

Crown Lengthening With Submucosal Frenotomy: A Case Report – For Aesthetic Management

Dr.Kavitha Jayavel¹, Dr.T.Preethi Meenakshi

²,Dr.S.Senthilkumar³Dr.V.Krishnan⁴, Dr S.Rajasekar⁵, Dr.R.T.Arun⁶

¹(Sr.Lecturer, Department of periodontics, Rajah Muthiah Dental College/ Annamalai University, India)

²(Post graduate, Department of periodontics, Rajah Muthiah Dental College/ Annamalai University, India)

³(Prof & Head Department of periodontics, Rajah Muthiah Dental College/ Annamalai University, India)

⁴(Prof,Department of periodontics, Rajah Muthiah Dental College/ Annamalai University, India)

⁵(Prof,Department of periodontics, Rajah Muthiah Dental College/ Annamalai University, India)

⁶(Prof,Department of periodontics, Rajah Muthiah Dental College/ Annamalai University, India)

Corresponding author: Kavitha Jayavel

Abstract: A short clinical crown may lead to poor retention form thereby leading to improper tooth preparation. Surgical crown lengthening procedure is done to increase the clinical crown length without violating the biologic width. Several techniques have been proposed for clinical crown lengthening which includes gingivectomy, apically displaced flap with or without resective osseous surgery, and surgical extrusion using periostome. This case report highlights a case of submucosal frenotomy with crown lengthening procedure of a 20 year old female patient.

Keywords: Surgical crown lengthening, Gingivectomy, Submucosal Frenotomy, Frenectomy

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I. Introduction

Aesthetic considerations have influenced the management of dental maladies in varying degrees for many years. Patient awareness and expectations have increased recently to the point that less than optimal aesthetics are no longer an acceptable outcome. An essential goal of treatment is long-term stability of the result; for this to be achieved the integrity of the dentogingival junction must be respected, and dental restorations and the periodontium must be in harmony. A predictable, successful outcome can only be expected if a complete and accurate diagnosis is obtained and used to generate an appropriate treatment plan.¹

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. Also nowadays, patients have a greater desire for more esthetic results which may influence treatment choice.²

Clinical crown of the tooth is the distance from gingival margin to incisal edge or occlusal surface of the tooth. This distance should be increased when:

- margins of caries lesion are subgingivally;
- margins of tooth crown fractures are subgingivally;
- tooth crown is too short for retention of restoration;
- there is excess of gingiva and anatomical tooth crown is opened partially.³

The common causes of short clinical crown include caries, erosion, tooth malformation, fracture, attrition, excessive tooth reduction, eruption disharmony, exostosis, and genetic variation. Therefore, this deficiency in clinical crown length should be increased 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.⁴ Badly mutilated teeth or the grossly decayed teeth often pose problems to the restorative dentists during their treatment due to unavailability of sufficient clinical crowns.⁵

The primary goal of restorative therapy is to replace the form, function, esthetics and comfort of the dentition. Equally important is to establish a physiologic periodontal climate and facilitate the maintenance of periodontal health. Thus a thorough understanding of relationship between periodontal tissue and restorative dentistry is paramount to ensure the maintenance of the tooth or teeth being restored.⁶ Hence a crown lengthening procedure prior to restorative treatment is mandatory during management of such teeth.⁵

Clinical crown lengthening refers to procedures designed to increase the extent of supragingival tooth structure for restorative or esthetic purposes. The concept of crown lengthening was first introduced by D.W.

Cohen (1962) and is presently a procedure that often employs some combination of tissue reduction or removal, osseous surgery, and/or orthodontics for tooth exposure. The amount of tooth structure exposed above the osseous crest (about 4mm) must be enough to provide for a stable dentogingival complex and biologic width to permit proper tooth preparation and account for an adequate marginal placement, thus ensuring a good marginal seal with retention for both provisional and final restorations.⁵ In these cases, it is necessary to evaluate the gingival biologic width (GBW), to clear out if it is not altered, will it remain healthy after tooth restoration. The continuing presence of a diastema between the maxillary central incisors in adults, has also been considered as an aesthetic problem. The presence of an aberrant frenum being one of the aetiological factors for the persistence of a midline diastema, the focus on the frenum has become essential.⁷ A frenum is an anatomic structure formed by a fold of mucous membrane and connective tissue and sometimes muscle fibres that attach the lip and cheeks to the alveolar mucosa and/or gingiva and the underlying periosteum.⁸

The frena may also jeopardize the gingival health by causing a gingival recession when they are attached too closely to the gingival margin, either because of an interference with the proper placement of a toothbrush or through the opening of the gingival crevice because of a muscle pull.⁷ The significance of the high attachment of the labial frenum in the etiology of some types of the periodontal disease has been widely acknowledged.⁹

