

Review Article

Clinical Significance of Biologic Width in Perio-Restorative Dentistry: A Review

Subhankar Poddar¹, Soumak Bagchi², Amit De³, D. Rambabu⁴, Savan S.R.⁵, Mona Chowdhury⁶

¹Second year M.D.S. Student, ²Consultant Periodontist, ³Senior Lecturer, ⁴Professor and HOD, ^{5,6}Professor, Department of Periodontics, Haldia Institute of Dental Sciences and Research, WB, India

ABSTRACT:

The relationship between periodontal health and the restoration of teeth is special and indivisible. Maintenance of gingival health is absolutely necessary for tooth and dental restoration's longevity. Violation of any kind to the biological width hinders the normal periodontium. Despite an increase emphasis on the perio-restorative interference in restorative dentistry, many clinicians have been unable to utilize the concept of biologic width in a practical manner. An adequate understanding of relationship between periodontal tissues and restorative dentistry is of supreme importance to make sure adequate form, aesthetics, proper function, and also comfort of the dentition. Hence, the purpose of this article is to describe the biologic width anatomy, evaluation and correction of its violation by different methods.

Key words: Biologic width, Periodontal Health, Margin placement, Bone sounding, Crown Lengthening Procedure

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Corresponding author: Dr. Amit De, Senior Lecturer, Department of Periodontics, Haldia Institute of Dental Sciences and Research, WB, India

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INTRODUCTION:

The harmonious relationship between the periodontal health and restoration has a great importance in dental practice. The harmony is maintained by preserving the biologic width in perio-restorative procedures. The junctional epithelium and supra-crestal connective tissue constitutes the biologic width. The main function of biologic width is to act as a barrier against the entrance of microorganisms into the inner side of the periodontal ligament. It has a protective mechanism for underlying bone. Some animal studies reported the migration of leukocytes through junctional epithelium toward bacterial plaque which may demonstrate the possible defence mechanism of biologic width. The purpose of this article is to enlighten the concept of biologic width and focus on the importance of it.

HISTORICAL PERSPECTIVES:

The "epithelial attachment" around teeth was first described in 1921 by Gottlieb (1921)¹. The "gingival crevice" or sulcus was later defined by Orban B, Mueller E. (1929)², followed by description of the connective tissue as three-dimensionally oriented fibers firmly connecting tooth structures to the adjacent gingiva by

Feneis H(1952)³. Marfino, Orban and Wentz (1959)⁴, were the first to demonstrate that the attachment of gingiva to tooth is composed of gingival connective tissue attachment and junctional epithelium. In 1959, Sicher⁵ investigated the morphology of epithelial and connective tissue attachments to the teeth, described as the dentogingival junction. In 1961, Gargiulo et al.⁶ quantified the vertical components of this structure in human cadavers and coined the term "biologic width". In 1977, described "Biologic Width" was described by Ingber et al⁷ and he has given the credit to D.Walter Cohen for first coining the term.

CONCEPT OF BIOLOGIC WIDTH:

Biologic width is the dimension consisting of junctional epithelium and connective tissue attachment coronal to the alveolar crest. In 1961, Gargiulo et al.⁶ described the dimensions and relationship of the dentogingival junction in humans. From the dentogingival components of 287 individual teeth out of 30 autopsy specimen measurement was made to establish that there is definite proportional relationship between the alveolar crest, the connective tissue attachment, the epithelial attachment and sulcus

depth. Garguilo et al⁶ reported the following mean dimensions-

1. Average depth of the histologic sulcus is 0.69 mm.
2. Average span of junctional epithelium measures 0.97 mm (0.71-1.35 mm).
3. Average span of supra alveolar connective tissue attachment from the bottom of the junctional epithelium is 1.07 mm (1.06-1.08mm).

Based on this work the total of the attachment is approximately 2.04 mm.

Dimension of Biologic width is not always constant, it depends on the location of the teeth in the alveolar bone. These findings were substantiated by Vacek et.al. (1994)⁸.

After detailed assessment of 171 cadaver tooth surfaces, the mean measurements for sulcus depth, epithelial attachment and connective tissue attachment were found to be 1.34 mm, 1.14, and 0.77 mm, respectively. Vacek et.al also realized that the connective tissue attachment was the most stable measurement, with the least degree of variance. Palomo and Kopczyk⁹ stated that a minimum biologic width of only 1.0 mm is necessary. An additional 1 to 3mm of exposed root coronal to the bone is required for the creation of a healthy gingival sulcus.

