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Gingival Phenotype and its Role as a Risk Indicator for Gingivitis and Periodontitis: A clinical study

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Abstract

Background-

The morphology of the normal gingival tissue mirrors the underlying structure of epithelium, lamina propria and alveolar bone. The quality of soft tissue surrounding a tooth refers to as the gingival phenotype which has a significant impact on the outcome of periodontal and endodontic therapy.

Aim- This study aims to evaluate the role of a thin gingival phenotype and inadequate width of keratinized mucosa as potential risk indicators for gingivitis and periodontitis.

Material and methods- This is a cross-sectional study including50 patients aged between 21 and 55 years.The patients were group as test group- patients with thin gingival phenotype (25) and control group- patients with thick gingival phenotype (25). Clinical parameters included gingival index (GI), plaque index (PI), bleeding on probing (BOP), pocket depth (PPD), gingival phenotype (GP) using a William's graduated periodontal probe, and the determination of the width of keratinized mucosa (WKM) were recorded. The data collected from the samples were tabulated, and descriptive statistics were performed using appropriate statistical software.

Results- The study showed that the plaque index (PI) and gingival index (GI) values were significantly higher in patients with a thin gingival phenotype (test group). The present study found no significant difference in probing depths between individuals with thick and thin gingival phenotypes. However, the study did confirm that individuals with a thin gingival phenotype exhibited higher probing depths when compared with those having a thick gingival phenotype.The width of attached gingiva was significantly higher in patients with a thick gingival phenotype.

Conclusion- The findings presented in this study underscore the significance of gingival phenotype in determining oral health outcomes. To expand on this knowledge, future research should consider larger and more diverse study populations, encompassing individuals of varying ages and ethnicities, to account for the potential influence of gingival pigmentation. Currently, there is a limited number of interventional studies in this domain, necessitating further exploration and subsequent application of these findings in clinical settings. In summary, gingival phenotype exhibits a clear correlation with gingival thickness, gingival width, and buccal bone thickness. The assessment of gingival phenotype should be an integral part of daily clinical practice to identify individuals at high risk, particularly those with a thin gingival phenotype.

Keywords: phenotype, keratinized mucosa, alveolar bone, periodontal disease.

Introduction

The intricate interplay of biological factors in determining an individual's oral health has led to a more in-depth investigation of the influence of gingival phenotype in the context of gingivitis and periodontitis.[1] Gingival

phenotype, a term referring to the visible characteristics of the gingival tissue, including thickness, plays a pivotal role in understanding the predisposition to periodontal diseases. A comprehensive exploration of the intricate factors shaping gingival health is essential to provide a more nuanced understanding of the dynamics at play.[2]

The 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditionsrecognized the significance of gingival phenotype by categorizing it as an essential component of periodontal health.[3] Within this nomenclature, gingival phenotype (GP) becomes a vital element, alongside the bone morphotype, emphasizing the merging of gingival thickness (GT) and the width of keratinized gingiva (GW). Thus, the assessment of GP is now considered a pivotal part of comprehensive treatment planning and risk assessment before any dental intervention, including soft tissue manipulation.

Gingival phenotype, often described as a biotype, delineates the clinical variations in the width and thickness of gingival tissue. Specifically, a gingival thickness of equal to or greater than 2 mm is categorized as a thick biotype (TkP), while a gingival thickness of less than or equal to 1.5 mm represents a thin biotype (TnP).[4] These biotypes are further classified into "thick-flat" and "thin-scalloped" biotypes. Thick gingival tissue is associated with a broader zone of keratinized mucosa and a flat gingival contour, indicative of robust underlying bony architecture. Notably, individuals with a thick biotype exhibit greater resistance to gingival inflammation compared to those with a thin biotype. The incidence of pocket formation and gingival recession is elevated among those with a thin gingival biotype, as corroborated by existing periodontal literature.[5,6]

Thick gingival tissues exhibit resilience to gingival recession and are more resistant to mechanical irritation or trauma. The thickness of both bone and gingival tissue directly influences the stability of the osseous crest and gingival margin, making it a pivotal factor impacting treatment outcomes in patients with periodontal concerns.[7] Furthermore, the presence of an adequate width of keratinized mucosa empowers the patient to maintain effective oral hygiene and efficient plaque removal. Research reveals that teeth surrounded by inadequate width of keratinized mucosa are prone to higher plaque accumulation.[8] Parameters of soft tissue inflammation, such as the gingival index and bleeding on probing, have been consistently observed to be elevated around teeth with insufficient width of keratinized mucosa. Nevertheless, it's important to acknowledge the conflicting data in periodontal literature regarding the clinical significance of keratinized mucosa width and gingival phenotype in preventing gingival inflammation.[9] Therefore, this study aims to evaluate the role of a thin gingival phenotype and inadequate width of keratinized mucosa as potential risk indicators for gingivitis and periodontitis.

