

# POST-ORTHODONTIC PERIODONTAL SURGERY IN THE MANAGEMENT OF EXCESSIVE GINGIVAL DISPLAY. A REVIEW AND CASE REPORTS

Tariq Ali khan<sup>1</sup>, Safia Rehmat<sup>1</sup>, Hussam<sup>1</sup>, Zeeshan Danish<sup>1</sup>, Muhammad Naveed<sup>1</sup>,  
Jamil Orakzai<sup>1</sup>

<sup>1</sup>Department of Periodontology Khyber College of Dentistry, Peshawar

## ABSTRACT

**Objective:** The purpose of this study is to discuss altered passive eruption as one of the etiological factors of Excessive gingival display, its diagnosis, and the periodontal surgical approach to treat Excessive gingival display after orthodontic treatment.

**Materials and Methods:** We present a case series of 10 patients reported to the Department of Periodontology, Khyber College of Dentistry during the year 2018 and 2019. The chief complaint of an excessive gingival display during a smile. Most of them were found with short clinical crowns, fibrotic gums, thick and flat biotype in maxillary and mandibular segments. The diagnoses were made based on classification given by Coslet et al. Periodontal surgical Flap procedure were performed, including osseous recontouring. All of these cases were treated under Local Anaesthesia.

**Results:** The 6 to 12 months follow up of these patients showed excellent color and contour of the gingiva. Healing was uneventful in the follow-up visits.

**Conclusion:** Correction of an excessive gingival display with esthetic mucogingival procedure gives esthetic and cosmetic benefits. Conventional surgical procedure using surgical blades was used as it is known to be an excellent tool as compared to other electrosurgical procedures in terms of patient and operator comfort.

**Keywords:** excessive gingival display, altered passive eruption, crown lengthening, biological width

## INTRODUCTION

An esthetically pleasing smile is a demand of every patient undergoing orthodontic treatment with esthetic concerns. Previously dental esthetics was perceived by public and dental professionals as mainly related to the alignment of teeth. Still, now pink esthetics is of paramount importance in the overall restoration of an ideal smile.<sup>1</sup> Assessment of the amount of gingival display in the esthetic zone is crucial for smile esthetics. The American Academy of Periodontology has recognized the excessive gingival display as a Mucogingival deformity and condition around teeth.<sup>2</sup>

The excessive gingival display is classified as Mucogingival deformity that occurred around teeth. It is widely accepted that a gingival display of more than 3 mm is esthetically unacceptable, but this concept may vary regarding social, cultural, and ethical considerations.

A gummy smile can be skeletal, dentoalveolar, dental-gingival, and neuro-muscular origins or a combination of these; therefore, accurate diagnosis and, accordingly, a treatment plan for an inter-disciplinary approach based on multi-factorial etiology is crucial for functionally and esthetically successful outcome.

This paper aims to discuss altered passive eruption as one of the etiological factors of EGD, its diagnosis, and the periodontal surgical approach to treat EGD after orthodontic treatment

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### Correspondence:

**Dr. Tariq Ali Khan**

Associate Professor Department of Periodontology  
Khyber College of Dentistry, Peshawar  
Email: tariqalikhan80@hotmail.com  
Contact: +92-341-388889

### Altered Passive Eruption Diagnosis And Classifications

According to Glossary of Periodontal Terms of the American Academy of Periodontology, Passive eruption is defined as:” tooth exposure secondary to apical migration of a gingival margin to a location at or slightly coronal to Cementoenamel junction”.<sup>3</sup> Active dental eruption is defined as the movement of a tooth from its site of development within the alveolar process to its functional position in the oral cavity.<sup>4</sup> Gottlieb and Orban<sup>5</sup> classified passive eruption into four phases believing it to be a normal physiological process of tooth eruption; however, it is now generally accepted that stage four is a pathological process. The passive eruption is a biological process in which dental-gingival junction shifts apically. It occurs after an active eruption and may continue throughout the teenage years.<sup>6</sup>

APE is a clinical condition in which the gingiva in an adult is located incisal to the cervical convexity of the crown and removed from the cementoenamel junction(CEJ) of a tooth.<sup>7</sup> Till date, there is no clear evidence on the mechanism that leads to APE, but few studies suggest it be associated with morphology adopted by the coronal periodontium. Coslet et al.<sup>8</sup> classified altered passive eruption into two types based on the location of the mucogingival junction to alveolar bone crest, and further classified into two main subgroups based on the position of the alveolar bone crest to the cementoenamel junction.

