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# Aesthetic Crown Lengthening for Gummy Smile Treatment Related to Altered Passive Eruption: A Case Report

## Estetis *Crown Lengthening* untuk Perawatan *Gummy Smile* yang Berhubungan dengan *Altered Passive Eruption*: Sebuah Laporan Kasus

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### Abstract

A healthy and beautiful smile can affect appearance and confidence. One of the aesthetic problems in dentistry that is often complained of by patients is excessive gingival display (gummy smile). The excessive gingival display can be caused by several factors, one of which is altered passive eruption (APE). One of the treatments to correct gummy smile related to APE is crown lengthening. Crown lengthening can be with bone reduction (gingivectomy with bone reduction) or without bone reduction (gingivectomy). Crown Lengthening with bone reduction is a surgical procedure that aims to maintain the dentogingival complex and to improve smile aesthetics. The purpose of this case report is to determine the crown lengthening with bone reduction (gingivectomy with bone reduction) procedure as a gummy smile treatment related to APE. A 23-year-old female patient, came to Dental Hospital of Universitas Airlangga with complaints of her upper gum which not in the same length and the teeth looked short, she considered her smile was less aesthetic. After conducting analyses relating to aesthetics and periodontal tissue, crown lengthening with bone reduction was chosen for this patient treatment. The treatment results are quite good, visible gingival margins that matched the gingival zenith and improved patient's smile profile. APE as the etiology of patient's gummy smile can be corrected. There are no post-surgical complications such as excessive pain and infection. A proper diagnosis, treatment plan, and good techniques can produce a harmonious smile on the patient.

**Key words:** Crown Lengthening; Gummy Smile; Gingivectomy

### Abstrak

Senyum yang sehat dan indah dapat mempengaruhi penampilan dan kepercayaan diri seseorang. Salah satu masalah estetis dalam bidang kedokteran gigi yang sering dikeluhkan oleh pasien adalah *excessive gingival display* (*gummy smile*). *Excessive gingival display* dapat disebabkan oleh beberapa faktor, salah satunya adalah *altered passive eruption* (APE). Salah satu perawatan yang dapat memperbaiki *gummy smile* yang disebabkan oleh APE adalah *crown lengthening*. *Crown lengthening* dapat dilakukan dengan pengurangan tulang (gingivectomi dengan pengurangan tulang) atau tanpa pengurangan tulang (gingivectomi). *Crown lengthening* dengan pengurangan tulang merupakan prosedur bedah yang bertujuan untuk mempertahankan kompleks dentogingival dan meningkatkan estetis senyum pasien. Tujuan dari laporan kasus ini adalah mengetahui prosedur *crown lengthening* dengan pengurangan tulang (gingivectomi dengan pengurangan tulang) sebagai perawatan *gummy smile* yang disebabkan oleh APE. Seorang pasien wanita berusia 23 tahun, datang ke Rumah Sakit Gigi dan Mulut Universitas Airlangga dengan keluhan gusi bagian atas yang tidak sama tingginya dan giginya terlihat pendek, ia menganggap senyumnya kurang estetis. Setelah melakukan analisis yang berkaitan dengan estetika dan jaringan periodontal, *crown lengthening* dengan pengurangan tulang dipilih untuk perawatan pasien ini. Hasil perawatan cukup baik, margin gingiva terlihat sesuai dengan gingival zenith dan meningkatkan profil senyum pasien. APE sebagai etiologi *gummy smile* pada pasien ini dapat diperbaiki. Tidak ada komplikasi pasca operasi seperti rasa sakit yang berlebihan dan infeksi. Diagnosis yang tepat, rencana perawatan, dan teknik yang baik dapat memberikan senyum pasien yang harmonis.