Aims and Objectives:

Hypothesis of the Study: Thin gingival phenotype and inadequate width of keratinized mucosa (<2 mm) increase the risk of developing gingivitis and periodontitis.

Objectives:

1. To determine the phenotype of the gingival tissue.
2. To determine the width of keratinized mucosa.

Material and Methods:

TEST GROUP-A PATIENT WITH THIN GINGIVAL PHENOOTYPE (RIGHT MANDIBULA CENTRAL INCISOR) NOTE: THE SHOW-THROUGH OF PERIODONTAL PROBE.

CONTROL GROUP-A PATIENT WITH THICK GINGIVAL PHENOTYPE (RIGHT MANDIBULAR CENTRAL INCISOR) NOTE: THERE IS NO SHOW-THROUGH OF PERIODONTAL PROBE.

This is a cross-sectional study including50 patients aged between 21 and 55 years. The patients were group as test group- patients with thin gingival phenotype (25) and control group- patients with thick gingival phenotype (25). Clinical parameters included gingival index (GI), plaque index (PI), bleeding on probing (BOP), pocket depth (PPD), gingival phenotype (GP) using a William's graduated periodontal probe, and the determination of the width of keratinized mucosa (WKM) were recorded.
Statistical Analysis:The data collected from the samples were tabulated, and descriptive statistics were performed using appropriate statistical software.

Results:

Oral Hygiene and Gingival Phenotype:

Oral hygiene in patients with thick and thin gingival phenotypes was comparable. Nevertheless, significant differences were observed when examining the plaque and gingival indices. Specifically, the plaque index (PI) and gingival index (GI) values were significantly higher in patients with a thin gingival phenotype.

THICK GINGIVAL PHENOTYPE				
	Plaque Index	Gingival Index	Probing Pocket Depth	Clinical Attachment Level
Ave	0.7868	0.7632	2.264	2.16
SD	0.32395627	0.29329621	0.72277244	0.692820323
SE	0.06479125	0.058659242	0.144554488	0.138564065
THIN GINGIVAL PHENOTYPE				
	Plaque Index	Gingival Index	Probing Pocket Depth	Clinical Attachment Level
Ave	1.86458333	1.942	3.352	3.584
SD	0.52553889	0.554090847	0.661513416	0.716286721
SE	0.10727518	0.110818169	0.132302683	0.143257344

Z - Value	-3.131881477	-3.47774961	-1.964912081	-2.526422682

Table 1: Table showing statistical values between test and control group

Key Comparisons:

The average PI, GI, PPD, and CAL (clinical attachment level) values for patients with thick gingival phenotype (TkP) were 0.7868, 0.7632, 2.264, and 2.16, respectively.

In contrast, the average PI, GI, PPD, and CAL values for patients with thin gingival phenotype (TnP) were 1.86458333, 1.942, 3.352, and 3.584, respectively.

Notably, the Z-values for PI and GI were significantly higher in patients with a thin gingival phenotype, indicating a higher degree of plaque accumulation and gingival inflammation. (Table 1, Graph 1).

