

DIAGNOSIS AND TREATMENT OF AN ALTERED PASSIVE ERUPTION : A CASE REPORT.

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Abstract

Altered passive eruption (APE) is a genetic condition characterized by a coronary position of the gingiva on the enamel which results in short clinical crowns. There are several clinical and radiological ways to diagnose the altered passive eruption as well as several treatment possibilities depending on the case and the classification of the APE. A successful new smile requires an adequate knowledge of the periodontal parameters, a reliable diagnosis, an effective surgical protocol and the respect of the principle of tissue preservation. In this case report, an altered passive eruption was diagnosed clinically and radiologically and treated through gingivectomy, osteoplasty and osteotomy.

Keywords : Altered passive eruption, Esthetic, Gummy smile, Surgical treatment.

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DIAGNOSTIC ET TRAITEMENT DE L'ÉRUPTION PASSIVE ALTÉRÉE : UN RAPPORT DE CAS

Résumé

L'éruption passive altérée est une condition génétique caractérisée par une position coronaire de la gencive sur l'email reflétant ainsi des couronnes cliniques courtes. Il existe plusieurs moyens de diagnostic clinique et radiologique de l'éruption passive altérée (APE) ainsi que plusieurs possibilités de traitements dépendamment du cas et de la classification relative à l'APE. Un néo-sourire réussi requiert une bonne maîtrise des paramètres parodontaux, un diagnostic fiable, un protocole chirurgical efficace et surtout le respect du principe de préservation tissulaire. Dans ce cas clinique, une éruption passive altérée a été diagnostiquée cliniquement et radiologiquement et traitée par le biais d'une gingivectomie, ostéoplastie et ostéotomie.

Mots-clefs : Diagnostic ; éruption passive altérée ; esthétique ; sourire gingival ; traitement chirurgical

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Introduction

Esthetic considerations have lately taken over in the dentistry fields. In order to define an esthetic smile, three main components have to be considered: teeth, lips and gingiva [1]. In some patients, an altered relationship between the teeth, the alveolar bone, and the soft tissue may result in a clinical condition known as gummy smile. Although this situation is not pathological, it embodies an unsightly effect and this can have several etiologies: a muscular etiology, in other words, a short upper lip or a hypertonic upper lip, a skeletal and a dental-alveolar etiology referring to an anterior pro alveolus or even an anterior vertical excess and finally a gingivodental etiology which consists of an excess of gingival growth: an altered active or passive eruption [2].

The active eruption is the process by which the tooth passes from its germinal state to its final position in the mouth, in occlusion with its antagonist [3]. It is usually accompanied by an apical apposition of cementum and alveolar bone throughout the life of the tooth to compensate for the normal wear that occurs. The altered active eruption (AAE) is a pathological condition of active eruption where the tooth does not come out enough of its socket and reaches the occlusal plane prematurely, thus leaving the cemento-enamel junction very close to the bone crest [4].

The passive eruption begins when the crown has completely erupted and it is defined by the apical migration of the gingival tissue until it reaches an adequate position on the cemento-enamel junction (CEJ), that is at a physiological distance of 0.5 mm to 2 mm, determining the position of the marginal gingiva. In the majority of cases, the passive eruption resolves spontaneously with complete eruption of the teeth, growth of the jaws and proper occlusion [4]. The altered passive eruption (APE) has been described as a genetic condition frequently associated with an excessive appearance of the



Figure 1 : Excessive gingival display during smiling

gum tissue. This condition is characterized by a coronary position of the gum tissue on the enamel, on the middle third of the anatomical crown, which results in clinically short crowns with a square appearance. When the passive eruption persists after a certain age (18 to 20 years old for women and 20 to 22 years old for men) it is then called altered passive eruption [3].

We herein report in this clinical case the management of a gummy smile due to an altered active and passive eruption, through the combination of a gingivectomy and an esthetic crown lengthening.

Case report

Case presentation

A 22 years old female patient presented to the periodontal department of the Faculty of Dentistry, Saint-Joseph University with the chief complaint of a gingival display during smiling and a square teeth shape (Fig.1) which affected her confidence and physiological state. The medical history revealed that she was systemically healthy, however the dental status displayed a bimaxillary fixed orthodontic treatment planned to end two weeks later.

Clinical examination

Extra-oral clinical examination

Miss R.S. presents a wide smile extended to the molars and a class 2 high smile line according to the classification of Liébart et al. [5], thus

leaving between 0 and 2 mm of marginal gingiva visible when smiling.