CLASSIFICATION	DESCRIPTION
TypeI-subgroup A	MGJ apical to alveolar crest resulting in a wide band of KT Osseous crest $\geq$ 2mm from CEJ
Type I- subgroup B	MGJ apical to alveolar crest resulting in a wide band of KT Osseous crest $\leq$ 2mm from CEJ
Typell- subgroup A	MGJ coronal to osseous crest resulting in an inadequate band of KT Osseous crest $\geq$ 2mm from CEJ
Typell- subgroup B	MGJ coronal to osseous crest resulting in an inadequate band of KT Osseous crest $\leq$ 2mm from CEJ

The position of the alveolar bone adjacent to the cement-enamel junction could interfere with the apical migration of the gingival margin in the passive eruption phase proposed by some authors.<sup>9</sup> According to this hypothesis, failure of the passive eruption phase causing excessive gingival overlap on anatomic crown results in Type I altered eruption, whereas in Type II altered passive eruption, failure of the active eruption phase resulting in the tooth not emerging enough from alveolar Bone thereby leaving cementoenamel junction covered by alveolar Bone. This situation may, in turn, prevent apical migration of gingival during the passive eruption phase.

Recently a modified classification is proposed.<sup>10</sup> The new classification emphasizes that the authors of the previous classification did not describe an important event that is an altered active eruption process that results in the proximity of alveolar Bone to CEJ. This modified classification preserved APE type I and typell according to the amount of keratinized gingiva, but inserted values to facilitate diagnosis(Typel $>$ 2mm keratinized tissue, Type II $<$ 2mm). Another modification is excluding subgroups A, B, and inclusion of categories APE alone or APE associated with AAE.

Several factors have been proposed that can cause Altered passive eruption. These include occlusal interference by soft tissues during the eruptive phase, genetic cause, thick and fibrotic gums, presence of thick Bone possibly preventing apical migration of gingival, orthodontic trauma, and endocrine conditions.<sup>11</sup>

Some authors have reported that after orthodontic treatment, a “gummy smile” may develop. Still, a single cross-sectional study to investigate it concluded that the prevalence of APE is higher after orthodontic treatment but not statistically significant, and APE is more common in an individual with thick-flat gingival biotype.<sup>12</sup>

### Diagnosis And Surgical Approach For Ape

The patient’s extra-oral examination includes evaluation of facial symmetry and height, lip, and smile. The patient is observed at rest and with a natural smile. The length of the lip at rest from the nose base to the wet border of the maxillary lip is measured. Upper lip length normally is 20-22mm in females and 22-24 mm in males. If the values are

less than the normal range, the diagnosis of the anatomical short lip is made. The maxillary lip length at rest is measured and then on a full smile. If the lip translates more than 6-9 mm in range, then the diagnosis of the hyper-mobile lip is made. Hyper-mobility of lip is due to the hyper-function of lip levator muscles. The prevalence of hypermobile lip is reported to be high in inpatient seeking treatment for gummy smile.<sup>13</sup> Injection of botulinum toxin type A provides benefits for a temporary period. The mucosal coronally repositioned flap has been reported in the literature to give stable result to prolong period.<sup>14</sup>

Vertical maxillary excess is another etiological factor for gummy smile.<sup>15</sup> The amount usually makes the diagnosis of the gingival display, anterior face height values, and cephalometric analysis. In the intra-oral examination, assessment of clinical crown length and width is made clinically with a caliper. Anatomical crown length can be done by trans-gingival probing under anesthesia, peri-apical x-ray to assess CEJ, and more accurately through CBCT to rule out short clinical crowns incisal wear.

Bone sounding or trans-gingival probing done under local anesthesia is a traditional technique to assess the distance of alveolar Bone from the gingival margin. IF the alveolar Bone is detected with CEJ 1.5 to 2 mm short of CEJ, then the diagnosis of APE subgroup A is made. But if the Bone is close to CEJ or overlaps without CEJ being detected, the diagnosis of subgroup B is made as such a case needs osseous correction to allow the space for biological width to re-establish.<sup>16</sup> The most accurate diagnosis is, however, made after flap elevation as most of the cases need osseous correction not only in height but also to reduce the bony prominence mostly seen in patients with thick flat periodontal biotypes.

These case reports relate a patient with APE treated with periodontal flap crown lengthening.

### CASE REPORT 1

A 24-year-old female was referred from the orthodontics department for correction of a gummy smile.

