



GINGIVAL BIOTYPE – A REVIEW

DR. SHWETA PATNAIK , DR. DEEPTI GATTANI , DR.
BHAGYASHRI GUDADHE

ABSTRACT

Gingival/periodontal biotype is now known to influence the indications and outcomes of various therapies routinely performed in a dental clinic. The delicate thin biotype is more susceptible to injury and responds in a different way clinically as compared to the sturdier thick biotype. Assessment, identification, and indicated treatment considerations are now becoming the key to achieve predictable results, good esthetics, and stability of soft tissue margins. This review describes the various classifications, methods of assessment and clinical considerations for both the thick and thin tissue biotypes.

Keywords - Gingival biotype, Gingival thickness, Osseous architecture, Periodontal therapy

Correspondence :

Dr. Shweta Patnaik
Post Graduate Student,
Department of Periodontology,
Swargiya Dadasaheb Kalmegh Smruti Dental College and Hospital, Nagpur
Email: - shwetz.2512@gmail.com

INTRODUCTION

Gingiva is the part of the oral mucosa that covers the alveolar processes of the jaws and surrounds the necks of the teeth. A well-scalloped gingival line at the cemento-enamel junction (CEJ) of the teeth forms one of the pillars of a beautiful smile. Clinicians handle gingiva in several dental procedures and the resulting gingival architecture is not always ideal. In the era of esthetics-driven dentistry, it is of paramount importance that a clinician should be well-aware of all the factors that may influence the final esthetic outcome of a treatment. One such factor that clinicians should consider before starting any restorative, prosthetic, and periodontal procedure is the “tissue biotype.”

Ochsenbein and Ross in their pioneer study indicated that there were two main types of gingiva morphology, namely the scalloped and thin or flat and thick gingiva.¹ The term “periodontal biotype” was later introduced by Seibert and Lindhe to categorize the gingiva into “thick flat” and “thin scalloped” biotypes.²

In general, the term gingival biotype has been used to describe the thickness of the gingiva in the facio-palatal dimension. Whereas the term “periodontal biotype” encompasses not only the thickness of gingiva, but also other features such as contour of gingiva, alveolar bone contour and thickness, amount of keratinized gingiva present, and crown shape.³

With the increase in the amount of literature on the topic, it is now understood that different gingival/periodontal biotypes behave in a different manner under similar clinical conditions. Furthermore, the treatment considerations for individuals with different biotypes differ.

This article reviews the characteristics and significance of various gingival biotypes and the many ways to determine them.

TYPES

In 1969, Oschenbein and Ross indicated that there were two main types of gingival anatomy— flat gingiva, that was associated with a square tooth form; and highly scalloped gingiva, that was associated with a tapered tooth form.¹ It was also proposed that the gingival contour closely mimics the contour of the underlying alveolar bone. The term periodontal biotype was used later by Seibert and Lindhe, who classified the gingiva as either thin-scalloped or thick-flat.² In a study by De Rouck et al, the thin gingival biotype occurred in one-third of the study population and was most prominent among women, while the thick gingival biotype occurred in two-thirds of the study population and occurred mainly among men.³ Studies have confirmed that central incisors with a narrow crown form are at greater risk of recession than incisors with a wide, square form.^{4,5}

According to the literature, the alveolar bone and the gingival margin surrounding a tooth with pronounced cervical convexity are located more apically than they would be in teeth with flat surfaces, suggesting that the gingival margin is affected by the cervical convexity of the crown.^{6,7}

Kois introduced in 1994 a classification system for the periodontal biotype in relation to the restorative margin. He took the cemento-enamel junction (CEJ) and the bone crest into consideration and defined three categories (high, normal and low crest). The restorative treatment outcome in each of these three crest positions is suggested to be strongly related to the gingival and alveolar crest form.⁸

CHARACTERISTICS OF GINGIVAL BIOTYPES (Figure 1)

The following characteristics have been assigned to each biotype. (Oschenbein and Ross, 1969)

THIN AND SCALLOPED	THICK AND FLAT
Delicate thin periodontium	Thick heavy periodontium
Highly scalloped gingival tissue	Flat gingival contour
Usually slight gingival recession	Gingival margins usually coronal to the cementoenamel junction
Highly scalloped osseous contours	Thick, flat osseous contour
Minimum zones of keratinized gingiva	Wide zone of keratinized gingiva
Small incisal contact areas	Broad apical contact areas
Triangular anatomic crowns	Square anatomic crowns
Insult results in recession	Insult results in pocket depth or redundant tissue
Subtle diminutive convexities in cervical third of the facial surface	Bulbous convexities in cervical third of the facial surface

Figure 1 Characteristic feature of each biotype

GINGIVAL BIOTYPE ASSESSMENT

Many methods (both invasive and non-invasive) have been used to evaluate the thickness of the gingiva. These methods include conventional histology on cadaver jaws, injection needles, transgingival probing, histologic sections, cephalometric radiographs, probe transparency, ultrasonic devices and CBCT.

