Aesthetic rehabilitation on fractured and altered passive eruption anterior teeth: A case report

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Abstract

Objective: This case report aims to present the management of crown fractures with pulpal exposure caused by traumatic injury and a condition called gummy smile or altered passive eruption (APE), through a multidisciplinary approach.

Methods: A 24-year-old male patient came to the Department of Conservative Dentistry Prof Soedomo Dental Hospital Gadjah Mada University, complained of broken teeth and pain in the upper front tooth due to an accident. Teeth number #12 and #21 experienced horizontal discontinuity to the dentine surface and some lines on the labial surface and #11 underwent a fracture with exposure of the pulpal tissue. The patient wanted to take care of broken teeth and improve his smile.

Results: A treatment plan was formulated, which consisted of a stepwise treatment including endodontic treatment, crown lengthening, prefabricated glass-fiber post followed by a core build-up, and finally, direct composite to achieve patient satisfaction.

Conclusion: The careful planning of a multidisciplinary approach such as endodontics, periodontics, and direct restorations can treat patients with complex aesthetic complaints relating to problems with the tooth and its soft tissues, and immediate restoration for providing a fast, predictable, economical, yet satisfactory result to improves patient self-confidence.

Keywords: Aesthetic rehabilitation, Fractured teeth, Gummy smile

DOI: 10.15562/jdmfs.v8i3.1469

Introduction

A smile is considered the symbol of beauty and a person’s wellbeing. The appearance of anterior teeth has a substantial influence on patient self-confidence. A variety of aspects including tooth width to length crown ratio, teeth form and position, dental midline, smile line, incisal embrasures, gingival tissue levels, the symmetry of contralateral gingival margins, and gingival display all influence the aesthetics of a person’s smile. Traumatic injuries are one of the main reasons for the fracture of upper anterior teeth. The need for the treatment is mostly aesthetics.

A fracture to the teeth can cause either damage to the pulp, crown or root damage, or avulsion of teeth from the socket. There is a high chance of fracture of the anterior teeth in the maxilla, and mostly is because of the teeth that protrude, so the lip cannot cover them adequately. Many activities can cause trauma to the teeth, such as falling off a bike, crashes, domestic violence, sports, or other causes that can lead to disability wounds in individuals also various forms of fractures, including crown fracture and tooth-root fracture. Crown fracture with exposed pulp involving enamel, dentin, and pulp known as a complicated crown fracture. The complicated crown fracture occurs about 2-13% of all dental injuries, most of which involve maxillary first incisors.

An active eruption could be described as the functional movement of the teeth at occlusal or incisal after a successfully pierce gums. This stage stops when teeth contact with the opposite teeth, and still can occur again when there are changes on the opposite teeth such as wear or loss of the teeth. On the other hand, a passive eruption is a biologic process whereby tooth eruption occurs normally. During this normal tooth eruption, the dentogingival junction shifts apically, when that happens, the size of the crown clinical will increase, called to track epithelial attachment at apical. The process of the passive eruption can be divided into 4 stage, which is that: Dentogingival junction be in enamel; Dentogingival junction be in enamel and cementum; Dentogingival junction be entirely in cementum by extension toward cementoenamel junction (CEJ); Dentogingival junction be in cementum accompanied by creating the surface roots as a result of the continuous of dentogingival junction toward cementum (gingival recession).

Altered Passive Eruption (APE) is a clinical situation produced by excessive gum overlapping over the enamel limits, resulting in a short clinical
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Figure 1. (Left) Preoperative labial view, (Right) The clinical appearance of the palatal side maxillary anterior teeth

Figure 2. Preoperative intraoral periapical radiograph

Figure 3. The ideal of tooth measurement and the height of gingival zenith analysis using smile analysis software

Figure 4. (Left) Mock up based on smile analysis, (Right) Silicone guide based on mock up model used as guide for aesthetic crown lengthening.