Intra-oral clinical examination

The intraoral clinical examination reveals the presence of excess gingiva in the upper and lower arch giving the teeth a square appearance. In addition, the antero-inferior teeth present an accentuated gingival hyperplasia, probably due to the orthodontic treatment accompanied by an average oral hygiene. In addition, we can also note the low insertion of the labial frenulum and the teeth number 11 and 12 present a broken incisal edge making them look shorter than the others (Fig.2).

Radiographical examination

The bite-wings and the retro-alveolar x-rays that were taken to evaluate the radiological crown height revealed the margin of difference between this value and the clinical one (Fig. 3). In addition, the distance between the alveolar bone and the CEJ was inadequate on some teeth. In fact, on the upper incisors, the alveolar crest is coronal to the CEJ labially and this distance is less than 1.5mm mesially and distally. Concerning the upper premolars, this distance is inadequate, whether it is on the right or left side. As for the lower arch, the distance between the alveolar crest and the CEJ is more than 1.5 mm on the anterior teeth but less than this threshold on the right and left premolars (Fig. 4).



Figure 2 : Intra-oral clinical examination

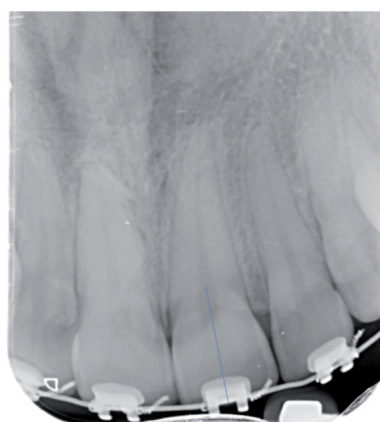
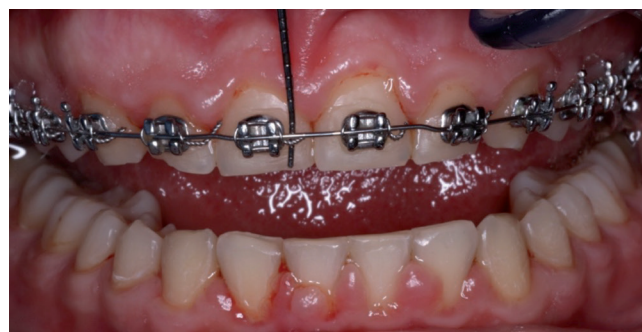


Figure 3 : The height difference between
A: the clinical crown (6mm)B: and the radiological crown (10 mm)

Global Treatment Plan

Diagnosis

Based on all previous examinations, R.S. had a mixed diagnosis of APE-I on the lower anterior teeth due to a large band of keratinized gingiva greater than 2mm and a CEJ-alveolar bone distance >1.5 mm; and APE-I-AAE on all the other teeth due to a large band of keratinized gingiva greater than 2 mm and a CEJ-alveolar bone distance < 1.5mm, according to the classification of Zangrando and al. (6)a “gummy smile” contributes to esthetic problems and is caused by several factors such as vertical maxillary growth, dentoalveolar extrusion, short upper lip, upper lip hyperactivity, altered passive eruption (APE).

Multidisciplinary treatment plan

After the clinical and radiographical examination, the following multidisciplinary treatment plan has been elaborated:

Upper and Lower bracket debonding. However, the orthodontist estimated that the upper arch needed 1 more month of treatment, therefore he only debonded the lower arch.

Deep scaling and oral hygiene instructions.

Periodontal re-evaluation after 10 days.

Lower arch: gingivectomy on the lower anterior teeth [33 to 43] and crown lengthening on the lower posterior teeth [44-45; 34-35].

1 month later and after the upper bracket debonding: esthetic crown lengthening on the upper arch from tooth number 15 to 25.

Restorative treatment for teeth number 11 and 12.

Non-surgical steps

After the bracket debonding of the lower teeth, we performed a deep scaling with the ultrasounds and a slight gingival curettage when needed (Fig. 5). This treatment was accompanied by very strict oral hygiene instructions: we recommended the patient to use a soft toothbrush twice a day using the modified Bass technique and to rinse with a 0.12% chlorhexidine solution for 10 days.

