

Case Report

CROWN LENGTHENING: FUNCTIONAL AND ESTHETIC REHABILITATION

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ABSTRACT

The biologic width includes both the connective tissue attachment and the junctional epithelium and has a mean dimension of approximately 2 mm. Invading the biologic width with a restoration can result in localized crestal bone loss, gingival recession, localized gingival hyperplasia, or a combination of these three. When restoring teeth that have subgingival caries or fractures below the gingival attachment, a clinical crown-lengthening procedure is needed to establish the biologic width. This article presents a series of three cases that utilized crown-lengthening procedures for esthetic and functional restoration.

Keywords: *Biologic Width; Crown Lengthening; Periodontium/Surgery*

INTRODUCTION

Surgical lengthening of clinical crowns represents one of the most commonly used procedures in contemporary periodontics. Indications include: (1) lack of sufficient length of a clinical crown to ensure a tooth preparation for fixed prosthodontics with retentive and resistance form; (2) pre-existing dental caries or restorations in the vicinity of the free gingival margins that prevent preparation of finish lines for restorative margins coronal to the biologic width; (3) the need to develop a ferrule for pulpless teeth restored with posts (Eissman and Radke, 1976; Sorensen and Engelman, 1990) and (4) unesthetic gingival architecture as a result of altered passive eruption (Coslet *et al.*, 1977).

The biologic width includes both connective tissue attachment and the junctional epithelium. Different studies have offered different mean dimensions of the biologic width. Invasion of the biologic width due to restorations could result in crestal bone loss, gingival recession with localized bone loss, localized gingival hyperplasia with minimal bone loss, or a combination of the three (De Waal and Castellucci, 1993).

Therefore, when restoring teeth with subgingival caries or fractures and below the gingival margin and abnormalities in symmetry and contour for esthetic purpose, a dentist has to determine if the tooth is salvageable, whether the crown needs to be lengthened, and which crown-lengthening procedure is appropriate. Clinical crown lengthening is performed to achieve margins on sound tooth structure, maintenance of the biologic width, access for impression techniques, and esthetics (Becker *et al.*, 1998). An ideal anterior appearance necessitates healthy and inflammation-free periodontal tissues.

This article presents three cases in which crown-lengthening procedures were used to restore teeth for esthetic purpose in one case and another two for prosthetic purpose which have been done by developing surgical-guide template to facilitate surgical planning and enhance communication between periodontist and restorative dentist.

CASES

All three patients had a noncontributory medical history; they all denied a history of smoking or alcohol consumption. Extraoral examination revealed no significant findings. All of them had a symmetric and a straight facial profile. Periodontal examination revealed good oral hygiene with minimal plaque and calculus deposits. The gingiva was pink and firm and the papillae were intact. Clinical examination revealed shallow probing depths, no mobility. The crestal bone level was within normal limits, and the crown to root ratio was favourable. Occlusal analysis revealed, among other findings, an Angle's class I relationship, with 70% overbite and 2 mm of overjet. No signs of fremitus were observed. The patients had adequate anterior guidance upon protrusion and adequate group function upon lateral excursions.

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Case Report 1

A 32-year-old woman presented to the Ahmedabad Dental College requesting “better-looking teeth”. Although the anterior maxillary teeth looked symmetric with respect to their contralateral counterparts (e.g., tooth 11 was similar to tooth 21 in terms of length and width), they were not proportionate in size. Prosthetic plan for the patient involved porcelain-fused-to-metal (PFM), crowns for teeth 11 to 21. The anterior teeth were heavily restored.



Figure 1: (A) Unesthetic smile (B) Pre-operative (C) Marking at desired crown length (D) Incisions for apically displaced flap (E) Resective osseous surgery (F) Sutures in place (G) 1 month post-operative (H) Prosthetic rehabilitation (I) and (J) Comparison of pre and post operative smile

