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“Gingival Biotype with Clinical Applicability: An Overview”

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ABSTRACT

Gingival biotype is of greatest concern in aesthetic reconstructive dentistry, particularly affecting the successful outcome of dental implant placement, periodontal surgeries such as root coverage and ridge augmentation procedures. As gingival biotype has been classified into thick and thin, their applicability into various diagnostic, surgical procedures are hence, must to redaction. The purpose of this article is to provide an overview on gingival biotype and application of available knowledge into practicality.

INTRODUCTION

Aesthetics reconstruction is a major concern for both clinician and patients in today's dentistry. An aesthetically pleasing smile encompasses the shape, size, position of the teeth that are in harmonious relationship with surrounding soft tissue. This compatibility of the soft tissue over the hard tissue depends upon myriad of factors, one of such factors is gingival biotype^[1].

The gingival biotype is concerned with the particular pattern and thickness of gingival tissue around the teeth. Literature observations though, illustrate disparities in gingival tissue may affect the aesthetic treatment outcome that arise as a result of variability in gingival tissue response to reconstructive surgical insult^[2]. The purpose of this article is to provide an overview on clinical variables and rectify their applicability for a specific treatment modality.

Gingival Biotype and Related Anatomic-Morphometric Analysis

Various techniques have been utilized in the correct identification of gingival biotype (**Table 1**). The correct identification of the gingival biotype is considered important in clinical practice as differences in gingival have been shown to exhibit a significant impact on the outcome of aesthetic restorative therapy^[3]. Correct clinical identification of gingival biotype can be done based on:

Gingival biotype and tooth form

It has been suggested that morphologic characteristics of the periodontium are related to the shape and form of the tooth.

There are two main types of gingival anatomy i.e. flat and scalloped, identified as the bulky, slightly scalloped/flat marginal gingival with short and wide teeth and the thin, highly scalloped marginal gingiva with long slender teeth. Various studies reported variability in the clinical appearance of healthy periodontal tissues based on tooth type, shape and form (CW/CL ratio). The associated clinical variables identified are probing gingival sulcus depth, probing attachment level, papilla fill and amount of gingival recession. It has been found that the subjects with long-narrow teeth have a comparatively thin periodontium, high papilla fill and exhibited more gingival recession, less probing gingival sulcus depth than the subjects who had a short-wide tooth form with a thick gingival biotype. Hence, there is a significant influence of the tooth type, shape and form (CW/CL) ratio on the probing attachment level, papilla fill and the amount of gingival recession on facial tooth surfaces [4,5]. Therefore, disparities in aesthetic outcome could arise as a result of variability in tissue response to reconstructive surgical trauma.

Table 1. Identification of Gingival Biotype.

Technique	Method	Study	Criterion	Advantages	Disadvantages
Direct Technique	Visual Inspection	Ochsenbein, Ross 1963	Dense, fibrotic-thick biotype	Simple, straightforward, noninvasive,	Subjective and highly variable
		Seibert, Lindhe 1969	Thin, friable- thin biotype		
Probe Transparency	Calibrated william's Periodontal Probe	Kan et al. 2003	Visibility of probe tip through gingival sulcus	Most accepted, Simple, convenient, and inexpensive	Difficult in identifying in pigmented gingiva
			Visible-thin biotype		
			Nonvisible-thick biotype		
Radiography	CBCT	Fu JH et al. 2010	Thickness of labial plate	Non-invasive, quantitative measurements,	Expensive, requires expertise, higher radiation exposure
			Thick plate- thick biotype	Simple, convenient, and non-invasive	Clinically unfeasible, expensive, difficult in maintaining directionality of transducer, commercially unavailable
Ultrasonography	Ultrasonic Transducer	Kydd et al. 1971	Thin plate-thin biotype < 1.2mm thin biotype	Simple, convenient, and non-invasive	Clinically unfeasible, expensive, difficult in maintaining directionality of transducer, commercially unavailable
			> 1.2mm thick biotype		
Direct Technique	Tension Free Calliper	Kan et al. 2010	< 1.5mm thin biotype > 1.5 mm thick biotype	Simple, convenient, and non-invasive	Precision of probe, angulations of probe, distortion of tissue during probing, invasive
	Transgingival probing by periodontal probe	Greenberg 1976	≥ 1.5 mm thick biotype		

