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Gingival Thickness Among Smokers and Non-smokers: A Comparative Study

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ABSTRACT:

BACKGROUND: It is a known fact that clinical appearance of gingiva directly correlates with the inflammatory status of the periodontium. Smoking and its effect on periodontium will be reflected in the gingiva by morphologic and histologic changes. The gingival thickness change is one among them. Thickness of gingiva seems to be of significance and an issue of concern in aesthetic and functional outcome of the periodontal, restorative and orthodontic therapy. Although, abundant literature is available regarding the effect of smoking on periodontium, very little has been focused on the thickness of gingiva among smokers and non-smoker healthy patients as well.

PURPOSE OF THE STUDY: The purpose of the study is to comparatively assess the gingival thickness among smokers and non-smokers.

METHODS: The study group included 30 age matched smokers and non-smokers whose gingival thickness was measured in the maxillary and mandibular anterior teeth by transgingival probing midbuccally in the attached gingiva and at the base of the interdental papilla. Plaque index and gingival bleeding index were recorded. The data was statistically analysed using paired t-test and Z-test.

RESULTS AND CONCLUSION: Gingival bleeding index and plaque index were similar between both the groups. Gingiva is thicker in interdental areas when compared to midbuccal areas both in smokers and non-smokers. Both midbuccal and interdental areas were thicker among smokers when compared to non-smokers.

Key words: *Gingival thickness, smokers, non-smokers, periodontal health.*

INTRODUCTION:

Many clinical and epidemiological investigations have unanimously shown that smoking is one of the factors to cause periodontal disease. The by-products originated from tobacco oxidation modify the clinical manifestation and the progression of periodontal diseases, and described smoking habit as a risk factor for periodontal diseases.¹

Along with several well established systemic effects, smoking plays a crucial role in progression of periodontal disease.² Various studies confirm the effect of smoking on periodontal tissues such as reduced oxygen tension, altered gingival inflammation and bleeding,¹ impaired gingival vasculature and gingival blood flow.³ These changes are attributable to the cotinine, a nicotine metabolic by-product, which has a peripheral constrictive action on gingival vessels.⁴ Also functional alteration

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brought about in chemotaxis, phagocytosis and oxidative burst are caused by tobacco smoking.

It is a known fact that clinical appearance of gingiva directly correlates with the inflammatory status of the periodontium. Gingiva is the mirror of periodontium whose features like color, contour, consistency, size, shape, surface texture and bleeding on probing speak of the underlying condition of the periodontium. Smoking and its effect on periodontium will be reflected in the gingiva by morphologic and histologic changes. The gingival thickness change is one among them. Appreciating such changes will lead to a better insight of pathogenesis, diagnosis and treatment planning. Measurement of gingival dimension is clinically meaningful for academicians, restorative dentists and periodontists. Those academicians or clinicians who record gingival thickness (GT) measurement regularly could understand the outcome measures meaningfully. The diagnostic ability of gingival thickness measurement is recommendable to distinguish bony and gingival enlargement. The prognostic ability of gingival thickness measurement is also appreciable in inflammatory induced clinical changes as well as those induced due to fibrosis. Along with recording of color, consistency, texture, position of gingiva GT measurement is a useful simple tool for disease and treatment outcome measurement.

In recent years, dimensions of different parts of masticatory mucosa, especially gingival thickness has become a subject of considerable interest in dentistry, both from epidemiologic, aesthetic and therapeutic point of view. Thickness of gingiva seems to be of significance in various other specialties like orthodontics, prosthodontics, implantology and not to specially mention Periodontics, as it is an issue of concern in aesthetic and functional outcome of the respective treatment.

Although, abundant literature is available regarding the effect of smoking on periodontium, very little has been focused on the thickness of gingiva among smokers and non-smoker otherwise healthy patients. The MEDLINE search with the keywords- smoking, gingiva, and gingival thickness revealed one literature on the effect of smoking on gingival thickness. Albeit one literature indicates an increase in gingival thickness in smokers, in which the gingival thickness is measured histologically.⁴ However, there are no studies which have measured gingival thickness of smokers clinically. Smoking is a common phenomenon and the result of periodontal treatment and its aesthetic counterpart is altered in smokers when compared to non-smokers.⁵

The objective of this work was to clinically evaluate the clinical parameters, plaque index and gingival bleeding index; the gingival thickness in smokers and non-smokers.

