

# Biologic width: the Prosthodontic perspective

Shajahan P A, Rohit Raghavan, Monisha V S

Dept. of Prosthodontics and Crown  
& Bridge, Royal Dental College,  
Palakkad, Kerala, India.

Access this article online

Website :  
royaldentalcollege.in/recline/



## ABSTRACT:

The first and most basic objective of restorative dentistry is preservation of the tooth structure. However, for the long-term survival of restoration, the periodontium must also remain healthy or vice versa. 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 review 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.

**Key words:** Biologic width, periodontium, restoration, esthetics, subgingival margins, tissue damage

Conflict of Interest: None declared

Source of Support: Nil

## INTRODUCTION

Dentistry of the modern era is dominated by restorative procedures that not only retain the functions of lost structures but also needs to retain the esthetics. Functional and esthetic restorations can gain complete patient's and dentist's satisfaction only when these restorations exist in harmonious relationship with the surrounding structures. Often dental practitioners come across to cases with chief complaints of a problematic or

faulty restorations that appear to be normal to an untrained eye. Consistent complaint of the patient towards the inconvenience, makes the dentist to examine the regions with restorations and such cases are diagnosed as the restorations violating the biologic width.

## BIOLOGICAL WIDTH

Biologic width is defined as the dimension of the soft tissue, which is attached to the portion of the tooth coronal to the crest of alveolar bone.

Biologic width is the term applied to the dimensional width of dentogingival junction (epithelial attachment and underlying connective tissue). The concept of biologic width was initiated by Gargiulo et al in 1961. The term biologic width was coined by D Walter Cohen.<sup>[1]</sup>

## SIGNIFICANCE

The significance of biologic width is that, it acts as a barrier and prevents penetration of microorganisms into the periodontium. Maintenance of biologic width is essential to preserve the periodontal health and to remove any irritation that may damage the periodontium. It is said that a minimum of 3mm space between the restoration margin and the alveolar bone is required to permit adequate healing and to maintain a healthy periodontium. This 3 mm consists of 1mm of supraalveolar connective tissue, 1mm of junctional epithelium and 1mm of sulcular depth. This allows for adequate biologic width (2.04mm) even when the margins are placed 0.5mm within the sulcus. The location, fit and finish of restorative margins are critical factors in the maintenance of periodontal health.<sup>[1,2]</sup>

## CATEGORIES OF BIOLOGIC WIDTH

In order to operationally define biologic width, Kois suggested that the restorative dentist must determine the total distance from the gingival crest to the alveolar crest. This procedure is termed bone sounding. The Glossary of Periodontal terms describes sounding as the penetration of anesthetized soft tissue by a probe in order to determine the topography of the alveolar process.

The patient is anesthetized and the periodontal probe is placed in the sulcus and pushed through the attachment apparatus until the tip of the probe engages alveolar bone. The measurements are made on anterior teeth mid-facially and at the facial or interproximal line angles<sup>[3]</sup>.

- ❖ Normal-crest patient
- ❖ High-crest patient
- ❖ Low-crest patient

## IMPORTANCE OF DETERMINING THE CREST CATEGORY

Determination of the crest category allows the operator to determine the optimal position of margin placement, as well as inform the patient of the probable long-term effects of the crown margin on gingival health and esthetics.<sup>[4]</sup>

## BIOLOGICAL CONSIDERATION

Restorative clinician have a narrow margin of error in order to

achieve a good esthetic restoration which is fully functional as well as best suited for patient health. Restorative dentist should know the importance of biological width in preserving the healthy and esthetically good looking gingival form around the tooth and implant.

## EFFECTS OF BIOLOGICAL WIDTH VIOLATION

The restorative procedure are technique sensitive and involves a great deal of understanding of the anatomy, function and condition of the teeth or implants and their surrounding structure. Placing restorative margin within the biologic width frequently leads to:<sup>[5]</sup>

- ❖ Gingival Inflammation.
- ❖ Clinical Attachment Loss.
- ❖ Bone Loss.

Clinically these sign of biological width violation appear as a pain around the restoration margin, bleeding from the inflamed gingival margin area of involved tooth and gingival recession.

