

## Anterior esthetic Crown lengthening surgery: A case report

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### Abstract

Maintaining healthy periodontium during teeth restoration procedures is an indispensable condition for obtaining regular functioning and esthetics. Crown lengthening is a surgical procedure designed to increase the extent of the supragingival tooth structure, so that the clinician can restore the tooth. The crown lengthening procedure (CLP) is commonly used to maintain the dentogingival complex in optimal conditions and to correct aesthetic defects through a smile design. Difficulty in maintaining appropriate gingival biological width (GBW) is a frequent problem encountered in this type of reconstruction. The ideal situation for periodontium is localizing the filling/complement border supragingivally, which is at least 3 mm from alveolar process edge. In the case, when the above conditions are impossible to fulfil, elongation of clinical crown is a method of choice. The aim of the current case reports is to evaluate the implications of CL in routine dental practice. The diagnosis requirements, periosurgery procedures of crown lengthening, importance of crown lengthening and esthetic improvements after crown lengthening are discussed in different sessions.

**Keywords:** Crown Lengthening Procedure (CLP); Biological Width; Esthetics; Periosurgery.

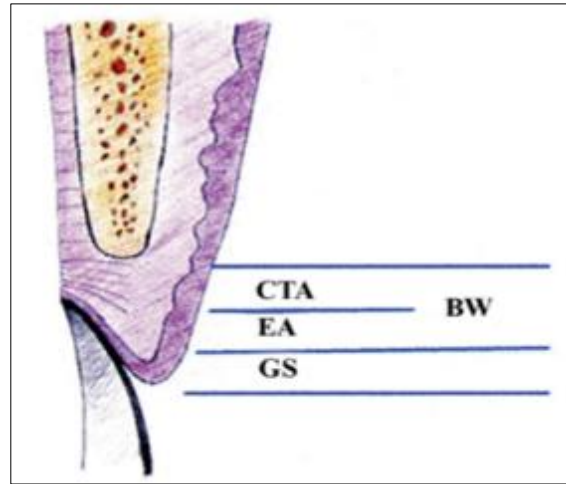
### 1. Introduction

Functional crown lengthening procedure is one of the treatments that is often done to expose or open the root surface by changing the position of the gum tissue and the alveolar bone edge more apically [1]. This procedure aims to maintain the biological width associated with the health of the periodontal tissues, and to provide adequate retention and resistance to the restoration to be performed [2].

The appearance of the gingival tissues surrounding the teeth plays an important role in the esthetics of the anterior maxillary region of the mouth. Abnormalities in symmetry and contour can significantly affect the harmonious appearance of the natural or prosthetic dentition. The increase in aesthetic expectations and the knowledge of the rules of aesthetics obligates one to perform restorations in harmony with the arrangement of lips, face, homonymous teeth, and with preservation of a healthy periodontitis. As well nowadays, patients have a greater desire for more esthetic results which may influence treatment choice. A significant increase in the range of periodontal treatments is observed today.

Maintaining a healthy periodontium during tooth reconstruction procedures is a prerequisite for obtaining aesthetics and function. For this purpose it is necessary to know the correct anatomy and the effects of fillings and prosthetic appliances on periodontium [3]. A common problem encountered with this type of restorations is the difficulty in maintaining adequate biological width. The term "biological width" (gingival biological width, GBW) means the gingival area attached to tooth surface, located coronally in relation to the alveolar ridge (Figure 1).

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**Figure 1** The approximate value of biological width. It consists of: epithelial attachment — EA (1 mm) and connective tissue attachment — CTA (1 mm) [3, 4].

An ideal anterior appearance necessitates healthy and inflammation-free periodontal tissues. Garguilo[5] described various components of the periodontium, giving mean dimensions of 1.07 mm for the connective tissue, 0.97 mm for the epithelial attachment and 0.69 mm for the sulcus depth. These measurements are known today as the biologic width. Ingber and others[6] observed that the presence of caries or restorations in close proximity to the alveolar crest may lead to inflammation and bone loss due to violation of the biologic width. Hence, they recommended that the restorative margin be a minimum of 3 mm coronal to the alveolar crest, suggesting that this margin could be achieved through a surgical intervention known as crown lengthening surgery. Some authors have questioned the necessity of this procedure, suggesting that if the biologic width is invaded, the body can re-establish the necessary dimensions on its own over time [7]. However, it is generally accepted that crown-lengthening surgery helps to relocate the alveolar crest at a sufficient apical distance to allow room for adequate crown preparation and reattachment of the epithelium and connective tissue [8]. Furthermore, by altering the incisogingival length and mesiodistal width of the periodontal tissues in the anterior maxillary region, the crown-lengthening procedure can build a harmonious appearance and improve the symmetry of the tissues.

