"Case Report"

Treatment for an Altered Passive Eruption (APE)

Irwandi Muslim, Ika Andriani

1School of Dentistry, Faculty of Dentistry Universitas Muhammadiyah Yogyakarta, Special Region of Yogyakarta, Indonesia
2Department of Periodontics, Faculty of Dentistry, Universitas Muhammadiyah Yogyakarta, Special Region of Yogyakarta, Indonesia

Corresponding author: ika.andriani@umy.ac.id

Abstract

Altered Passive Eruption (APE) is a condition where the gingival margin is more incisal or occlusal than the cementoenamel junction. Apart from disrupting the aesthetics of a smile, this condition can also be a risk factor for periodontal disease. APE is characterized by a gummy smile and short-looking teeth. Periodontal crown lengthening surgery is a treatment option that can be given to treat this case. The choice of periodontal crown lengthening surgery procedure must be adjusted based on the APE classification of the patient's case. This case report aims to describe the management of APE type 1A with periodontal crown lengthening surgery through gingivectomy. A 25-year-old female patient came to RSGM UMY with complaint that the gums on the front teeth of the upper jaw seemed large. The patient's general health is good. The results of intraoral examination showed that there was an elevation of the gingiva towards the incisal direction, and the teeth appeared short on 12, 11, 21, and 22. The examination also showed the presence of cretinized gingival tissue that appeared larger vertically on 12, 11, 21, and 22. On radiographic examination, the distance between the cementoenamel junction and the crestal bone is greater than 1 mm. The patient's APE classification was type 1A, hence gingivectomy was performed in this case. In treating APE cases, determining the correct diagnosis and selecting appropriate therapeutic management must be considered according to the patient's case. All therapeutic decisions must be discussed with the patient in order to satisfy their desires.

Keywords: Altered Passive Eruption; Gingivectomy; Gummy Smile

INTRODUCTION

These days, a lot of people worry about their looks and desire to appear well, especially when it comes to their facial features. It's because facial appearance has a big impact on how people identify with themselves.1 For a very long time, a person's smile has defined their facial features and come to represent facial beauty.2

The aesthetics of a smile are influenced by a balance of many factors, including the appearance of the incisors and gingiva when the lips are resting and smiling, the curve of the smile, the relationship of the teeth's midline to the face's midline, the tooth ratio, and the colour of the teeth.2 Aesthetic is one of the primary reasons patients seek dental care nowadays.3

Excessive gingival display while smiling might have an impact on the appearance of a person's smile. Excessive gingiva is defined as visible gingiva that is more than 2 mm high when smiling.4 Gummy smile is a term used to describe the look of excessive gingiva when smiling. Gummy smiles can be caused by excessive vertical growth of the maxilla, overerupted maxillary incisors, a short or incompetent upper lip, upper lip hyperactivity, altered passive eruption (APE), or a combination of these conditions.5

APE is a hereditary and developmental abnormality that occurs during the passive eruption of teeth. Passive eruption is the process by which the gingiva migrates apically, exposing the tooth crown.6 If this process is interrupted, the gingival border may become more incisal
or occlusal to the cementoenamel junction (CEJ). Typically, the gingival margin is 1 or 2 mm more incisal or occlusal than the CEJ. If it is more than that, the tooth crown will appear short and square.\textsuperscript{7}

Aside from disturbing the appearance of the smile, APE has been associated to an increased risk of periodontal disease. Excessive gingiva on the convex surface of the tooth crown can lead to plaque accumulation and inflammation of the gingival margin. In addition, severe gingival conditions can raise the risk of recurring gingival trauma.\textsuperscript{8}

APE is managed by periodontal crown lengthening surgery. This surgical approach is used to remove excess gingiva, expose the clinical crown anatomy, and restore the biological width of the gingiva to normal, hence improving the aesthetic appearance of the teeth and gingiva.\textsuperscript{8} The crown lengthening procedure to be performed must be determined based on the APE classification.

APE is classified into two types and two subtypes:\textsuperscript{9}

**Type 1:** The gingival margin is more incisal or occlusal than the CEJ; the distance between the gingival margin and the mucogingival junction is > 2 mm; and the mucogingival junction is more apical than the alveolar bone crest.

**Type 2:** The gingival margin is more incisal or occlusal than the CEJ. The distance between the gingival margin and the mucogingival junction is < 2 mm. The mucogingival junction is located at the CEJ level.

