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The Biologic Width in Aesthetic Dentistry: Concepts Challenges and Controversies

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The concept of the biologic width has been with us for more than half a century with original work credited to Gargiulo, Wentz and Orban¹. The biologic width describes a state of biologic equilibrium that must be maintained around the margins of restorations in order to avoid untoward consequences of its violation. Equilibrium is “the condition in which all acting influences are balanced or cancelled by equal opposing forces, resulting in a stable system or “the state of balance or static; the absence of net tendency to change. Biology-Online.org (2009)”².

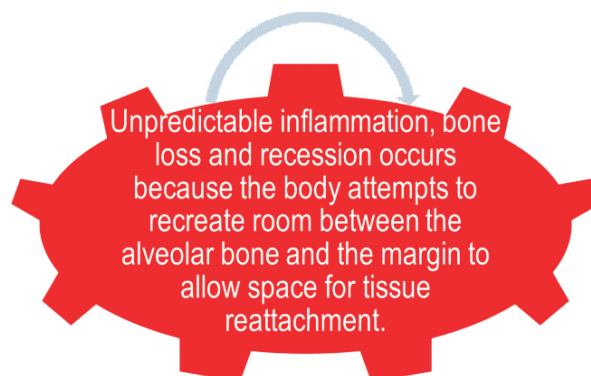
There are different types of equilibrium namely dynamic equilibrium, genetic equilibrium and homeostatic equilibrium. The natural question is “what kind of equilibrium applies to biologic width?” This brings to fore, the concepts of true versus dynamic equilibrium. The biologic width is an attempt of the body to maintain a state of biologic equilibrium which differs from a steady state³. The biologic is therefore closest to a state of dynamic equilibrium. It has been argued that many biologic systems are maintained in a true equilibrium. In a practical sense, however, some true equilibriums are actually dynamic equilibriums, most true equilibriums need low-energy maintenance.

The next natural question is “what then is the biologic width?” The concept has a strong anatomic basis which includes a connective tissue attachment occupying 1.07 mm of space above the crest of the alveolar bone, the junctional epithelial attachment which occupies another 0.97 mm of space above the connective tissue attachment. The combination of the two measurements, averaging approximately 1 mm each, therefore constitutes the biologic width. To the clinician, the biologic width has been

described as “the dimension of space that the healthy gingival tissues occupy between the base of the sulcus and the underlying alveolar bone, “the natural distance between the gingival sulcus and the height of the alveolar bone” and “is comprised of the junctional epithelial attachment (1mm) and the connective tissue attachment(1mm).”

Clinical implications of the biologic width

Beyond the anatomic and biologic details of the biologic width, the clinical implications are all important. In fact, the clinical implications necessitated the detailed anatomic exploration and biologic explanations. The clinical importance of the biologic width relates to three major areas namely, preserving healthy gingival tissues, controlling the gingival form around restorations and guided positioning of restoration margins. This guide is important because the inflammation that results from the violation is actually a protective mechanism, an attempt by the tissues to recover the violated space and achieve tissue reattachment.



Three options exist for margin placement including supragingival which though having the least periodontal impact is unpopular being unaesthetic. The subgingival which would have been the most aesthetic exerts the worst impact on periodontal health leaving the equigingival option which might be the best option.

The strict advocacy for a single type of margin will, however, be as over simplistic as at times impracticable. Such a recommendation is only possible on the assumption that all patients requiring a restoration will possess adequate crown length, which is impossible. Compromise is therefore at times inevitable however, such compromise should be done with sound clinical judgment. These situations usually present as challenges in such situations when supragingival placement is inevitable. A workaround for this situation would be the use of translucent materials like ceramic veneers due to their better aesthetics and excellent periodontal friendliness. Despite gaining popularity, the equigingival margin placement was traditionally unpopular due to plaque retention, gingival inflammation and potential unsightliness in the event of minor gingival recession. These challenges can however, be overcome by aesthetically blending restoration margins with the tooth and achieving a smooth, polished interface at the gingival margin.

The margin with the greatest challenge/controversy is the subgingival margin which is favoured by conservation dentists because restorative considerations may dictate such placements and because a subgingival may at times be inevitable to create an adequate resistance/retentive form. It is also popular with some conservation dentists in order to allow for significant contour alterations to adjust for dental caries/deficiency. To some conservation dentists, the attraction to the subgingival margin might simply be attributable to the sheer temptation to mask the tooth–restoration interface or simply sticking to tradition. Despite the advantages/misgivings, from a periodontal viewpoint, both supragingival and equigingival margins are well-tolerated and are preferable whenever possible and the subgingival margin is the worst periodontal culprit. This verdict is based on the margin not being as accessible as the supragingival or equigingival margins and the possibility of restoration margin being placed too far below with the attendant risk of violation of the biologic width.

