Gingival Biotype: A Secret for Esthetic Success

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Abstract

Gingival biotype, in the recent years, has gained substantial interest as one of the important pillars for esthetic success. This review provides recommendations to be considered prior to performing any dental procedure to attain best clinical results. Several methods for measuring biotype have been suggested. Gingiva is often subjected to various insults during routine dental procedures. Hence, understanding the gingival biotype can provide insights into precautions rendered necessary during tissue handling to avoid undesirable treatment outcomes.

Keywords
- gingival biotype
- gingival thickness
- TRAN

Introduction

The gingiva is the part of the oral mucosa that covers the alveolar processes of the jaws and surrounds the neck of teeth.[1] An esthetically pleasing smile is characterized by a well-scalloped gingival margin at the cement–enamel junction. Gingival biotype is one of the many factors that determine the long-term success of esthetic restorations. Since the gingiva is frequently encountered during most dental procedures, clinicians must be acquainted with different biotypes and their behaviors under similar clinical conditions. This shall not only render long-term success of restorations but also esthetically promising results.

Gingival biotype is considered as a genetically determined trait[2] that describes the thickness of gingiva faciopalatally. Several terms have been used by various authors in the past (►**Table 1**). In the most recent consensus report, it was referred to as periodontal phenotype.[3] The term periodontal phenotype encompasses the combination of gingival phenotype (three-dimensional gingival volume) and the buccal bone thickness, that is, the bone morphotype. Biotype is genetically determined and cannot be modified. However, phenotype describes a dimension that can change through time depending upon environmental factors and clinical intervention. It can also be site specific.[3]

A thick biotype is generally related to good periodontal health. It is characterized by dense tissues and has a sufficient zone of attached gingiva. Thick tissues can withstand trauma and exhibit less clinical inflammation. It enables manipulation, encourage creeping attachment, and enhance the esthetics of implants.[13-15]

Thin biotype is characterized by thin gingival tissues. It is almost translucent in appearance and possess minimal zone of attached gingiva. It is also highly accentuated that suggests the presence of minimal bone. Also, thin biotype is less resistant to gingival recession when it is subjected to inflammatory and surgical insults.[6,16] Gingival recession or visible restorative margins can create esthetic problems particularly when anterior teeth are affected. Hence, determining the tissue biotype is a crucial step prior to planning any esthetic procedure.

Gingival Biotype Assessment

Different techniques for assessment of gingival biotype are listed in (►**Table 2**). Other methods for biotype determination include histologic examination of cadaver jaws, injection needles, and cephalometric radiographs.[18] A method that is simple to apply in clinical practice along with being reliable would be best suited for clinicians to modify treatment plan and produce more predictable results.

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Table 1 Different forms of gingival tissues as described by various authors

Year	Author	Classification
1923	Hirschfeld[4]	Based on the alveolar contour as thin and thick gingival forms
1969	Oschenbein and Ross[5]	Tapered tooth form was associated with scalloped thin type and square tooth form with flat thick gingiva. Also, the contour of gingiva mimics the contour of the underlying alveolar bone
1977	Weisgold[6]	Based on form and function as thin in scalloped periodontium and thick in flat periodontium
1986	Claffey and Shanley[7]	Based on thickness measured by a stainless-steel wire with a cutoff shank of a probe; thin (≤1.5 mm) and thick (≥2.0 mm)
1991	Olsson and Lindhe[8]	Gingival morphology based on tooth dimensions; long narrow central incisors associated with thin periodontium and thick with square, wide form
1994	Kois[9]	Based on the relationship between CEJ and the alveolar crest—normal (alveolar crest 3 mm apical to CEJ), high (alveolar crest less than 3 mm), low (alveolar crest more than 3 mm)
1996	Eger et al[10]	Based on gingival morphology via cluster analysis as normal, thin, thick
2009	De Rouck et al[11]	Based on the gingival transparency of probe when inserted in to the sulcus; thick and thin
2010	Kan et al[12]	Based on the tissue morphology and makeup as thick, dense, fibrotic and thin, translucent, and friable
2018	Jepsen et al[3]	Suggested the term periodontal phenotype that describes the combination of gingival phenotype (i.e., three-dimensional gingival volume) and the buccal bone plate thickness (bone morphotype) By observing the periodontal probe shining through the gingival tissue as— probe visible: thin (≤1 mm) Probe not visible: thick (>1 mm) (Figs. 1 and 2)

Abbreviation: CEJ, cement–enamel junction.