#### Goals of Crown Lengthening Facilitating an ideal restorative results

- To gain access to subgingival caries, root resorption and /or post /pin restoration.
- To increase clinical crown height that lost from caries, fracture or excessive wear.
- To provide additional tooth structure for a —ferrule effect|| beyond post or core, etc.
- To improve axial retention and resistance form for better long term predictability.

#### Preserving the health of the periodontium.

- Adjust bone height and soft tissues position away from the proposed crown margins to prevent biologic width impingement after crown cementation.
- To eliminate chronic irritation/ inflammation, tissue discomfort and pain, and bone loss around an existing crown causing biologic width impingement.
- To avoid worsening tooth prognosis while maintaining a crown to root ratio of at least 1:1 and while minimizing the reduction of bone and soft tissues of the adjacent teeth.

Good communication between the restoring dentist and the periodontist is important to achieve optimal results with crown-lengthening surgery, particularly in esthetically demanding cases. In addition to establishing the smile line, the restoring dentist evaluates the anterior and posterior occlusal planes for harmony and balance, as well as the anterior and posterior gingival contours. This information allows the restoring dentist to determine the ideal incisogingival length and mesiodistal width of the anterior maxillary teeth. On the basis of these projections, the periodontist recontours and relocates the gingival margin and the alveolar crest to achieve both an esthetically pleasing appearance and periodontal health. The following case report illustrates these concepts.

## 2. Case Report

A 23-years-old man was referred to the Department of Periodontics of Universitas Airlangga, Surabaya, Indonesia. The patient requesting “better-looking teeth”. His medical history was noncontributory, and he denied a history of smoking or alcohol consumption. He presented a good general health and maxillary anterior teeth with short clinical crown which broken after playing football. Dental examination revealed inadequate clinical crown height with 11 compared with 21 [Figure 2]. Periodontal examination revealed good oral hygiene with minimal plaque and calculus deposits. Healthy gingival biotype present. The gingiva was pigmented and firm; interdental papillae were intact. Clinical examination revealed probing depths of 3 mm - 4 mm with no pathologic mobility. The maxillary frenal attachment was of mucosal type with attached gingiva of 5 mm. Radiographic examination with 11 and 12 revealed no alveolar bone loss. The root length was found to be adequate. The patient, professor by profession, was a non-smoker with no contributing medical history. Extraoral examination revealed no significant findings with a normal lip line and minimal gingival display while smiling. No periapical radiolucency at radiographic examination was detected, the periodontal ligament was within normal limit, and the crown-to-root ratio was about 1 : 3. At clinical examination, periodontal pocket depth was 3 mm or less. Neither periodontal problems nor teeth mobility was detected. The primary concerns of this patient included anterior esthetics and dissatisfaction with the size and shape of teeth. A treatment plan was formulated in consultation with the restoring dentist and crown lengthening was recommended to increase the amount of supragingival tooth structure so as to allow a healthy, optimal relationship between the restoration and the periodontium. After determining the problem, the surgical technique was determined. The treatment plan realized was the crown lengthening of elements 11 and the installation of direct tooth veneers. The patient was informed about the treatment and a written consensus was obtained according to local legislation. The patient opted for surgical correction. Written informed consent was obtained.

Initially, an impression of the maxilla was obtained to realize the diagnosis wax-up (Figure 3). For the osteotomy, measurement of the distance between the guide edge and the cervical bone was recorded (Figure 4,5,6). This distance should be about 3 mm, for the biologic width maintenance and installation of prosthesis. At first, gingivectomy 1 mm on tooth 11, then flap elevation with sulcular technique. Elevated flap with rasparatorium and TKN. Thus, a full-thickness (papilla preservation) mucoperiosteal flap was elevated and the gingival collar extracted with a Gracey curette. The creation of a precise biologic width requires, in addition, a precise osseous contouring, which was performed using manual instruments (surgical chisels) and carbide/diamond burs with adequate irrigation, for preventing bone necrosis. Confirmation of bone reduction results. Then, the flaps were sutured. After 1-month healing. Then, final restoration direct veneer on teeth 11 (Figure 12).



