Prevelance Of Gingival Recession And Its Association With Gingival Biotype In Mandibular Anterior Teeth

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Abstract: Background: In the current era of aesthetically focused dentistry, it is of utmost importance that clinicians must consider how the soft tissue will respond to the various, prosthetic, restorative and periodontal procedures. The gingival morphologies which were identified according to their facio-palatal dimensions were earlier named as the scalloped and thin or flat and thick gingiva. A more specific term "Periodontal Biotype" was later introduced to classify the gingiva into 'thick-flat' and 'thin-scalloped' biotypes. Currently, the term "gingival biotype" has been widely used by the clinicians to categorize the thickness of the Gingiva. Aim of Study: The aim of this study is to determine whether Gingival Biotype has any correlation with the Age, Gender, occurrence and the severity of gingival recession in six mandibular anterior teeth. Material and Methods: A total number of 100 patients were examined , biotype was assessed with the help of two methods probe transperancy(PT) and transgingival probing(TP) methods and its association with the age, gender and recession defects (recession depth & width) in mandibular anterior teeth was statistically analysed with the help of ANOVA, unpaired-t test & post-hoc test. Result: Prevelance and severity of gingival recession in lower anteriors is likely to be seen more commonly in left central incisors(21%) and left canines(21%) , among the participants majority of the females subjects(76%) were shown to have thin biotype, with no significant age related difference in the gingival biotypes in both genders. Conclusion: Prevelance and severity of gingival recession was more common in females due to the presence of thin biotype when accessed with both TP and PT methods with no age related difference in the biotype. [Chand J Natl J Integr Res Med, 2020; 11(2):90-96]

Key Words: Gingivitis, Periodontitis, Gingival biotype, Transgingival probing, Probe -transperancy, Gingival recession

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Introduction: Goldman and Cohen (1979) first described a "Tissue barrier concept" in which they have highlighted the role of thick band of connective tissue in limiting the spread of inflammation into the periodontal structures, later on WennstrÖm (1985) also stated that a thin marginal tissue will be at greater risk of recession in cases of plaque induced inflammatory lesions.

Two main gingival morphologies, were first identified and named as scalloped and thin or flat and thick gingiva[1], later the term "periodontal biotype" was introduced by Seibert and Lindhe[2] which has described the gingiva into "thick-flat" and "thin-scalloped" biotypes. Currently, the term gingival biotype has been frequently used in describing the thickness of the gingiva in the facio-palatal dimension[3], it is well known that thick gingival tissue is relatively dense in appearance with a wide zone keratinized gingiva, On the other hand, a thin biotype is delicate and translucent, friable with a minimum zone of attached gingiva.[4] literature suggest that these two gingival biotypes respond differently to inflammation, trauma and surgical insult.[4] It has also been observed that Periodontitis results in increased pocket formation in thick biotype and gingival recession in thin tissues[5].

Gingival recession is the shift of the marginal gingiva apical to the cemento-enamel junction which causes exposure of root surface and puts the patient at risk for dentine hypersensitivity, difficulty in plaque control, root caries, abrasion/erosion of roots along with functional and esthetic concerns[11], Most common causes of gingival recession included trauma from occlusion, faulty tooth brushing habits, extension of Periodontal inflammation, tooth malposition, tooth morphology, or other iatrogenic factors such as Orthodontic treatment or faulty restorations[25]. Identifying gingival biotype in early stages of the Periodontal evaluation and examination can contribute towards decrease in the incidences and severity of gingival recession, assist in treatment planning, predicting the prognosis and chances for post- surgical relapse for any prosthetic, surgical, mucogingival and Implant procedures.

Several methods have been proposed till date to measure gingival thickness or gingival biotype such as by the direct method also known as

transgingival probing method (TP),[8] Probe transparency(PT)method,[9] Ultrasonic devices[10] and Cone Beam Computed Tomography (CBCT)[11].