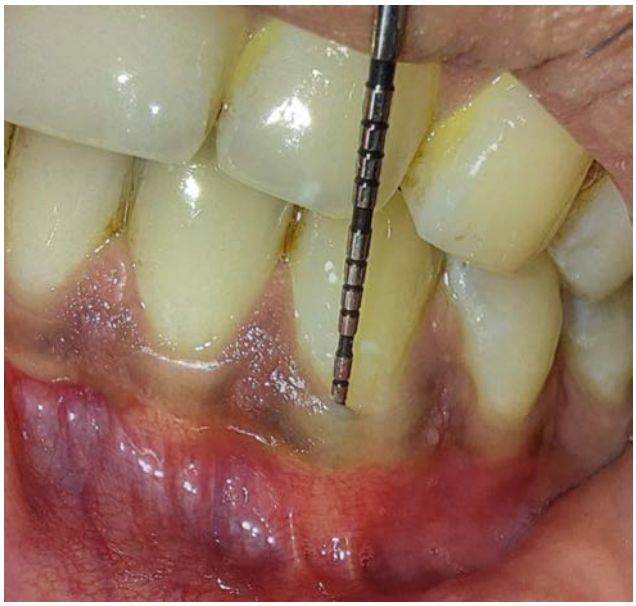

Fig. 1 Thin biotype.

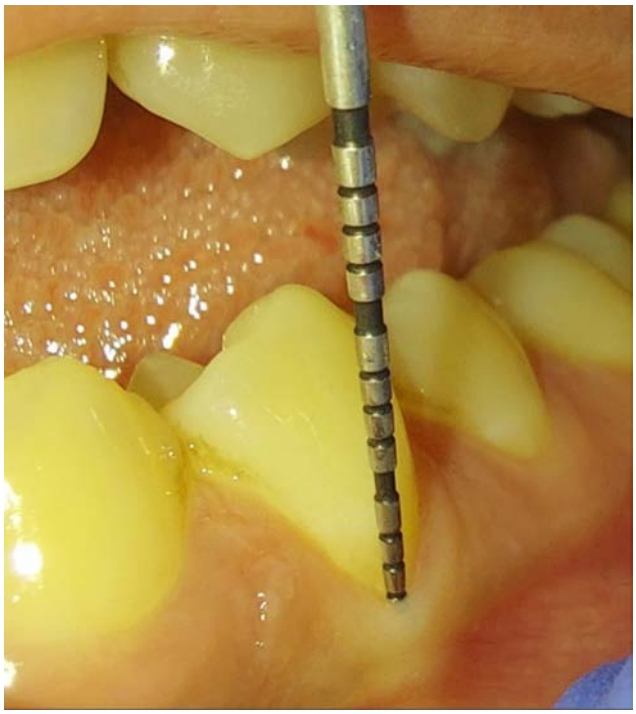

Fig. 2 Thick biotype.

Gingival Biotype and Clinical Perspectives

Flap Procedures

Ample evidence suggests that thin gingiva is more predisposed to recession than gingiva that is thick. This often leads to dentinal hypersensitivity, abrasion and/or cervical wear, root caries, and an increase in plaque accumulation.

The primary determinant of the effectiveness of treating mucogingival defects is thickness of gingival tissues at the surgical site. A flap thickness of 0.8 to 1.2 mm was found to be associated with a more predictable prognosis. Also, flap margins can be inadvertently thinned that may increase the risk of postoperative recession, especially if the biotype is thin.[22] Therefore, clinicians must handle flaps carefully in such situations.

Recommendation: Patients with a thinner biotype can ideally be treated with connective tissue graft technique combined with a coronally advanced flap that will produce a pseudo-thick biotype to avoid unesthetic or undesirable results.[23]

Crown Lengthening Procedures

Determination of biotype is an important factor to be considered during crown lengthening procedures. Following full-thickness flap procedures, bone resorption of ~0.5 to 0.8 mm is seen to occur.[18] Hence, it is difficult to predict the

Table 2 Different techniques available for the assessment of gingival biotype

Technique		Advantages	Disadvantages
Visual examination	Gingiva is examined visually and evaluated on the basis of its general appearance	Simple and noninvasive	The degree of tissue thickness cannot be assessed by this method. Low accuracy due to a high interexaminer variation[17]
Direct methods a. Transgingival probing	Thickness determined with a periodontal probe. Thick > 1.5 mm Thin < 1.5 mm	Simple and inexpensive	Invasive nature; requires administration of local anesthesia[18]
b. Endodontic reamers, files	Gingiva is first anesthetized and pierced perpendicular to a point lying in the center of gingival margin and mucogingival junction. Endodontic reamer/file with a rubber stop are usually used. The measurement is recorded against a digital caliper	Precise measurement	Invasive in nature; could lead to an increase in local volume and patient discomfort due to local anesthesia administration[19]
c. Probe transparency method (TRAN)	Sulcus sampling done on the midfacial aspect of the tooth Probe visible: thin Probe not visible: thick	Good accuracy, simple, rapid, and minimally invasive[11]	
Ultrasonic method	An ultrasonic device with an attached sensitive thin probe is used. It utilizes pulse echo to determine the thickness of biotype	Precise measurement, digital display, eliminates interexaminer variability, and is noninvasive	Less feasible due to high cost of equipment and availability is limited[20]
Cone beam computed tomography (CBCT)	Thickness of both hard and soft tissues can be visualized and measured	Highly accurate results; no interexaminer variability	Exposure to radiation and increased costs for patients[21]

final hard and soft tissue position following flap procedures. This could possibly manifest as gingival recession specially in thin biotype.

