

Aesthetic crown lengthening in gingival enlargement patients with orthodontic treatment: A case report

Shalahuddin Maulidi ¹, Aqila Alfakhry ¹, Antonius Lucky Arnando ² and Agung Krismariono ^{3,*}

¹ Faculty of Dental Medicine, Universitas Airlangga, Indonesia.

² School of Dental Medicine, Universitas Ciputra, Indonesia.

³ Department of Periodontology, Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia.

World Journal of Advanced Research and Reviews, 2024, 24(02), 1248–1253

Publication history: Received on 29 September 2024; revised on 06 November 2024; accepted on 09 November 2024

Article DOI: <https://doi.org/10.30574/wjarr.2024.24.2.3402>

Abstract

Introduction: The orthodontic treatment process that is carried out can cause changes in the soft tissue and hard tissue of the tooth support and the most common is the enlargement of the gingiva. One of the managements in the case of gingival enlargement is crown lengthening, which is carried out by taking gingival tissue with or without bone reduction to further expose the tooth structure so that a better ratio of dental crown and gingiva is obtained. The purpose of this article is to describe the crown lengthening procedure with bone reduction to correct excessive gingival display in patients with orthodontic treatment on the anterior teeth of the upper jaw

Case Report: A 19-year-old female patient came to the Periodontology Specialist Poly on a referral from the Dental Orthodontic Specialist of RSGM Universitas Airlangga with complaints that the upper front teeth looked shorter. The patient does not have problems with the periodontal tissue and has no history of systemic diseases such as diabetes, high blood pressure, and no history of allergy to medications.

Case management: After the analysis is carried out on the periodontal tissue, the therapy option is in the form of crown lengthening with bone reduction for the treatment of the case.

Conclusion: Determining etiological factors and proper examination is very important to determine a crown lengthening action plan as the elimination of gingival enlargement so that it can improve aesthetic appearance.

Keywords: Gingival enlargement; Crown lengthening; Aesthetics

1. Introduction

During the process of orthodontic treatment procedures, changes can occur in the soft tissues and hard tissues of the dental support. The most commonly found change is the enlargement of the gingiva which results in gingival pockets with or without loss of attachment [1]. Enlarged gingiva in patients with fixed orthodontics can be caused by inflammation due to the accumulation of plaque bacteria due to cleaning of the tooth surface which is obstructed by local factors in the form of fixed orthodontic devices [1,2]. The combination of metals and/or elements such as nickel in orthodontic braces, which is located in the oral cavity, can be a medium of exposure to bacterial interactions that cause manifestations in oral tissues. Some studies report that nickel ions present in orthodontics may cause the etiological factors of fibroblastic proliferation characteristics of gingival enlargement [3].

* Corresponding author: Agung Krismariono

The management of gingival enlargement after scaling, curettage, root planing and polishing and not shrinking, it is necessary to carry out a surgical procedure, namely by gingivectomy or crown lengthening. The crown lengthening procedure is performed by taking gingival tissue with or without bone reduction to further expose the tooth structure so that a better ratio of the crown to gingiva is obtained [4]. Common causes of poor gingival crown ratio (clinically short-looking crown) include caries, erosion, dental malformations, fractures, attrition, excessive tooth reduction, eruptive disharmony, exostosis, and genetic variation [5].

The crown lengthening procedure aims to form a symmetrical and ideal gingival margin, creating the right clinical crown dimensions, ensuring the harmonization of the smile from the right first and second premolars to the left first and second premolars, while maintaining results with optimal biological width, which is 3 mm away from the new gingival margin for alveolar bone remodelling [4,6]. In addition, the ultimate goal of the crown lengthening procedure is to provide adequate crown dimensions for a stable dentogingival complex and for restorative margin placement, thus achieving the best marginal seal and aesthetic final restoration [5].

Crown lengthening requires several considerations, including biological and anatomical aspects of the teeth. In the biological aspect, it is necessary to pay attention to the dimensions between the crest alveolar bone crest and the free gingival boundary [7]. The crown lengthening procedure was first introduced by D. W. Cohen based on two principles, namely the formation of biological width and the maintenance of adequate keratinized gingiva around the teeth [8]. Biological width is defined as the physiological dimension of the junctional epithelium and connective tissue attachment, according to a previous study conducted by Gargiulo et al. [5]. In this study, the authors showed that humans, on average, showed connective tissue attachment of 1.07 mm, above the apex of the alveolar bone, and junctional epithelium, below the base of the gingival sulcus, 0.97 mm. The combination of these two measurements is a biological width, which is an average of 2.04 mm [5].