Gingival biotype and labial plate thickness

Gingival biotype is significantly related to labial plate thickness, alveolar crest position, keratinized tissue width, gingival architecture, and probe visibility. A strong correlation exists between gingival biotype and labial plate thickness as identified by cone beam computed tomography. A thick/average biotype is associated with thicker labial plate, wider keratinized tissue width, narrow distance from the cement enamel junction to the initial alveolar crest, and probe non visibility through the gingival sulcus [6,7].

For clinical applicability in subjects with thin gingival biotype, care should be taken during extraction and immediate implant placement to prevent labial plate fracture. A thin gingival biotype is found associated with a thin alveolar plate and more ridge remodeling has been anticipated when compared with thick periodontal biotype. Preservation of alveolar dimensions (such as socket preservation or ridge preservation techniques after tooth extraction) is critical for achieving optimal aesthetic results in thin biotypes; atraumatic extraction also may be necessary [7].

Gingival biotype and Schneiderian membrane thickness

Applicability of clinical methods to identify gingival biotype can be instituted to overcome the complication i.e. the perforation of the sinus membrane in sinus graft procedures. It has been suggested that a correlation exists between the sinus membrane thickness and the risk of perforation, as established based on maxillary mucosal biopsies from the sinus floor during otorhinolaryngologic surgical interventions and gingival thickness in the area of the maxillary anterior teeth. It has been reported that the average thickness of the Schneiderian membrane is 0.97 ± 0.36 mm and in subjects with thick gingival biotype is $1.26 \pm$

0.14 mm, compared to thin gingival biotype, 0.61 ± 0.15 mm Schneiderian membrane^[8]. Hence, clinical identification of gingival biotype is a reliable factor for predicting sinus membrane thickness.

Gingival biotype and aesthetic reconstructive surgeries

The success of aesthetic reconstructive surgeries showed marked correlation with the gingival morphologic entities or biotypes. The gingival tissue thickness at the surgical site is key factor in determining the success of mucogingival defects treatment^[9,10]. In cases with root coverage surgeries, a thick gingival biotype flap produced more predictable outcomes^[11,12]. There is a correlation between flap thickness and complete root coverage.

Gingival biotype and implant dentistry

Gingival biotype has been described as one of the key elements for a successful treatment outcome in implant dentistry^[13]. It has been suggested that the presence of papilla between immediate single-tooth implants and adjacent teeth is correlated with a thick-flat biotype. Moreover, more gingival recession at immediate single-tooth implant restorations has been noted with a thin-scalloped biotype. A thick gingival biotype is a desirable characteristic that positively affect the aesthetic outcome of an implant restoration because thick tissue biotype is more resistant to mechanical and surgical insult^[14].

Based on current literature thick gingival biotype is geared up against thin gingival biotype. Thicker biotype available with thick labial plate, potentiate regeneration around implant (holding bone graft and soft tissue graft in position, enhances primary wound closure, revascularity, site protection). Moreover, better peri-implant soft tissue depth can be achieved due to resistant to mucosal recession. Thicker biotype is better at concealing titanium/metal margin, more accommodating to different implant position and resultant abutment angulation^[15,16]. Although, cases with thin biotype variety, the selection of abutment provides more concerns due to its inability to barricade to conceal titanium/metal margin and highly prone to mucosal recession on irritation/insult. Hence, for thin tissue phenotype variety, minimally invasive or flapless surgery is more appealing because it minimizes compromises to the blood supply of underlying bone and decreases the risk of recession after implant placement^[17].

CONCLUSION

The gingival perspective is the most accountable aspect of aesthetic dentistry. Re-establishing gingival shape and form should be an integral part of any aesthetic treatment planning, and ensuring correct biotype identification provide a firm foundation for future health, approval and longevity of the final result.

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