**Figure 2** Dental examination revealed inadequate clinical crown height with 11 tooth compared with 21 tooth



**Figure 3** An impression of the maxilla was obtained to realize the diagnosis wax-up



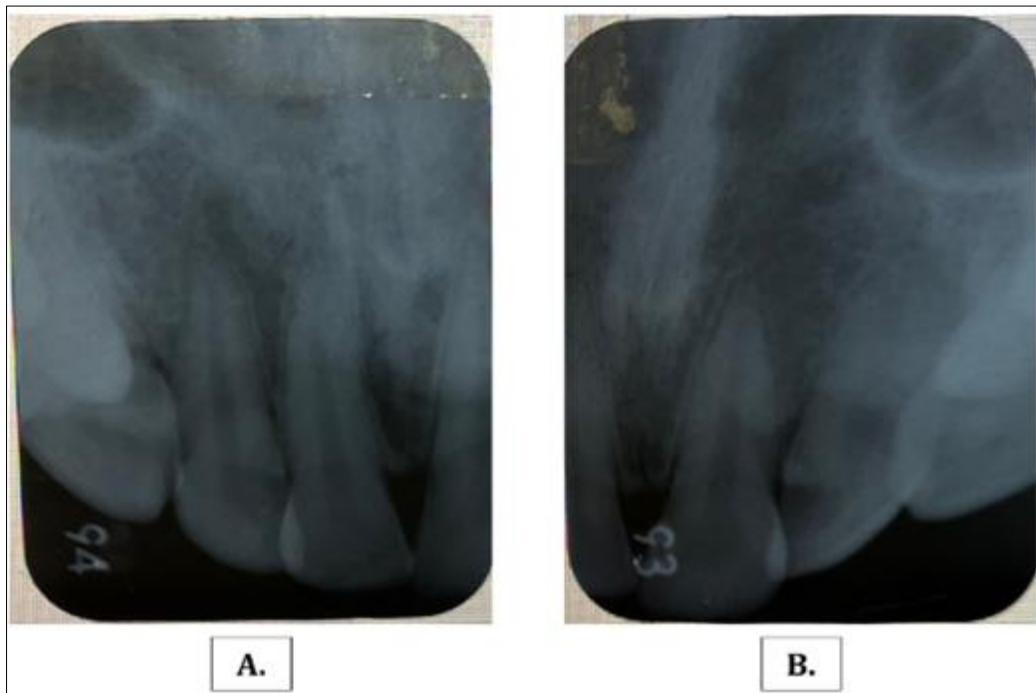
**Figure 4** For the osteotomy, measurement of the distance between the guide edge and the cervical bone was recorded (measurement the probing depth of 11 tooth)