The indication of crown lengthening is for restorative and aesthetic purposes, to remind the clinical crown height caused by caries or fractures, to achieve subgingival caries access, to obtain the ferrule effect on restoration, altered passive eruption, gummy smile, make the symmetry of the gingiva on the smile line, correct the position marginal restoration when there is invasion of biological width, and gingival hyperplasia [4,6,9]. Contraindications to crown lengthening are inadequate crown-root ratio, irreversible caries or fractures, compromised aesthetics, high furcation, surgical procedures that cause unesthetic results, inadequate restorative space, and patients unable to perform proper maintenance [4]. This case report aims to explain the crown lengthening surgery procedure with the aim of obtaining the ideal gingival margin dimension so as to achieve a harmonious smile in patients with orthodontic treatment.

2. Case report

A 19-year-old female patient came to the Periodontology Specialist Poly on a referral from the Dental Orthodontist Specialist of RSGM Universitas Airlangga with complaints that the upper front teeth appeared shorter. The patient admitted that he routinely cleaned tartar every 6 months to 1 year with the last history of cleaning his tartar 2 months ago. The patient did not have a history of systemic diseases such as diabetes, high blood pressure, and did not have a history of allergy to drugs, but had a history of allergy to food in the form of crab.

On intraoral examination, there is a gingival hyperplasia on almost the entire surface of the dental buccal of the upper jaw. There is bleeding on probing in dental regions 13, and 42. In the bone sounding examination, a depth of 3 mm was obtained at teeth 13, 12, 11, 21, 22, 23. No periodontal pockets and dental mobility were found.

Based on the clinical examination that has been carried out, the patient was diagnosed with chronic gingivitis with an etiology in the form of plaque. The treatment plan in phase 1 is dental health education (DHE), scaling teeth in the upper and lower regions. The planned phase II treatment is aesthetic crown lengthening with bone reduction (gingivectomy with bone reduction) in regions 13, 12, 11, 21, 22, 23 and crown lengthening without bone reduction in dental regions 17, 16, 15, 14, 24, 25, and 26. There is no maintenance plan in phase III and phase IV treatment is maintenance.



Figure 1 Pre-operative clinical condition of dental region 13, 12, 11, 21, 22, 23

3. Case management

A The crown lengthening procedure begins with asepsis in the patient with the administration of povidone iodine, and continues with local anesthesia infiltration using septocaine on the mucobuccal fold of the dental region 13, 12, 11, 21, 22, 23. Dental crowns with widths and lengths of 13, 12, 11, 21, 22, 23 were measured using Chu's gauge and biological width measurements were measured using bone sounding. Bleeding points were created using pocket marker forceps (PMF) in regions 13, 12, 11, 21, 22, 23. External bevel incision is carried out using blade no 15c following the bleeding point. Excision of gingival tissue using curettage. Then a sulcular incision was made in regions 13, 12, 11, 21, 22, 23 with blade no. 15c and a full thickness flap was performed then followed by ostectomy (bone reduction) in regions 13, 12, 11, 21, 22, 23 using a round bur. Irrigation of the operating area uses saline. The flap is then repositioned and sewn with an interrupted suture technique.

Patients were given a prescription in the form of amoxicillin 500 mg 3 times a day for 5 days and mefenamic acid 500 mg 3 times a day and taken if pain arises, and chlorhexidine gluconate 0.2% mouthwash twice a day. Regular postoperative instructions are given to patients not to consume hot and spicy foods or hot drinks for 3 days after surgery. The patient came for control 7 days postoperatively, denying any pain and the stitches were in good condition. The control patient returned 15 days later, there were no complaints of pain and the stitches were in good condition, then debridement was carried out using saline irrigation and suture removal was carried out.



