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Crown Lengthening with Osteotomy and without Osteotomy (Gingivectomy) for Aesthetic Compromises of Upper Anterior Teeth: A Case Report

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Abstract:

Introduction: The appearance of a smile is significantly influenced by the anatomical shape of the teeth and supporting tissues. Crown lengthening, combined with restorative procedures, can address aesthetic concerns related to gingival shape abnormalities and tooth morphology. The purpose of crown lengthening surgery is to remove a portion of the tooth-supporting tissue to obtain a longer clinical crown dimension. **Objective:** This report aims to detail a crown lengthening procedure followed by veneer restoration of the anterior teeth to achieve optimal aesthetics. **Case:** This report aims to detail a crown lengthening procedure followed by veneer restoration of the anterior teeth to achieve optimal aesthetics. **Management:** Initial scaling and root planing were performed. One week later, crown lengthening surgery was conducted—involving bone reduction for teeth 12 and 13 but not for tooth 11. After three weeks, porcelain veneers were placed. **Result:** Two weeks post-procedure, the gingival margin height was aligned. Veneer placement provided a harmonious aesthetic outcome, enhancing the patient's smile. **Conclusion:** Crown lengthening effectively increases the clinical crown dimension, while subsequent veneer restoration refines tooth morphology for maximum aesthetic result.

Keywords: Aesthetic compromises, Bone soundings, Crown lengthening,

Introduction

A smile is a vital aspect of human expression, influencing social interactions and self-confidence. [1] As the demand for an ideal smile grows, patients increasingly seek dental interventions to enhance aesthetics. [2] The gingival component plays a crucial role in creating a harmonious smile, balancing the lips, gingiva, and teeth. These elements collectively shape the smile's structure and aesthetic appeal. [3]

The clinical extent of a dental crown—from the occlusal or incisal edge to the gingival margin—is essential for achieving a pleasing smile, particularly in the maxillary anterior teeth.[4] Principles of smile design, including the fundamental recognition of face type, incisal edge position, dental components, and gingival height, are important factors in achieving an exquisite smile. An appealing and pleasing smile falls into the medium smile category, where the crowns of all incisors are fully visible, accompanied by 1-2 mm of gingival display.[5] The appearance of the grin might be affected by asymmetrical gingiva, which lowers confidence.[6] The ideal smile proportions formed by the maxillary anterior teeth can be achieved by paying attention to: 1. The gingival margin of the central incisive tooth is symmetrical and has the same distance or 1mm more apical than the lateral incisive 2. The gingival margin of the canine tooth is 1mm more apical than the lateral incisor 3. The level of the gingival margin of the canine teeth is aligned with the interpapillary line 4. The smile needs to display a small portion of the gingiva that is apical to the central incisive to canine teeth, and it should match up with smile line 5. The length of the lateral incisive appears 1.5mm lower than the central incisive.[7] Townsend (1993) states that the maxillary central incisors should be equal. Meanwhile, the lateral incisors should be 1-2 mm shorter. The central maxillary incisor tooth length should be about measures 13.5 mm, while the maxillary lateral incisor has a length of 12 mm. In contrast, Wheelers (1974) stated that the central maxillary incisor tooth is 10.5 mm in length (out of the incisal margin to the cement-enamel intersection) and 8.5 mm in width (from the mesial to the distal). Gillen et al. determined the maxillary central incisor and canine teeth are equivalent in length and 20% longer than the lateral incisor teeth. The canine and lateral incisor crowns have a length-to-width ratio of 1:2.1. the ratio between the length and width of the central incisors is 1:1.1. The length of the clinical crown in male teeth is greater than in female teeth.[8] However, in the process of tooth growth and development and the structure of the oral cavity, the ideal situation to create a perfect smile is sometimes disturbed by various factors such as unequal tooth growth, changes in tooth location, lip flexibility and anatomy and gingival morphological abnormalities.

Periodontal treatment plays an important role in achieving an ideal smile by creating good tooth shape proportions and placing the gingival margin at an appropriate height and location in relation to the lips.[2] One periodontal condition is a crown lengthening surgical procedure designed to reduce periodontal tissue in order to extend clinical crowns based on expected indications. Crown lengthening, as defined by the American Academy of Periodontology, is a process that extends a tooth's clinical crown. Crown lengthening treatment is usually used on teeth that will be restored with crowns but have inadequate clinical crown length for crown retention, so it is necessary to lengthen the clinical crowns using bone reduction or not. Crown elongation without bone loss is called gingivectomy and bone reduction is called bone reduction or osteotomy. Crown lengthening treatment must consider the biologic width.

