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### Surgical lengthening of the clinical crown a prosthodontic concept- Case report

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#### Abstract

An adequate understanding of the relationship between periodontal tissues and restorative dentistry is paramount to ensure adequate form, function, esthetics, and comfort of the dentition. While most clinicians are aware of this important relationship, uncertainty remains regarding specific concepts such as the biologic width and indications and applications for surgical crown lengthening. This case discusses the concept of the biologic width and its relationship to periodontal health and restorative dentistry. The importance of restorative margin location, materials, and contours related to periodontal health is also addressed. The rationale and indications for surgical crown lengthening are elaborated. Particular surgical principles of crown lengthening are examined in detail.

**Keywords:** crown lengthening, gingival biological width, periosurgery, porcelain fused to metal crown (PFM).

#### Introduction

The appearance of the gingival tissues surrounding the teeth plays an important role in the esthetics of the anterior maxillary region of the mouth. Abnormalities in symmetry and contour can significantly affect the harmonious appearance of the natural or prosthetic dentition. As well nowadays, patients have a greater desire for more esthetic results which may influence treatment choice. An ideal anterior appearance necessitates healthy and inflammation-free periodontal tissues. Garguilo<sup>1</sup> described various components of the periodontium, giving mean dimensions of 1.07 mm for the connective tissue, 0.97 mm for the epithelial attachment and 0.69 mm for the sulcus depth. These measurements are known today as the biologic width. Ingber and others<sup>2</sup> observed that the presence of caries or restorations in close proximity to the alveolar crest may lead to inflammation and bone loss due to violation of the biologic width. Hence, they recommended that the restorative margin be a minimum of 3 mm coronal to the alveolar crest, suggesting that this margin could be achieved through a surgical intervention known as crown-lengthening surgery. Some authors have questioned the necessity of this procedure, suggesting that if the biologic width is invaded, the body can re-establish the necessary dimensions on its own over time.<sup>3</sup> However, it is generally accepted that crown-lengthening surgery helps to relocate the alveolar crest at a sufficient apical distance to allow room for adequate crown preparation and reattachment of the epithelium and connective tissue.<sup>4</sup> Furthermore, by altering the incisogingival length and mesiodistal width of the periodontal tissues in the anterior maxillary region, the crown lengthening procedure can build a harmonious appearance and improve the symmetry of the tissues. Good communication between the restoring dentist and the periodontist is important to achieve optimal results with crown-lengthening surgery, particularly in aesthetically demanding cases. In addition to establishing the smile line, the restoring dentist evaluates the anterior and posterior occlusal planes for harmony and balance, as well as the anterior and posterior gingival contours. This information allows the restoring dentist to determine the ideal incisogingival length and mesiodistal width of the anterior maxillary teeth. On the basis of these projections, the periodontist recontours and relocates the gingival margin and the alveolar crest to achieve both an aesthetically pleasing appearance and periodontal health. The following case report illustrates these concepts <sup>[1]</sup>.

**Clinical Report**

A 25-year-old female was self-referred to Al-Badar Rural Dental College and Hospital Gulbarga Karnataka, Department of Prosthodontics. The patient was concerned about the long term prognosis of her teeth and her chief complaints were Missing tooth in upper anterior region of jaw, poor esthetics and masticatory difficulty, Prior to treatment, a detailed dental, medical and social history was obtained. The patient was in good general health and the medical and dental histories were non-contributory. An extensive clinical examination was performed. Periodontal examination revealed good oral hygiene with minimal plaque and calculus deposits. The gingiva was pink and firm, and the papillae were intact. Clinical examination revealed shallow probing depths, no mobility and adequate amounts of keratinized attached gingiva. Review of the full mouth series revealed no significant findings. The crestal bone level was within normal limits, and the crown to root ratio was favourable. Occlusal analysis revealed, among other findings, an Angle's class I relationship, with 70% overbite and 2 mm of overjet. No signs of fremitus were observed. The patient had adequate anterior guidance upon protrusion and adequate group function upon lateral excursions