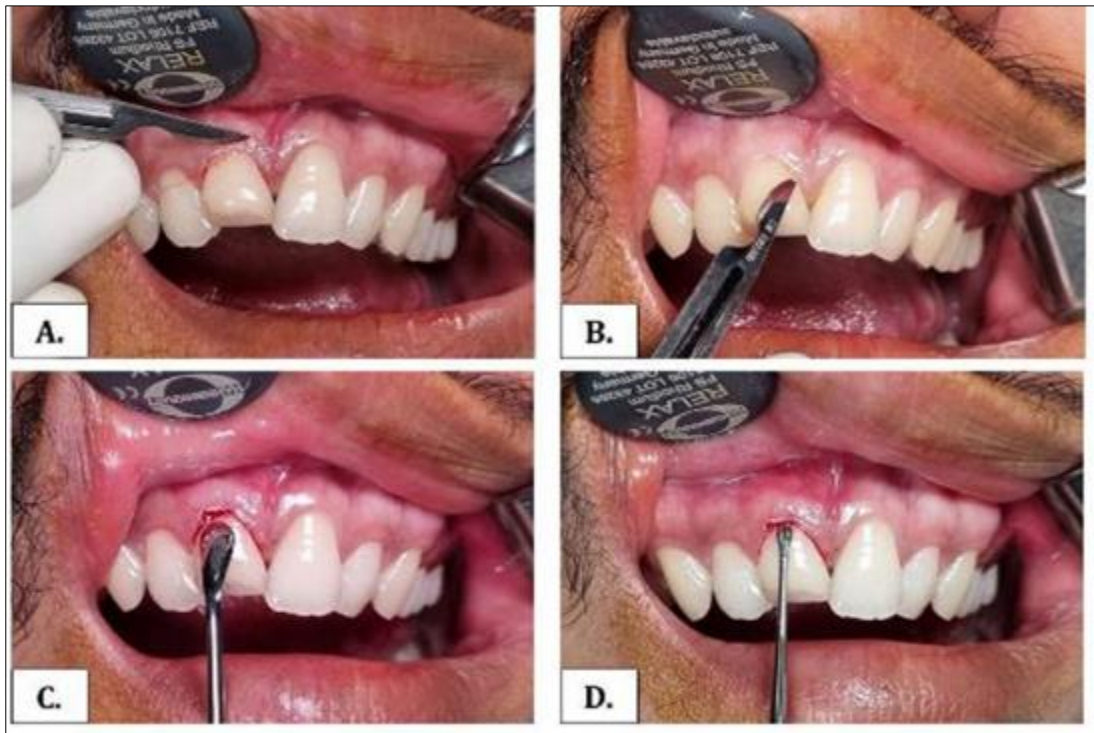
**Figure 5** For the osteotomy, measurement of the distance between the guide edge and the cervical bone was recorded (measurement the bone sounding of 11 tooth)



**Figure 6** Measurement the tooth with chu gauge



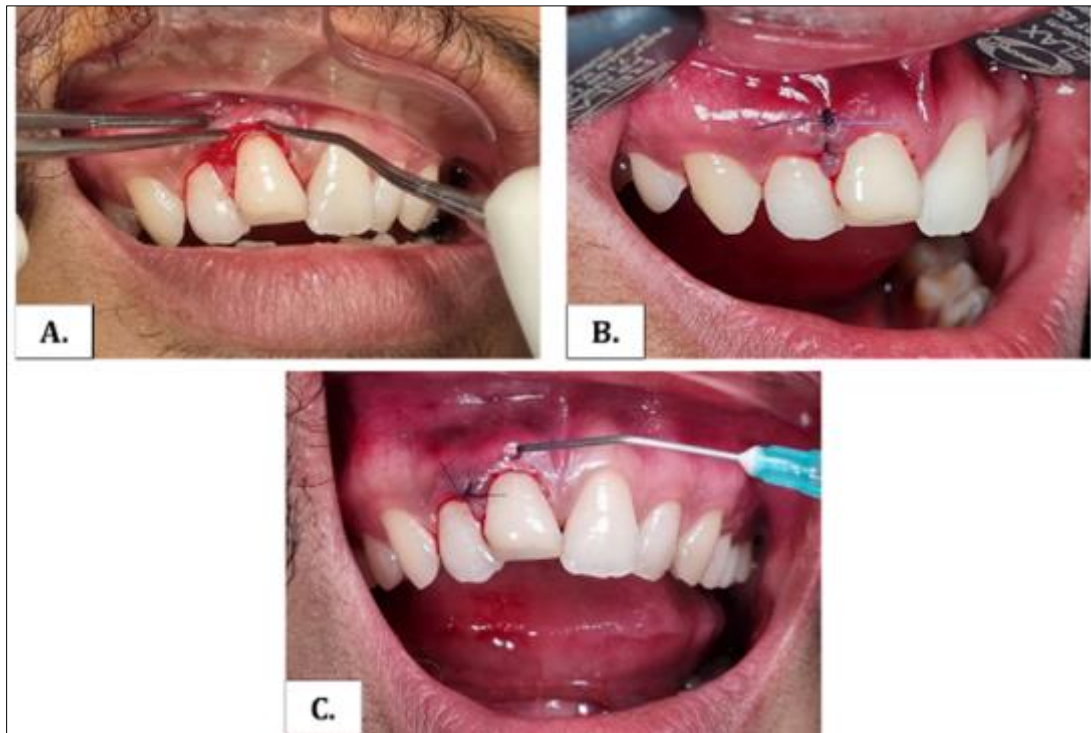
**Figure 7** Periapical Radiography on 11 tooth and 21 tooth