CLINICAL SIGNIFICANCE OF BIOLOGIC WIDTH:

The clinician should know about the normal anatomy and appropriate guideline to determine the optimal position of margin placement.

Nevins and Skurow (1984)¹⁰ has given the following guidelines for placement of restoration margin:

1. If the sulcus probing depth is 1.5 mm or less, the restorative margin could be placed 0.5mm below the gingival tissue crest.
2. If the sulcus probing depth is more than 1.5 mm, the restorative margin can be placed in half the depth of the sulcus.
3. If the sulcus probing depth is more than 2 mm, gingivectomy could be performed to lengthen the tooth, and create a 1.5mm. Then the patient can be treated as per rule 1, the restorative margin could be placed 0.5 mm below the gingival tissue crest.

The margin of a crown should not be placed closer than 2.5 mm from alveolar bone. An intra-crevicular margin is not possible to place in high crest patient, because the margin will be too close to the alveolar bone, resulting in biological width impingement.

Supra-gingival margin of restoration has the least impact on the periodontium. Supra-gingival margin is placed in non-esthetic areas due to the marked contrast in colour and opacity of traditional restorative materials against the tooth.

Equigingival margins were thought to favour more plaque accumulation, and hence result in greater gingival inflammation and recession. Any minor gingival recession would create an unsightly margin display so

that the use of equigingival margins traditionally was not desirable. Both supragingival and equigingival margins are well tolerated from a periodontal viewpoint now a days.

The placement of restoration margins beneath the gingival tissue crest is frequently influenced by restorative considerations because of caries or tooth deficiencies, and/or the tooth/restoration interface. Placement of restorative margin within the biologic width is detrimental to periodontal health and acts as a plaque retentive factor. When the restoration margin is placed too far below the gingival tissue crest, it will impinge on the gingival attachment apparatus and constant inflammation is created and made worse by the patient's inability to clean this area.

Body attempts to recreate space between the alveolar bone and the margin to allow space for tissue reattachment, particularly in those areas where the alveolar bone surrounding the tooth is very thin in width. In comparison to a flat periodontium with thick fibrous tissue, highly scalloped thin gingiva is more prone to recession and bone loss.

VIOLATION OF BIOLOGIC WIDTH:

Probing is done under local anaesthesia to the bone level, referred to as 'Bone Sounding' or 'Trans-gingival Probing' and subtracting the sulcus depth from the resulting measurement. If this measurement is less than 2 mm at one or more locations, then diagnosis of biologic width violation can be confirmed, for this measurement required teeth with healthy gingiva and should be performed on more than one tooth to ensure accurate assessment and reduce individual and site variation. When crown is placed subgingivally then preparation margin potentially endanger biologic width and lead to periodontal reaction.

Violation of biologic width leads to bleeding on probing, chronic progressive gingival inflammation around the restoration, gingival recession, localized gingival hyperplasia with minimal bone loss, clinical attachment loss, pocket formation, alveolar bone loss.

CORRECTION OF VIOLATION OF BIOLOGIC WIDTH:

Violation of biologic width can be corrected by surgical removal of bone away from proximity to the restoration margin, or orthodontically extruding tooth and thus moving the margin away from the bone. Crown lengthening procedure can be done by two ways i) Internal bevel Gingivectomy (undisplaced Flap) with or without ostectomy ii) Apically repositioned flap with or without ostectomy¹¹.

Forced eruption by orthodontic procedures should be considered in cases where traditional crown lengthening via ostectomy cannot be accomplished, like anterior area as ostectomy would lead to a negative architecture and also remove bone from the adjacent teeth, which can compromise the function of these teeth. Contraindications to forced eruption are 1.inadequate crown to root ratio,

2.lack of occlusal clearance for the required amount of eruption and any possible periodontal complications.

CONCLUSION:

The biologic width is essential for preservation of periodontal health and stability of the teeth. The goal of any restorative treatment should be to restore the health of the tooth and periodontium for optimum health and function. Violation of biologic width may occur due to incorrectly placed restorative margins and poorly adapted restoration. When restorative margin is required 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. As per protocol to maintain proper biologic width minimum 3 mm distance should exist between the restorative margin and the alveolar bone, considering 2mm for biologic width space (attachment of epithelium and connective tissue above alveolar crest) and 1mm for sulcus depth. Encroachment of restoration into biologic width would initiate crestal bone resorption to allow space for establishment of a minimum biologic width.

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