingivectomy.
 - b) Gingival flap surgery.
2. Mucoperiosteal flap with ostectomy (with bone resection):
 - a) Single stage procedures (carried out in either of the following orders):
 - i. Flap Reflection, ostectomy, apical positioning
 - ii. Flap Reflection, ostectomy, gingivectomy, positioning
 - iii. Gingivectomy, flap reflection, ostectomy, positioning
 - b) A two-stage procedure, which requires flap reflection, ostectomy, followed by repositioning after 4 to 6 weeks - gingivectomy.

Regardless of the surgical procedure, it is of utmost importance to give the patient proper post-surgery instructions to avoid unwanted movements of tissue during the healing phase. In most cases, no antibiotic prophylaxis is required, and oral NSAIDs are able to provide sufficient pain control [1].

Gingival reduction only (without bone resection)

Gingival Reduction only techniques are rarely used because bone resection is usually required to achieve optimum crown length. In cases where only soft tissue removal is needed, there are two options, gingivectomy with a beveled incision or Apically positioned flap with a reverse bevel incision [1].

Gingivectomy can be performed by blades or specially designed knives such as the Kirkland knife and Orban knife. They are used to make beveled incisions at an angle of about 45 degrees in an apico-coronal direction towards the long axis of the tooth (Figure 4). Some clinics prefer using diode lasers due to their advantage of intraoperative hemostasis and more delicate strokes [13].

Minimally apically positioned flaps are preferred when small amounts of labial gingiva have to be removed without bone resection. They offer the advantage of preserving the papilla. Another advantage they offer is that bone resection can be performed immediately after gingival resection if required [1].

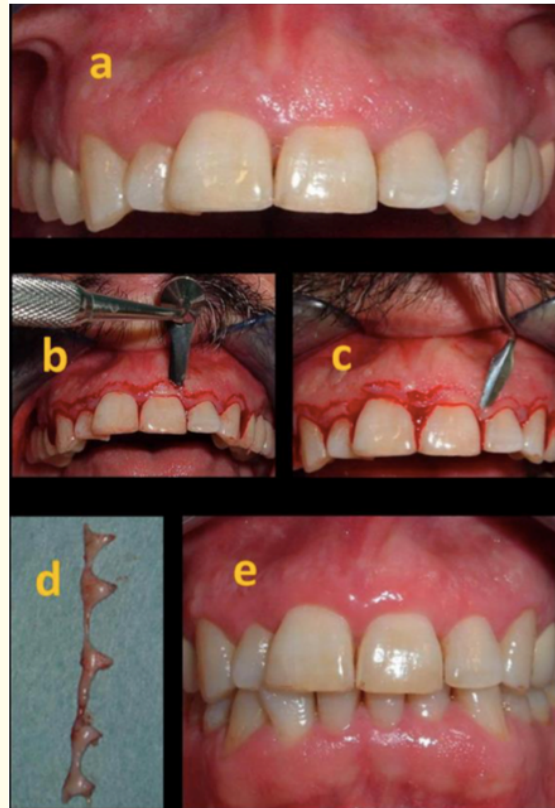


Figure 4: Gingivectomy with Orban and Kirkland knife [1].

Mucoperiosteal flap with ostectomy (with bone resection)

Mucoperiosteal flaps with ostectomy are frequently required to achieve enough exposure to the clinical crown.

One-stage surgical crown-lengthening techniques

Two techniques are discussed here.

The first technique involves raising a Mucoperiosteal flap, ostectomy, followed by the apical position of the tissues near or at the crest of the alveolar bone [14]. This procedure is useful when there is a limited amount of keratinized gingiva. The advantage of this procedure is that all of the keratinized gingivae are preserved. A healthy band of free and attached gingiva remains after the surgery [15].

The second technique (Figure 6) begins with an internal bevel incision gingivectomy, resulting in the placement of the gingival tissues at their final anticipated position labially, regardless of their position with respect to the underlying alveolar bone. Adequate keratinized gingiva must remain. After the gingivectomy, an incision is made in the sulcus, and a full-thickness flap is reflected to expose the underly-



Figure 5: One stage surgical crown lengthening with ostectomy
A. Pre-operative, B. Osseous reduction, C. Apically repositioned flaps, D. Final prosthesis [15].



Figure 6: Single stage esthetic crown lengthening (Second technique) [1].

ing bone. If restorative dentistry is not planned, 2 mm of the bone from the CEJ should be removed to expose the maximum amount of clinical crown while preserving the biological width. This prevents possible root exposure and recession in the future. Care should be taken to leave the interdental papilla intact. Labial osteotomy is performed to position the bone at least 3 mm away from the newly created free gingival margin. The flap is then repositioned and sutured [1].