When the biologic width is thus violated from any form of margin placement, two possible tissue responses are evoked, inflammation and alveolar bone loss. The reason for these responses can be easily explained using the concept of

homeostatic equilibrium⁴.

Diagnosis of a violation of the biologic width

The diagnostic criteria for the diagnosis of violation of the biologic width are 7-fold, namely:

- 1) A restoration margin placed 2mm or less away from the alveolar bone
- 2) Inflamed gingival tissues around the restoration margin
- 3) Bone loss which may accompany gingival inflammation
- 4) Discomfort while probing un-anesthetized restoration margin
- 5) Distance < 2mm from margin to alveolar crest under local anesthesia
- 6) Width less than margin to alveolar crest of healthy tissues upon circumferential examination
- 7) No other aetiological factors evident explaining the observed changes

It is important to note that the biologic width is patient-specific, with widths as narrow as 0.75 mm and as wide as 4.3mm⁵. Therefore, it is necessary to obtain the 'custom' biologic width using the following protocol;

- 1) Identify a tooth with healthy gingival tissues
- 2) Give local anesthesia
- 3) Measure the gingival sulcus = a
- 4) "Sound to bone"- probe to the bone level = b
- 5) Subtract sulcus depth (a) from the resulting measurement (b). The custom biologic width = b – a⁵.

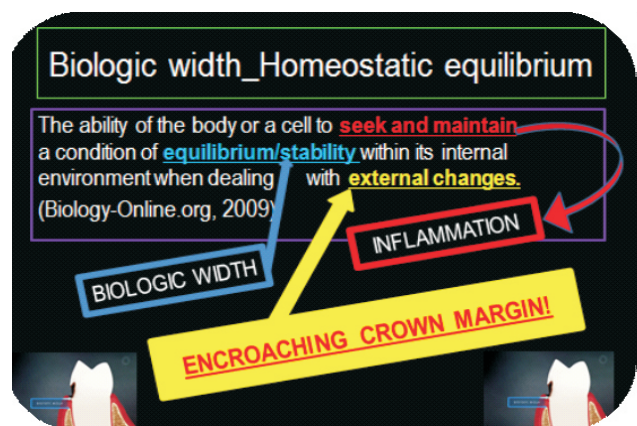
Risk factors for and correction of violated biologic width

The risk factors for violating the biologic width include; very thin alveolar bone, trauma from restorative procedures, thin, fragile gingiva and highly scalloped gingival form⁶. Treatment options for a violated biologic width include surgical crown lengthening, orthodontic extrusion alone, slow orthodontic extrusion with subsequent surgery, rapid orthodontic extrusion with weekly supracrestal fiberotomy especially when biologic width violation is on the interproximal side and when it occurs across the facial surface and the gingival tissue level is correct⁷. It is often advisable to remove an additional 0.5 mm of bone as a safety margin/zone.

Finally, it is important to observe the following;

- 1) Request for a pre-placement periodontal assessment to include gingival sulcus measurements, gingival biotype and gingival bioform.
- 2) Look out for shallow sulci, 1.0 to 1.5 mm
- 3) In shallow sulci, don't extend more than 0.5 mm subgingivally
- 4) The free gingival margin is close to the top of the attachment
- 5) Future recession is unlikely with shallow sulci.
- 6) Deeper sulcular probing depths provide more freedom
- 7) The deeper the gingival sulcus, the greater is the risk of recession

It has been advised that if the sulcus probes 1.5mm or less, the restoration margin should be placed 0.5mm below the gingival tissue crest. This is especially important on the facial aspect and will prevent a biologic width violation in a patient who is at high risk in that regard. For a sulcus of more than 1.5mm, the margin should be placed half the depth of the sulcus below the tissue crest. This places the margin far



enough below tissue, so that it will still be covered if the patient is at higher risk of recession. If a sulcus greater than 2mm is found, especially on the facial aspect of the tooth, it is important to evaluate to see if a gingivectomy could be performed to lengthen the teeth and create a 1.5mm sulcus.

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