**Subtype A:** Distance between alveolar crest and CEJ \( \geq 1.5 \) mm.

**Subtype B:** Distance between alveolar crest and CEJ < 1.5 mm.

The management of gummy smile caused by APE is a challenge for dentists. The dentist must be able to make an accurate diagnosis, establish a suitable treatment plan, and discuss numerous treatment options with the patient. All of this is done to address patient's aesthetic needs and desires.\textsuperscript{7} The purpose of this case report is to explain how to treat APE with periodontal crown lengthening surgery through a gingivectomy procedure.

**CASE REPORT**

On November 21, 2023, a 25-year-old female patient came to RSGM UMY with complaints that the gums on the front teeth of her upper jaw appeared large and weird when smiling. This problem started out about 7 years ago. The patient's overall health was good, and she has no food or medicine allergies. The results of the intraoral examination showed that there was an elevation of the gingiva towards the incisal direction, the teeth seemed short on teeth 12, 11, 21, and 22, and the width of the gingival margin to the mucogingival junction was around 4 mm. The Oral

![Figure 1. Classifications of APE\textsuperscript{7}](image)

<table>
<thead>
<tr>
<th>APE Classifications</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>Gingivectomy</td>
</tr>
<tr>
<td>1B</td>
<td>Gingivectomy &amp; Bone Reduction</td>
</tr>
<tr>
<td>2A</td>
<td>Apically Positioned Flap</td>
</tr>
<tr>
<td>2B</td>
<td>Apically Positioned Flap &amp; Bone Reduction</td>
</tr>
</tbody>
</table>

Table 1. Treatments of APE\textsuperscript{7}
Hygiene Index (OHI) score was 4, and the Plaque Index O’Leary (PI) score was 45%. Probing Depth (PD) and Bleeding on Probing (BOP) examinations on the distal, facial, and mesial sides of teeth 12, 11, 21, and 22 showed in the following results:

<table>
<thead>
<tr>
<th>PD &amp; BOP</th>
<th>12</th>
<th>11</th>
<th>21</th>
<th>22</th>
</tr>
</thead>
<tbody>
<tr>
<td>PD Buccal</td>
<td>333</td>
<td>332</td>
<td>233</td>
<td>233</td>
</tr>
<tr>
<td>BOP Buccal</td>
<td>--+</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>PD Palatal</td>
<td>233</td>
<td>232</td>
<td>332</td>
<td>223</td>
</tr>
<tr>
<td>BOP Palatal</td>
<td>--+</td>
<td>---</td>
<td>++</td>
<td>---</td>
</tr>
</tbody>
</table>

**Table 2. PD and BOP on the 1st visit**

The clinical crown lengths on teeth 12, 11, 21, and 22 measured 8 mm, 9 mm, 9 mm, and 8 mm, respectively. Radiograph examination revealed that the gap between the cementoenamel junction and the top of the alveolar crest is greater than 1.5 mm. The objective examination and radiography revealed that the patient's APE classification is type 1A, thus the periodontal crown lengthening surgical treatment procedure was a gingivectomy.

**CASE MANAGEMENT**

Scaling and root planing, as well as periapical radiographs of teeth 12, 11, 21, and 22 were performed during the first visit on November 21, 2023. The patient was advised to practise good dental hygiene and was requested to return in one week for post-scaling and root planing control, and to have gingivectomy surgery. Before the series of treatments began, the patient was told of the procedures to be performed and requested to sign an informed consent form.

At the second appointment, which was held on November 28, 2023, the patient returned to continue treatment for a gummy smile caused by APE. The patient had no issues following treatment during the first appointment. The intraoral examination revealed the OHI score was 1 and the PI score was 18%. The clinical crown lengths of teeth 12, 11, 21, and 22 were the same as on the first visit. Probing Depth (PD) and Bleeding on Probing (BOP) examinations on the distal, facial, and mesial sides of teeth 12, 11, 21, and 22 showed in the following results:

<table>
<thead>
<tr>
<th>PD &amp; BOP</th>
<th>12</th>
<th>11</th>
<th>21</th>
<th>22</th>
</tr>
</thead>
<tbody>
<tr>
<td>PD Buccal</td>
<td>233</td>
<td>232</td>
<td>233</td>
<td>233</td>
</tr>
<tr>
<td>BOP Buccal</td>
<td>- -</td>
<td>- -</td>
<td>- -</td>
<td>- -</td>
</tr>
<tr>
<td>PD Palatal</td>
<td>222</td>
<td>222</td>
<td>222</td>
<td>222</td>
</tr>
<tr>
<td>BOP Palatal</td>
<td>- -</td>
<td>- -</td>
<td>- -</td>
<td>- -</td>
</tr>
</tbody>
</table>

