Esthetic Management of Gummy Smile with Maxillary Bone Protuberance and Altered Passive Eruption of Teeth

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Abstract

Gummy smile and teeth with a short appearance are the typical presentation of altered passive eruption (APE) which can lead to the impairment of esthetic appearance. This case report will discuss the esthetic surgical management of APE associated with short clinical crowns and prominent maxillary bone protuberance. Crown lengthening surgery with osseous contouring of the maxillary anterior teeth region was carried out to expose the ideal clinical crown height and to reduce the thickness of the bony protuberance to improve the gummy smile. Following good oral hygiene practices and periodical review, the outcome of the crown lengthening procedure was esthetically remarkable.

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Introduction

The presence of gummy smile and teeth with a short appearance are typical presentations of altered passive eruption (APE). It has been established that five clinical situations can result in a gingival smile: short upper lip, hypermobile upper lip, dentoalveolar upper extrusion, excessive upper jaw growth and APE.[1,2] In 1968, Goldman and Cohen defined APE as the situation in which "the gingival margin in the adult is located incisal to the cervical convexity of the crown and removed from the cementoenamel junction of the tooth".[3]

To date, the occurrence of APE in the adult population has been little studied due to a lack of specific diagnostic criteria.[4] Volchansky and Cleaton-Jones reported a 12.1% incidence of APE in 1025 patients with a mean age of 24.2 ± 6.2 years.[5] The most significant relevance of an APE case is its esthetic consequences. In relation to smile esthetics, the critical consideration is the relationship of the gingival margins to the edge of the upper lip.[6] However, there are limited resources reporting the management of gummy smile associated with APE and thick maxillary alveolar bone. Therefore, this case report is presented to demonstrate esthetic crown lengthening surgery for the management of gummy smile in massive maxillary bone protuberance and APE.

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Case Report

Mr. AA, a 31-year-old healthy male patient, was referred to the Periodontic Clinic, Universiti Kebangsaan Malaysia for the management of his bulky gingiva and short upper anterior teeth that led to an unesthetic appearance and gummy smile (Figure 1).

Figure 1. Baseline. Note the generalized erythematous and rolled marginal gingiva with

blunted interdental papillae and short clinical crowns of the maxillary anterior teeth.

Intraorally, the maxillary anterior crowns appeared short and squarish in shape with prominent bony protuberance. The oral hygiene was unsatisfactory, and the gingiva appeared to be erythematous with bleeding on probing. Intraoral periapical radiographs showed no alveolar bone defect, with the level of the alveolar bone crest at approximately 1–2 mm from the cementoenamel junction (CEJ) (Figure 2). Mr. AA was diagnosed with APE and dental biofilm-induced generalized gingivitis.

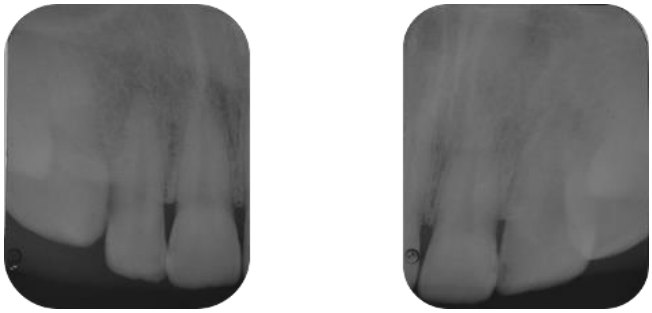
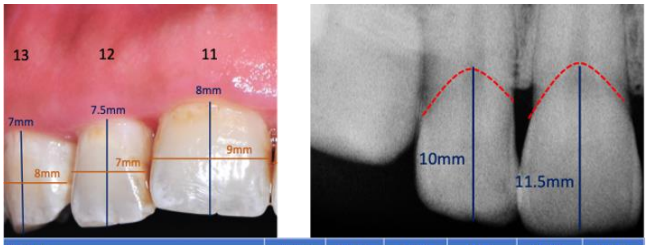


Figure 2. Intraoral periapical radiograph investigation. Note the level of the alveolar bone crest approximately 1–2 mm from the cementoenamel junction (CEJ).

Figure 3. After initial treatment. Note the remarkable improvement of the gingival health.

The objectives of the treatment were to attain healthy periodontal health status, increase the height of the clinical crowns of the maxillary anterior teeth and to reduce the thickness of the maxillary labial bone for a better esthetic smile appearance. Non-surgical periodontal therapy (NSPT) including oral hygiene instruction and motivation was successfully carried out to reduce inflammation and bacterial load, and to enhance the patient's motivation to achieve optimum plaque control.