Figure 2 Crown lengthening surgical procedure. (A) Bleeding point results using PMF in regions 13, 12, 11, 21, 22, and 23. (B) Gingival incision follows the bleeding point. (C) Excision of gingival tissue using curettage. (D) Full thickness flap in zones 13, 12, 11, 21, 22 and 23. (E) Bone reduction using round bur. (F) Results of crown lengthening surgery procedures in regions 13, 12, 11, 21, 22 and 23



Figure 3 Drawing the healing phase of the post-op crown lengthening in regions 13, 12, 11, 21, 22, 23. (A) 1week post-op. (B) 2 weeks post-op. (C) 1month post-op

4. Discussion

Crown lengthening procedures aim to reduce excess gingival and bone tissue to increase the clinical crown length and ensure appropriate margins for the planned prosthesis examination [10]. Crown lengthening procedures are also indicated for aesthetic treatment, known as aesthetic crown lengthening, to correct gingival asymmetry and also for the correction of clinically short crowns due to altered passive eruption resulting in the appearance of excess gingiva or known as a "gummy smile"[11,12]

Altered Passive Eruption (APE) is a genetic and developmental disorder characterized by apical migration of soft tissues that causes excessive gingival appearance and covers the clinical crown of the tooth [13]. The classification of APE according to Coslet et al. is as follows: 1. Based on the anatomical relationship of the gingival and dental crowns: a. Type I: the gingival margin is located in the incisal or occlusal of the CEJ, and the mucogingival junction (MGJ) is at the apical to the alveolar crest, the keratinized gingival dimension is wider than normal, and the clinical crown is short. b. Type II: the dimensions of the gingival margin to MGJ are normal, the free gingival margin is located in the incisal or occlusal of the CEJ, and the MGJ is located in the CEJ. 2. Based on the proximity of the alveolar bone crest to the Cementoenamel junction (CEJ): a. The alveolar crest is located 1.5-2 mm from the CEJ. b. The alveolar crest is at exactly the same level as the CEJ line, or the alveolar crest is located very close to the CEJ line [13].

Periodontal treatment with altered passive eruption (APE) conditions can be performed with a crown lengthening procedure with tissue reduction with or without bone reduction with the aim of exposing the dental crown. The classification of treatments for APE or gummy smile is as follows: 1. Type I-A: gingivectomy (crown lengthening without bone reduction). 2. Type I-B: gingivectomy with bone reduction (crown lengthening with bone reduction), or scalloped inverse-bevelled flap to CEJ, positioned (unrepositioned) flap. 3. Type II-A: reposition flap. Type II-B: flaps that are positioned to the apical with bone reduction [14].

Treatment of gingival enlargement is based on pathological causes and changes. The etiology of gingival enlargement is different, so the best treatment is based on individual case considerations [8,15]. In this case report, a crown lengthening procedure with gingivectomy accompanied by bone reduction (Type I-B) was carried out which is a phase II treatment and is carried out after phase 1 treatment in the form of scaling and root planing. In this case report, the patient was diagnosed with chronic gingivitis accompanied by an excessive gingival display condition with an etiology in the form of plaque. All of these surgical procedures aim to unlock the ideal gingival margin dimension so that there is a harmonious smile.

Gingival enlargement elimination is carried out with the aim of facilitating the maintenance of oral hygiene because if not eliminated, it will aggravate enlargement and will have an impact on oral health related to quality of life [8]. According to Peres, et al. (2019), gingivectomy improves visibility and accessibility to remove superficial deposits and smooth the roots thoroughly, creating a supportive environment for the healing and restoration of physiological contours of the gingiva. One of the great advantages of gingivectomy is the transformation of the gingival pocket that is difficult to clean into a gingival sulcus that is easy to clean [8,15].

The crown lengthening procedure with gingivectomy with bone reduction was chosen based on the consideration of the patient's clinical condition with gingival hyperplasia and the results of the bone sounding examination showed the location of the alveolar crest close to CEJ. The choice of surgical procedure depends on the condition of the gingiva, the level of the alveolar bone crest, the gingiva biotype, and the width of the keratinized gingiva. The success of the crown lengthening aesthetic procedure is also influenced by the gingival biotype and the positioning of the biological width. In thin gingival biotypes it can lead to bone resorption and recession, while in thick biotypes it can lead to chronic gingival inflammation, which will negatively impact the final success of restoration in the aesthetic area. Bone correction in this

case is necessary after gingival excision, with the aim of recontouring the alveolar crest to the level where the biological width position is repositioned to obtain the ideal gingival margin dimension [2].

