



Surgical Management of Pink: White Ratio - A Case Series of 7 Cases

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Abstract

Crown lengthening procedures are an essential aspect of periodontal therapy in order to gain ideal restorative and aesthetic treatment outcomes. These are considered as the gold standard in treating insufficient clinical crown height, not only for addressing aesthetic concerns, but also to maintain a stable periodontium. These procedures are performed by gingivectomy, flap surgery or a combination of surgical and non-surgical modalities. This case series demonstrates the various clinical scenarios where crown lengthening is the treatment of choice. It also demonstrates the type of crown lengthening to be done in viz., adequate or a lack of biologic width and apically positioned or undisplaced flap.

Keywords: Biologic Width; Aesthetics; Apically Positioned Flap; Gingivectomy; Osseous Reduction

Introduction

Crown lengthening techniques have been proposed to raise the degree of supragingival tooth structure for cosmetic, restorative, and functional reasons. D.W Cohen [1] first proposed the concept of crown lengthening in 1962 and is now commonly performed by combining tissue reduction or removal, osseous surgery, and/or orthodontics for tooth exposure. The common causes of short clinical crown include caries, erosion, tooth malformation, fracture, attrition, excessive tooth reduction, eruption disharmony, exostosis, and genetic variation. Therefore, crown lengthening procedures are indicated when margins of caries or margins of the tooth fractures are subgingivally placed, the crown is too short for retention of the restoration, there is an excess of gingiva, and anatomical tooth crown is partially erupted. The ultimate goal of crown lengthening is to provide a tooth crown dimension adequate for a stable dentogingival complex and for the placement of a restorative margin, so as to achieve the best marginal seal and an aesthetically pleasing final restoration. In this case series, we have discussed crown lengthening as a procedure that meets both the functional and aesthetic needs of the patients [2]. The tooth number has been stated in FDI system of notation.

Case Report 1

A 34-year-old female patient reported to the Department of Periodontics, after being referred by the Department of Conser-

vative Dentistry and Endodontics, with a severely carious distal half of 13 (Figure 1a). Intraoral periapical radiograph of the tooth (Figure 1b) showed the caries extending beneath the gingival margin, rendering it inaccessible for restoration after undergoing root canal treatment. Hence, the patient was advised a crown lengthening procedure with respect to 13. The patient had no systemic history and we proceeded with an apically displaced flap without osseous reduction. After administering adequate local anaesthesia, a no.15 blade and Bard-Parker handle were used to place vertical releasing incisions at the distal line angles of 12 and 14. A full thickness mucoperiosteal flap was raised using a #P9 molt periosteal elevator (Osung USA), after giving sulcular incisions. After the flap was reflected, we observed that an adequate biologic width was present (Figure 1c), which needed no osseous reduction. The flap was then stabilized apically, by periosteal sutures. This method of suturing was necessary to maintain the apical position of the flap during the healing period. It was done by engaging the underlying periosteum along with the flap while taking the bite for suturing. Other incisions were approximated using simple interrupted (non-resorbable black braided multifilament) sutures (Figure 1d). The patient was given appropriate post-operative instructions and recalled after a week. The follow-up visits showed that there was enough accessibility. The Department of Endodontics followed it up with the restoration and patient was highly satisfied with her treatment outcome, more so because it was in the aesthetic region.



Figure 1a: Preoperative.



Figure 1b: Radiographic view.



Figure 1c: Intraoperative.



Figure 1d: Sutures placed.



Figure 2a: Preoperative.



Figure 2b: Radiographic view.



Figure 2c: Intraoperative.



Figure 2d: 2 weeks postoperative.



Figure 2e: Post composite build-up.

Case Report 2

A 23-year-old man reported with the chief complaint of broken lower front teeth (Figure 2a) due to blunt force trauma, 3 months earlier. He was referred to the Department of Periodontics for increasing the crown length for better restorability. Patient had a no systemic history. On clinical and radiographic examination (Figure 2b), we found that crown length and biologic width were inadequate with 31 and 41. An apically displaced flap with osseous reduction was planned following endodontic treatment. After administering local anaesthesia, vertical releasing incisions were given at the distal line angles of 32 and 42. Sulcular incisions were given to raise a full thickness flap. The flap was reflected and the area thoroughly debrided (Figure 2c). It was stabilized at an apical position, using periosteal sutures. Simple interrupted sutures were placed to approximate the incision lines (non-resorbable 3-0

mersilk suture). Patient was given post-operative instructions and called for follow-up after two weeks (Figure 2d). Subsequent visits showed excellent results and adequate crown height was achieved. The Department of Conservative Dentistry then performed a composite build-up to restore the teeth (Figure 2e).