**Table 3. PD and BOP on the 2nd visit**

On the second appointment, a periodontal gingivectomy was performed. The treatment began by wiping the injection site and applying a topical anaesthetic on it. Allow 1-2 minutes for the topical anaesthetic to take action. Povidone iodine was applied to the intraoral area that will be worked on as well as the
surrounding extraoral area. The supraperiosteal injection technique was then used to administer anaesthesia to the area of teeth 13, 12, 11, 21, 22, and 23. Following that, the bleeding point was marked with a dental explorer. Bleeding points on teeth 11 and 21 were adjusted with the gingival margin lines of teeth 13 and 23, which considered ideal. Meanwhile, the bleeding point on teeth 12 and 22 were 1 mm more coronal than the bleeding points on teeth 11 and 21. An external bevel incision was made 1 mm apical to the bleeding point, forming a 45-degree angle to the coronal. Incised the facial gingiva with a Kirkland knife or scalpel no. 15 and the interdental area with an Orban knife. The incised gingiva was removed by using a Gracey curette. The surgical area was cleaned of any remaining necrotic tissue, granulation, and calculus with a curette until the surface was clear. Scaling and root planing of the teeth should also be taken. Gingivoplasty was performed to contour the gingiva by using scalpel no. 15, then followed by irrigation with saline solution and haemorrhage control by pressing sterile gauze on the wound. After the wound had dried sufficiently, a periodontal dressing was applied.

**Figure 4. Documentation of gingivectomy**

The patient was given amoxicillin three times a day for five days, mefenamic acid which was only consumed when the surgical site was painful, 0.2% chlorhexidine gluconate mouthwash to help control plaque in the oral cavity, postsurgical education, and was asked to return in one week for removal of the periodontal dressing and evaluate the healing process.

On the third appointment, December 5, 2023, the patient returned to RSGM UMY for post-gingivectomy monitoring. There were no complaints following the surgical operation. The patient took mefenamic acid only a few hours after surgery and antibiotics three times every day for five days. Chlorhexidine gluconate 0.2% mouthwash was used twice daily for three days. An intraoral examination revealed that the gingival healing process had occurred on teeth 12, 11, 21, and 22. The patient's OHI score was 0.66 and the PI score was 16%. The clinical crown lengths for teeth 12, 11, 21, and 11 were 9 mm, 11 mm, 10 mm, and 9 mm, respectively. Probing Depth (PD) and Bleeding on Probing (BOP) examinations on the distal, facial, and mesial sides of teeth 12, 11, 21, and 22 showed in the following results:

<table>
<thead>
<tr>
<th>PD &amp; BOP</th>
<th>12</th>
<th>11</th>
<th>21</th>
<th>22</th>
</tr>
</thead>
<tbody>
<tr>
<td>PD Buccal</td>
<td>111</td>
<td>100</td>
<td>101</td>
<td>111</td>
</tr>
<tr>
<td>BOP Buccal</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>PD Palatal</td>
<td>222</td>
<td>221</td>
<td>212</td>
<td>221</td>
</tr>
<tr>
<td>BOP Palatal</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

**Table 4. PD and BOP on the 3rd visit**

At the third visit, the patient's teeth were cleaned with a brush and pumice to eliminate remaining plaque and were educated on how to maintain proper dental hygiene. The patient was pleased with the outcome of the treatment and gained...
enough confidence to smile broadly.

Figure 5. Gingival appearance 7 days after gingivectomy

Figure 6. Gingival appearance when smiling 7 days after gingivectomy

DISCUSSION

The eruption of teeth is divided into two phases: active and passive. The active phase is defined by tooth movement in the occlusal or incisal plane, whereas the passive phase is associated with apical migration of the soft tissue that covers the tooth crown. If problems occur during the passive eruption phase, the gingiva may partially close the tooth crown's anatomy. This phenomenon is referred to as altered passive eruption (APE).

APE is described as a condition in which a portion of the tooth crown is covered due to disturbances during the passive phase of tooth eruption in a patient aged 18 or older. This is due to the fact that clinical crown height increases till the age of 18-19. Clinical crown height will remain steady after the ages of 18 to 19.

APE is managed by periodontal crown lengthening surgery. This surgical strategy is used to remove excess gingiva, expose the clinical crown anatomy, and restore the biological width of the gingiva to normal, hence improving the aesthetic appearance of the teeth and gingiva. The crown lengthening procedure to be conducted must be determined based on the APE classification. Gingivectomy is a periodontal surgical procedure used in the treatment of APE that is performed in APE classification 1A, as mentioned in this case report.

