

Introduction

Once caries affects a tooth and the restorative margin now becomes subgingival, the ability to restore the tooth often depends on the distance from the alveolar crest and where our restorative margin would take place, due to what we know as biological width. In order to restore teeth, we often want to ensure we are not invading this biological width, as well as keeping an adequate ferrule. A mainstream option to dealing with teeth that must be restored subgingivally has been clinical crown lengthening. In this procedure, the gingival margin is surgically relocated and often the alveolar crest is also lowered in a controlled manner. This results in gaining more space between our restorative margin and the alveolar crest, therefore preserving the biological width as well as helping regain ferrule.

Crown lengthening is the standard procedure that is preformed to surgically relocate the gingival margin and reduce crestal bone to preserve biological width. Traditionally, surgical crown lengthening is the treatment of choice for cases that would be impinging on biological width. This review of the literature is to determine if there are other viable treatment options instead of the solitary crown lengthening technique.

Biologic Width Overview

Biological width is normally defined as the amount of soft tissue (the sum of the epithelial attachment and connective tissue) that is needed to keep a healthy and stable relationship of the periodontium as it relates to the crestal bone. The mean amount cited throughout the literature is ~2.04mm. Biological width becomes important when we are restoring subgingival restorations that are usually due to caries. Once a restoration is placed where it impinges on the biological width, the most common result is chronic gingival inflammation in the area. Furthermore, if the alveolar bone is thin, the body may try to recreate this natural space, and bone loss may also occur which can be unpredictable⁵.

Crown lengthening, however, is not without its own side effects including the process being a surgical procedure, adversely affecting the crown to root ratio, possibly lowering the crestal bone level of an adjacent tooth, and potential to expose furcations and root concavities⁶. Alternative options to crown lengthening may include deep margin elevation (DME), also known as proximal box elevation, in our restorative design.

Deep Margin Elevation

In many cases in which deep margin elevation is preformed, caries has destroyed tooth structure at a depth that is subgingival, destroying the clinical attachment area that the tooth used to have, thereby impinging on biological width. The main consequence of placing restorative crown margins on teeth in which we invade the biological width is chronic inflammation and an unhealthy periodontal attachment⁵.

It is important to note that the periodontium reacts differently to not only different types of materials, but largely to surface texture as well⁷. Indirect restorations by themselves on deep margins result in inadequate isolation for impressions as well as cementation, and difficulty in cleaning the excess cement when cementing a crown².

According to an article that studied the clinical as well as the histological response to subgingival composite resins on the periodontium, it was found that subgingival restorations resulted in a periodontium that was similar in health as that of untreated root surfaces. This article greatly favors the clinical and histological outcomes of using the deep margin elevation technique in restorative dentistry¹. However, this article in particular contained a limitation of including only teeth that were subgingival but greater than or equal to 3mm from the crestal bone after caries removal.

DME clearly does not allow for connective tissue attachment to be obtained on the resin material, and does not recreate the normal biological width that was destroyed by the carious process of the tooth. Instead, what DME accomplishes is a different type of healthy periodontium, one that is mainly comprised of long junctional epithelium with a slight connective tissue attachment on the dentin that is located below our margin. This situation appears to result in a still seemingly health periodontium that is well tolerated. Clinically, deep margin elevation appears to be very successful⁷.

Deep margin elevation is where the margin of the tooth is advanced coronally after caries removal by using resin. Therefore, DME is dependent on the ability to get proper isolation while bonding several layers of composite on the deep margin. When choosing which teeth are good candidates for this procedure, teeth with more keratinized tissue showed a higher gingival index (had more gingival inflammation)⁷.

DME Protocol and Procedure

DME may be performed in any case of deep proximal lesions if the following criteria are in place⁶:

- 1) Isolated working filed (with rubber dam in place)
- 2) Isolated margins to provide an adequate margin and seal
- 3) The connective tissue component should not be violated by the matrix

Procedure:⁶

- Remove caries
- Place matrix so that is well sealed with proper gingival emergence profile and is stable (may be accomplished with a sectional matrix placed inside of a tofflemire and tightening, then pack a Teflon tape as wedge is often difficult to properly use in this area)
 - The presence of sufficient tooth structure at both the buccal and lingual walls is necessary for the stability of the matrix
 - The matrix should be narrow so that it can slip between the curvature of the tooth and into the subgingival area (a normal matrix would need to be reduced with scissors ~2-3mm)
 - No rubber dam or gingiva should be between the tooth and the matrix
- Re-prep the margin with a fine diamond burr prior to bonding
- Immediate dentinal sealing should be done using 3-step etch and rinse and dentin adhesives
- A composite resin base is then placed raising the margin ~2mm and light cured
- Once the margin is elevated, the preparation can be completed by careful elimination of flash using a scaler or a #12 blade
- A bitewing should be taken to make sure no gaps or excess is present before proceeding to final restoration

Results

Results showed that in some clinical evaluations, the survival rate of partial lithium disilicate restorations using deep margin elevation was 97% over a 12 year observation period². Other articles showed that bonding indirect restorations to those that had deep margin elevation performed resulted in a lower percent of gap-free margins (84% with deep margin elevation compared to 92% gap free margins with direct luting to dentin) which did not influence the fracture strength of teeth².

It is also important to note that the presence of having deep restorations with composite margins did not negatively affect the periodontal status of a tooth^{1, 3}, and were compatible with gingival health with levels similar to that of untreated root surfaces^{1, 2}.

Furthermore, cases that had DME performed showed high survivability, however there is a lack of high quality clinical trials and reviews that examine the long term survivability of deep margin elevation compared to crown lengthening procedures⁴.

Indications and Clinical Significance

Overall, more research needs to be done to see if deep margin elevation has a long term success rate that is similar to the more mainstream crown lengthening technique. Deep margin elevation is very technique sensitive and demanding on the practitioner, but may help save the patient from having to get crown lengthening preformed especially when socioeconomic factors come into play.

There is little clinical data to neither support nor discourage the use of this technique in clinical practice².

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