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Crown Lengthening in Esthetic Zone: Case Report

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Abstract

Gingival tissue appearance plays a significant part in the overall structure of the look in the esthetic zone, particularly in patients with a medium or high smile line. Several methods can be performed to improve gum esthetics and enhance the smile's appearance, such as crown lengthening. Crown lengthening is a periodontal resection procedure that aims to remove a portion of the supporting periodontal tissue. Crown lengthening procedures may require only gingivectomy or additional osseous recontouring. Crown lengthening procedures may require only gingivectomy or additional osseous recontouring. This clinical case report describes crown lengthening procedures using a different gingivectomy technique and various instruments that allowed optimal results in the aesthetic zone. Cases: This case report presents a case of 25-year-old female patient with excessive gingival display (gummy smile) referred from the department of orthodontics to manage the inadequate space for bracket placement caused by Altered Passive Eruption (APE), and surgery was done by using a 3D-designed surgical guide as a template for crown lengthening and modified technique involving conventional and diode laser for gingivectomy and gingivoplasty. **Discussion:** Crown lengthening in the aesthetic zone requires careful planning and execution to achieve optimal results. The procedure can be challenging due to balancing functional and esthetic considerations.

Keywords: Gummy smile; esthetic crown lengthening; altered passive eruption

1. Introduction

A healthy and aesthetically pleasing smile is vital to an individual's overall appearance and confidence. However, excessive gingival display, commonly called a gummy smile, can significantly detract from the beauty of a smile. The American Academy of Periodontology (AAP) defines a gummy smile as a deformity and mucogingival condition that affects the area around the teeth. Gingiva that appears when smiling less than 2–3 mm can be considered attractive, whereas overexposure (>3 mm) is generally considered unattractive and is known as a gummy smile, which is usually considered an aesthetic problem. [1, 2] One of the primary causes of gummy smiles is altered passive eruption (APE), characterized by the gingival margin being higher than the ideal reference tooth. [1, 2] APE is identified when there is an exaggerated gingival display with short clinical crowns and healthy periodontal tissues.[3,4]

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Crown lengthening is a periodontal resection that removes part of the supporting periodontal tissue to increase exposure to the coronal tooth structure. Indications for crown lengthening include subgingival caries, crown or root fractures, altered passive eruption, short teeth, uneven gingival contours, cervical root resorption, and short clinical abutment. Crown lengthening surgery has been categorized as aesthetic or functional. Aesthetic crown lengthening is usually performed in the aesthetic zone, as in the upper maxillary anterior region, to reduce the appearance of the gingiva and increase the clinical crown's height to improve the tooth ratio's height and width. Central incisors are the dominant component in anterior teeth, with an ideal width-to-height ratio of 75–80%. The gingival margin for the lateral incisors must be 1 mm coronal to the central incisor, and the canine must be as high as the central incisor. On the other hand, functional crown lengthening is performed to expose the crown structure so that the functional prosthesis can be placed above the open crown.[5, 6]

Altered Passive Eruption (APE) was classified by Coslet and colleagues (1977) into two main classes according to the relationship of the gingiva to the anatomic crown. It subdivided those classes according to the position of the osseous crest. The two types are subdivided into four categories: 1A, 1B, and 2A, 2B. Type I: the vertical length of the keratinized gingiva is larger than normal, the gingival margin is incisal to the CEJ, the dimension of the keratinized gingiva is wider than usual, and the clinical crown appears shorter. Type II: the dimension of gingival keratinization is normal, and the mucogingival junction is positioned at the CEJ. Subtype A. The alveolar crest is located 1.5 to 2 mm from the CEJ. Subtype B. The alveolar crest is coincident with the CEJ. [7] The treatment for APE or gummy smile is as follows: 1. Type I-A: gingivectomy only (crown lengthening without ostectomy or bone reduction). 2. Type I-B: gingivectomy with ostectomy (crown lengthening with bone reduction), or scalloped inverse–beveled flap to CEJ, positioned (unrepositioned) flap. 3. Type II-A: reposition flap. 4. Type II-B: the flea positioned to the apical with bone reduction. [7, 8]