Crown appearance, that gives the sensation of hidden teeth. APE or known as retarded passive eruption or delayed passive eruption occurs when the marginal gingiva is malpositioned incisally in adulthood on the anatomic crown and does not approximate the CEJ. In general, the relationship which is considered “normal” from the gingival margin to CEJ is exactly or approached by CEJ on permanent teeth that have been fully erupted. Coslet classifies APE’s condition into two main classifications depending on the gingiva relationship with the anatomic crown and is further divided into two subclasses based on the alveolar crest position. Type 1 is represented by the presence of the gingival margin incisally or occlusally to the CEJ, where there is a noticeably broader band of gingiva from the gingival margin to the mucogingival junction. The mucogingival junction is usually apical to the alveolar crest in these cases. Type 2 is represented by a gingival dimension from the margin to the mucogingival junction that appears to fall within normal width. In this type, all of the gingival is located on the anatomic crown, and the mucogingival junction is located just at the level of the CEJ. Both types 1 and 2 then subdivided into 2 subcategories, which is A and B. In the subcategory A, the alveolar crest-CEJ relationship corresponds to the 1.5-2.0 mm distance accepted as normal. This distance allows for the normal insertion of the gingival fiber apparatus into the cementum. In the subgroup B, the alveolar crest is at the level of CEJ. This relationship, although uncommon in adult, is frequently observed during the transitional dentition that is undergoing active eruption.

The significance of the alveolar crest-CEJ distance is related to the gingival fiber apparatus. In both type 1 and type 2, when the alveolar crest is located at or near the CEJ in the adult, there is a lack of available cementum apical to the CEJ and coronal to the alveolar crest for the insertion of the collagen bundles of the gingival fiber apparatus. This prevents the normal apical movement of the attachment apparatus as the final stage of eruption. It is not uncommon for alveolar bone to approximate the CEJ, causing a failure of apical migration of the attachment apparatus. Some investigators have coined the term altered active eruption to describe this situation, in which a coronally placed attachment apparatus results from the coronally placed alveolar bone. The altered active eruption corresponds to the type 1B altered passive eruption in Coslet’s classification, which is the most common type of APE according to Dolt’s in his clinical experience. Usually comes with gingival recessions, the excessive gingival display while smiling is a common condition reducing smile esthetics. Treatment choices of APE type 1 mostly involved gingivectomy and apically positioned flap (APF) and osseous respective surgery. While APE type 2 that showed excessive growth of the maxillary process needed more multidisciplinary treatment plans including prosthodontics, orthodontics, and periodontal surgery, type 1 APE treatment is a risky and rather complicated.
procedure for bone resection in upper anterior teeth. Excessive bone resection may result in residual gingival recession, elsewhere, a limited resection and flap management may only a partial resolution of APE condition. Moreover, a coronal regrowth of the gingival margin following APF may frequently happen to reduce the length of postsurgical clinical crowns. Therefore, the lack of a well-planned surgical procedure may cause an aesthetic failure when treating APE.9

Case Report
A 24-year-old male patient came to the Department of Conservative Dentistry Prof Soedomo Dental Hospital Gadjah Mada University, complained of broken teeth and pain in the front upper right tooth due to an accident a few days before. Patients want to take care of broken teeth and improve smiles. Clinical examination revealed teeth number #12 and #21 experienced horizontal discontinuity to the dentine surface and some lines on the labial surface, and #11 underwent a fracture with exposure of the pulpal tissue figure 1. Percussion and vitality tests in these three teeth showed positive results.

Radiographic examination revealed a radiopaque line on the crown area of the teeth that runs horizontally irregular from the distal side to the mesial of the #11 and #21. Figure 2 not seen the damage to periodontal and periapical tissue. Based on the diagnosis radiograph, bone crest level, which was about 1.5-2 mm next to the apical of CEJ indicat- ing the patient’s teeth have been perfectly erupting. The compact form of gingiva causes the connective tissue of the gingiva to undergo a slightly slow displacement during the passive eruption phase.