Biologic width is the dimension below the gingival sulcus which consists of epithelial attachment (0.97 mm) and connective tissue attachment (1.07 mm) so that when combined, the biologic width has a width of 2.04 mm, if the width of the biologic width is abnormal due to an operative action or inappropriate restoration placement, it can cause several problems such as periodontal pockets, alveolar bone decomposition, gingival recession, masticatory discomfort, and gingival inflammation. [9]

Indications for crown lengthening were carious lesions located subgingivally, root fractures in the cervical one-third area such that the mechanical retention of the restoration is inadequate due to loss of tooth structure, restoration margins that are deep and located in the subgingival region and cause uncontrolled inflammation and loss of attachment caused by margin placement that injures the biologic width, crown lengthening in combination with apical resection of the tooth root, hemisection to ensure adequate access to dental care, to enhance the appearance of gummy smiles and cases with altered passive eruption[10]. Contraindications to crown lengthening are as follows insufficient ratio of crown to root. Second, High furcation that will be visible when crown lengthening is performed with bone reduction. Third, Inappropriate treatment results. Fourth, one tooth in the anterior teeth has an uneven and excessively deep gingival edge, especially in those with noticeable smile lines. Fifth, aesthetic issues arise in anterior teeth with lengthy clinical crowns. Sixth, patients who smoke, are cooperative, have good dental health, and have a history of periodontal disease may be candidates for crown lengthening surgery.[2] This case study aimed to identify the crown lengthening method with and without bone reduction as a treatment for the issue of anterior teeth's unsightly gingival borders and to attain smile harmony.

Case

The patient came to the periodontia clinic of Universitas Airlangga Teaching Dental and Oral Hospital on referral from the dental conservation department, the patient wanted to treat the upper front teeth which were felt to have an imperfect smile because the teeth looked tilted and the height of the gums was uneven when smiling. The patient came in good health, was not under medical treatment, did not smoke, denied having allergies and had no systemic diseases. The patient last had her tartar removed one month ago, claims to brush twice a day in the shower and before bed. The patient wanted preliminary treatment in the periodontia department for subsequent front tooth veneer treatment in the dental conservation department.

On intra oral examination, it was found that the height of the gingival margin in the right anterior region was not parallel to the gingival margin of the left anterior tooth, the gingival margin of the right upper anterior tooth was more coronal when compared to the left front anterior tooth. Bone sounding was found to be 3 mm long from the gingival margin to the apex of the alveolar bone on teeth 11, 12, and 13 (Figure 1). Digital smile design *(DSD)* was made before crown lengthening with the aim of determining the alignment of the gingival margins of the right and left anterior teeth and creating a picture of the expected gingival margin height. The DSD image obtained the length ratio of the right anterior teeth 11, 12 and 13 when compared to the left anterior 21, 22 and 23 has a difference in margin height ranging from 0.5-1mm (Figure 2).

Based on the clinical picture of the patient obtained a diagnosis of mucogingival deformities around teeth 11, 12 and 13 (a picture of excess gingiva). The treatment plan in phase I periodontal therapy is Dental Health Education *(DHE)* where the patient is asked to maintain oral hygiene before surgery, scaling and root planning of the maxillary and mandibular teeth. Phase II periodontal treatment is crown lengthening without using bone reduction (gingivectomy) on tooth 11, and crown lengthening with bone reduction (osteotomy) on teeth 12 and 13. Phase III treatment is the insertion of porcelain veneers on teeth 12, 11, 21, and 22, this is because the patient wants the shape of the teeth to look better and uniform. Phase IV periodontal treatment or maintenance phase is carried out 7 days postoperative control (1 week), control for suture removal 14 days postoperative (2 weeks) and post veneer insertion control.

Figure 1: Measurement using bone sounding obtained 3mm length from the gingival margin to the top of the alveolar crest.

Figure 2: Digital Smile Design (DSD).

Case Management

The choice of crown lengthening with and without bone reduction (osteotomy) is the right choice in this case because the difference in the height of the gingival margin of the maxillary right anterior teeth is only corrected by gingivectomy alone and some must be corrected using bone reduction. In tooth 11, the correction of the gingival margin was carried out using crown lengthening without bone reduction, this is because the adjustment of the gingival margin of tooth 11 when compared to the gingival margin of tooth 21 only needs 0.5 mm, so that with a bone sounding length of 3 mm in tooth 11 only needs to be done gingivectomy. In teeth 12 and 13, it is necessary to extend the dental clinical crown by 1mm, so that with a bone sounding length of 3 mm in teeth 12 and 13, it is necessary to reduce the bone to get the length of the clinical crown aligned with teeth 22 and 23. Digital Smile Design (DSD) creation and analysis is carried out before surgery to measure the alignment of the anterior teeth and calculate the required clinical crown length. Measurements on the DSD found that tooth 11 required a gingival margin reduction of 0.5mm and teeth 12 and 13 required a gingival margin reduction of 1 mm.