Materials and methods:

The present study was conducted in the Department of Periodontics, College of dental sciences, Davangere, Karnataka, India. Both male and female patients of age group 18-45 years were included. Control group consisted of non-smoker patients with clinically healthy gingiva and experimental group included smoker patients with gingivitis according to CDC (Centre for Disease Control) criteria for current smokers⁶- those patients who have smoked more than 100 cigarettes in their lifetime and have smoked at the time of interview. Exclusion criteria included patients with periodontitis, history of systemic diseases, use of any medications possibly affecting the periodontal tissues, extensive restorations, caries or tooth replacements, gingival recession in anterior teeth, pregnant or lactating women. The patients were informed about the procedure, its purpose, the degree of discomfort that might occur before

conducting the procedure; a written consent was obtained by all the subjects.

Procedural steps:

The study group included fifteen male smokers whose gingival thickness was measured in the maxillary and mandibular anterior teeth by transgingival probing.⁷ At first, the clinical parameters of Plaque index⁸ and Gingival bleeding index⁹ were recorded followed by scaling and polishing. The attached gingiva and interdental papilla were anesthetized using xylonor spray (lignocaine 15.0 g) and if required infiltration was done using 2% lignocaine HCl with 1:80,000 adrenaline injection. Using a UNC-15 (University of North Carolina) probe the gingival thickness was assessed midbuccally in the attached gingiva and at the base of the interdental papilla. A sharp probe was inserted in the labial gingiva, followed by UNC-15 probe, which was inserted perpendicular to the long axis of the tooth until it contacted the hard surface i.e bone. Similarly the gingival thickness was assessed at the base of the interdental papilla.⁷ All the measurement was done by a single calibrated examiner. Measurements were then rounded to the nearest 0.5 millimeter. (Fig 1,2)

The measurements were subjected to statistical analysis. Mean values and standard deviations were calculated. The paired t-test was used to compare the clinical parameters and Z test was used to compare the thickness of gingiva among smokers and non-smokers in midbuccal and interdental region.

Results:

The study included a total of thirty subjects which included fifteen non-smokers and fifteen smokers within the age range of 18-45 years, who were age matched. A total number of two hundred ten interdental sites and one hundred eighty midbuccal sites were included in control group. Numbers of sites in interdental areas in experimental

group are one hundred ninety eight and one hundred sixty nine in midbuccal areas. Clinical parameters like plaque index and gingival bleeding index were assessed among the groups, which showed no significant difference between the groups. (Table 1) The plaque index was scored and was found that a non-significant difference existed between the groups with a p-value of 0.15. The gingival bleeding index also did not show any difference between the groups. (p-value 0.68)

The gingival thickness in midbuccal region, 59.2% of smokers are in the range of 1-1.5 mm, whereas 66.9% of non-smokers have the midbuccal gingival thickness of 1-1.5 mm. Similarly, 29.3% of smokers have interdental gingival thickness of 2-2.5mm and 42.4% of non-smokers have interdental gingival thickness of 1-1.5 mm. (Table 2)

Comparison between the midbuccal (1.16 ± 0.40 mm) and interdental gingiva (1.76 ± 0.64 mm) in smokers showed significantly higher thickness in the interdental region. Similarly in non-smokers also, the interdental gingiva (1.26 ± 0.61) was thicker than midbuccal gingiva (1.08 ± 0.42). (Table 3)

Table 4 illustrates the comparison of midbuccal gingival thickness among smokers and non-smokers, which shows that midbuccal thickness in smokers (1.16 ± 0.40 mm) is higher than in non-smoker group (1.08 ± 0.42). Likewise, interdental gingival thickness in smokers (1.76 ± 0.64 mm) is higher than in non-smokers (1.26 ± 0.61). Therefore, both intergroup and intragroup comparison of the gingival thickness is statistically significant with a p-value < 0.001 .