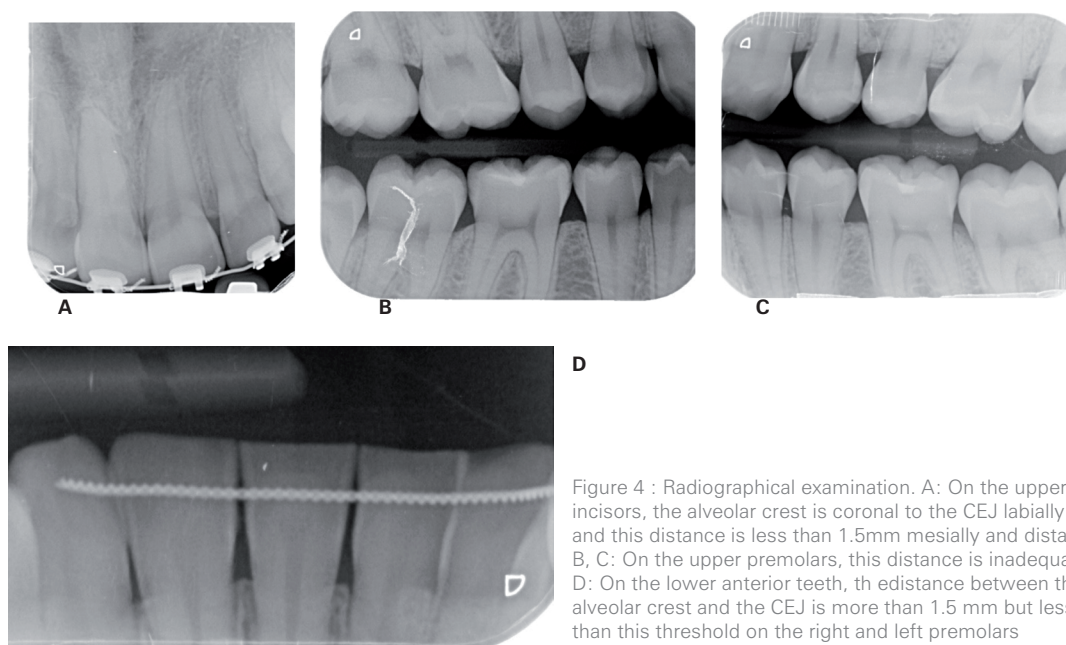


Figure 4 : Radiographical examination. A: On the upper incisors, the alveolar crest is coronal to the CEJ labially and this distance is less than 1.5mm mesially and distally. B, C: On the upper premolars, this distance is inadequate. D: On the lower anterior teeth, the distance between the alveolar crest and the CEJ is more than 1.5 mm but less than this threshold on the right and left premolars



Figure 5: Scaling and gingival curettage after the lower bracket debonding



Figure 6: 10 days after the scaling and the oral hygiene instructions

During the periodontal re-evaluation, the inflammation has decreased especially on the lower anterior teeth but the oral hygiene could be improved (Fig. 6). Therefore, we insisted on a good and consistent brushing technique and we set the surgery appointment for the week later.

Surgical steps

Lower arch treatment

Firstly, local anesthesia (articaine 2% with epinephrine 1:100,000) was administered in the vestibular mucosa from mandibular right second premolar to mandibular left second premolar. Secondly, concerning the anterior teeth, a gingivectomy was performed: internal bevel incisions were done on

the labial side only, using a surgical blade #15C placed at a 45° angle to the tooth long axis. An intrasulcular incision followed and the gingival collar was removed with a Colombia curette (Fig. 7a). For the premolars, a mucoperiosteal flap was raised and the fibrous tissue has been curetted after the gingivectomy. An osteotomy was then performed and the bone resection was done with an end-cut bur to create 2 to 3 mm space between the CEJ and the bone crest followed by an osteoplasty using a medium granulation diamond ball bur and a fine granulation one near the roots to eliminate interproximal bone, under copious saline irrigation (Fig. 7b). Finally, the flap was repositioned with simple sutures using

absorbable monofilament 5/0 sutures (Fig. 7c). The sutures were removed 2 weeks later (Fig. 7d).

Upper arch treatment

An esthetic crown lengthening was done following the same steps as for the lower premolars and a frenectomy was performed to enhance the results, given the low position of the labial frenulum (Fig. 8 a to e).

Post-operative treatment

600 mg ibuprofen at the rate of one tablet every 6 hours and as needed.

Chlorhexidine mouthwash 24 hours after surgery, 3 times a day for 1 week.