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After discussion with the restorative dentist, esthetic crown-lengthening was recommended to allow a healthy, optimal relationship between the teeth and the periodontium. Apically displaced flap was planned as the width of attached gingiva was inadequate. The initial inverse bevel incision was performed so as to achieve the ideal contour on the anterior teeth. Crevicular incisions were given and for the apical displacement of flap vertical releasing incisions were given. Flap was raised and the bone was exposed to calculate the biologic width. The osseous resection, performed only on the buccal surface, exposed 3 mm of root surface from the gingival margin to the alveolar crest; this allowed for attachment of the junctional epithelium and connective tissue. The flap was apically repositioned and sutured with 5-0 silk suture. Post-operative medication and instructions were given to the patient. Final preparation of the teeth began a half year later, since gingival recession can occur as long as 6 months after the surgery. One millimetre of coronal dentin was achieved by the crown lengthening surgery on tooth 12 to allow for the ferrule effect. Studies have shown that the ferrule effect significantly reduces the incidence of fracture in a nonvital tooth by reinforcing the tooth at its external surface. Final insertion of the PFM crowns was performed 10 months after the crown-lengthening surgery.

Case Report 2

A 55-year-old man presented to the Ahmedabad Dental College with the chief complaint of lack of posterior occlusion and generalized severe tooth attrition. The patient described untreated nocturnal bruxism.



Figure 2(A): Intra-operative: (a), (b) and (c) Pre-operative stent placement for marking desired crown height (d), (e) and (f) Marking at desired crown length (g), (h) and (i) Incision (j), (k) and (l) Resective osseous surgery (m), (n) and (o) Sutures in place

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Similar surgical crown extension was planned but the area of concern was mandibular teeth. Diagnostic waxing was accomplished and template was fabricated with the use of stock artificial teeth to anticipate contour and dimensions of future artificial crowns. The template was trial seated intraorally to ensure stability. Sounding of the alveolar crest was accomplished at this visit, under local anesthesia, with a UNC15 probe (Hu-Friedy Co Inc, Chicago, Ill.) to determine the height of supracrestal gingival tissue, which averaged 4 mm. A facial scalloped surgical incision was outlined 2 mm submarginal, following the surgical template from mandibular left molar to right molar. From analysis of the template, it was obvious that the position of the alveolar crest was already 3 mm from a future finishing line for the planned restoration of the right canine, and only minimal osteotomy was necessary for remaining anterior teeth. Bone recontouring, both facially and lingually, was initiated with the use of a round diamond stone mounted on a high-speed handpiece with copious water irrigation, followed by contouring with hand instruments. After the planned dimensions were achieved, the flap was sutured with 4-0 silk interrupted sutures. Post-operative medication and instructions were given to the patient. Final prosthesis was given after 6 months.



Figure 1(B): Comparison of Pre and Post Operative: (a) Pre-operative (b) Surgical stent preparation on cast (c), (d) and (e) Pre-operative crown height (f), (g) and (h) Post-operative crown height (i) and (j) Comparison of pre and post operative

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DISCUSSION

The biologic width includes both connective tissue attachment and the junctional epithelium. Different studies have offered different mean dimensions of the biologic width (Gargiulo *et al.*, 1961) reported an epithelial attachment of 0.97 mm and a connective tissue attachment of 1.07 mm, while (Vacek *et al.*, 1994) reported mean measurements of 1.14 mm for epithelial attachment and 0.77 mm for connective tissue attachment. Both studies found that measuring the connective tissue attachment produced more consistent results than measuring the epithelial attachment. There is a significant relationship between restorative dentistry and periodontal health. As restoration margins get deeper subgingivally, inflammation becomes more severe (Reitemeier *et al.*, 2002). Restoration margins placed near alveolar bone cause the formation of periodontal pockets and bone loss (Gunay *et al.*, 2000; Schatzle *et al.*, 2001). Periodontal surgery is recommended to support restorative dentistry and improve long-term prognosis. Depending on the specific clinical situation, a dentist can perform one of several clinical crown-lengthening procedures. Osseous resective surgery for clinical crown extension is an irreversible procedure that commonly requires the reduction of supporting bone. A strategic plan of bone recontouring must be programmed to achieve a satisfactory and biologically acceptable result. The template may assist the restorative team to analyze limiting factors and may be modified as a radiographic template to visualize the amount of root would remain in bone after the surgery (Scutella, 1999). Anatomic determinants such as gingival architecture and consistency and individual supracrestal gingival tissue must be previously recorded and may limit bone recontouring. The surgical template described has proven extremely useful in specific situations.

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