The clinical condition when evaluated 1 week, 2 weeks and 1 month after the surgical procedure showed quite satisfactory results. Signs of inflammation were still visible at the 1- and 2-week post-op evaluations but a good gingival tissue regeneration process occurred. The position of the gingival margin is at the expected position. After a 1-month post-op evaluation, the gingival tissue appeared healthy and the margin was in the expected position. All of these surgical procedures aim to open the clinical crown structure so that the gingival margin becomes ideal and a harmonious smile is obtained and improves the aesthetic aspect of the patient. The success of this treatment is also influenced by the patient's ability to maintain good OH and the absence of systemic conditions experienced by the patient.

5. Conclusion

Determining etiological factors and proper examination is very important in order to determine a crown lengthening action plan as the elimination of gingival enlargement and improvement of the gingival margin dimension so that it can restore the physiological anatomy and aesthetic aspects of the patient.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

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

References

- [1] Sopiati S, Komara I, Hendiani I, Pribadi IMS. Gingivektomi Pembesaran Gingiva Pasien Ortodontik (Laporan Kasus). *Cakradonya Dental Journal*. 2023 Jun 19;13(1):32–8.
- [2] Eid HA, Assiri HA, Kandyala R, Togoo RA, Turakhia VS. Original Research Gingival Enlargement During Fixed Orthodontic Treatment. *Eid HA Et Al. Vol. 6, Journal of International Oral Health*. 2014.
- [3] Huerta AG, Maesse JLE, Huerta PG. Gingivectomy as a Treatment for Gingival Hyperplasia Induced by Orthodontics. *Case Report. Rev Mex Periodontol*. 2019 Jul 30; X (1–2):21–3
- [4] Wilson, Amalia M, Merchantara B, Abidin T. Surgical Crown Lengthening: A Case Report. *Journal Of Dentomaxillofacial Science*. 2022;7(1):61–3.
- [5] De Oliveira PS, Chiarelli F, Rodrigues JA, Shibli JA, Zizzari VL, Piattelli A, Et Al. Aesthetic Surgical Crown Lengthening Procedure. *Case Rep Dent*. 2015; 2015:1–4.
- [6] André P. Saadoun DDS M. *Esthetical Soft Tissue Management of Teeth and Implants*. Wiley-Blackwell; 2013. 1–20 P.
- [7] Karimah F, Hartanti H. Perawatan Crown Lengthening pada Gigi Anterior Pasca terjadi Fraktur. *Insisiva Dental Journal: Majalah Kedokteran Gigi Insisiva*. 2018;7(2).
- [8] DA W, Amalia M, SK S, Abidin T. Crown Lengthening dan Frenektomi pada Daerah Estetik (Laporan Kasus). *Cakradonya Dental Journal*. 2023 Aug 5;13(2):114–9.
- [9] Saquib S, Nadeem Bijle M, Ahmed N, V MK, Shahabe SA, Gouda Patil S, Et Al. Esthetic Crown Lengthening: Theoretical Concepts and Clinical Procedures Introduction Esthetic Crown Lengthening: Theoretical Concepts and Clinical Procedures [Internet]. 2012. Available From: <https://www.researchgate.net/publication/263851113>
- [10] Kuswandani S, Irwan A, Soeroso Y, Sulijaya B. Crown Lengthening Procedures after Orthodontic Treatment and Before Placement of Prosthetic Crowns. *Br J Med Med Res*. 2016 Jan 10;17(8):1–6.
- [11] Krismariono, A. Triangular Frenotomy: A Novel Technique for Gummy Smile Correction. *J Int Dent Med Res*. 2020 Oct 07; 13(40: 1565-1568)

- [12] Krismariono, A. Coronally Positioned Vestibule for Gummy Smile Correction. *J Int Dent Med Res*. 2018 Apr 06; 11(2): pp. 707-710.
- [13] Apriantika I, Krismariono A. Aesthetic Crown Lengthening for Gummy Smile Treatment Related to Altered Passive Eruption: A Case Report. *Dentika: Dental Journal*. 2020 Nov 19;23(2):28–33.
- [14] Effendi Nasution E, Octavia Nasution R. Penatalaksanaan Aesthetic Crown Lengthening untuk Perawatan Gummy Smile berhubungan dengan Altered Passive Eruption. *Clinical Dental Journal) UGM*. 2020;6(2).
- [15] Millena Mathias P, Tais Da Silva L, Idiberto José Zotarelli F, Igor Mariotto B, Marcelo Augusto Rudnik G, Patrícia Garani F. Gingivectomy Approaches: A Review. *International Journal of Oral and Dental Health*. 2019 Sep 8;5(3).