Gingivectomy is a procedure of removal of excess or overgrown gum tissue. Three main techniques are used to perform a gingivectomy: manually with a scalpel, laser, and electrosurgery. Each technique has its advantages and disadvantages, which are discussed below. The manual technique involves using blades and other periodontal surgical instruments to cut the tissue and place the gingival margin in a more ideal position. Scalpel has the advantages of being easy to use, having precise incisions with well- defined margins, healing fast, and preventing lateral tissue damage. The disadvantages of a scalpel are the need for anesthesia, bleeding that results in inadequate visibility, and the incision cut is not sterilized. [9]

Laser is an acronym for light amplification by stimulated emission of irradiation. Four main types of laser are used in dentistry, and they are different in the wavelengths of the emitted light energy. These types are the carbon dioxide laser (CO2), the diode laser, the neodymium: Aluminum-Yttrium-Garnet I (Nd: YAG), and the Erbium: Aluminum- Yttrium-Garnet i(Er: YAG). [9, i10] Diode laser is commonly used; it is highly absorbable by hemoglobin and melanin, allows easy manipulation of soft tissue during gingival recontouring, and improves epithelization and healing of the wound. Heat will be generated during the laser, resulting in coagulation, drying, and vaporization in energy absorption. This will prevent bleeding by sealing the blood vessels and inhibiting the pain receptors at the incision site. i2-6mm is the range of incision in-depth of the diode laser. The advantages of lasers are that they require less anesthetic, better control of the laser, lower post-operative inflammation and pain, and improve healing in the surgical site. All are the benefits of using a laser in surgery. The disadvantage of laser is the high cost; some researchers reported that laser is associated with poorer wound healing and greater tissue desiccation than a scalpel. [9, 10]

Due to the increasing digitalization of identity in recent years, countless concepts have emerged, leading to new ways of diagnosing, planning, and performing dental treatments. Guided dentistry refers to the virtual simulation of treatment before it is performed, making it impossible to visualize a virtual simulation of the final result before treatment. [11, 12, 13]

This case report aims to describe a crown lengthening procedure accompanied by mastectomy to incorrect excessive gingival appearance in a patient with altered passive eruption I (APE) of maxillary anterior teeth using a surgical guide.

2. Case Report

2.1. Case

A 25-year-old female patient was referred from the department of orthodontics to the periodontology department at RSGM University of Sumatera Utara to have treatment in the interior region of the maxilla because of inadequate space for bracket placement caused by altered passive eruption (APE). There was no contributing medical or family history and non-smoker. The patient has good oral hygiene and highly cooperates. Based on the clinical examination that has been carried out, the patient was diagnosed with gingivitis with mucogingival deformity around the teeth (excessive gingival display) in the inform of altered passive eruption (APE) type 1B with bone sounding results of 3 mm. The treatment plan in phase I is identical health education (DHE), scaling teeth in the upper and lower regions, and orthodontic treatment or unaligned teeth correction. Phase II treatment is crown lengthening with bone reduction (gingivectomy with bone reduction) in regions 15, 14, 13, 12, 11, 21, 22, 23, 24, and 25. There is a treatment in phase III, and phase IV treatment is a maintenance phase.

Initially, a calibrated examiner was not involved in the surgical procedures and took clinical measurements. After pretreatment clinical evaluation I (Figures 1 and 2), the following measurements were taken in a periapical, standardized X-ray of the involved teeth. The T-bar tip of the proportional gauge (Chu's anesthetic Gauges, Hu-Friedy Inc, Chicago, IL) was used to establish the incorrect dimension of clinical crowns.