The crown lengthening procedure was performed on teeth 11, 12 and 13 with preliminary preparation of measuring blood pressure, checking vital signs, checking the clinical condition of the operating area and aseptic action on the operating area. Aseptic measures using povidone iodine on the lips and gums, followed by topical anesthesia in the form of gel. Infiltration anesthesia was performed on the area to be operated using lidocaine HCl on the open fold mucosa of teeth 11, 12 and 13. Measurement of the length of the gingiva to be cut was carried out using PFM (Pocket Forcep Marker) as deep as the sulcus until a bleeding point was obtained as a guide in making the incision. The gingival cut was performed using blade no.15c with an external bevel incision technique following the bleeding marker that had been made, the incision was made from the mesial of tooth 11 proceeding continuously towards the distal of tooth 13 (Figure 3A) After obtaining the slice line on the gingiva, it was removed using a curette and gingivoplasty was performed (Figure 3B). When the expected gingival length and gingival contour were neat on teeth 11, 12 and 13, flap opening was performed in the sulcus of teeth 12 and 13. The flap was performed to gain access to the bone to be reduced (Figure 3C). The flap was only carried out on the sulcus line of teeth 12 and 13 without using a vertical incision and the tissue was removed in full thickness until the bone was visible, crown lengthening with bone reduction was carried out using a low-speed bur as much as 1mm in the apical direction of the alveolar crest, bone reduction was carried out along with saline irrigation (Figure 3D). After obtaining the expected clinical crown length, the bone reduction area was irrigated using saline and then sutured using the simple interrupted suture technique using nylon 4.0 thread. The surgical area was again irrigated using saline and dried and bleeding control was carried out and then closed using periodontal dressing (Figure 3E).

Postoperative instructions to the patient are not rinse the mouth especially in the surgery area for 1 week, preserve oral hygiene using a brush tooth consistently, using mouthwash but the surgery area should not be brushed, do not consume spicy and hot food for 3 days after surgery, keep the periodontal dressing undone for 1 week, and do not chew on the surgery area and instructed to control 1 week and two weeks after surgery. The medication given to the patient was amoxicillin 500 mg 3 times a day for 5 days, mefenamic acid 500 mg if painful and chlorhexidine 0.2% mouthwash twice a day.

A week after surgery, an evaluation was carried out, the patient admitted that there were no complaints of pain, only discomfort 3 days postoperatively, clinically obtained sutures were still in good condition and according to the patient's recognition the periodontal dressing had been removed 5 days after surgery. Irrigation was performed on the surgical area as a debridement action and instructed the patient to maintain oral hygiene and scheduled for

control 1 week later (14 days postoperative). Evaluation 14 days (2 weeks) after surgery the patient admitted that there were no complaints of pain, the clinical picture was found that the sutures were still in good condition, the gingiva was within normal limits and there was only a little debris in the suture area (Figure 4A). Evaluation of gingival margin height on teeth 11, 12 and 13 was as expected. On control day 14, the sutures were removed and saline irrigation was performed. After the surgical area had been cleaned and the sutures had been removed, tooth molding was done on the maxillary anterior to make porcelain veneer crowns. One week later, porcelain veneer crowns were inserted on teeth 12, 11, 21 and 22 (Figure 4B). Figure 4C shows the results before and after treatment.