Clinical examination of the temporomandibular joints did not demonstrate any dysfunction. Ideally, the central incisors and canines are approximately equal in length and are usually 20% longer than the lateral incisors. The central incisors should be 25% wider than the lateral incisors and 10% wider than the canines. Furthermore, the length-to width ratio of individual teeth should be 1.2:1 for the canines and lateral incisors and 1.1:1 for the central incisors. The prosthetic treatment plan for the patient involved porcelain fused - to-metal (PFM), crowns for teeth 11, 21 and 22. After discussion with the restorative dentist, esthetic crown lengthening was recommended to allow a healthy, optimal relationship between the teeth and the periodontium. The restoring dentist then took alginate impressions. A wax-up of the anterior maxillary teeth was done to determine the incisogingival length, the mesiodistal width and the contour of the teeth that would lead to a pleasing appearance.



**Fig 1:** Close-up view of the anterior maxillary teeth before the surgery



**Fig 2:** Wax-up of the maxillary teeth. The dotted line represents the preoperative gingival margin.

Initial inverse bevel incision was performed so as to achieve the ideal contour on the anterior teeth. This incision is carried out in a parabolic manner, with the most apical point or gingival zenith for the central incisors located just distal to the tooth axis and the gingival zenith for the lateral incisors coinciding with the tooth axis.



**Fig 3:** surgical removal of marginal gingival i.r.t 21

The marginal gingival height for the maxillary central incisors is at approximately the same level as the height for the canines, whereas the marginal gingival height for the lateral incisor is slightly lower when the teeth are in an Angle's class I relationship. Care was taken to ensure that the incisions blended with the gingival contour of the posterior teeth. The papillae were raised in a split-thickness fashion, and this process was followed by creation of a full-thickness flap apically. Thus, the papillae were kept intact palatally to avoid tissue recession (fig 4)



**Fig 4:** 'C' shape marginal gingiva

The flap was apically repositioned and sutured with 5-0 Dexon suture. Chlorhexidine rinse 0.12% BID was prescribed for 2 weeks, and the patient was given appropriate postoperative instructions [2].



**Fig 6:** Marginal gingival of 21 after 2 week

Final preparation of the teeth done after three month later (**Fig 5**), since gingival recession can occur as long as 3 months after the surgery. Care was taken to ensure that the margins of the temporary crown were smooth and closely adapted to ensure gingival health.



**Fig 5:** Tooth prepared for PFM crown i.r.t 11 & 22

One millimetre of coronal dentin was achieved by the crown lengthening surgery on tooth 12 to allow for the ferrule effect. A ferrule is a band of cast metal encircling the external dimensions of the residual tooth. In a tooth with a crown, the walls of the crown form a ferrule, which encases the gingival 1 to 2 mm of the axial walls of the preparation above the crown margin; this is called the ferrule effect. Studies have shown that the ferrule effect significantly reduces the incidence of fracture in a nonvital tooth by reinforcing the tooth at its external surface.

Final insertion of the PFM crowns was performed 6 months after the crown-lengthening surgery. (**Fig 7**)



**Fig 7:** Final insertion of PFM crowns



**Fig 8:** PRE- OPERATIVE



**Fig 9:** POST- OPERATIVE

### Conclusion

Extension of the preparations subgingivally to attain better retention form may have adverse reactions in the periodontium and may compromise esthetics. In these cases, surgical enhancement of the clinical crown is generally necessary to provide a dimension of clinical crown that permits acceptable tooth preparation and fabrication of a restoration compatible with the surrounding supracrestal gingival tissues. The vertical dimension, centric relation, and occlusal plane must be determined first, followed by a diagnostic wax up which is essential for fixed prosthesis. The complications with the short clinical crown demand a circumspect treatment plan and proper sequencing of therapy to ensure an optimal result for both the patient and the clinician. Proper treatment sequencing is critical when a patient requires multiple fixed restorations in conjunction with a removable partial and complete denture. An accurate diagnostic and interdisciplinary approach is necessary for obtaining improved, conservative and predictable results in aesthetically.

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