Figure 1. Initial clinical photograph of the patient

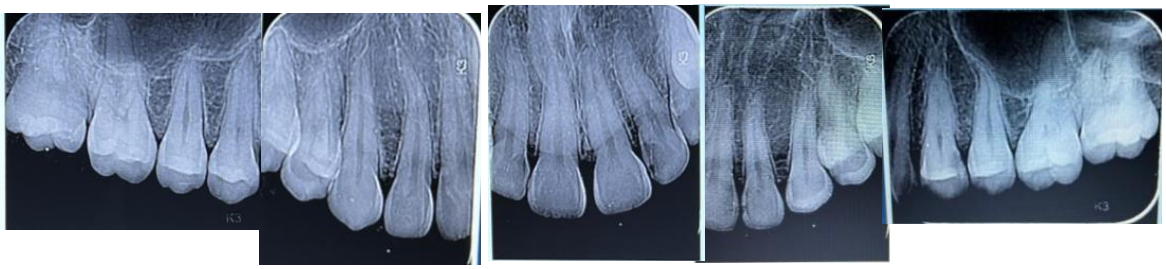

Figure 2. Initial clinical photograph of the patient

The gauge was placed in the tooth's center, and it was observed that the red marks of the horizontal arm determined the width of the tooth; therefore, the red mark of the vertical arm indicated the height of the clinical crown (Figure 3). The bone sounding was then performed with a bone sounding gauge I (Hu-Friedy Inc, Chicago, IL) to measure the gingival margin to alveolar crest width, also deciding to perform gingival excision with or without bone reduction I (Figure 3). After clinical and radiological examinations, photographs were taken for data collection. iA smile design was designed using DSDApp, and a crown lengthening guide was created (Figure 4).

Figure 3. Clinical measurement (clinical crown proportion and bone sounding examination of before crown lenghtening surgery

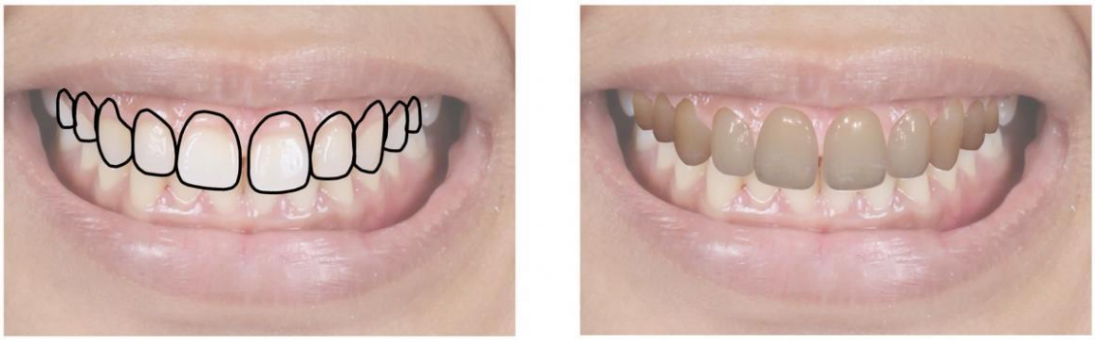

Figure 4. Smile design was designed using DSDApp

2.2. Case Management

Patient preparation and good pressure were initially measured, following extraoral (lips) and intraoral asepsis using povidone-iodine. Topical anesthesia with lidocaine spray followed by infiltration anesthesia. Therefore, a surgical guide was placed; the dinner edge guided the gingivectomy, and the router edge guided the height of the bone crest. The initial horizontal discontinuous incision was made by using blade no. 15C (Figure 5), followed by the elimination of the excision gingiva with a sickle, then performed. Gingivoplasty was performed after all teeth were proportional in width-to-height ratio using laser (Figure i6). Secondary muscular incision by using blade no.15C. The ostectomy is performed following the outer edge, guiding the height of the bone crest (Figure 7). The periodontal dressing was then applied at the site for about one week. The patient was prescribed amoxicillin 500 mg 3 times a day for 5 days, mefenamic acid 500 mg 3 times a day and taken if pain occurs, and chlorhexidine gluconate 0,2% twice a day. 7 days postoperatively, inpatients were then asked to income for evaluation. The patient denied pain, and the suture was in good condition. Patients were recalled 10 days later. There were no claims of pain, and the suture was in good condition. Then, debridement using saline irrigation and suture removal were performed (Figure 9). The patient was then referred back to the orthodontics department for diastema enclosure with an orthodontic appliance (Figure 10).