Initial extra-oral and intra-oral examination revealed a slightly short upper lip with short clinical crowns. Periapical were taken to assess the CEJ and bone levels. After the evaluation of the periodontal and esthetic aspect, the diagnosis of APE was estab-

lished. Surgery was performed under LA followed by bone sounding indicating osseous crest in proximity to CEJ revealing class I subgroup B. Bleeding points in accordance with desired clinical crown length were made. Sub-marginal papilla sparing incisions are given, followed by a full-thickness flap.<sup>17</sup> Extensive osseous resection was done, keeping the alveolar crest 1.5mm away from CEJ and reducing thick bony overgrowth. Flap repositioned at the bone level, and vertical mattress suture is given.<sup>11</sup>



Fig 1: Baseline intra-oral view of patient



Fig 2: sub-marginal incision given



Fig 3: Full-thickness Flap elevation showing side

**CASE REPORT 2**

A 22-year-old female patient referred from the orthodontic department for correction of a gummy smile. Extra-oral and intra-oral examination revealed short clinical crowns, fibrotic gums, thick and flat biotype in maxillary and mandibular segments. Surgery was planned in two visits. Maxillary arch crown lengthening was done from tooth 15 to 25. After LA bone sounding followed by gingival incisions in accordance with desired clinical crown lengths. The full-thickness flap elevated, and the gingival collar was removed with curettes. Mild osseous resection and contouring were done to create positive architecture. The flap was repositioned at the bone level, and vertical mattress and few interrupted sutures were given. After three weeks of healing mandibular crown lengthening was done by gingivectomy followed by flap elevation and very mild bone contouring and flap repositioned with interrupted sutures.



**Fig 4: Osseous Resection is done on the Right Class I subgroup B of APE**



**Fig 5: 4 Weeks post-surgical intra-oral view**



**Fig 5: 4 Weeks post-surgical intra-oral view**



**Fig 6: 1.5 Years Follow up of Patient**



**Fig 1: Pre-operative intra-oral view of patient**



**Fig 2: 2 Weeks Post-Surgical Intra Oral View**



Fig 3: 2 Weeks Post-Operative view of Mandibular arch



Fig 4: 1.5 Years Post-Surgical Intra Oral View

## DISCUSSION

Diagnosis of altered passive eruption needs thorough extra-oral and intra-oral examination to exclude the possibility of any other etiological factor of Excessive gingival display. The patient is observed in repose and smiling naturally—lip length at rest and on smiling measured. Location and detection of CEJ are very important. If the CEJ is located in a normal position from the gingival margin, then short teeth are due to incisal wear or variation of normal anatomy. A periodontist also evaluates the periodontal condition, gingival phenotype, gingival outline, and zenith and interdental papilla while planning surgical procedures with high esthetic demands. Periapical radiographs and, most precisely, CBCT provides good details of adequate root length and bony support, location of CEJ, and proximity of osseous crest to CEJ.<sup>18</sup>

The majority of the cases with APE needs mucoperiosteal flap elevation<sup>9</sup> to get access to the alveolar bone, need for osseous reduction and contouring, creating positive bony architecture, and need for apical repositioning of the flap to increase keratinized tissue width if inadequate as periodontal surgical management of APE demands high esthetic

outcome. The biology of periodontal tissue needs to be respected, leaving space for biological width to re-establish while performing crown lengthening surgery. Creating a zone for biological width is of paramount importance for healthy periodontal support and stable surgical outcome.<sup>19</sup>

The periodontal surgeries for APE performed at the Periodontology department KCD are planned, taking into account all extra-oral and intra-oral findings, diagnostic radiographs, thorough periodontal evaluation, Bone sounding at the start of surgery, and selection of appropriate surgical and suturing technique.

Lack of awareness regarding the effect of these surgical procedures in improving the over-all esthetics of a patient, non-compliance in oral hygiene maintenance, and regular recall visits limits the number of esthetic crown lengthening procedures periodontology department.

Patients with excessive gingival display need a multidisciplinary approach<sup>20</sup> as multiple etiological factors might be present in a patient that needs orthodontic, Periodontal, and Restorative treatment as well. So a well-designed treatment plan and referral for appropriate treatment needs to be done, such patients.

## CONCLUSION

Correct diagnosis of APE as an etiological factor for excessive gingival display and proper selection of preferred periodontal surgical technique not only fulfills the esthetic requirement of a patient but also ensures the healthy periodontal support provided patient is maintaining good oral hygiene measures. It also guarantees the long term stability of a surgical outcome.

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