Case Report 3

A 44-year-old male reported with pain in the second quadrant. On examination, that a large carious lesion was observed with 25. Patient was advised to endodontic treatment (Figure 3a) preceding crown lengthening procedure. With no medical history, the patient was appointed for surgery. Under local anaesthesia, a no.15 blade was used to place vertical incisions at mesio-buccal line angle of 24 and disto-buccal line angle of 26. A full thickness flap was reflected. Since biologic width was adequate, no osseous reduction was required (Figure 3b). After complete debridement, the flap was sutured apically using periosteal sutures (non-resorbable 4-0 mersilk suture). Post-operative healing was satisfactory (Figure 3c). The patient was then referred for preparation of a prosthesis.



Figure 3a: Preoperative.



Figure 3b: Intraoperative.



Figure 3c: 1 week postoperative.

Case Report 4

A 38-year-old man was referred with the chief complaint of insufficient crown length with 45 and 46 (Figure 4a). After evaluating the patient clinically and radiographically and obtaining no relevant medical history, the patient was advised to undergo crown lengthening procedure. At the time of the surgery, patient was administered local anaesthesia, vertical incisions were given at distal line angle of 44 and mesial line angle of 47. A full thickness flap was reflected (Figure 4b). Biologic width was compromised, which indicated osseous reduction. The flap was apically stabilized using periosteal sutures, and figure of 8 sutures to approximate the vertical and sulcular incisions (Figure 4c). Patient was instructed in post-operative care. Healing was satisfactory (Figure 4d) and patient proceeded with prosthetic treatment.

Case Report 5



Figure 4a: Preoperative.



Figure 4b: Intraoperative.



Figure 4c: Periosteal and simple interrupted sutures placed.



Figure 4d: 2 weeks post-operative

A 41-year-old woman was referred for a clinical crown lengthening procedure with 14. On examination, we observed that very little crown structure of the tooth 14 was visible (Figure 5a). As biologic width was also inadequate, an apically positioned flap with osseous reduction was advised. Patient had no relevant systemic history. The surgery was initiated by administering local anaesthesia after which vertical incisions were placed at distal line angle of 13 and mesial line angle of 15. After a full thickness flap was reflected, the flap was positioned apically and stabilized. Figure of 8 sutures (non-resorbable black braided silk) were placed along other incision lines (Figure 5b). Post-operative directions were given. Follow-up visits showed sufficient crown length for prosthetic treatment (Figure 5c).

Case Report 6



Figure 5a: Preoperative.



Figure 5b: Sutures placed.



Figure 5c: 2 weeks postoperative.

A woman aged 21 years, came with a chief complaint of short tooth in upper front region (Figure 6a). Clinical examination revealed that tooth 12 was severely decayed. Patient gave no medical history. After endodontic treatment, crown lengthening was advised. For the surgical procedure, gingivectomy was done first to expose the tooth. To compensate for insufficient biologic width, sulcular incisions were given to raise a mucoperiosteal flap, to per-

form osseous reduction (Figure 6b). Simple interrupted sutures (non-resorbable 5-0 mersilk) were placed (Figure 6c). Post-operative healing was uneventful. The results were excellent and patient was further referred for prosthetic rehabilitation.

Case Report 7



Figure 6a: Preoperative.



Figure 6b: Intraoperative.



Figure 6c: Sutures placed.

A 27-year-old male, having insufficient crown height with 44 (Figure 7a), was referred to the Department of Periodontics. Subsequently, a complete systemic history revealed no abnormalities. After clinically and radiographically evaluating the patient, he was scheduled for crown lengthening procedure. Surgery commenced with administration of local anaesthesia, followed by vertical releasing incisions along distal line angles of adjacent teeth, sulcular incisions to reflect a full thickness flap and debridement (Figure 7b). Adequate biologic width required no osseous reduction and flap was stabilized apically with periosteal sutures. Other incision lines were approximated with figure of 8 sutures (Figure 7c). Post-surgical instructions were given and follow-up visits showed exceptional results for further treatment.