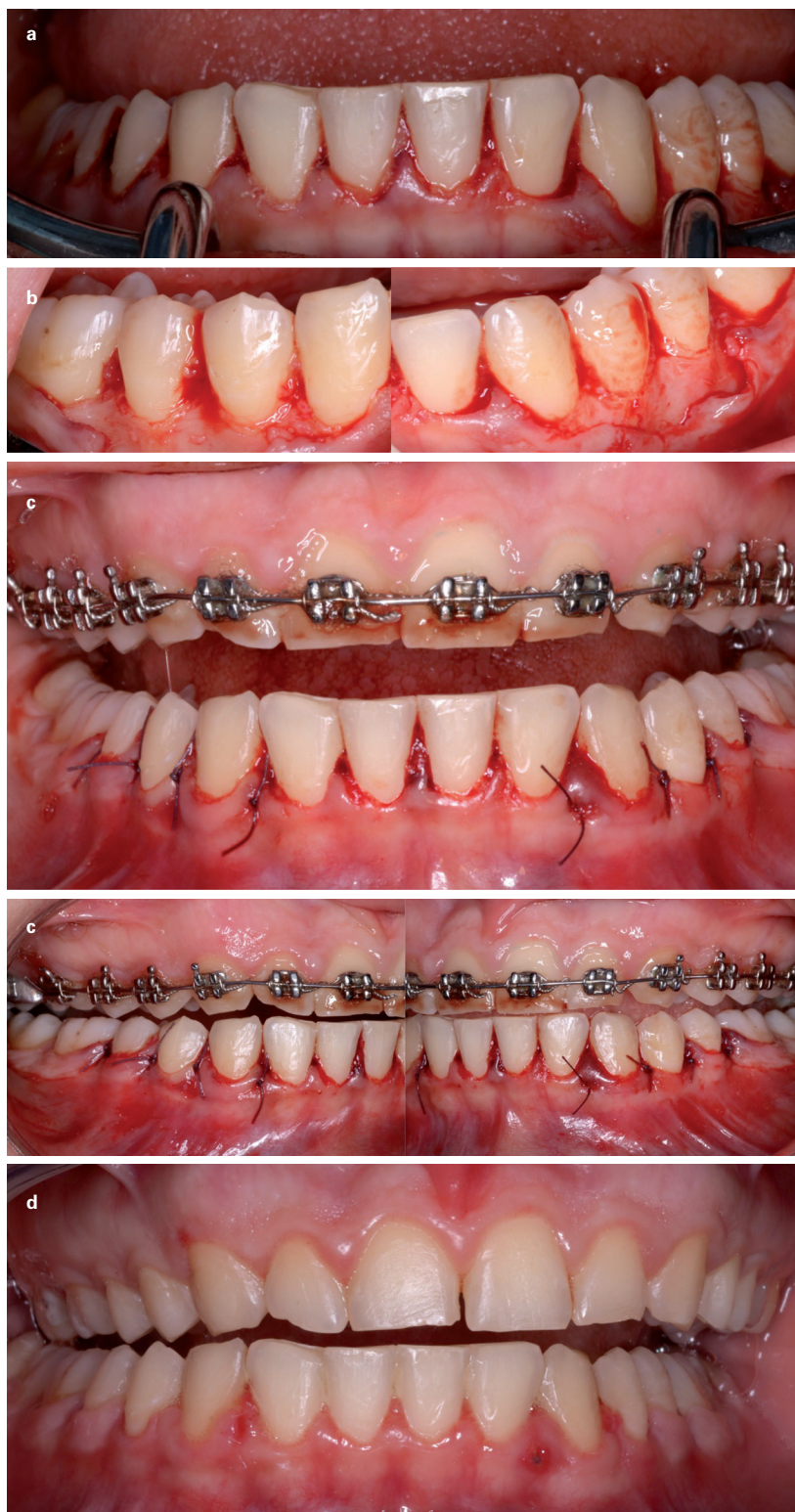


Figure 7 : Gingivectomy and crown lengthening on the lower arch:

- (a) : Gingivectomy on the anterior teeth
- (b) : Osteotomy and osteoplasty on the premolars
- (c) : Results after suturing
- (d) : Results upon suture removal (2 weeks later)

No brushing during the first week following the surgery.

Application of an ice pack for 4 to 5 hours after the surgery with a 10 min alternation of application and 15 min of non-application.

It is forbidden to come into contact with any heat source during the 24 hours that

follow the surgery.

A soft and cold diet is recommended on the day of the surgery and the soft diet is continued for the next few days.

Follow-up

The patient was recalled weekly for the first month, but showed one time 2 months after the surgeries (Fig.9).