The accuracy of the diagnosis and classification of APE is an important part of this case management. APE can be diagnosed clinically as a condition in which the gingival margin is more than 2 mm occlusal to the CEJ. Dental explorers can be used to examine the CEJ in the sulcus. If no CEJ is detected in the sulcus, APE can be diagnosed. Aside from that, a radiographic examination can be performed to help diagnose APE. If the radiography image demonstrates that the tooth's clinical crown height is less than its anatomical crown height, APE can be diagnosed.

Following the diagnosis of APE, the next step is to determine the type and subtype of APE. The type of APE is determined by examining the height of the keratinized gingiva. Type 1 APE is characterised by excessive gingival attachment (> 2 mm), while type 2 APE has normal attached gingival height (≤ 2 mm). The APE subtype is determined by the distance between the alveolar crest bone and the CEJ. The parallel plane technique of retro-alveolar radiography is used to assist in the examination. If the gap between the alveolar crest bone and the CEJ is ≥ 1.5 mm, the APE subtype is A. If the gap between the alveolar crest bone and the CEJ is less than 1.5 mm or parallel to the CEJ, the APE subtype is B.

During the initial stage of treatment prior to surgery, patient's oral hygiene status must be evaluated. During the first stage, treatment consists of starting comprehensive daily plaque control and
educating patient on how to maintain proper dental hygiene. Patient should be taught how to correctly brush their teeth and encouraged to start using dental floss or other instruments to clean the interdental spaces. Furthermore, during the first stage of treatment, calculus and microbiological plaque are cleared out. Good oral hygiene is easy to maintain if the tooth surface is clear of calculus and plaque deposits.\textsuperscript{12}

Controlling infectious organisms during phase I treatment is crucial. Good dental hygiene prior to surgical treatments is necessary to avoid infection, delayed healing, and treatment failure. Patients who are unable to keep 20\% or less of their tooth surface free of plaque have a lower likelihood of having a successful surgery.\textsuperscript{12}

The gingivectomy procedure is the easiest crown lengthening surgical treatment that does not require bone reduction. This technique involves cutting off the excess gingival area.\textsuperscript{13} When performing gingivectomy surgery on the maxillary anterior teeth, special care is taken to ensure that the therapy results in an attractive smile. The ideal gingival aesthetic parameters are used to determine the limitations of gingival margin reduction. The gingival margin of the canine tooth should be parallel to the gingival margin of the central incisor tooth, whereas the gingival border of the lateral incisor tooth should be slightly lower (0.5-1 mm). These factors will maximise the aesthetic of a smile.\textsuperscript{14}

The healing process following gingivectomy is slow; it takes around 5 weeks to restore gingival epithelialization to normal. The first response following gingivectomy is the formation of a blood clot (coagulum). The coagulum then gets replaced by granulation tissue. Within 24 hours, new connective tissue cells, particularly angioblasts, proliferate beneath the surface layer of inflammatory and necrotic tissue. On the third day, many fibroblasts showed up in the area. Coronal growth of highly vascularized granulation tissue results in the formation of a free gingival margin and a new sulcus. Within two weeks, blood cells from the periodontal ligament generate capillaries that move to the granulation tissue and bind with gingival blood vessels. In 5 to 14 days, superficial epithelialization is complete. Keratinization is weaker in the first four weeks following gingivectomy than before resection.\textsuperscript{15}

The epithelium usually takes about a month for it to recover completely.\textsuperscript{15} Because of the slow healing process, topical medications, antibiotics, and amino acids have been used to promote recovery after gingivectomy surgery.\textsuperscript{16}

In this case report, the patient was pleased with the final appearance of her teeth and gingiva. The patient now feels more confidence when smiling than before. To provide the best possible service to patients, it is necessary to determine the accurate diagnosis, establish an appropriate treatment plan, and discuss numerous treatment options with patients.\textsuperscript{7}

CONCLUSION
APE is a hereditary and developmental disorder affecting the passive eruption of teeth. APE can be treated through periodontal crown lengthening surgery. The crown lengthening procedure chosen depends on the patient’s APE classification. Dentists must be able to accurately diagnose and classify APE, provide appropriate treatment plans, and discuss alternative treatment options with patients. All of this is done to fulfil patient’s aesthetic needs and desires, as well as to ensure that the treatment results are satisfactory.
ACKNOWLEDGMENT
The author thanks Dr. drg. Ika Andriani, MDSc., Sp. Perio for her assistance as a mentor and supervisor in treating the patient mentioned in this case report, ensuring that the therapy works smoothly and satisfactorily. The author also wants to thank Reza Pratama and M. Firli D.Q. for their assistance in patient care.

REFERENCES
15. Kazakova, R., Tomov, G., Vlahova, A., Zlatev, S., Dimitrova, M., Kazakov, S., ... & Capodiferro, S.