Visual evaluation

Simple visual evaluation is used in clinical practice to identify the gingival biotype; however it may not be considered a reliable method, as it cannot be used to assess the degree of gingival thickness.^{1,2,5}

Probe transparency

The gingival tissue's ability to cover any underlying material's colour is necessary for achieving esthetic results, especially in cases of implant and restorative dentistry. The most commonly used method for determining biotype is placement of a probe within the gingival sulcus and evaluating for probe visibility. If the probe can be seen through the gingival tissue, the biotype is classified as thin. Conversely, if the probe cannot be seen through the gingival tissue, the biotype is classified as thick.

Modified caliper

A tension-free caliper can only be used at the time of surgery and cannot be used for pretreatment evaluation.

Transgingival probing

In this method tissue thickness is measured using a periodontal probe. When the thickness is greater than 1.5mm, it was categorized as thick biotype and if less than 1.5 mm, it was considered as thin. This method although simple and non-invasive, has inherent limitations such as precision of the probe during probing, which is to the nearest 0.5mm, the angulation of the probe during probing and distortion of tissue during probing.⁹

Ultrasonic devices

A 1971 study by Kydd et al was the first to measure the thickness of palatal mucosa using an ultrasonic device.¹⁰ These devices appear to offer excellent validity and reliability.

Cone beam computed tomography

CBCT scans have been used extensively for hard tissue imaging because of their superior diagnostic ability. In contrast to transgingival probing and the ultrasonic device, CBCT method provides an image of the tooth, gingiva and other periodontal structures. Moreover, measurements can be repeatedly taken at different times with the same image obtained by soft tissue CBCT which is not feasible by other methods.

CLINICAL SIGNIFICANCE

Periodontal biotype assessment is an important element in the diagnostic and prognostic phases of treatment. The influence of gingival thickness has been documented in various applications, including non-surgical periodontal therapy, mucogingival therapy, guided tissue regeneration (GTR), crown lengthening, and implant dentistry.

- Patients with gingiva <1.5 mm thick, lost attachment after non-surgical periodontal therapy, whereas sites with gingiva ≥ 2 mm thick demonstrated no attachment loss.¹¹
- In root coverage procedures, a thicker flap was associated with a more predictable prognosis. Gingival thickness ≥ 0.8 mm was associated with 100% root coverage with a coronally advanced flap.¹²
- Less post-treatment recession was observed after GTR procedures with tissue thickness >1 mm compared with sites <1 mm.¹³ A systematic review and meta-analysis suggested a correlation between a critical gingival thickness threshold of >1.1 mm and complete root coverage after connective tissue grafting and GTR procedures.¹⁴
- A thicker biotype has been correlated with greater tissue rebound after surgical crown lengthening as compared to a thin gingival biotype.^{15,16}
- Thin periodontal biotypes are associated with slightly greater buccal marginal tissue recession around implants compared with thick biotypes.^{17,18} Spray et al documented that, as buccal bone thickness approached 1.8 to 2.0 mm, bone loss decreased significantly and evidence of bone gain after implant placement was seen.¹⁹ Huang et al (2005) reported that implant

sites with thin mucosa were prone to angular bone defects, while stable crestal bone was maintained in implants surrounded by thick mucosa.

Gingival recession is one of the most common complications resulting from single anterior tooth implant placement.²⁰ Hence gingival biotype is a diagnostic key for predicting the esthetic success of an implant.

- Mucogingival problems may result from orthodontic movement of teeth away from the alveolar process, particularly among patients with thin periodontium. It was found that the bucco-lingual thickness determines gingival recession and attachment loss at sites with gingivitis during orthodontic treatment.
- For patients with a thin gingival biotype, extreme care should be taken during extraction to prevent labial plate fracture. According to Fu et al, the thickness of the labial gingival tissue has a moderate association with the underlying bone.²¹
- Preservation of alveolar dimensions (such as socket preservation or ridge preservation techniques after tooth extraction) is critical for achieving optimal esthetic results in thin biotypes; atraumatic extraction also may be necessary.

CONCLUSION

By understanding the nature of tissue biotype (thickness), a practitioner can employ appropriate clinical procedures to minimize soft tissue loss and alveolar resorption and provide a more favourable tissue environment. Different gingival biotype can influence the diagnosis and treatment planning for different patients. In addition, these techniques when appropriately applied can save on treatment time and cost for patients. Inclusion of biotype assessment

in the diagnostic record of the patient can give the clinician an idea about the care to be taken in tissue handling, the type of procedure to be employed in a certain situation as well as the expected outcome.