Figure 7a: Preoperative.

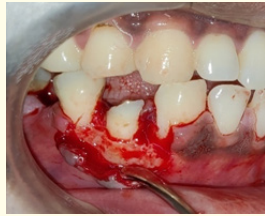


Figure 7b: Intraoperative.



Figure 7c: Sutures placed.

- Restorative needs
- Access subgingival caries
- Produce a ‘ferrule’ for restoration.
- Aesthetics
- Short teeth
- Gummy smile.

Biologic width is a crucial concept defined as distance between apical end of gingival sulcus and crest of alveolar bone [4]. Biologic width is defined as the physiologic dimension of the junctional epithelium and connective tissue attachment, according to the pioneering study conducted by Gargiulo, *et al.* [5]. In this study, the authors demonstrated that humans, in average, show a connective tissue attachment of 1.07 mm, above the alveolar bone crest, and a junctional epithelium, below the base of the gingival sulcus, of 0.97 mm. The combination of these two measurements constitutes the biologic width, that is, 2.04 mm in average. However, in clinical practice, normal biologic width is approximately 2mm [6]. Rosenberg, *et al.* furthered this concept and combined the average biologic width of 2.04 mm with the 1 mm to 2 mm essential for restorative dentistry, concluding that 3.5 mm to 4 mm of sound supraosseous crest tooth structure is needed to fulfil the total requirement for restorative dentistry.

If biologic width is violated, a zone of chronic inflammation develops [7]. There is insufficient space for a “normal” length of junctional epithelium to develop [8]. The area is easily damaged by mechanical oral hygiene practices, and chronic inflammation persists. A subgingival margin, close to the alveolar bone crest, severely impairs plaque control [9]. The procedures mentioned in this article were all performed keeping in mind this very important concept of maintaining the biologic width, in line with the literature which states the significance of the same.

Crown lengthening procedures can be performed by one of the following ways [10-12]

- Gingivectomy
 - Conventional
 - Laser
 - Electrocautery
- Internal Bevel Gingivectomy/Flap Surgery/Undisplaced Flap: with or without osseous reduction
- Apically Positioned Flap: with or without osseous reduction
- Combined (surgical and non-surgical)

External bevel gingivectomy is indicated when keratinized tissue is adequate, to avoid violation of biologic width when the incision is made [13,14]. An apically positioned flap is of high sig-

Sr. No.	Age/gender	Tooth no.	Biologic width	Type of clp
1.	34/F	13	Adequate	Apically positioned flap without osseous reduction
2.	23/M	31, 41	Inadequate	Apically positioned flap with osseous reduction
3.	44/M	25	Adequate	Apically positioned flap with no osseous reduction
4.	38/M	45, 46	Inadequate	Apically positioned flap with osseous reduction
5.	41/F	14	Inadequate	Apically positioned flap with osseous reduction
6.	21/F	12	Inadequate	Undisplaced flap with osseous reduction
7.	27/M	44	Adequate	Apically positioned flap without osseous reduction

Table 1: Summary of the 7 case reports discussed above.

Discussion

Crown lengthening procedures are the periodontal surgeries designed to increase the extent of supragingival tooth structure to enable restoration [3]. It is indicated in the following scenarios

nificance as it is used not only for crown lengthening but also as a pocket elimination flap surgery. It can be performed on multiple adjacent teeth at the same time, but is contraindicated for a single tooth crown lengthening in the aesthetic zone [15,16]. However, in our case report 5, the involvement of any more adjacent teeth, would result in recession and an improper crown to root ratio. Hence, this was an exception to the above contraindication.

Conclusion

From the cases discussed above, it is evident that crown lengthening procedures play an important role in the rehabilitation and restoration of function and aesthetics. Maintenance of the pink to white ratio is of great significance for prolonging the success of the treatment. To conclude, crown lengthening surgery is a practical choice for enabling restorative therapy or enhancing aesthetics. To plan a crown lengthening surgery, nevertheless, it is necessary to assess the patients' overall periodontal health as well as their oral hygiene practises. Furthermore, attaining enhanced, conservative, and predictable results in aesthetic areas requires a multidisciplinary, accurate diagnostic approach.

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