Knox and Young histologically studied the frenulum, and they found both elastic and muscle fibers in their sections. In contradiction, several other researchers and current texts have concluded that no muscle fibers are present in the maxillary labial frenulum. Probably the most thorough study was accomplished by Henry et al. They found considerable dense collagenous tissue, loose connective tissue, and elastic fibers but no muscle fibers.¹⁰

Orthodontic and anatomic approaches have led many authors to classify the type of the frenum exclusively according to the morphological means.⁹

Depending upon the extension of attachment of fibres, frenum has been classified as follows:

1. Mucosal- when the fibres are attached up to mucogingival junction
2. Gingival- when fibres are inserted within attached gingiva
3. Papillary- when fibres are extended into interdental papilla; and
4. Papilla penetrating- when the fibres cross the alveolar process and extend up to the palatine papilla.

Clinically, papillary and papilla penetrating frenum are considered as pathological and have been found to be associated with loss of papilla, recession, diastema and plaque accumulation. The abnormal frenum is detected visually by applying tension over the frenum to see the movement of the papillary tip or the blanch which is produced due to ischemia in the region. In such cases it is necessary to perform a frenectomy for aesthetic and functional reasons. There are several surgical techniques for removal of labial frenum.

In this case report we discuss a case of an esthetic management of an anterior tooth crown by means of a submucosalfrenotomy procedure with gingivectomy.

II. Case report

This case report highlights a case of submucosal frenotomy with crown lengthening procedure of a 20 year old female patient. The patient reported with a chief complaint of spacing in between the anterior teeth. Patient was a systemically healthy subject. On extra oral examination no abnormalities were detected. On intraoral examination, oral hygiene was inferred as good oral hygiene. Altered passive eruption was noted in relation to upper anteriors. Maxillary labial frenum was found to be of gingival type.

A treatment plan was formulated and it was planned for surgical gingivectomy with a submucosal frenotomy procedure.

Phase I therapy was carried out and this was followed by surgical phase.

Surgical site; ie; maxillary anteriors were adequately anesthetized with 2% lignocaine with 1:100000 adrenaline and an external bevel gingivectomy was done (Fig.1). External bevel incisions were made in relation to facial and palatal aspects of 13-23 with a Kirkland knife (Fig.2&3). The excess gingival tissue was removed thereafter. A submucosal frenotomy was performed in relation to the maxillary labial frenum with the help of a No.15 size Bard Parker blade(Fig.4). A vertical incision was given along the length of the frenum and then the submucosal fibres were exposed and relieved(Fig.5). Periosteal sutures were placed on either sides ie., lateral aspects of the frenum were sutured(Fig.6). Then a periodontal dressing was given to cover the entire surgical site(Fig.7).

On the postoperative 10th day sutures were removed and healing was noted(Fig.8).



Fig.1: Preoperative View



Fig.2: External bevel incisions made with Kirkland knife



Fig.3: External bevel incisions made in relation to 13-23

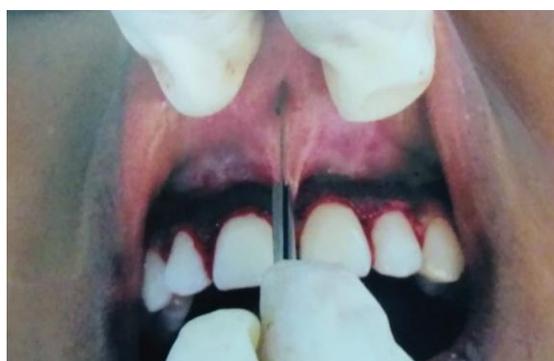


Fig.4: Vertical incision given through the length of the frenum with a scalpel



Fig.5: Submucosal, periosteal fibres exposed and relieved in relation to the maxillary labial frenum



Fig.6: Sutures placed



Fig.7 :Periodontal dressing given



Fig.8:Postoperative View

III. Discussion

Crown lengthening is performed for aesthetic improvement during restorations and in teeth with subgingival caries or fractures; in addition, this surgical procedure can establish an accurate bone width and correct gingival asymmetries. The esthetic crown lengthening requires gingivectomy procedures to expose the needed additional tooth structure; therefore, a minimum of 2 to 5mm of keratinized tissue is necessary to ensure the gingival health.⁴ When a restoration is placed, the preservation of an intact healthy periodontium is mandatory to prolong the life of the teeth being restored. The dentist must attempt to eliminate all factors that could lead to the accumulation of bacterial plaque and its subsequent effects on the gingival tissues and underlying bone.⁶

The case discussed here highlights the crown lengthening procedure of an unesthetic small crown by means of a gingivectomy procedure and a submucosal frenotomy in relation to maxillary anteriors.

The indications for crown lengthening are:

- Restorative needs
- To increase clinical crown height lost due to caries, fracture or wear
- To access subgingival caries
- To produce a “ferrule” for restoration
- To access a perforation in the coronal third of the root
- To relocate margins of restorations that are impinging on biological width.
- Aesthetics
- Short teeth
- Uneven gingival contour
- Gummy smile.