This technique is indicated in cases of inadequately exposed clinical crown and a requirement for bone removal. The advantage is that it is done in a single visit. Healing, however, is not always predictable, despite obedience to biologic principles [12].

Two-stage surgical crown-lengthening technique

This procedure is indicated when, along with increased clinical crown length, the labial bone reduction is required. The first stage involves the reflection of a full-thickness flap to access the facial alveolar bone. The papillae are preserved. Vertical incisions can be used in isolated areas to minimize flap size and to avoid a flap reflection over the papillae. Bone removal is then performed after flap reflection. The position of the restorative margin must be anticipated so that the appropriate amount of bone can be removed. There must be at least 3 mm of space between the crown margin and the bone so that the biologic width is preserved. If no restorations are planned, the labial alveolar bone margin should be positioned 2 mm from the Cementoenamel Junction [12].

After osteotomy, the flap is repositioned at its original position with sutures. Two weeks postoperatively, gingival healing appears to be complete. At 4 to 6 weeks postoperatively, gingival tissues appear stable, and the patient is recalled for the second stage, an internal bevel gingivectomy. The alveolar crest is sounded, and the length of supra-alveolar gingiva is determined. This number is subtracted from 3mm, and that amount of gingiva be removed with no damage to the free gingival margin. Complete gingival healing is achieved at two weeks [12]. The two-stage procedures were developed because of unpredictable or delayed healing in the one-stage technique, which often resulted in another surgery [12].

Conclusion

Esthetic Crown lengthening has now become an integral part of the esthetic dentistry armamentarium and is used regularly to improve the form and retention of restorations that are placed within the esthetic zone.

Case selection and periodontal examinations are very important before planning the procedure. The complete periodontal condition of the patients and their oral hygiene habits should be assessed. It is successful in cases with excessive gingiva, short clinic crowns and asymmetrical gingival margins. It is important to take into consideration the concept of biological width while planning esthetic crown lengthening. Various surgical treatment protocols are available for performing the procedure, depending on whether or not bone resection is required.

Bibliography

1. Assaf M. "Esthetic crown lengthening for upper anterior teeth: indications and surgical techniques". *Journal of International Dental and Medical Research* 1.3 (2014): 86-91.
2. Anoop S. "Crown lengthening surgery: a periodontal makeup for anterior esthetic restoration". *Journal of Interdisciplinary Dentistry* 8.3 (2018): 132.
3. American Academy of Periodontology (Edition). "Glossary of periodontal terms". *American Academy of Periodontology* (2001).

4. Kokich Jr V O., *et al.* "Comparing the perception of dentists and lay people to altered dental esthetics". *Journal of Esthetic and Restorative Dentistry* 11.6 (1999): 311-324.
5. Allen EP. "Use of mucogingival surgical procedures to enhance esthetics". *Dental Clinics of North America* 32.2 (1988): 307-330.
6. Schroeder HE. "Fine structure of the developing epithelial attachment of human teeth". *Monographs in Developmental Biology* (1971): 2.
7. Gargiulo A W., *et al.* "Dimensions and relations of the dentogingival junction in humans". *The Journal of Periodontology* 32.3 (1961): 261-267.
8. Ingber JS. "The" biologic width", a concept in periodontics and restorative dentistry". *Alpha Omegan* 70 (1977): 62-65.
9. Silness J. "Fixed prosthodontics and periodontal health". *Dental Clinics of North America* 24.2 (1980): 317-329.
10. Dragoo MR and Williams GB. "Periodontal tissue reactions to restorative procedures". *The International Journal of Periodontics and Restorative Dentistry* 1.1 (1981): 8.
11. Lanning SK., *et al.* "Surgical crown lengthening: evaluation of the biological width". *Journal of Periodontology* 74.4 (2003): 468-474.
12. Sonick M. "Esthetic crown lengthening for maxillary anterior teeth". *Compendium* 18.8 (1997): 807-812.
13. Lee EA. "Aesthetic crown lengthening: classification, biologic rationale, and treatment planning considerations". *Practical Procedures and Aesthetic Dentistry* 16.10 (2004): 769-778.
14. Kois JC. "Altering gingival levels: the restorative connection part I: biologic variables". *Journal of Esthetic and Restorative Dentistry* 6.1 (1994): 3-7.
15. Lai J Y., *et al.* "Anterior esthetic crown-lengthening surgery: A case report". *Journal-Canadian Dental Association* 67.10 (2001): 600-603.

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