**Kata kunci:** *Crown Lengthening*; *Gummy Smile*; *Gingivectomy*

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## INTRODUCTION

A smile is an important aspect in someone's appearance, affects body expression and influences social interactions. Therefore, the demand for dental aesthetics remains high as patients desire an ideal smile.<sup>1</sup> When smiling, a balanced relationship between dental elements (color, shape, position and symmetrical) are needed within the gingiva, mucosa and lips.<sup>2</sup> Usually, patient complained about their teeth length looked short and showed an excessive gingival display (gummy smile). Ideally, the entire length of the clinical crown of the maxillary anterior teeth are shown, and the incisal curve of the maxillary teeth will be paralleled with the lower lip curvature.<sup>3</sup>

The clinical crown length of a tooth is marked by the distance from the gingival margin to the incisal edge or tooth occlusal surface.<sup>4</sup> Touati stated that each anterior maxillary tooth has a certain aesthetic role. The central maxillary incisors provide stability and balance, lateral maxillary incisors give charm, and the canines give strength to the aesthetic zone.<sup>5</sup> Townsend (1993) stated that the central maxillary incisors teeth must be in the same length while the lateral incisors must be 1-2 mm shorter. The length size of maxillary central incisors teeth must be around 13.5 mm, the maxillary lateral incisor length is 12 mm. Meanwhile, according to Wheelers (1974), the maxillary central incisor length is 10.5 mm (from the incisal edge to the cemento-enamel junction) and 8.5 mm wide (from mesial to distal) in three major racial groups; Caucasoid, Mongoloid, and Negroid. Gillen et al. concluded that the central incisors and canine were the same length and were 20% longer than lateral incisors. The length and width ratio of canine crown and lateral incisor crown were similar, namely 1:2.1. Instead the length and width ratio of central incisors is 1:1.1. The clinical crown length of a man's teeth is greater than the woman's teeth in three major racial groups; Caucasoid, Mongoloid, and Negroid.<sup>6</sup>

An excessive gingival display or gummy smile is a condition of mucogingival disorder which affect periodontal health and smile aesthetics.<sup>2</sup> A person is said to have a gummy smile, when their gingival aspect is seen more than 3 mm when smiling.<sup>7</sup> The cervical crown of maxillary anterior teeth is located approximately 1 mm from attached gingiva so the smile will balance.<sup>8</sup> The etiology of excessive gingival display is associated with the excessive maxillary growth, dentoalveolar extrusion, short upper lip, upper lip hyperactivity. Altered Passive Eruption (APE) or combination.<sup>9</sup> The prevalence of excessive

gingival display is 10% around the age of 20-30 years and often occurring in women.<sup>6</sup>

APE is a genetically and developmental disorder. It commonly characterized by apical migration of the soft tissue leads to excessive gingival display and covering the clinical crown of the tooth.<sup>10</sup> The incidence rate of APE is 12.1% based on a study of 1025 patients with an average age of  $24.2 \pm 6.2$  years.<sup>6</sup> Goldman and Cohen (1968) mentioned that APE occurs due to the failure of soft tissue to move apically during teeth passive eruption.<sup>11</sup> APE can be identified through clinical and radiographic examinations.<sup>3</sup> Classification of APE according to Coslet et al. are as follows<sup>11</sup>: 1. Based on the relation of gingiva and tooth crown anatomy: a. Type I: the gingival margin located at incisal or occlusal of the CEJ, and the mucogingival junction (MGJ) is apical to alveolar crest, the dimension of the keratinized gingival wider than usual, and the clinical crown is short. b. Type II: the gingival margin dimensions to the MGJ is normal, the free gingival margin is located at incisal or occlusal from the CEJ, and the MGJ is located at the CEJ. 2. Based on the proximity of the alveolar bone crest to the Cementoenamel junction (CEJ). a. Crest alveolar is located 1.5-2 mm from CEJ. b. Crest alveolar is precisely at the same level as the CEJ line, or bone crest lies very close to the CEJ line.

Periodontal surgical treatment play pivotal role to achieve ideal aesthetic by creating the ideal teeth proportion and placing the gingival margins in the right position considering its relation to the lips.<sup>12</sup> The treatment for APE or gummy smile are as follows<sup>11</sup>: 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 – beveled flap to CEJ, positioned (unrepositioned) flap. 3. Type II-A: apically positioned flap (repositioned flap). 4. Type II-B: apically positioned flap with bone reduction (osseous surgery).