Discussion:

Smoking has a long-term chronic effect on periodontium which can be attributed to the impairment of inflammatory and immune responses.¹⁰ Various studies have shown changes in the microbial flora in smokers.^{11,12} The suppression of

neutrophil chemotaxis and phagocytosis has been described.^{10,13} Although long term studies are rare, available studies unanimously agree that treatment failures and relapse of disease are predominantly seen in smokers.¹⁴ According to literature, gingival thickness have been assessed by invasive method using a disposable sterile needle,¹⁵ boley gauge,¹⁶ stainless steel wire¹⁷ & bone sounding with a periodontal probe.^{18,19} While non-invasive methods included the use of ultrasonographic methods with A mode and B mode^{20,21} and visual assessment with the use of a periodontal probe.^{22,23} Visual assessment A comparative assessment of transgingival probing and ultrasonic method for gingival thickness was done.⁷ A similar study was done comparing USG & endodontic reamer.²⁰

Considering the effects of smoking on various periodontal tissues, gingival thickness has been least focused. Only little literature is found regarding the effects of smoking on the thickness of gingiva. One study of Villar CC and de Lima AF, 2003 assessed this entity using a histological method. No clinical study has been conducted in this regard so far. The patients were age matched in the range of 18-45 years. The age also seems to be an important factor in determining the thickness of gingiva as few authors have suggested that the gingiva is thicker in younger people when compared to older subjects attributed to the age related thinning of epithelium and diminishing keratinisation in elderly.¹⁸

Studies have concluded that the thickness of gingiva plays a vital role in development of mucogingival problems and in the success of treatment for recession and wound healing.¹⁶ Hence, assessment of gingival thickness becomes mandatory clinically. Although many studies have been conducted measuring the thickness, most of them have measured the thickness of gingiva using histological methods^{4,21} and ultrasonographic methods,¹⁶ and clinically by transgingival probing.⁷

The results of this study are discussed as follows. In the present study, plaque level was similar in smokers and non-smokers. Several studies have been conducted to compare the plaque levels among smokers and non-smokers. Earlier studies have reported increased plaque levels among smokers and attributed it to increased prevalence of periodontal disease.^{22, 23} Although studies done in later years have shown no significant changes in plaque levels in gingivitis patients.^{24,25,26,27}

Gingival bleeding score was not significantly different among the groups as supported by several studies.^{1,28} But the results of this study are in contrast with few studies^{23,29, 30} which showed reduced bleeding even at similar plaque levels. The possible reasons quoted for reduced bleeding include decreased number of blood vessels, pale gingiva and thus reduced bleeding. It is attributed to the long term impairment of periodontium vasculature rather than the simple vasoconstriction of nicotine. The difference in bleeding tendency at similar plaque levels between smokers and non-smokers could be due to difference in plaque pathogenicity of naturally occurring and experimental gingivitis.

The literature regarding the effects of smoking on the gingival thickness is minimal. An increased gingival thickness was shown by one study that was conducted to assess the gingival thickness in smokers by histological means. The marginal gingival thickness was measured and concluded that epithelial base thickness was larger in smokers when compared to non- smokers.⁴

In this present study, both smokers and non smokers showed thicker interdental gingival than midbuccal aspect. Anatomically, both midbuccal and interdental gingiva was thicker in smokers. Analysis of gingival thickness in midbuccal & interdental region among both the groups showed increased thickness in smokers when compared to non-

smokers. The gingival thickness in non-smoker group was 1.08 mm midbuccally and 1.26 mm interdentially. In smokers, midbuccally it was 1.16 mm and interdentially 1.76 mm.