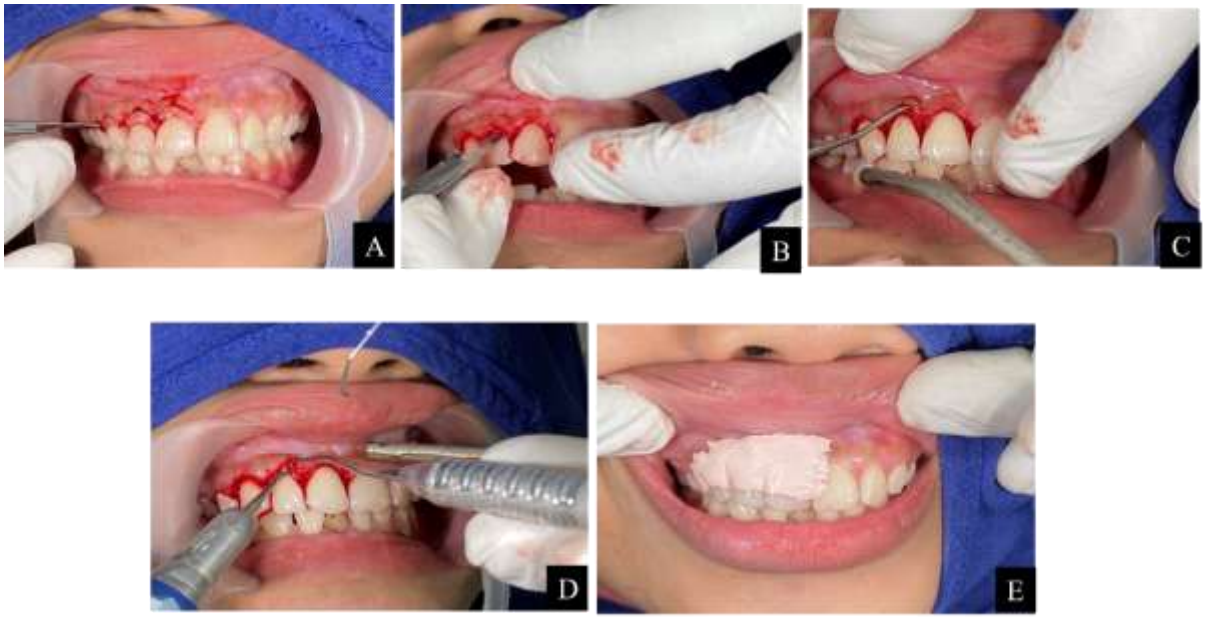

Figure 3. External bevel incision (A); Gingivectomy and gingivoplasty (B)*;* Sulcular incision (C); Osteotomy (bone reduction) (D); Periodontal dressing (E).

Figure 4. 14-day postoperative control (A); Porcelain veneer insertion of teeth 12,11,21,22 (B); Before and after treatment (C).

Discussion

Selection of crown lengthening therapy with and without bone reduction was appropriate in this case. The difference in clinical crown length requirements on the maxillary right anterior teeth was the reason. With a bone sounding length of 3 mm on teeth 11, 12 and 13, the sounding depth was divided into 2 mm biologic width and 1 mm sulcus. The combination of crown lengthening with and without bone reduction was done because tooth 11 only required an additional clinical crown of 0.5mm to be aligned with the gingival margin of tooth 21, so with a bone sounding depth of 3mm, only crown lengthening without bone reduction (gingivectomy) was required to obtain the desired length without disturbing the length of the biologic width. In teeth 12 and 13, the selection of crown lengthening with bone reduction is necessary because these teeth require an increase in the length of the clinical crown up to 1mm, so that if only a gingivectomy is performed without a bone reduction of 1mm, the cut will be right at the biologic width and will relapse in the future. Crown lengthening in the maxillary anterior region

should consider the relationship of the upper lip line to the visible teeth and gingiva, the relationship of the smile line and the incisal edge position of the upper anterior teeth, and the relationship of the visible gingiva from an aesthetic point of view. It is important to check the symmetry of the right and left sides.[11] A 1mm bone reduction on the tooth is necessary to obtain a suitable clinical crown and not reduce the length of the biologic width during healing. Postoperative placement of veneer crowns is one of the important reasons operators must pay attention to the length of the biologic width. Placement of crowns that injure the biologic width will cause problems in the future such as gingival inflammation, masticatory discomfort, gingival recession, alveolar bone destruction, and periodontal pockets.[12] In this case, a combination therapy of crown lengthening with and without bone reduction was chosen due to the presence of biologic width.

Insertion of veneers after periodontal treatment is carried out because the shape of the maxillary anterior teeth is less symmetrical between right and left, so it is necessary to adjust the shape of the teeth using veneers. The use of porcelain veneer material is because this material has good quality in terms of strength, color that matches the natural color of the teeth, light weight and has good interaction with the gingival margin. Crown lengthening treatment in some cases does end with the fabrication of a crown, as the goal of crown lengthening is to obtain a longer clinical crown as retention of the crown restoration.

Conclusion

Crown lengthening therapy is a therapy that can be performed to correct the length of clinical crowns, the need for appropriate crown length is based on aesthetic reasons as well as reasons to obtain retention of crown restorations. The choice of crown lengthening with bone reduction or without bone reduction is based on the desired length of the clinical crown and the biologic width. Violation of the biologic width will cause soft tissue problems in the future, and lead to gingival relapse. The existence of Digital Smile Design (DSD) can assist the operator in determining the symmetrical alignment of the gingival margin, this technology can also help project the amount of the expected dental clinical crown and guide the operator in performing crown lengthening. Dental crowns play an important role in creating a symmetrical tooth shape and size, the selection of porcelain crown materials, especially in anterior teeth, has advantages both in aesthetics and strength.

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Conflict of Interest:

There is no conflict of interest to declare.

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