Figure 4. Gummy smile appearance during wide smiling.



Tooth	UR3	UR2	UR1	UL1	UL2	UL3
Crown width (mm)	8	7	9	9	7	8
Clinical crown height (mm)	7	7.5	8	9	8	7
Radiographic/actual crown height (mm)		10	11.5	11.5	10	
Difference (mm)		2.5	3.5	2.5	2	

Figure 5. Presurgical measurement. Actual crown height was confirmed by periapical radiograph.

Tooth	UR3	UR2	UR1	UL1	UL2	UL3
Width (mm)	8	7	9	9	7	8
Clinical height (mm)	7	7.5	8	9	8	7
New clinical crown height (H = W x 1.25)	11.2	10.2	10.2	11.2	10.2	11.2
Difference (mm)	4.2	2.7	2.2	2.2	2.2	4.2

Figure 6. Preoperative measurement. The new clinical crown heights (H) were determined by a crown width (W) to crown height ratio equal to 1:1.25 [5].

After stabilizing the periodontal health (Figures 3 and 4), comprehensive treatment with crown lengthening surgery was planned to expose the ideal clinical crowns and improve the patient's gummy smile.[7] The new ideal clinical crown heights were carefully planned to make sure they would not violate the supracrestal

attachment tissue width, which was measured as 2.04 mm.[8] The keratinized tissue width of 5 mm was observed to ensure it was adequate for the gingivectomy procedure and able to provide the patient's comfort during brushing in the future. Periapical radiograph was used to investigate the actual crown heights and the distance from the CEJ to the alveolar bone crest (ABC) level. It showed that the remaining subgingival crown heights of the maxillary anterior teeth that could be exposed were in the range of 2–4 mm (Figure 5). The new clinical crown heights, esthetically proportionate in size and shape, were decided by using a crown width (W) to crown height (H) ratio equal to 1:1.25 as proposed by Sterrett et al. (Figure 6).[9] The outline of the new clinical crown heights was finalized and transferred to the diagnostic cast to be used as a reference for construction of the surgical guide (Figure 7).

Figure 7. Marking of the new clinical crown heights of upper anterior teeth to simulate the desired outline gingival level tooth form on the diagnostic cast.

Figure 8. Placement of surgical guide.

Crown lengthening surgery with osseous contouring of the maxillary anterior teeth region proceeded according to the prepared surgical procedure and diagnostic outline of the new clinical crown heights. The constructed surgical guide was fitted over the existing dentition as guidance to mark the bleeding points and draw the outline before initial incision (Figure 8).

Figure 9. Marking of the apical extent of the new gingival margin.

Figure 10. Registering the new gingival level.

Figure 11. Excision and removal of gingival soft tissues.

The height of the marginal gingiva which needed to be removed from maxillary right to left canine was marked with a no. 9 probe (Figures 9 and 10). Incision of the gingival tissue was then carried out following the marked bleeding points

using a no. 15c surgical blade. An intrasulcular incision was made subsequently at the buccal site from the mesial of maxillary right second premolar extending to the mesial of maxillary left second premolar to facilitate adequate exposure of the thick maxillary bone when raising the flap. The palatal gingiva and papillae were preserved to ease coronal repositioning of the interdental tissues during flap closure. After the incision of marginal and intrasulcular tissues, the unwanted gingiva was excised with Prichard's curette (Figure 11) and a full-thickness mucoperiosteal flap was raised with a Buser periodontal tissue elevator.

Figure 12. Full mucoperiosteal flap raised. Thick labial bone was observed.

Figure 13. Osseous contouring on reduction of alveolar bone crest height and labial bone thickness.

Thick maxillary labial bone and a high crestal bone height level was noted, encroaching coronal to the CEJ of the incisors, which was associated with the diagnostic criteria of APE (Figure 12).[3] Osseous contouring of the crestal bone ledge and thick labial bone was performed using tungsten carbide surgical burs under copious saline irrigation to reduce the bone thickness by about 1–2 mm. After that, alveolectomy of the ABC was carried out and a new distance of approximately 3 mm was established from the new ABC to the CEJ of teeth 13 to 23 (Figure 13). The remaining tissue remnants attached to the crowns or root surfaces were removed with a Gracey curette to prevent creeping of the gingival margin that can cause relapse of the gummy smile in the future. Finally, the interdental bone was contoured following the alveolar bone vertical grooves and completed by gingivoplasty of the thick interdental papilla tissues to establish a harmonious anatomy of maxillary bone and gingiva.