Considering the site specificity issue of periodontal disease, the numbers of sites included are adequate. Few authors illustrate the significant value of site specific monitoring in periodontal diagnosis and treatment planning especially in management of localized periodontal lesions.^{31, 32} However, studies with larger sample size and longitudinal studies can be considered for further investigation in this regard. Various studies have concluded that the thickness of gingival plays a vital role in development of mucogingival problems, in the prognosis and treatment for recession and wound healing.¹⁶

Clinical transfer

The gingival thickness is a subjective measurement, so far, the present study result provides the objective measurement of gingival thickness in patients of age 18-45 years. The soft tissue response after orthodontic treatment, the aesthetic outcome of perioplastic surgeries is highly dependent on the gingival thickness. The gingival recession occurrence post surgically (flap and root coverage procedures) are governed by the gingival thickness i.e. thin gingiva appears to recede more than the thick gingiva. This is of special value in aesthetically important areas like anterior teeth region. It is necessary to define the thin and thick gingiva in terms of numerical value. The measurement of gingival thickness as a part of gingival status recording in clinical situation is recommended.

Conclusions

Anatomically, interdental gingiva is found to be thicker than the midbuccal gingiva in both smokers and non-smokers. Both midbuccal and interdental

areas were thicker among smokers when compared to non-smokers at similar plaque and gingival bleeding levels.

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Fig 1: Marking of midbuccal and interdental papilla sites before measurement.

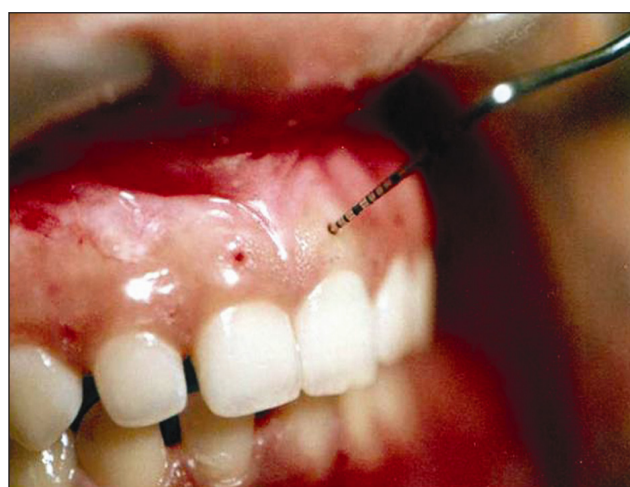


Fig 2: Measurement of thickness using periodontal probe.

Table 1: Mean plaque and gingival bleeding scores

	Smokers	Non - smokers	t - value	P - level
Plaque index	1.56 ± 0.52	1.32 ± 0.34	1.48	0.15, NS
Gingival bleeding index (%)	76.9 ± 11.2	78.9 ± 14.8	0.42	0.68, NS

Table 2: Range of gingival thickness in smokers and non-smokers

GT	Midbuccal (%)		Interdental (%)	
	Smokers	Non-smokers	Smokers	Non-smokers
0.5-1	8.9	13.9	1	16.9
1-1.5	59.2	66.9	23.2	42.4
1.5-2	24.3	12.1	27.8	23.7
2-2.5	6.5	5.0	29.3	10.7
2.5-3	0.6	0.9	9.6	2.4
3-3.5	0.6	1.2	7.6	3.6
3.5-4	-	-	1.5	0.3

Table 3: Intra group comparison of gingival thickness

SITE	Groups compared	Mean ± SD	Smokers vs Non smokers	
			Z - value	P - level
Midbuccal	Smokers	1.16 ± 0.40	10.9	<0.001, HS
	Non smokers	1.76 ± 0.64		
Interdental	Smokers	1.08 ± 0.42	4.43	<0.001, HS
	Non smokers	1.26 ± 0.61		

Table 4: Intergroup comparison of gingival thickness

SITE	Groups compared	Mean ± SD	Smokers vs Non smokers	
			Z - value	P - level
Midbuccal	Smokers	1.16 ± 0.40 (CI - 0.4 - 2.0)	2.19	0.03, S
	Non smokers	1.08 ± 0.42 (CI - 0.2 - 1.9)		
Interdental	Smokers	1.76 ± 0.64 (CI - 0.5 - 3.1)	8.98	<0.001, HS
	Non smokers	1.26 ± 0.61 (CI - 0.1 - 2.5)		