

Esthetic and Functional Crown Lengthening Surgery- Review Article

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Introduction

Crown lengthening procedure is utilized to increase the clinical length of teeth for restorative or esthetic purposes. Surgical crown lengthening involves increasing the supragingival tooth structure of teeth by either apically positioning the gingival margin, removal of supporting bone or both [1]. The major goal of crown lengthening involves increasing tooth structure, establishing and maintaining biologic width around teeth as well as maintaining adequate keratinized tissue around a tooth [1]. In establishing biologic width the goal is to allow 3mm between gingival margin and alveolar bone. These dimensions have been found by multiple studies to allow adequate room to prevent biologic width impingement [1-4,6].

Gargulio and colleagues measured the Biologic width in cadavers by studying the Dento-gingival complex they concluded that the epithelial attachment measured on average .97mm, while the connective tissue attachment measure was 1.07mm and the sulcus was .69mm [5]. Biologic width is a combination of the junctional epithelium and connective tissue and measures an average of 2.04mm when combined with the sulcus depth, the measurement of space required is 2.73mm between gingival margin and alveolar bone crest [5,6].

From measurements from Gargulio, it was found that while the connective tissue attachment was the most constant factor and was usually about 1.07mm, epithelial attachment was the most variable part of the dento-gingival complex measurement [5]. Restorations placed into the biologic width can result in symptoms that can

range from discomfort in tissue around restorations, bleeding on probing and localized gingival hyperplasia to gingival recession, attachment loss and bone loss [7].

In assessing clinical signs of biologic width violation in patients, they include bleeding on probing, chronic localized gingival inflammation, gingival recession, pocket formation around the restorations, alveolar bone loss and gingival hyperplasia. To prevent these symptoms the use of Crown lengthening is essential to correct the violation. Indications for Crown lengthening procedures include sites with short clinical crowns, subgingival caries or extensive decay, teeth with fracture that require increased tooth structure, when the goal is to create a ferrule effect with restorations, to relocate a margin that was impinging on biologic width, for esthetic reason to match adjacent teeth, for patients with gummy smiles, for uneven gum contours, and to get access for coronal third root perforations [6,7].

When there is inadequate crown to root ratio, or there is non-restorable caries or fracture, or when there is potential for esthetic compromise and potential for excessive damage to periodontium of adjacent teeth, alternate treatment such as extraction should be considered in order not to cause unstable results [2,7].

Crown lengthening can be either performed for esthetic reasons to correct gummy smiles or gingival overgrowth or for functional and restorative reasons to increase retention of restorations, expose caries, increase tooth structure above alveolar crest and prevent violation of biologic width or for both reasons [1]. This article presents on case reports involving both esthetic and functional crown lengthening and combination of both as well as information for dentists to know what type of procedure to utilize when faced with need for crown lengthening.

Esthetic Crown Lengthening

Esthetic crown lengthening is often utilized to correct uneven gingival margins, address the presence of altered passive eruption or for treating gingival overgrowth. During the tooth eruption process, two types of eruption occurs: Active and Passive eruption [11]. Active Eruption occurs when teeth erupt into the oral cavity, while Passive eruption involves apical migration of soft tissue covering the crown of teeth [11].

Altered passive eruption occurs when during tooth eruption, the gingival margin level fails to move apically to levels at or near the Cemento-enamel junction (CEJ) and is located incisal to the CEJ. A number of studies have reviewed classification system for Altered passive eruption [9-11], and Coslet and colleagues defined 2 major types: Type I involving gingival excess, with the gingival margin located incisal or occlusal to the CEJ, and Type II involving normal amounts of gingival tissue and the gingival margin located within normal range from the CEJ and all the attached gingival tissue located on the anatomic crown and the mucogingival junction located at the level of the CEJ [9-11].

Type I altered passive eruption is divided into Type IA present with soft tissue excess and normal osseous crest to CEJ relationship to address this condition, it requires only gingivectomy to correct it. Type IB presents with combination of excess tissue and osseous crest at level of CEJ and needs osseous recontouring to address condition [9,10]. Type IIA presents involves patients that present with reduced keratinized tissue and normal bone crest to CEJ relationship with need for apical repositioning of flap with no osseous recontouring while Type IIB presents with inadequate keratinized tissue and osseous crest at level of CEJ with need for both apical repositioned flap and osseous recontouring in order to achieve esthetic results without impingement on biologic width [10].

In diagnosing what teeth have altered passive eruption, sites in the mouth with the gingival margin located 3mm or more above the CEJ of adjacent teeth can be characterized as having altered Passive eruption. It can occur around multiple teeth presenting as a Gummy smile, or around individual teeth in the arch giving the appearance of gingival margin asymmetry compared to adjacent teeth. Esthetic crown lengthening is needed to correct it when it is diagnosed and therapy indicated is based on the classification it falls under.