## EVALUATION OF BIOLOGIC WIDTH VIOLATION

If a patient having discomfort when restorative margin levels are assessed with a probe, it is a good indication for biologic width violation. The most important diagnostic method is bone sounding, which is done by probing under local anesthesia to bone level. Biologic width is assessed by subtracting the sulcular depth from the resulting bone sounding measurement. If this distance is less than 2mm, then a violation of biologic width can be diagnosed. Radiographic evaluation can assess interproximal violation of biologic width. But it is not diagnostic because of tooth superimposition.<sup>[1]</sup>

## CORRECTION OF BIOLOGIC WIDTH VIOLATION

Biologic width violation can be corrected surgically or orthodontically. Surgical correction is aimed at removing the bone away from the restorative margin while in orthodontic correction, the tooth is moved coronally away from the bone. Surgical correction is done by gingivectomy, apically repositioned flap with or without ostectomy. Orthodontic correction is done either by slow eruption or forced eruption with supracrestal fiberotomy.<sup>[6]</sup>

The mode of treatment is chosen based on the width of attached gingiva present, biologic width measurements as obtained from bone sounding, and esthetic requirements<sup>[1]</sup>

## TYPES OF RESTORATIVE MARGINS

The restoration margins can be grouped in any of the following three categories: - supragingival, equigingival, and subgingival.<sup>[6]</sup>

**Address for Correspondence:**  
Monisha V S, Dept. of Prosthodontics  
and Crown & Bridge, Royal Dental  
College, Palakkad,  
Kerala, India.  
E-mail: monisha.vaishnavam@gmail.com

Date of Submission:  
Date of acceptance:

**Supragingival margin**

It is the least irritating to the periodontium and is easy to prepare. The final fit and finish of the margins and removal of excess cement are also the easiest to achieve. Though this type of margin has the least impact to the periodontium, it is unaesthetic and preferred only in non-esthetic areas.

**Equigingival margin**

Equigingival margin can be easily blended with the tooth and can be finished easily to provide a smooth and polished margins. But such margins are not desirable as they are thought to favor more plaque accumulation and therefore result in greater gingival inflammation.

**Subgingival margin**

Though it is esthetic, it is detrimental to periodontal health as it acts as a permanent irritant to the periodontium. Many studies have demonstrated qualitative and quantitative changes in subgingival microbes, increased plaque index, gingival recession and pocket depth.

Biologic width encroachment becomes more common when planning for subgingival restorations in cases that are fractured or carious, near the alveolar crest. Also esthetics demands often require hiding of restorative margins below the gingival margins i.e., pushing them down into the sulcus, which may cause biologic width violation.<sup>[7]</sup>

It is widely believed that the best biological place for a restorative margin is supragingival. Supragingival margins stay away from the periodontal tissues, and have the following advantages:

- Preservation of tooth structure during tooth preparation.

- Impressions are more predictable, with minimal or no cord packing.
- Provisional restorations are easier to make, and the soft tissues will be healthier when the patient returns for cementation of the final restoration.
- Removing excess cement is much easier when the margin is visible.

Conventionally equigingival margins were not recommended as they were thought to retain more plaque than supragingival or subgingival margins and therefore cause greater gingival inflammation. There was also the concern that any minor gingival recession would create an unsightly margin display. These concerns are not valid today, not only because the restoration margins can be esthetically blended with the tooth but also because restorations can be finished easily to provide a

smooth, polished interface at the gingival margin. From a periodontal viewpoint, both supragingival and equigingival margins are well tolerated. The greatest biologic risk occurs when placing subgingival or equigingival margins for finishing procedures, and in addition, if the margin is placed too far below the gingival tissue crest, it violates the gingival attachment apparatus. Not only do restorative margins placed subgingivally risk invading the attachment apparatus, but also unwanted tissue effects appear to result merely due to their subgingival location, regardless of the depth of the sulcus penetration.<sup>[8]</sup>

**CRITERIA FOR PLACEMENT OF MARGIN<sup>[7,8]</sup>**

The following three rules can be used to place subgingival margins:

- If the sulcus probes 1.5 mm or less, place the restoration margin 0.5 mm below the gingival tissue crest. This is especially important on the facial aspect.
- If the sulcus probes more than 1.5 mm, place the margin one half the depth of the sulcus below the tissue crest. This places the margin far enough below the tissue so that it still is covered if the patient is at higher risk of recession.
- If a sulcus greater than 2 mm is found, especially on the facial aspect of the tooth, then evaluate to see whether a gingivectomy could be performed to lengthen the teeth and create a 1.5 mm sulcus.

