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Case Report

Management of Altered Passive Eruption: Review & Case Report

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Abstract: A smile is the most common facial expression to display satisfaction, joy or happiness. 'Gummy smile' in case of short clinical crown constitutes a relatively frequent esthetic disadvantage characterized by excessive display of the gums during upper lip smiling. One situation that can lead to gummy smile is "Altered passive eruption". It is defined as a dentogingival relationship wherein the gingival margin is positioned coronally to the cementoenamel junction due to the disruption in the development and eruptive patterns of the teeth. In this article periodontal surgical procedure is described to find the effectiveness of internal bevel gingivectomy with osseous contouring to restore gingival health and the esthetic parameters of the smile line.
Keywords: APE, Gummy smile, smile lip

INTRODUCTION

Increased concern on facial esthetics, both patients and dentists are developing a greater awareness on the dento-gingival relationship effecting the beauty of the smile. In the past, the major dilemma related to gingival levels for the restorative dentist was the management of the patient with long teeth secondary to periodontal surgery [1]. The evolution of periodontal plastic surgical techniques and better understanding of the features associated with an esthetic smile have permitted the existence of various therapeutic procedures in periodontology. This has contributed to a more multidisciplinary approach in dentistry treatment. To achieve excellent periodontal esthetics, it requires a treatment planning with the evaluation of all factors that interfere with the harmony and symmetry of the smile elements [2]. Synthetic crown margin placement, clinical crown size/length, crown contour and biological width are important etiological factors in gingival and periodontal health [3]. Short teeth associated with gummy smile are frequent patients complaint. The diagnostic assessment of the smile is reflective of the amount of gingiva and tooth exposed during smiling. The clinical condition can be termed "short tooth syndrome". The etiology associated with each specific condition must be identified separately and elucidated by the clinician since the treatment planning and management is different for each condition [4]. Gummy smile or excessive gingival display may be a result of several factors, such as gingival enlargement, altered or delayed passive eruption, insufficient clinical crown length, vertical maxillary excess, and a short lip. This problem can be corrected by various periodontal surgeries such as gingivectomy, gingivoplasty, apically displaced flap with or without osseous resection and undisplaced flap/internal bevel gingivectomy. A variety of factors including teeth form/position and gingival tissue levels may influence overall smile aesthetics. Excessive gingival display, resulting in short clinical crowns, has been described in literature by several authors as "altered passive eruption (APE). This clinical situation has been attributed to failure in concluding the passive eruption phase [5].

TOOTH ERUPTION

The dentogingival junction (DGJ) is habitually located close to the cementoenamel junction, the gingival margin slightly covering the limits of the dental crown [6]. The term "altered passive eruption" refers to the supposed causal mechanism underlying

this morphological variant. It should be remembered that tooth eruption comprises two phases: an active eruption phase which causes the tooth to emerge into the oral cavity, and a passive eruption phase involving apical migration of the soft tissues covering the crown of the tooth. The phenomena observed in both phases are reviewed below.

Active eruption phase

According to Steedle *et al*., 6 stages – three prefunctional and three postfunctional – can be cited in active eruption of the human tooth, as classified below:

- A follicular growth phase in which the tooth grows symmetrically within the crypt without undergoing displacement. This period lasts until the crown has calcified and 2-4 mm of root have formed.
- A pre-emergence eruptive outbreak beginning with displacement of the tooth in the occlusal direction, with a considerable increase when the cuspid of the crown approaches the immediate vicinity of the gums.
- A post-emergence eruptive outbreak at the moment when the tooth breaks through the gums and begins to emerge into the oral cavity. Maximum eruption velocity is reached in this stage. As the opposing cuspids approach each other, eruption gradually slows.
- Juvenile occlusal equilibrium. Once the tooth has reached occlusion with its antagonist, eruption movement ceases for some years.
- A puberal eruptive outbreak, characterized by rapid somatic growth during puberty and which at facial level is characterized mainly by an increase in lower facial height. Such bone growth is accompanied by a new active tooth eruption period that lasts at least 2-3 years, and concludes when the face reaches maturity. A relative equilibrium or balance is then restored at around 18 years of age.
- Adult occlusal equilibrium. Eruption does not cease abruptly on reaching physical maturity; rather, the potential is maintained throughout life, with small increments in lower facial height and tooth eruption.

Passive eruption phase

The term passive eruption is attributed to Gottlieb and Orban in 1933, and implies apical migration of the dentogingival junction (DGJ). Classically, the passive phase has been divided into four stages according to the location of the DGJ with respect to the cementoenamelline : (a) the DGJ is located on the enamel; (b) the epithelial attachment is located on the enamel and also on the root cement surface; (c) the epithelial attachment is entirely located on the cementum and (d) both the epithelial attachment and gingival margin lie apical to the cementoenamel junction [7].