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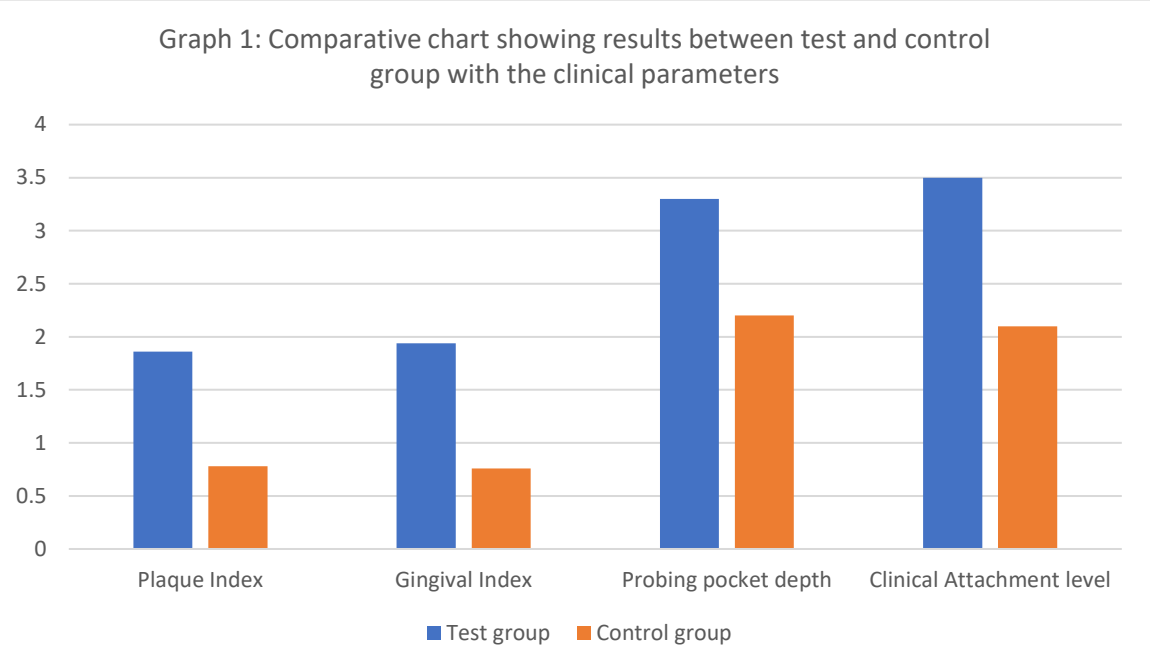

Discussion:

Gingival Phenotype and Oral Hygiene:

One of the most relevant factors associated with the assessment of gingival phenotype in clinical practice is the identification of high-risk patients susceptible to soft tissue complications, such as gingival or mucosal recession. This study underscores the connection between gingival phenotype and the maintenance of oral hygiene, emphasizing the pivotal role played by this factor. The study findings reveal that individuals with a thick gingival phenotype exhibit superior oral hygiene practices when compared to their thin gingival phenotype counterparts. Importantly, the plaque index and gingival index were notably lower in individuals with a thick gingival phenotype, underscoring the reduced risk of plaque accumulation and gingival inflammation.

Keratinized Gingiva Width and Gingival Phenotype:

The width of attached gingiva was significantly higher in patients with a thick gingival phenotype, aligning with findings from previous research, including the work of Rijal A et al.[10] This suggests an inherent association between the width of keratinized gingiva and the periodontal phenotype, with thicker biotypes characterized by a more pronounced keratinized gingival width.

Probing Depth:

Interestingly, the study's results concerning probing depth differ from findings in previous research. While David M. Kim et al. (2019) reported greater probing depths in subjects with a thick gingival phenotype[11], the present study found no significant difference in probing depths between individuals with thick and thin gingival phenotypes. However, the study did confirm that individuals with a thin gingival phenotype exhibited higher probing depths when compared with those having a thick gingival phenotype.

Clinical Implications:

The clinical implications of these findings are significant. Recognizing the direct connection between gingival phenotype and oral hygiene practices can guide clinicians in identifying potential sites in the oral cavity of patients with a heightened susceptibility to gingival inflammation. These individuals, particularly those with a thin gingival phenotype and inadequate width of keratinized mucosa (<2 mm), can benefit from early diagnosis and tailored treatment plans that enhance the long-term stability of their teeth. Moreover, this knowledge empowers patients to maintain optimal oral hygiene, a crucial aspect in preventing future periodontal diseases. Furthermore, the treatment outcomes for patients already afflicted by periodontal diseases and undergoing procedures such as flap surgery, root coverage, and regenerative techniques can be improved to achieve better healing and the stability of the gingival margin and osseous crest.