According to American Academy of Periodontology, crown lengthening is a procedure to lengthen clinical tooth crown. It is usually used to open the supragingival tooth structures in which the clinical crowns of the available teeth are inadequate for restoration needs and for aesthetic purpose by placing gingival margins into the apical, bone reduction, or combination of both. Crown lengthening is a treatment for gummy smile cases with etiology of APE. This procedure is also used to maintain optimal conditions of the dentogingival complex. There are 2 aspects of crown lengthening, namely aesthetic

crown lengthening and functional crown lengthening. The procedure of crown lengthening must reach the normal biological width. Biological width is the dimension epithelium attachment (0,97 mm) with connective tissue attachment (1,07 mm). The normal size of biological width is 2,04 mm. If an abnormal biological width is found, several problems may occur such as gingival inflammation, discomfort, gingival recession, alveolar bone destruction and periodontal pocket formation.<sup>7</sup>

The Indications for crown lengthening are<sup>13</sup>: 1. Subgingival deep caries lesion. 2. Root fractures in the cervical third. Inadequate mechanical retention because of the teeth structure loss. 3. Deep restoration margin and located at subgingival area causing inflammation and loss of attachment that uncontrollable by other procedures. 4. As a combination treatment on apical resection, hemi section to create good access to the oral health maintenance. 5. To increase aesthetic on gummy smile and APE cases.

The contraindications of crown lengthening are as follows<sup>14</sup>: 1. Inadequate crown to root ratio. 2. High furcation. 3. Good treatment results are not achievable. 4. In one anterior tooth which can cause unequal gingival margin especially in patients with high smile lines. 5. In anterior teeth whose clinical crown are long therefore generate esthetic problems. 6. Patient with smoking habits, patient's cooperativity, patient's dental health, periodontal diseases history might be considered for crown lengthening treatment.

The purpose of this case reports is to determine the procedure of aesthetic crown lengthening with bone reduction as treatment for excessive gingival display which caused by APE.

## CASE

A 23-year-old woman came to Dental Hospital of Universitas Airlangga complains of the gum of upper front teeth were not in the same height. Thus, it was considered less aesthetic when smiling. Patient also complains of short upper front teeth. She did not have any systemic disorder, and she denied a history of drugs consumption and food allergic.

At intraoral examination revealed that there was an excessive gingival display of 3,5 mm on the tooth 11 (Figure 1). In examination using Chu's guide revealed an abnormal width and length ratio on tooth 11 and 21. In bone sounding examination revealed 1 mm depth on tooth 13, 12, 11, 21, 22, 23. Neither pocket nor teeth mobility on mentioned region was detected. The periapical radiographic examination, the alveolar crest level was close to CEJ (Figure 2).

Based on clinical and radiographic examination, the patient was diagnosed with mucogingival deformities and condition around teeth (excessive gingiva display). The etiology was caused by APE (type I-B). The treatment plan proposed in phase 1 was dental health education (DHE), upper and lower teeth scaling. Phase II treatment proposed was aesthetic crown lengthening with bone reduction (gingivectomy with bone reduction) on 13, 12, 11, 21, 22, 23 region. There is no phase III because this patient did not need restorative phase. Phase IV treatment proposed was maintenance. A digital smile design (DSD) was made before crown lengthening with bone reduction procedure performed (Figure 3).



Figure 1. Preoperative Clinical photograph (representing an excessive gingival display of 3,5 mm and asymmetric crown length due to the uneven gingival zenith)

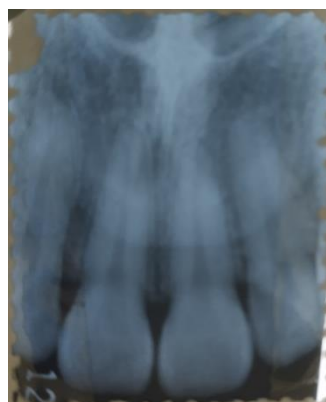


Figure 2. Periapical Radiographic Examination



Figure 3. Digital Smile Design (DSD)

## CASE MANAGEMENT

Aesthetic crown lengthening with bone reduction (gingivectomy with bone reduction) is the right choice for APE type I-B because of the most predictable result and minimal side effect for the patient than another treatment such as orthodontic appliances.