From the histological perspective, passive eruption is divided into four stages: I) Dentogingivaljunction is located in the enamel. II) Dentogingivaljunction is located in the enamel as well as the cement. III) Dentogingival junction is entirely located in the cement, extending in coronary direction to the cement-enamel junction (CEJ). IV) Dentogingival junction is located in the cement; there is root exposition as a result of a continuous migration. This can be considered a pathological state rather than a physiological state. When the dentogingival junction remains in Stage I, even after adulthood sets in, an event called *altered passive eruption* takes place. This in turn, can be classified in the following fashion: Type I the gingival margin is in a coronary position with respect to CEJ with a wide strip of inserted gum. Type II thegingival margin is in a coronary position with respect to CEJ with a normal strip of inserted gum. In turn, it can be sub-classified into A: distance from alveolarcrest to CEJ 1.5-2.0 mm and B: alveolar crest at the level of CEJ. Aesthetic crown lengthening for the four types of altered passive eruption is significantly different. Type I, subgroups A and B are the most prevalent [8].

DIAGNOSIS OF APE

The first step in diagnosis is to observe the patient in both smiling and repose. Further data is required if excess gingiva is displayed. First the maxillary lip needs to be evaluated for both length and activity. The average length of the maxillary lip in repose is 20 to 22 millimeters in females and 22 to 24 millimeters in males . If the maxillary lip is the cause of a gummy smile, there is no treatment necessary. Next, location of the cementoenamel junction needs to be identified with a probe subgingivally. If the cementoenamel junction is located in a normal position in the gingival sulcus, then the short clinical crown is probably due to incisal wear on abnormal tooth morphology. When the cementoenamel junction is not detected in the sulcus a diagnosis of altered passive eruption can be made. The next step is bone sounding. A measurement from the gingival crest to the alveolar crest is taken. This should be approximately 3 millimeters. Usually the cementoenamel junction approximates the base of the sulcus; in altered passive eruption this measurement can be used to determine the relationship between the cementoenamel junction and the alveolar crest. Normal relationships require approximately 2 millimeters for both epithelial and connective tissue attachment between the cementoenamel junction and alveolar crest; therefore, a decision can be made which treatment is necessary[1]. Radiographic viewing of the cementoenamel junction position can facilitate diagnosis of altered passive eruption. If the clinical crown length is less than the anatomical crown length measured on the radiograph,then altered passive eruption is present.

TREATEMENT OPTIONS OF APE

It has been proposed that treatment of altered passive eruption should be evaluated by the following criteria: periodontal involvements, restorative requirements, orthodontic requirements. Periodontal involvements can be treated one of two ways surgically. Performing a gingivectomy is the first option for periodontal correction. When it is determined that the osseous level is appropriate, that greater than 3 millimeters of tissue exists from bone to gingival crest, and that an adequate zone of attached gingiva will remain after surgery a gingivectomy is indicated [1]. An apically positioned flap with ostectomy is required when the osseous levels are approximating the cementoenamel junction. Osseous recontouring is necessary when insufficient root is exposed to allow for a proper biologic width . The timing of periodontal surgery is a source for debate. Orthodontic treatment typically precedes periodontal surgery, since movement of teeth may affect gingival harmony. Dolt [1] recommended that if clinical crowns are short due to altered passive eruption, crown lengthening should be performed prior to orthognathic surgery. Garber and Salama suggested a two-phase approach: initial periodontal surgery before orthognathic surgery with a second alteration following orthognathic surgery if necessary. Restorative concerns of altered passive eruption come from difficulty of restoring a tooth with excess tissue. Also the appearance of short clinical crowns needs to be properly diagnosed. If incorrectly diagnosed, crown and bridgework performed to lengthen tooth appearance will leave patient with unaesthetic appearance and an extreme deep bite Orthodontic therapy can be affected by excess gingival tissue from altered passive eruption. Excess gingiva can make orthodontic treatment more difficult. From placing brackets and bands to oral hygiene a number of procedures are affected. Evian suggests removing tissue prior to orthodontic therapy. This allows the orthodontist to evaluate esthetic and functional needs more accurately because the entire crown is visible [9].

CASE REPORT

Case 1

This is the case of a 23-year-old female patient reported to the department of periodontics, Sharad Pawar Dental College & Hospital Sawangi (Meghe) complaining of excessive gingival display and short clinical crowns. Orthodontic treatment was at the stage of completion. After initial therapy consisting of oral hygiene instruction and scaling the gingival condition improved. However, the gingival margin remained on the enamel coronal to the CEJ. This case was diagnosed as delayed passive eruption of type II, subtypes B. Radiographic examination revealed bone level approximating the CEJs of the teeth. Probing depth was 2 to 3 mm, revealing the presence of pseudopockets. After local anesthesia was administered, pocket depth was marked and internal bevel incision followed by crevicular incision and interdental incision was given and the tissue was excised. Fullthickness flaps were reflected buccally and palatally to expose the underlying bone. The level of alveolar bone was at the CEJ, thus impinging the biologic width. An osseous resective procedure provided biologic width of 2 mm in all teeth, thus creating more space for the soft tissue to be repositioned approximately at the CEJ. Scalloping of the gingiva was then performed using a no. 15c blade. The flaps were sutured back with simple interrupted suture to reposition the papillae in the interproximal areas. During a recall visit of the patient 1 year after the procedure, the established dentogingival unit appeared stable. Therefore, by reducing soft tissue inflammation, apical repositioning of gingival flaps, and establishing a new biologic width (2.0 mm) through osseous resective surgery predictable esthetic outcome can be achieved.