Future Research and Conclusion:

The findings presented in this study underscore the significance of gingival phenotype in determining oral health outcomes. To expand on this knowledge, future research should consider larger and more diverse study populations, encompassing individuals of varying ages and ethnicities, to account for the potential influence of gingival pigmentation. Currently, there is a limited number of interventional studies in this domain, necessitating further exploration and subsequent application of these findings in clinical settings. In summary, gingival phenotype exhibits a clear correlation with gingival thickness, gingival width, and buccal bone thickness. The assessment of gingival phenotype should be an integral part of daily clinical practice to identify individuals at high risk, particularly those with a thin gingival phenotype.

In conclusion, this comprehensive exploration of gingival phenotype's role as a risk indicator for gingivitis and periodontitis provides valuable insights into its multifaceted influence on oral health. Recognizing the significance of this factor and its interplay with oral hygiene, keratinized mucosa width, and periodontal parameters is essential for clinicians to provide more precise treatment strategies and enhance patients' long-term oral health. This research paves the way for further investigations and underscores the importance of integrating gingival phenotype assessment into routine clinical practice to identify individuals at higher risk for gingival inflammation and periodontal diseases.

References:-

1. Kurien T et al. The influence of gingival biotypes on periodontal health: A cross-sectional study in a tertiary care center. IP International Journal of Periodontology and Implantology 2021;6(2):103–108.
2. Chakraborthy K. Dimensions of Periodontium (Biotype Versus Phenotype) – A Literature Review. RGUHS Journal of Dental Sciences. Year:2022, Volume: 14, Issue: 4, Page no. 24-30, DOI:10.26463/rjds.14_4_18.
3. Caton J et al. A new classification scheme for periodontal and peri-implant diseases and conditions – Introduction and key changes from the 1999 classification. J Periodontol. 2018;89(Suppl 1):S1–S8.
4. Das G, Ahmed AR, Suleman G, Lal A, Rana MH, Ahmed N, Arora S. A Comparative Evaluation of Dentogingival Tissue Using Transgingival Probing and Cone-Beam Computed Tomography. Medicina (Kaunas). 2022 Sep 19;58(9):1312. doi: 10.3390/medicina58091312. PMID: 36143989; PMCID: PMC9504133.
5. Manjunath RG, Rana A, Sarkar A. Gingival Biotype Assessment in a Healthy Periodontium: Transgingival Probing Method. J Clin Diagn Res. 2015 May;9(5):ZC66-9. doi: 10.7860/JCDR/2015/13759.5956. Epub 2015 May 1. PMID: 26155566; PMCID: PMC4484158.
6. Alasiri MM, et al. Association between Gingival Phenotype and Periodontal Disease Severity—A Comparative Longitudinal Study among Patients Undergoing Fixed Orthodontic Therapy and Invisalign Treatment. *Healthcare*. 2024; 12(6):656. https://doi.org/10.3390/healthcare12060656.
7. Sharma, P., Bawa, S. K. S., Chauhan, P., & Malhotra, D. (2024). Gingival Biotype: A Key to Successful Aesthetics–Its Role and Functions–Observation-Based Research. European Journal of Dental and Oral Health, 5(2), 9–12. https://doi.org/10.24018/ejdent.2024.5.2.212.
8. Ravidà A, Arena C, Tattan M, Caponio VCA, Saleh MHA, Wang HL, Troiano G. The role of keratinized mucosa width as a risk factor for peri-implant disease: A systematic review, meta-analysis, and trial sequential analysis. Clin Implant Dent Relat Res. 2022 Jun;24(3):287-300. doi: 10.1111/cid.13080. Epub 2022 Mar 17. PMID: 35298862; PMCID: PMC9311272.
9. Stefanini M, Pispero A, Del Fabbro M, Gobbato L, Ghensi P, Lodi G, Sculean A, Zucchelli G, Grusovin MG. The Effect of Keratinized Mucosa on Peri-Implant Health and Patient-Reported Outcome Measures: A Systematic Review and Meta-Analysis. *Applied Sciences*. 2023; 13(15):8631. https://doi.org/10.3390/app13158631.
10. Rijal A et al. Evaluation of Width and Thickness of the Attached Gingiva and Its Association with Age, Gender, and Arch Location in the Nepalese Population. The Scientific World JournalVolume 2023, Article ID 8877273, 11 pages.
11. David Kim et al. Effect of gingival phenotype on the maintenance of periodontal health: An American Academy of Periodontology Best Evidence Review. J Periodontol. 2020;00:1–28.