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REVIEW

# Gingival biotype and its clinical significance – A review

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**Abstract** Gingival biotype has a significant impact on the outcome of restorative and regenerative therapy. The disparity in treatment outcome is possibly because of the difference in tissue response to trauma. Hence in clinical practice identification of the periodontal biotype is significant. Gingival thickness can be assessed by various invasive and non invasive methods. Thick and thin tissues often respond differently to inflammation and trauma. Periodontal surgical technique can improve the tissue quality and treatment outcome. This review paper highlights the general aspects of gingival biotype, methods to assess gingival thickness, response to treatment, techniques to improve tissue quality and its clinical significance.

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## 1. Introduction

The long term success of esthetic restorations depends on several factors like gingival biotype, architecture of the gingival tissue and shape of the anterior teeth. The gingival morphology plays an important role in determining the final esthetic outcome. Therefore during treatment planning, it is important to recognize differences in gingival tissue. Different gingival biotypes respond differently to inflammation, restorative, trauma and parafunctional habits.[1,2] These traumatic events result in various types of periodontal defects which respond to different treatments. Long back, Ochsenbien and Miller discussed the importance of "thick vs. thin" gingiva in restorative treatment planning.[1]

The morphologic characteristics of the gingiva depends on several factors like the dimension of the alveolar process, the form of the teeth, events that occur during tooth eruption, the eventual inclination and position of the fully erupted teeth.[3,4] A gingival thickness of $\geqslant 2$ mm is defined as thick biotype and a gingival thickness of $< 1.5$ mm as thin biotype.[5] A clinician's knowledge in identifying gingival biotypes is paramount in achieving optimal treatment outcomes. Various invasive and non invasive methods were proposed to measure tissue thickness. These include direct measurement,[6] probe transparency method,[7] ultrasonic devices,[8] and cone-beam computed tomography scan.[9] Placing a periodontal probe in the gingival sulcus and observing the transparency is a simple method to determine tissue thickness.

The term periodontal biotype introduced by Seibert and Lindhe categorized the gingiva into "thick-flat" and "thin-scalloped" biotypes. Thick gingival tissue is associated with a

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**Figure 1** Thick periodontal biotype.

**Figure 2** Squarish teeth with flat gingival architecture.

**Figure 3** Thin periodontal biotype.

broad zone of the keratinized tissue and flat gingival contour suggestive of thick bony architecture and also is more resistant to inflammation and trauma. Thin gingival tissue is associated with a thin band of the keratinized tissue, scalloped gingival contour suggestive of thin bony architecture and is more sensitive to inflammation and trauma. Inflammation of the periodontium results in increased pocket formation and gingival recession in thick and thin tissues respectively.[5]

Tissue biotype is a critical factor that determines the result of dental treatment. The initial gingival thickness is significant as it may predict the outcome of root coverage procedures and restorative treatments.[10,11] However periodontal surgical techniques can enhance tissue quality resulting in a more favorable treatment outcome.

## 2. Gingival biotypes and their characteristics

According to Ochsenbien and Ross (1969), gingival biotypes are of two types.[1] They are scalloped and thin or flat and thick gingiva. They proposed that the contour of the gingiva closely followed the contour of the underlying bone. Later Siebert and Lindhe categorized the gingiva into "thick - flat" and "thin – scalloped" biotypes. A gingival thickness of $\geqslant 2$ mm (measurements of 1.6–1.9 mm were not accounted for) was considered as thick tissue biotype and a gingival thickness of $< 1.5$ mm was referred as thin tissue biotype.[5]

Becker et.al proposed three different periodontal biotypes: flat, scalloped and pronounced scalloped gingiva. Measuring from the height of the bone interproximally to the height at the direct midfacial, their findings are as follows: flat = 2.1 mm, scalloped = 2.8 mm, pronounced scalloped = 4.1 mm.[12]

Data in a study suggest that in 85% of the population, the thick periodontal biotype was more prevalent than the thin scalloped form (15%).[13] Thick periodontal biotypes are usually associated with periodontal health. The tissue here is dense and fibrotic with a large zone of attached gingiva. Surgical evaluation reveals a thicker and flatter underlying osseous form. The thick gingiva usually comes with low or high gingival scalloping[14]

Patients with thick-flat biotypes demonstrate short papillae whereas thick-scalloped biotypes show long papillae. This morphometric disparity could result in a more papilla loss in the latter. The other distinctive features of a tissue with thick biotypes include flat soft tissue and bony architecture, denser and more fibrotic soft tissue curtain, large amount of attached masticatory mucosa (Fig. 1), resistance to acute trauma and respond to disease with pocket formation and infra bony defect. Moreover, the teeth are more square in shape (Fig. 2) and shows flatter posterior cusps. The contact areas of adjacent teeth are larger faciolingually and incisogingivally.[15]

Thin gingival biotypes are delicate, highly scalloped and translucent in appearance (Fig. 3). The soft tissue appears delicate and friable with a minimal amount of the attached gingiva. The underlying bone is thin or minimal bone over the labial roots with possible presence of fenestrations and dehiscence.[15] Patients with thin scalloped biotypes are considered at risk as they have been associated with a compromised soft tissue response following surgical and or restorative treatment.[13,16–20] Unlike in thick biotypes the teeth are more triangular with steeper posterior cusps. The contact areas of adjacent teeth are small faciolingually and incisogingivally and are located towards incisal or occlusal third.[15]

The gingival thickness affects the treatment outcome possibly because of the difference in the amount of blood supply to the underlying bone and susceptibility to resorption.[2,21] Gingival or periodontal diseases are more likely to occur in patients with a thin biotype and the remodeling process, after tooth extraction results in more dramatic alveolar resorption in the apical and lingual directions.[2] An atraumatic extraction and preservation of the alveolar plates are essential, if the site is to be used for implant placement. When compromise of the alveolar plate is expected, it is then necessary to utilize ridge augmentation protocols.

## 3. Methods to determine gingival thickness

Many methods were proposed to measure gingival thickness. The gingival thickness can be assessed by the direct method,[6] Probe transparency (TRAN) method,[7] Ultrasonic devices[8] and Cone Beam Computed Tomography (CBCT) scans.[9]

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