Fig-1: preoperative view showing short clinical crown

Fig-2: internal bevel incision for marginal tissue exicision

Fig-3: reflection of fullthickness mucoperiosteal flap showing level of bone at CEJ

Fig-4: Osteotomy creating the space of 2mm for biological width

Fig-5: Suturing with simple interrupted suture

Fig-6: post-operative view at 1 year

Case 2

In this case 26-year-old female patient reported to our department complaining of excessive gingival display and short clinical crowns. Initial therapy provided to the patient consist of oral hygiene instruction and scaling. However, the gingival margin remained on the enamel coronal to the CEJ. case was diagnosed as delayed passive eruption of type II, subtypes A and B, depending on the sites. Radiographic examination revealed no bone loss, and some areas showed bone closely approximating the CEs of the teeth mainly in the interproximal area . Probing depth was 3 to 4 mm, revealing the presence of pseudopockets. After local anesthesia was administered, pocket depth was marked and internal bevel incision followed by crevicular incision and interdental incision was given and the tissue was excised. Fullthickness flaps were reflected buccally and palatally to expose the underlying bone. The level of alveolar bone was 1.5-2 mm from CEJ, providing biological width of 2 mm in some sites and in the other sites the level of alveolar bone is at CEJ or only 0.5 mm from CEJ impinging the biological width. An osseous resective procedure provided biologic width of 2 mm in the teeth where there is alveolar bone level less than 2 mm, thus creating more space for the soft tissue to be repositioned approximately at the CEJ. Scalloping of the gingiva was then performed using a no. 15c blade. The flaps were sutured back with simple interrupted sutues. During a recall visit of the patient 1 years after the procedure, the established dentogingival unit appeared stable. Therefore, by reducing soft tissue inflammation, apical repositioning of gingival flaps, and establishing a new biologic width (2.0 mm) through osseous resective surgery, the esthetic can be improved.

Fig-7: preoperative clinical view showing short clinical crown and gummy smile in case 2

Fig-8: post operative clinical view in case 2

DISCUSSION

Usually, maxillary central incisors have a width-to-length ratio of 0.75 to 0.80 [2]. The gingival margin of the maxillary lateral incisor is normally 1.0 mm below that of the adjacent maxillary central incisors/canines. Short clinical crown and gingival display are the common finding in altered passive eruption. Appropriate diagnosis is an important step to proceed for the correct treatment. In case 1 the diagnosis was made as type I subclass B as the gingival margin is in a coronary position with respect to CEJ with a wide strip of inserted gum and alveolar crest at the level of CEJ. While case 2 was diagnosed as type I subtype A & B as the gingival margin is in a coronary position with respect to CEJ with a wide strip of inserted gum and alveolar crest at the level of CEJ in some sites and 0.5 – 2 mm in other sites. Treatment options for APEs depending upon the diagnosis can be selected. In the present cases, the appropriate treatment was crown lengthening, with mucoperiosteal flap through internal-beveled, due to the large amount of keratinized gingiva, permitting further lengthening of up to 3 to 4 mm after incision. However, if the amount of initial keratinized gingiva is not enough, the performance of apical position flap is indicated [10]. When the bone crest is less than 3 mm distant from the CEJ, regardless of the amount keratinized gingiva, it is necessary to perform osteoplasty and osteotomy, creating the necessary biological width (3 mm) [11, 12]. The treatment provided in the present cases was gingivectomy as here was presence of pseudo pockets in the range of 3-4mm and also sufficient amount of keratinized gingiva was present along with full thickness mucoperiosteal flap and osteoplasty &

osteotomy at the place where the distance of CEJ to crest of bone is less then 3mm. More invasive techniques can be used to treat APE, such as orthognathic surgery and plastic surgery [10,12,13] (Invasive techniques for treating APE are considered in cases involving extraoral causes of a gummy smile, such as vertical maxillary excess and hypermobile/short upper lip. It is unlikely to expect that intraoral proceedings can promote a suitable result in the treatment of APE when the cause is related to high discrepancies among extraoral parameters [10,12,14].

CONCLUSION

Correct diagnosis and technique is important in case of APE , it was possible to obtain harmony in the smile through crown-lengthening surgery by gingivectomy and flap surgery with osteotomy & osteoplasty, because it is a less invasive technique and it permits the establishment of an esthetical smile and reduction in case of gummy smile.

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