A treatment plan was formulated, which consisted of a stepwise treatment including endodontic treatment, crown lengthening, prefabricated glass-fiber post followed by a core build-up, and direct composite restoration. Root canal therapy of the #11 was completed on the first appointment using a step back technique, and obturation was done using the lateral condensation technique.

Profile photographs and the dental impression were taken at the second appointment. Smile analysis was done using Smile Designer Pro software and showing the ideal size of #11 and #21 clinical crown was 8.5 mm for width and 10.5 mm for height figure 3. The excision of gingiva had to be carried on to get the ideal ratio. A crown lengthening procedure was conducted using a silicon guide that had been made previously figure 4. After the crown lengthening procedure, hemostatic material was applied, and the patient was given post-surgical instructions and was prescribed antibiotics and pain relievers. The patient was scheduled for post-surgical evaluation one week later.

The palatal index was made from rubber-based putty print based on the mock-up model that had been made before; and made up only to the incisal limit, then shade matching was done using the button technique in tooth #21. Preparations were conducted using depth marker bur on the labial side. After measuring the working length of the post canal, the stopper was set on the Peeso-reamer to remove the gutta-percha and on the precision drill for the post canal preparation. Then the post was tried in, and a radiograph was taken when the height of the post was corresponding with the previous measurement. Furthermore, the prefabricated glass-fiber post was cemented using self-adhesive resin cement. The core post was made using composite resin, and then the composite resin restoration was carried out with a palatal silicone index that had previously been made figure 5.

Discussion
The main purpose of dental treatment should provide both functional and aesthetic results to achieve patient satisfaction and the longevity of function. In this case, the patient undergoing numerous treatments that include endodontics on the pulp exposure tooth fracture, crown lengthening on the anterior teeth to correct the gingival zenith and the size of the incisive, and direct composite resin restoration as the final restoration.

The results of smile design analysis show that the incisor clinical crown of the patient is shorter than it should be, this condition is known as gummy smile or more specific is APE. In this case, the patient can be categorized under an APE type 1 subclassification A. The golden standard ratio of the ideal size proportion of central incisor is 80% (weight: height),10,11 to produce an ideal smile line for the patient, the crown procedure lengthening must be done by 1 mm on #11 and 0.7 mm on #21.

Complex aesthetic treatments require continuity to produce a final restoration that has healthy periodontal support and provides a more aesthetic smile line. APE treatment requires careful planning, ranging from the depth of the existing sulcus, the distance between the crest alveolar with CEJ, and the height margin of gingiva against dental incisal, in order to create the optimum biologic width and long-lasting restoration. The biological width is
defined as the dimension of the soft tissue, which is attached to the portion of the tooth coronal to the crest of the alveolar bone. The most optimal biological width to ensure the periodontal health tissue is 3 mm. This 3 mm consists of 1 mm supracrestal connective tissue attachment, 1 mm junctional epithelium and 1 mm for gingival sulcus on an average. A rupture or unfulfillment of this biologic width may trigger the presence of bone inflammation and resorption.

The crown lengthening procedure is known to be the most effective treatment for handling APE. In these cases, gingival zenith is also corrected with the crown lengthening procedure. The gingival zenith is the most apical point of the free margin of the gingiva, which is slightly more inclined to the distal than the midpoint of the dental axis for the entire anterior tooth. Gummy smile or APE conditions must be identified from the beginning because the success of aesthetic rehabilitation depends on several factors, such as the height of the alveolar crest, and the thickness attached gingiva.

**Conclusion**

Based on the case presented, all of the treatment series (endodontic, crown lengthening, and direct restoration) are highly recommended for traumatized anterior teeth with APE conditions. The careful planning of a multidisciplinary can treat patients with complex aesthetic complaints relating to problems with the tooth and its soft tissues, and immediate restoration for providing a fast, predictable, economical, yet satisfactory result to improve patient self-confidence.

**Acknowledgment**

The authors would like to thank the Head of the Endodontics Specialist Program, Department of Conservative Dentistry, Faculty of Dentistry, Gadjah Mada University for the support for this case report publication.

**Conflict of Interest**

The authors report no conflict of interest.

**References**