**FINISH LINE/RESTORATION MARGIN DESIGN****Beveled shoulder**

When porcelain-fused-to-metal (PFM) restorations were introduced, the metal collar was considered an ideal margin for this type of prosthesis. Thus, the prescribed finishing line was the beveled shoulder, based on the notion that its use would reduce the marginal opening of the gold casting.

**Knife edge**

For PFM restorations if a knife-edge finishing line is to be used then the butt joint necessary to accommodate the porcelain has to be created within the metal coping further coronally. Despite its theoretical conservatism, combination of this finishing line with PFM restorations tends to under-prepare the axial walls leading to the resulting crown being bulky and unaesthetic. Conversely, the preparation may become overtapered leading to an unretentive final restoration.

**Flat shoulder**

This design has, over time, replaced the beveled shoulder as the

resulting butt joint permits the use of a bulk of porcelain at the margin, thus removing the need for a metal collar.

A shoulder width of 1 mm to 1.5 mm at a 90° to 100° angle to the root surface is ideal. The axial line angle should be rounded to reduce stress concentration in that area. This design is sometimes referred to as the radial shoulder.

**Chamfer**

This is now the finishing line of choice for most cast veneer preparations and hence recommended for most ceramic restorations. Chamfers are less likely to have undercuts and are generally considered to be more conservative than shoulder preparations although a similar degree of tooth reduction is required.

**CRITERIA FOR SELECTION OF FINISH LINE**

The following criteria for margin selection seem reasonable:

- a. The selected margin must provide a predictable level of marginal integrity. The cervical margin designs that meet this criterion include: The shoulder, the shoulder bevel, and the slant shoulder.
- b. The shoulder and shoulder bevel meet the criterion to provide smooth materials to the gingival sulcus so as to minimize plaque accumulation. The shoulder can be used with a metal margin, which can be highly polished, or with a porcelain margin, which results in glazed porcelain in the sulcus.
- c. In situations where esthetics are important, the clinician has three options.
  - For an all-ceramic crown, a shoulder margin with a rounded internal angle or a deep chamfer should be prepared to end at approximately 90 to the external angle of the labial or buccal surface with a depth of 1 and 1.5 mm.
  - Traditional metal-ceramic restorations are completely opaque, thus preventing light from passing into the tooth and root. This results in a root that appears dark, and the margin appears gray; even the gingiva appears gray. When using highly translucent feldspathic porcelain clinicians can achieve a “contact lens” effect, making the margin disappear. As a result there is no need to hide the margin subgingivally.
  - When using a more opaque zirconia crown the margin can safely be placed at the gingival margin in the esthetic zone.<sup>[8]</sup>

**CONCLUSION**

The health of the periodontal tissues is dependent on properly designed restorations. Undoubtedly it is preferable if margins can remain coronal to the free gingival margin. Obviously, subgingival margin placement is often unavoidable. If restorative margins need to be placed near the alveolar crest, crown-lengthening surgery or orthodontic extrusion should be considered to provide adequate tooth structure while simultaneously assuring the integrity of the biologic width. Although individual variations exist in the soft tissue attachment around teeth, a minimum of 3 mm should exist from the restorative margin to the alveolar bone, allowing for 2 mm of biologic width space and 1 mm for sulcus depth.

**REFERENCES**

1. Rajendran M, Usha Rao G, Logarani. A, Sudagaran M, Badgujar S R. Biologic Width - Critical Zone for a Healthy Restoration. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) Feb 2014;13:93-98
2. Shenoy A, Shenoy N, Babannavar R. Periodontal considerations determining the design and location of margins in restorative dentistry. Journal of Interdisciplinary Dentistry Jan-Apr 2012;2:1
3. Kois JC. Altering Gingival Levels: The Restorative Connection Part I: Biologic Variables. Journal of Esthetic and Restorative Dentistry 1994;6:3-7.
4. Robins JW. Tissue management in restorative Dentistry, Special Issue-dentalegis, October 2007
5. Malathi K, Singh A. Biologic width: Understanding and its preservation. International Journal of Medical and Dental science Jan 2014;3:1
6. Nugala B, Kumar S, Sahitya S, Krishna P M. Biologic width and its importance in periodontal and restorative dentistry. Journal of Conservative Dentistry. 2012;15:12-17.
7. Gavelis JR, Morency JD, Riley ED, Sozio RB. The effect of various finish line preparations on the marginal seal and occlusal seat of full crown preparations. J Prosthet Dent 1981;45:136.
8. Donovan T, Chee W. Cervical margin design with contemporary esthetic restorations. Dent Clin North Am 2004;48:417-31.