3. Discussion

The aesthetic appearance of a smile is determined considering three main components: the teeth, the clip framework, and the gingival scaffold. Gingival shape and gingival contour are the two important aspects of gingiva that affect the final aesthetic outcome. Gingival shape is the curvature of the gingival margin of the tooth, determined by the CEJ and the osseous crest.[4]

Figure 5. Surgical guide

Figure 6. Conventional gingivectomy using blades and gingivoplasty by diode laser.

Figure 7. Flap elevation, ostectomy and postsurgery.

Figurei8.i iPre-surgeryiand post-surgery.

Figure 9. Diastema iclosure with iorthodontic appliance iby iorthodontic iresident.

Figurei 10. 3 months follow-up

Altered passive Eruption, (APE) directly affects the weight of the smile and can result in an aesthetic impression that the patient has very small teeth and a thick gum line. Several factors have been implicated in APE, including occlusal interference during the eruptive phase, thick and fibrotic gums, and hereditary conditions. During the active eruption phase, the gum moves with the crown until the erupting tooth reaches the occlusal plane of its antagonist. In the passive eruption stage, the gum immigrates apically until the gingival margin reaches a stable cervical level.i[14]

In this case report, crown lengthening with bone reduction is phase III treatment carried out after scaling and root planning treatments. Identifying the etiology of this excessive gingival display is important because proper identification leads to an inappropriate and structured treatment plan. In this case, the patient was diagnosed with excessive gingival display, and the etiology of APE type I was because the gingival margin was located at the incisal of the CEJ, the mucogingival junction (MGJ) was apical to the crest of the alveolar bone, the dimensions of the gingiva were wide, and the clinical crown of the tooth was short. Based on bone sounding and radiographic examination, this case was classified into subgroup B because the alveolar crest was located close into the CEJ.i[7,i15]

Crown lengthening by using ia surgical guide provides proper soft and hard tissue management and, therefore, reduces the chances of under ior over-contouring of these tissues, facilitating predictability, reproducibility, and long-term pleasant outcomes. In addition, optimal fit, lease of fabrication, and time-efficient procedure are among the advantages of the technique.[11] Gingivectomy using laser is very easy to apply, and it also provides good healing results.

Akram et al., 2017 Laser gingivectomy found that the pain was less compared to the pain in conventional gingivectomy. This could be attributed to the heat generated by the laser that inhibits the pain receptors and the coagulation, which provides a dry and isolated environment and less infection in the wound. [9] Kumar et al. 2015 comparative evaluation of healing after gingivectomy with electrocautery and laser, at 24 h and 72 h, healing was observed on both laser side and electrocautery side, there's no statistical difference was found between the laser and the cautery group, the pain was slightly more on the laser side, no difference between laser and electrocautery regarding haemostasis. [10]

4. Conclusion

In this case report, aesthetic crown lengthening with bone reduction was performed after gingivectomy, this was necessary to reflect the full-thickness flap and perform ostectomy (bone reduction) to obtain adequate biological distance and width from the alveolar crest to the gingival margin of 3 mm and to get a healthy periodontal tissue that is free from inflammation. The double surgical guide's efficiency helped the operator and saved time during surgery, guiding gingivectomy and ostectomy so as not to under or over-contour the soft and hard tissue. Selection of an inappropriate technique depends on the clinician's decision, preference, and experience. The doctor must be familiar with all the different methods and be able to change or modify the surgical procedure if necessary, such as the use of a surgical guide.

The results of crown lengthening treatment, in this case, can meet patient expectations; the gingival margin appears to be in line with the gingival crest, and the patient's smile profile improves. APE is the etiology of gummy smiles in patients that can be improved. After the surgical procedure, there were complaints of excessive pain and complications. Predictable treatment results, as expected from a crown lengthening procedure with a bone reduction in cases of APE or excessive gingival display, can be achieved through inappropriate diagnosis, treatment planning, and surgical techniques.

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