REFERENCES

- Ochsenbein C, Ross S. A re-evaluation of osseous surgery. *Dent Clin North Am.* 1969;13(1):87-102.
- Seibert JL, Lindhe J. Esthetics and periodontal therapy. In: Lindhe J, ed. *Textbook of Clinical Periodontology*, 2nd ed. Copenhagen, Denmark: Munksgaard; 1989:477-514.
- De Rouck T, Eghbali R, Collys K, De Bruyn H, Cosyn J. The gingival biotype revisited: transparency of the periodontal probe through the gingival margin as a method to discriminate thin from thick gingiva. *J Clin Periodontol.* 2009;36(5):428-433.
- Olsson M, Lindhe J. Periodontal characteristics in individuals with varying form of the upper central incisors. *J Clin Periodontol.* 1991;18(1):78-82.
- Olsson M, Lindhe J, Marinello CP. On the relationship between crown form and clinical features of the gingiva in adolescents. *J Clin Periodontol.* 1993;20(8):570-577.
- Hirschfeld L. A study of skulls in the American Museum of Natural History in relation to periodontal disease. *J Dent Res.* 1923;5:241-265.
- Morris ML. The position of the margin of the gingiva. *Oral Surg Oral Med Oral Pathol.* 1958;11(9):969-984.
- Kois JC. Altering gingival levels: The restorative connection. Part 1: biologic variables. *J Esthet Dent.* 1994;6(1):3-7.
- Greenberg J, Laster L, Listgarten MA. Transgingival probing as a potential estimator of alveolar bone level. *J Periodontol.* 1976;47(9):514-517.
- Kydd WL, Daly CH, Wheeler JB 3rd. The thickness measurement of masticatory mucosa in vivo. *Int Dent J.* 1971;21(4):430-441.
- Claffey N, Shanley D. Relationship of gingival thickness and bleeding to loss of probing attachment in shallow sites following nonsurgical periodontal therapy. *J Clin Periodontol* 1986;13:654-657.
- Baldi C, Pini-Prato G, Pagliaro U, et al. Coronally advanced flap procedure for root coverage. Is flap thickness a relevant predictor to achieve root coverage? A 19-case series. *J Periodontol* 1999;70:1077-1084.
- Andereggs CR, Metzler DG, Nicoll BK. Gingiva thickness in guided tissue regeneration and associated recession at facial furcation defects. *J Periodontol* 1995;66:397-402.
- Hwang D, Wang HL. Flap thickness as a predictor of root coverage: A systematic review. *J Periodontol* 2006;77:1625-1634.
- Pontoriero R, Carnevale G. Surgical crown lengthening: A 12-month clinical wound healing study. *J Periodontol* 2001;72:841-848.
- Arora R, Narula SC, Sharma RK, Tewari S. Evaluation of supracrestal gingival tissue after surgical crown lengthening: A 6-month clinical study. *J Periodontol* 2013;84:934-940.
- Chen ST, Darby IB, Reynolds EC, Clement JG. Immediate implant placement postextraction without flap elevation. *J Periodontol* 2009;80:163-172.
- Evans CD, Chen ST. Esthetic outcomes of immediate implant placements. *Clin Oral Implants Res* 2008;19:73-80.
- Spray JR, Black CG, Morris HF, Ochi S. The influence of bone thickness on

facial marginal bone response: Stage 1 placement through stage 2 uncovering. *Ann Periodontol* 2000;5:119-128.

20. Goodacre CJ, Kan JY, Rungcharassaeng K. Clinical complications of osseointegrated implants. *J Prosthet Dent*. 1999;81(5):537-552.

21. Fu JH, Yeh CY, Chan HL, Tatarakis N, Leong DJ, Wang HL. Tissue biotype and its relation to the underlying bone morphology. *J Periodontol*. 2010;81(4):569-574.

Authors Information

Dr. Shweta Patnaik

PG student,

Department of Periodontology,

Swargiya Dadasaheb Kalmegh Smruti

Dental College & Hospital, Nagpur

Dr. Deepti Gattani

Professor & Head,

Department of Periodontology,

Swargiya Dadasaheb Kalmegh Smruti

Dental College & Hospital, Nagpur

Dr. Bhagyashri Gudadhe

PG student,

Department of Periodontology,

Swargiya Dadasaheb Kalmegh Smruti

Dental College & Hospital, Nagpur

Submit your next manuscript to CRJMS and take full advantage of :

- Convenient manuscript submission (through website) and by mail (editorcrjms@gmail.com).
- Thorough Peer review
- Author friendly Article Processing Charges
- No space constraints or extra color figure charges
- Immediate publication on acceptance Inclusion in International Database including Google Scholar
- Manuscript writing assistance for New Authors