Discussion

This clinical case is a typical case of an altered passive eruption associated with an altered active eruption classified as type I according to Coslet et al. [7] (the attached gingiva is located coronary to the CEJ, a broad band of keratinized gingiva extends apically beyond the alveolar crest while the muco-gingival line is apical to it) and subtype B (the alveolar crest is coronary or coincides with the CEJ); and type I subtype A for the lower anterior teeth. The classification of Coslet and al. is the most adopted in the literature. However, several biological principles such as the association with the altered active eruption (AAE) have not been mentioned, so a modified classification has emerged to thereby provide a guide to the diagnosis and planning of a surgical treatment. Thus, according to Zangrando et al. (6) a “gummy smile” contributes to esthetic problems and is caused by several factors such as vertical maxillary growth, dentoalveolar extrusion, short upper lip, upper lip hyperactivity, altered passive eruption (APE this case is classified as APE-I-AAE and APE-I for the lower anterior teeth. Indeed, an adequate clinical examination is necessary to make the correct diagnosis. Several esthetic alterations occur

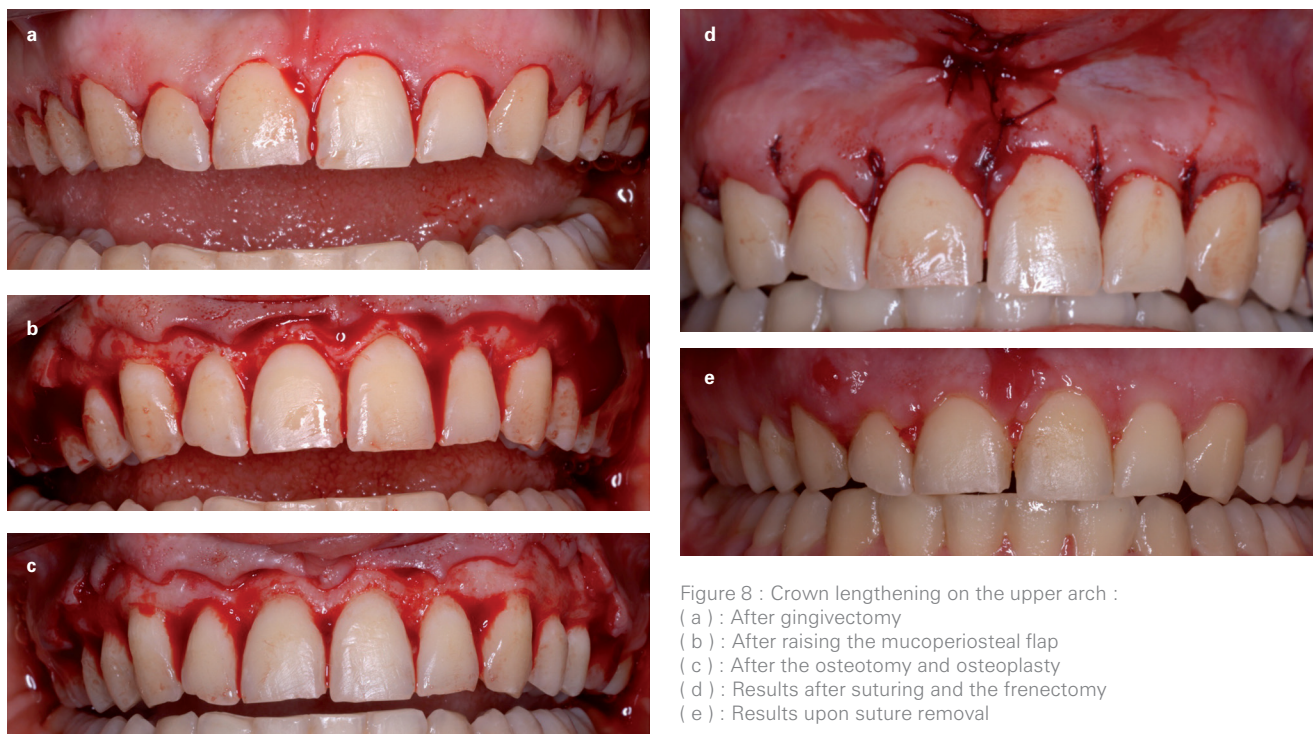


Figure 8 : Crown lengthening on the upper arch :
 (a) : After gingivectomy
 (b) : After raising the mucoperiosteal flap
 (c) : After the osteotomy and osteoplasty
 (d) : Results after suturing and the frenectomy
 (e) : Results upon suture removal