Contra-indications & Limiting Factors

- Inadequate crown to root ratio
- Non restorability of caries or root fracture
- Esthetic compromise
- High furcation
- Inadequate predictability
- Tooth arch relationship inadequacy
- Compromised adjacent periodontium or esthetics
- Insufficient restorative space
- No maintainability⁵

<i>Proposed Classification System for Aesthetic Crown Lengthening Procedures</i>			
Classification	Characteristics	Advantages	Disadvantages
Type I	Sufficient soft tissue allows gingival exposure of the alveolar crest or violation of the biologic width.	May be performed by the restorative dentist. Provisional restorations of the desired length may be placed immediately.	
Type II	Sufficient soft tissue allows gingival excision without exposure of the alveolar crest but in violation of the biologic width.	Will tolerate a temporary violation of the biologic width. Allows staging of the gingivectomy and osseous contouring procedures. Provisional restorations of the desired length may be placed immediately.	Requires osseous contouring. May require a surgical referral.
Type III	Gingival excision to the desired clinical crown length will expose the alveolar crest.	Staging of the procedures and alternative treatment sequence may minimize display of exposed subgingival structures. Provisional restorations of desired length may be placed at second-stage gingivectomy.	Requires osseous contouring. May require a surgical referral. Limited flexibility.
Type IV	Gingival excision will result in inadequate band of attached gingiva.		Limited surgical options. No flexibility. A staged approach is not advantageous. May require a surgical referral.

Gingival biological width (biologic membrane, dentogingival attachment) is the area of gingiva attached to the surface of the tooth coronary from the alveolar bone. This determination is based on the study of Garguilo A. W., Wentz F. and Orban B. in 1961 on dentogingival junction of cadavers. It was established as the width necessary for gingiva to attach to the tooth.

The biologic width dimension appears to constitute a constant feature in the human periodontium, and it has therefore been suggested that it be considered an immutable therapeutic parameter. Clinical observation indicates that impingement of the biologic width will result in attempts by the gingival tissue to reestablish its original dimension through bone resorption or, in the presence of thick alveolar bone, chronic gingival inflammation.¹¹

Crown lengthening for aesthetic reasons was indicated only in the <30 year-old age group which seemed logical considering the youth's beauty-seeking sensations. Supra-eruption, severe coronal destruction and inadequate inter-occlusal space could also lead to short clinical crowns.¹²

Various other crown lengthening techniques have also been studied which are also effective such as a study done by Oncu et al, was done to compare the efficacy of scalpel vs laser gingivectomy. This study showed that the diode laser has more advantages than conventional surgery in the gingivectomy procedures. That includes a reduced intra operative and postoperative bleeding, a reduced pain sensitivity and recovery time.¹³

Another surgical extrusion technique (clinical crown lengthening) using periosteal elevator can be used to successfully treat a grossly damaged crown structure as a result of tooth fracture, dental caries and iatrogenic factors especially in the anterior region, where esthetics is of great concern.¹⁴

While an aberrant frenum can be removed by any of the surgical techniques, a functional and an aesthetic outcome can be achieved by a proper technique selection, based on the type of the frenal attachment.⁷ Nevertheless, in spite of the various modifications which have been proposed for frenectomy, the widely followed procedure which remains is the classical technique. The classical technique leaves a longitudinal surgical incision and scarring, which may lead to periodontal problems and an anaesthetic appearance, thereby necessitating other modifications. The techniques like simple excision and a modification of V-rhomboplasty fail to provide satisfactory aesthetic results in the case of a broad, thick hypertrophied frenum.⁸ Aberrant frenum can also be in the form of lingual tongue tie. In a study by Lavigne, showed that frenotomy in neonates, if performed by trained professionals, can improve breastfeeding.¹⁵ Also, Laser technology has been considered as an alternative to the conventional techniques, presenting several advantages such as: shorter operative working time, tissue cauterization and sterilization, hemostasis, less local anesthesia requirement, and fewer postoperative complications (pain, swelling and infection). Laser also enhances access and visualization due to the lack of interposed instruments and bleeding at the operative field. Additionally, the need for suture is eliminated and a uniform depth in the surgical site is maintained, reducing unnecessary damage to tongue muscle.¹⁶

IV. Conclusion

There are two primary indications for clinical crown lengthening surgery. The first one is an aesthetic indication for increasing the length of clinical crowns. The second indication, and the most common, as practice shows, is the positioning of the tooth preparation border supragingivally or gingivally, in order to avoid the negative impact of dental restorations on the biological width, resulting in chronic inflammation of the periodontium around the applied prosthetic restoration.¹⁷ In the present study, a gingivectomy procedure with submucosal frenotomy was carried out considering esthetics, biologic width and we found excellent results with minimal postoperative complications.

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