The bleeding was controlled, and the flap was approximated and secured by primary closure with a simple interrupted suture (VICRYL® 5-0, Ethicon) (Figures 14 and 15). Two-week postoperative review showed the surgical site tissues healed uneventfully without any complication (Figure 16). The patient was further reviewed under professional oral hygiene maintenance care once every 2 weeks for 1 month.

Figure 14. Gingivoplasty at the inner part of thick keratinized gingiva and interdental tissues.

Figure 15. Flap approximated with simple interrupted suture.

At 6 months follow-up, the outcome of the crown lengthening procedure was esthetically remarkable (Figure 17). It showed a good

gingival and alveolar bone contour with the ideal crown height of the maxillary anterior teeth (Figure 18). Mr. AA was able to maintain a good oral hygiene practice and is currently under 6-monthly review. He was very happy with the result and felt more confidence when speaking and smiling.

Figure 16. Postoperative review after 2 weeks.

Figure 17. Postoperative review at 6 months.

Figure 18. Wide smile during postoperative review at 6 months. Note the remarkable improvement of the gingival health with normal scalloped gingival margin and esthetic appearance of the maxillary anterior teeth.

Discussion

In the present case, Mr. AA was concerned about the appearance of short crowns on his upper anterior teeth and unusual bulky gingiva. The presence of gummy smile and teeth with a short appearance are typical presentations of APE.[10] The novelty of this case report is the method of the initial investigation and treatment planning to provide predictable outcomes after the crown lengthening surgery on short clinical crown of APE teeth associated with unusual protuberance of maxillary alveolar bone. We described and discussed the steps performed at before, during and after the surgical procedure. The method for determining the new clinical crown height has been defined by most authors as a height/width ratio of 0.80 (height = width × 1.25) for the upper central incisor (which represents the key tooth for esthetical composition of the smile). This is used as a standard in prosthodontics, periodontics and orthodontics.[9,11] Therefore, on establishing ideal widths based on intact teeth, it is suggested to use the proportion of 80 ± 5% to define the ideal height, relating to the facial pattern and to the individual's natural dental proportions. Besides that, the relation of proportion between the crown heights of anterior teeth proposed by Gillen et al. (1994) suggest that the height of the clinical crown of the upper lateral incisor must be 82% of the height of the crowns of the central incisor and canine.[12] Therefore, canines and upper central incisors would have the same anatomical crown height.

Prior to a crown lengthening procedure, the whole periodontal condition and oral hygiene status were carefully evaluated and managed. Esthetic crown lengthening requires gingivectomy procedures to expose the additional tooth structure needed; therefore, a minimum of 2 to 5 mm of keratinized tissue is necessary to ensure gingival health.[13] Moreover, management of the papilla is another critical aspect of the surgery to avoid the emergence of black triangles. The palatal papilla should be preserved, and the interproximal bone should be carefully contoured in order to maintain the anatomic structures of both soft and hard tissues so that the interproximal tissues are allowed to proliferate coronally. The papilla should be present when the distance from the bone crest to the base of the contact area is about 5 mm or less.[14] Any smaller residual interproximal space can be eliminated by apically positioning the contact area of the definitive restoration.[14] In the

osseous contouring at the crestal bone in this case, 3 mm was removed by measurement from the crest to the CEJ. This should result in approximately 1 mm of connective tissue attachment, 1 mm of junctional epithelium and 1 mm of sulcus depth.[15] Failure to respect the integrity of the dentogingival junction is likely to result in chronic inflammation and subsequent attachment loss, which will have adverse esthetic consequences. The thickness of the maxillary labial bone was reduced approximately 1-2 mm and contoured following the natural anatomy of the attached gingiva to give better esthetic and reduce the appearance of gummy smile.

During postoperative review, the patient's oral hygiene was maintained once every 2 weeks by professional supportive periodontal therapy. Good oral hygiene and healthy gingival status are very important to prevent relapse of the height of the marginal gingiva and clinical crowns.

Conclusions

Crown lengthening surgery is a viable option to improve the esthetic appearance of gummy smile in APE. However, the periodontal status of the patient and their oral hygiene practices should be at an optimum level prior to crown lengthening surgical procedures. Furthermore, a comprehensive diagnosis and treatment planning are necessary to deliver the patient's esthetic needs and for long-term successful outcomes.

Declaration of Interest

The authors declare no financial interest in companies whose materials are included in this article.

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