**Figure 8** (A). Gingivectomy 1 mm on 11 tooth; (B). Flap elevation with sulcular technique; (C,D). Elevated flap with raspatorium and TKN



**Figure 9** (A). A full-thickness (papilla preservation) mucoperiosteal flap was elevated; (B). Elevated flap with TKN; (C,D). Precise osseous contouring, which was performed using manual instruments (surgical chisels) and carbide/diamond burs with adequate irrigation, for preventing bone necrosis



**Figure 10** (A). Confirmation of bone reduction results; (B). Flaps were sutured; (C). Irrigation post-surgery



**Figure 11** (A). Control 2 weeks after surgery before aff hecting; (B). Control 3 weeks after surgery; (C). Control 1 month after surgery



**Figure 12** Restoration Direct Veneer on 11 tooth

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### 3. Results and Discussion

Crown lengthening treatment is based on two principles: the establishment of BW and maintenance of adequate keratinized gingiva (KG) around the tooth. The BW, now referred to as the supracrestal tissue attachment is defined as the dimension of soft tissue that is attached to the portion of the tooth coronal to the alveolar bone crest [9,10]. Studies show that a minimum of 3 mm of space between restorative margins and alveolar bone would be adequate for periodontal health, allowing for 2 mm of BW space and 1 mm for sulcus depth [11]. Whenever possible, an adequate width of KG ( $\geq 2$  mm) should be maintained around a tooth for gingival health [12].

In this case, crown lengthening with bone reduction was taken as the treatment of choice, to maintain the periodontal health and postoperative aesthetics of the patient.

The position of the lip on smiling is very important as it will determine the amount of tooth and gingiva on display affecting the final aesthetic outcome [13]. In regions of the mouth where aesthetics is important, wound healing after crown lengthening surgery must be allowed to proceed to completion if optimal results are to be achieved. After crown lengthening surgery, the periodontium continues to remodel and mature. Brägger et al. reported that gingival recession can occur between 6 weeks and 6 months after the surgery [14]. Hence, if restorations are planned, recessions must be closely observed during the healing phase. Temporary crowns or direct veneer should be retained until the wounds are completely healed (possibly up to 6 months), after which final crown preparation or direct veneer and insertion can be done. If these guidelines are followed, the gingival recession can be minimized. In this case, we have delivered the permanent restoration within 3 months and follow-up shows no recession at all.

The health of the periodontal tissues is dependent on properly designed restorative materials. Overhanging restorations and open interproximal contacts should be corrected during the disease control phase of periodontal therapy. Subgingival margin placement is often unavoidable, but care must be taken to involve as little of the sulcus as possible. Evidence suggests that even minimal encroachment on the subgingival tissue can lead to detrimental effects on the periodontium. If restorative margins need to be placed near the alveolar crest, crown lengthening surgery or orthodontic extrusion should be considered to provide adequate tooth structure while simultaneously assuring the integrity of the BW. Although individual variations exist in the soft-tissue attachment around teeth, there is general agreement that a minimum of 3 mm should exist from the restorative margin to the alveolar bone, allowing for 2 mm of BW space and 1 mm for sulcus depth.

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### 4. Conclusion

Functional crown lengthening result affects the quality of restoration post treatment. One of the indications for crown lengthening is a functional indication related to changes in the position of the gingival tissue and the apical edge of the alveolar bone. The apical shift of the gingival tissue and alveolar bone serves to maintain the biological width, so that it can provide sufficient resistance to the restoration and maintain the health of the periodontal tissue. The tooth margins after functional crown lengthening also provide ideal conditions during treatment because it facilitates the isolation procedure, making it easy to obtain a clean and dry work area. The aim of the current case reports is to evaluate the



implications of crown lengthening in routine dental practice. The diagnosis requirements, procedures of crown lengthening, importance of crown lengthening and esthetic improvements after crown lengthening are discussed in different sessions.

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## Compliance with ethical standards

### *Acknowledgments*

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### *Disclosure of conflict of interest*

No conflict of interest.

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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