Case Report on Esthetic crown lengthening

A thirty eight year old African American female presented with uneven margin #7 and altered passive eruption. She was very concerned about the tooth and wanted to correct the condition due to esthetic concerns. In classifying altered passive eruption, she falls in the category of Type IB Passive Eruption and required crown lengthening with flap surgery and osseous recontouring to address her condition. Pictures show before and after results and the ability of crown lengthening to address gingival conditions and result in gingival location that is both esthetic and in harmony with

adjacent teeth, as well as also prevents biologic width violation. In her case, crown lengthening was performed for both esthetic reasons to address altered passive eruption and uneven gum tissue as well as for functional reasons to prevent biologic width violation (1, 2, 3 and 4).



Figure 1: Initial Picture of patient needing esthetic Crown lengthening tooth #7.



Figure 2: Picture to show need for esthetic Crown lengthening #7.



Figure 3: Post operative Result.



Figure 4: Final restorations in place.

Functional Crown lengthening

Functional Crown lengthening is performed to prevent biologic width impingement, allow establishment of a ferrule effect, expose subgingival caries and root fractures and increase supragingival tooth structure to improve retention of restorations [2]. Ong and colleagues created a decision tree for surgical crown lengthening and classified crown lengthening cases as either type I or Type II based on the presence of adequate keratinized (Type I) or inadequate keratinized tissue (Type II) around the tooth [1].

Based on the classification, they subclassified the sites further as Type IA which involves sites with adequate keratinized tissue and free restorative margin (FRM) or CEJ is more than or equal to 2mm from the bone. They classified sites as (Type IB) as sites with adequate keratinized tissue but the distance from the free restorative margin (FRM) or CEJ is <2mm from the bone crest and Type IIA sites as sites with inadequate keratinized tissue and 2mm or more distance between the FRM or CEJ and bone [1]. They classified Type IIB sites as sites with inadequate keratinized tissue with distance from FRM or CEJ less than 2mm from bone crest [1].

Based on these findings, their recommendations is that for Type IA cases which present with adequate keratinized tissue and the bone crest is equal or more than 2mm from the CEJ or FRM, the therapy that is indicated is Gingivectomy. For Type IB cases with adequate keratinized tissue, when the bone crest is less than 2mm from the CEJ, the recommended therapy is gingival flap and with osseous resection. For Type IIA cases with inadequate keratinized tissue where the bone crest is equal to or more than 2mm from the CEJ, only apically positioned flaps are indicated. For Type IIB cases with inadequate keratinized tissue and with the CEJ less than 2mm from the bone crest, both osseous gingival flap and osseous resection are indicated [1] (Figures 5-9).



Figure 5: Initial presentation for Functional Crown lengthening tooth #29.



Figure 6: Xray of initial presentation.



Figure 7: Clinical picture immediately after procedure.



Figure 8: Clinical picture at post-op.

Figures 5,6,7, and 8 show functional crown lengthening for a Type IB classification site. The functional crown lengthening procedure was performed to increase crown height, prevent biologic width violation, increase crown retention as well as prevent continued inflammation from the biologic width violation.

Discussion

The goal of crown lengthening is to increase the clinical crown length of teeth for esthetic or restorative purposes. This can involve Crown lengthening utilizing gingivectomy, gingival flaps and apically positioned flaps with or without ostectomy to increase tooth structure and prevent biologic width violation. While the goal of crown lengthening is primarily to allow 3mm distance between the gingival margin and bone crest, the type of procedure utilized depends heavily on local conditions at the site. When the bone crest is too close to the gingival margin, ostectomy procedure is indicated to prevent biologic width impingement. When the bone crest is in the correct positions from the gingival margin, a gingivectomy or apically positioned gingival flap is indicated depending on the amount of keratinized gingival tissue present.

An alternative procedure to crown lengthening that does not involve a surgical procedure involves the use of orthodontic extrusion. Orthodontic extrusion involves using orthodontic appliances involving arch wires or elastics attached to the tooth and use of occlusal plates and elastics to extrude teeth with inadequate tooth

structure, subgingival caries, biologic width violation or coronal root fractures. 15, 16 For sites that have altered passive eruption, Crown lengthening is indicated. While extrusion is able to be used to lengthen teeth it is not very predictable alone in addressing sites requiring crown lengthening for esthetic reasons since the exact location of the gingival margin might require surgical therapy to be made harmonious with adjacent teeth.

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