Recommendation: Permanent restorations are recommended after a healing period of 6 months specially in the anterior esthetic region. Tissue thickness may be improved by soft tissue grafting 6 to 8 weeks prior to crown lengthening procedures.[24]

Restorative Procedures

Thin periodontal biotypes being friable, the possibility of recession increases after crown preparation. Overcontoured restorations are found to particularly lead to the development of tissue injury and gingival recession especially in thin biotype. Thicker biotypes have greater resistance to tissue recession and can better mask the margins of restorations that are even placed subgingivally.[14]

Recommendation: It is advisable to position the margins of prepared restorations supragingivally in thin biotype cases. Failing to do so may cause a grayish hue of the restorative margin to be visible through the thin and translucent gingival tissues thereby compromising esthetics specially in anterior esthetic regions.[14]

Gingival Retraction Cords

Precautions must be undertaken in thin biotype cases to prevent soft tissue injury especially in procedures that involve the placement of retraction cords. Thin cords are usually advised for retraction.

Recommendation: Chances of recession increase if cord is kept for more than 15 minutes.[14] Also, the cord must be moist while removal to avoid tissue tears.

Implant Dentistry

Thick tissues are preferred around dental implants as they conceal titanium of implants better and also are accommodating to different implant positions.[25,26] Therefore, compared with a thin biotype, thicker tissues are favored around implants. Also, significantly less bone resorption is seen in thick biotypes after implant placement compared with thin biotypes.

Recommendation: An immediate implant placement can be considered in a thick biotype with predictable outcomes as it can help to preserve the osseous structures.[27,28] However, a delayed implant placement is preferable when the thickness of the surrounding tissues is not sufficient.

Orthodontic Therapy

Pretreatment assessment of the biotype prior to orthodontic therapy is an important step as perforation of cortical plate may occur especially in thin biotype leading to soft tissue recession and exposure of root.[29]

Recommendation: Nonsurgical periodontal therapy and/or surgical correction of any soft or hard tissue defects

using membranes and grafts may be required during orthodontic phase.[30] Such procedures can be performed either before or after orthodontic therapy to create a pseudo-thick biotype to prevent tissue collapse.

Tooth Extraction

In comparison to thin biotypes, thick biotypes are associated with minimal ridge atrophy after extraction. Excessive forces can cause fracture of buccal alveolar plate in thin biotype resulting in bone resorption and unpredictable bone healing.[31]

Recommendation: Undue extraction forces in thin biotype cases should be avoided to minimize ridge atrophy and buccal alveolar plate fracture.

Gingival Biotype Enhancement Techniques

Presence of thin gingival biotype can impede outcomes of many esthetic dental therapies. Prospects of enhancing the biotype in such cases exists. When a thin biotype is surgically converted to a thick one, it is termed as "pseudo-thick gingiva." Such procedures are done mainly to achieve stable results that are functionally and esthetically acceptable.

a. The most reliable and frequently reported technique of enhancing tissue thickness is the use of connective tissue grafts (CTG).[32] It can either be harvested from the palate or tuberosity and then placed subepithelially at the site of interest. The use of acellular dermal matrix as an alternative to CTG has also been documented in numerous literature.
b. Use of platelet rich fibrin membrane: Platelets release several growth factors like platelet derived growth factors and endothelial growth factor.[33]
c. Membranes that are fetal in origin such as amnion and chorion membranes have also been used.[34] These allografts are derived from the human placenta. They are usually placed under a tunnel or pouch or coronally advanced flap and then sutured.

Conclusion

Gingival biotype behaves differently when exposed to insults thereby dictating the outcomes of numerous dental procedures. Biotype assessment in routine clinical examination should be considered imperative to avoid unaesthetic treatment consequences. Advancements over the decades in periodontal surgical techniques have provided several opportunities of improving tissue quality. Such techniques not only augment the restorative environment but also provide desirable treatment outcomes. Hence, biotype should be considered as an integral component during inter- and multidisciplinary treatment approaches that provide clinicians with the required insights and precautions necessary for tissue handling.

Conflict of Interest
None declared.

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