following an APE such as the square aspect of the crowns, the exposure of a band of smile keratinized gingiva and flattened gingival scallops. Although these factors are typical of the APE, they can also be manifestations of other pathologies involving different etiologies and treatments, hence the importance of periodontal probing. It is imperative to locate the CEJ with the periodontal probe: if it is in its physiological position in the sulcus, the APE is excluded from diagnosis. However, establishing the position of the CEJ through probing is not easy with a case of APE because the gingiva is firmly attached with a junctional epithelium all along the enamel. In addition, the alveolar crest is coronary or coincides with the CEJ which prevents its detection. Therefore, to distinguish between subtypes A and B the traditional technique turns out to be the technique of bone probing under anesthesia. If the CEJ could be detected by the probe then it is a subtype A and if the probe reaches the bone crest without passing through the CEJ it is a subtype B. However, this technique is rarely

applicable because by probing, we cannot be sure if we are on the bony crest or on the CEJ. Thus, the distinction between subtypes A and B cannot be done only after opening a flap [8]. In addition, two factors are added to the diagnosis, which are the presence of interproximal bony balconies and pseudo-pockets with increased pocket depth despite the absence of attachment loss, which is the result of an enlarged gum [3].

On the other hand, retro-alveolar x-rays make a useful contribution to our diagnosis: if a considerable difference ($\geq 3\text{mm}$) is detected between the height of the clinical crown and the radiological crown an altered passive eruption is confirmed [3].

Recent advances in imaging have resulted in a marked improvement in image resolution allowing periodontal analysis of hard and soft tissues. Particularly in the case of APE, CBCT allowed an accurate diagnosis of the reduced distance between the CEJ and the marginal gingiva as well as a precise determination of the height of the anatomical crown, a key reference

for surgical treatment. It has been demonstrated by Batista et al. in 2012 [9] that the periodontal parameters measured on CBCT are more relevant and precise than the conventional method.

After establishing the correct diagnosis, the surgical treatment must be adapted to the type of APE after performing an adequate scaling to eliminate gingival inflammation and pseudo-pockets. Indeed, in the case of APE-I (keratinized gingiva $> 2\text{mm}$; distance CEJ-alveolar ridge = 1.5mm) according to the modified classification, a gingivectomy and a gingivoplasty may be indicated because there is no alteration in the distance CEJ-bone crest, so a flap is unnecessary (lower anterior teeth in our case). Moreover, the apically positioned flap without osteotomy but with osteoplasty only, is indicated in the case of APE-II (keratinized gingiva $\leq 2\text{mm}$; JEC-alveolar ridge distance = 1.5mm) according to the modified classification. In this case, intra-sulcular incisions are made and inter-proximal bony balconies are eliminated and inter-dental



Figure 9 : Follow-up (2 months)

concavities are created which allow the repositioning of the papillae at the end of surgery and cause postoperative relaxation of the upper lip called “lip dropping” by Ribeiro et al. [10]. Finally, an osteotomy is used in case the APE is accompanied by an altered active eruption, in other words, in the case of APE-I-AAE (keratinized gingiva > 2mm; insufficient CEJ-alveolar ridge distance) and APE-II-AAE (keratinized gingiva ≤ 2mm; insufficient CEJ-alveolar ridge distance).

Unlike the conventional surgical technique, the Er: YAG laser is a less invasive technique used in cases of crown lengthening. In fact, it does not require an apically repositioned flap, neither suture and it reduces working time and bleeding. However, the application of the Er: YAG laser should be done with caution due to the drawbacks and potential thermal effects such as necrosis and charring [11]. Despite the multiple benefits of laser in periodontology cited in the literature, a study by McGuire and Scheyer [12] explains the risks involved in its use. Several patients suffered from postoperative damage after having undergone laser crown lengthening: either bony defects, or the persistence of certain bony tissue causing irregularities that can lead to the violation of the biological space, or damages to the roots during bone resection.

Conclusion

The surgical treatment of the altered passive eruption is primarily indicated to improve the gummy smile but also to reduce the difficulty in controlling plaque by the patient due to short clinical crowns and pseudo-pockets. Each type of APE has its own treatment, depending on the quantity of keratinized gingiva and the distance between the CEJ and the bony crest. However, whatever the technique adopted, compliance with the surgical steps and periodontal parameters is essential in order to have a good arrangement of soft and hard tissues and finally to have an esthetic result that follows the standards of a healthy periodontium.

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