The procedure of aesthetic crown lengthening with bone reduction on elements 13, 12, 11, 21, 22, 23 was performed in several steps. Initially, patient preparation, blood pressure was measured, and a written consensus was obtained. Asepsis in both extra oral (lips) and intraoral using povidone iodine. Topical anesthesia with lidocaine spray followed by infiltration anesthesia with lidocaine HCl on mucco-buccal fold and palatal teeth element of 13, 12, 11,

21, 22, 23 was performed. Crown teeth of 13, 12, 11, 21, 22, 23 width and length were measured using chu's gauge and biological width was measured using bone sounding. Bleeding point then created using pocket marker forceps (PMF). The external bevel incision using blade no 15c was established as guided by the bleeding points (Figure 4A). The gingival tissue excision was using a curette. Then sulcular incision was performed in the region of 13, 12, 11, 21, 22, 23 with blade no. 15c (Figure 4C) and confirmation the gingival margin using Chu's guide (figure 4B). Full thickness flap was elevated then followed by ostectomy (bone reduction) on 13, 12, 11, 21, 22, 23 region using round bur (Figure 4D



Figure 4A to E. (A) External bevel incision; (B) Confirmation using Chu's guide; (C) Sulcular incision; (D) Ostectomy (bone reduction); (E) Suture of the surgical region

Irrigation on the operating area using saline. The flaps were then repositioned and sutured with interrupted suture technique (Figure 4E). Patient was prescribed with amoxicillin 500 mg 3 times a day for 5 days and mefenamic acid 500 mg 3 times a day and taken if pain occurs, and chlorhexidine gluconate 0,2% twice a day. Routine postoperative instructions were given to the patient to not consuming

hot and spicy foods or hot drink for 3 days after surgery.

7 days postoperative, patients were then asked to report and came for evaluation. Patient denied for pain and the suture was in good condition. Patients were recalled 15 days later. No claimed of pain and suture was in good condition then debridement using saline irrigation and suture removal were performed (Figure 5).



Figure 5A to B. (A) 15 days postoperative treatment;(B) Smile of patient after crown lengthening

Table 1. Length, probing depth, and bone sounding for each tooth before and after crown lengthening treatment

	Tooth	Length (mm)	Probing Depth (mm)	Bone Sounding (mm)
Preoperative	13	9	0.5	1
	12	8	0.5	1
	11	8	0.5	1
	21	9	0.5	1
	22	8	0.5	1
	23	9.5	0.5	1
Postoperative	13	12	2	3
	12	10	2	3
	11	11	2	3
	21	11	2	3
	22	10	2	3
	23	12	2	3

## DISCUSSION

In this case report, crown lengthening with bone reduction was a phase II treatment which was done after scaling and root planning treatment. It is important to identify the etiology of this excessive gingival display because the correct etiology identification leads to an appropriate and structured treatment plan. In this case, patient was diagnosed with an excessive gingival display and etiology of APE type I due to the gingival margin is located incisal from the CEJ, and the mucogingival junction (MGJ) is located apically from the alveolar crest, the gingiva dimension was wide and the clinical crown teeth was short. Based on the bone sounding and radiographic examination, this case is classified in the subgroup B due to the alveolar crest is located close to the CEJ.

Excessive gingival display due to APE can be corrected by periodontal surgical interventions including gingivectomy or crown lengthening, with or without bone reduction.<sup>2</sup> The choice of surgical

procedure depends on the gingiva architecture, bone crest level, gingival biotype, and keratinized gingival width. All these surgical procedures aim to open the clinical crown structure. Hence, the gingival margin is more incisal than the CEJ.<sup>3</sup>

Several studies mentioned that APE is contributing to the occurrence of periodontal disease due to the oral hygiene maintenance which may be obstructed by excessive gum closure above the teeth and the absence of adequate adhesion of connective tissue to the root cementum. Thus, it is affecting the periodontal tissue defense. APE also directly affects patient's smile aesthetically because of the teeth size looked small and wide gum.<sup>1</sup>

In this case, aesthetic crown lengthening with bone reduction is performed, after gingivectomy, it is necessary to reflect full thickness flap and do an ostectomy (bone reduction) with the aim of obtaining an adequate biological width and the distance from the alveolar crest to the gingival margin of 3 mm, and to obtain health and inflammation-free periodontal tissue. We used DSD to predict the results of crown lengthening and for communication with the patients.

The treatment results of crown lengthening in this case met patient's satisfactory, visible gingival margins that matched the gingival zenith and improved patient's smile profile. APE as the etiology of patient's gummy smile can be corrected. After the procedure there were no complaints of excessive pain and no complications.

The predictable treatment result is as expected from the crown lengthening procedure with bone reduction for APE or excessive gingival display case can be achieved through diagnosis, treatment plan and appropriate surgical techniques.

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