Material and Methods: 100 patients (42 females, 58 males) between 20 to 50 years of age having miller's class I, II , III, IV gingival recession in mandibular anterior region were included and divided into two groups of 20-30 years and 31-50 years . Recession width and depth was measured on six mandibular anterior teeth (that is, right and left canines, lateral incisors, and central incisors) at the mid-labial site, for each patient one tooth having maximum defect was included in the study. A single blinded trained and calibrated examiner conducted the entire procedure. Patients with long term (more than 2 weeks) use of antibiotics in past 3 months, Mucosal disorders like high frenal attachment, Medically compromised individuals, pregnant females, patients undergoing orthodontic therapy were excluded from the study, study design was approved by institutional ethical committee.

Recession Depth (RD), and Recession Width (RW) for all involved teeth was measured with the help of UNC-15 Probe(Figure-1), All selected patients were given a verbal description of the study and were made to sign an informed consent form prior to commencement of the procedure.

Figure 1-Measurement Of Recession Length

Methods To Determine Gingival Thickness: In the Transgingival probing (TP) method, after infiltration with local anesthetic solution, the gingival thickness was assessed midbuccally using an endodontic reamer (20 number) fitted with a rubber stopper as shown in (Figure-2) and measured on the ruler up to the nearest millimeter. This measurement was made halfway between the mucogingival junction and the free gingival groove in the attached gingiva as shown in the figure. The thickness of the attached gingiva was recorded for mandibular anterior teeth with maximum recession depth and width (Figure 1). Errors were minimized by allowing only one examiner to perform all the measurements. When the thickness is >1.5 mm, it was categorized as thick biotype and if less than 1.5 mm, it was considered as thin[11].

Figure 2- Transgingival Probing Method For Detection Of Gingival Biotype

Another method used was Probe Transparency (PT) method (Figure3), in this method, the gingival biotype is considered thin if the outline of the probe is visible through the gingival margin from the sulcus or pocket .

Figure 3- Probe Transperancy Method For Detection Of Gingival Biotype

However this method has inherent limitations, such as precision of the probe, inability of the probe to reflect through the gingival due to the presence of melanin or any other mucosal pigmentations which obscure the visibility of the probe.

Statistical Analysis: The mean recession depth and width in thick and thin biotype in the mandibular anterior teeth were compared using post-hoc test for multiple comparisons. The mean thickness of gingival was compared among different age groups and gender by performing one-way analysis of variance (ANOVA). The unpaired *t*-test was used to compare the mean thickness of gingival between male and female subjects and also to compare between six mandibular anterior teeth. $P < 0.05$ was considered as statistically significant. All the statistical analysis were performed by using SPSS version 16.0 software (IBM SPSS Statistics, USA).

Results: Mean age was 34±8.15 for females and 40±2.36 for males, 39 out of 58 males and 10 out of 42 females revealed a thick biotype when measured with direct or transgingival probing method (Table-1) , whereas only 25 out of 100 subjects showed a positive probe transperancy test in which 18 were females and 7 were males (Table-1), suggesting a highly significant result in gender based distribution of gingival thickness (p-001**)

Table 1- Variations In Gingival Biotype Based On Gender

Gender	Transgingival Probing (T.P.)		Probe Transperancy(P.T) (P.T)	
	Thick	Thin	Positive	Negative
Male	39	19	7	51
Female	10	32	18	24
P-value	0.001**		0.001**	

0 cells (.0%) have expected count less than 5. The minimum expected count is 10.50.
0 cells (.0%) have expected count less than 5. The minimum expected count is 20.58.

However no such difference was seen in different age groups 20-30 years and 31-50 years (Table-2), most commonly involved teeth with maximum recession defect were mandibular left canine and left central incisor (Graph-1)with mean recession length of 3.10±1.86 and recession depth of 2.38±1.39 (Table-3) in canine, overall result showed a statistically significant association between gender based distribution of gingival biotype, thin and transparent biotype being more prevelant in females, additionaly thin and transparent biotype is positively co-related with occurrence and severity of the gingival recession.

Table 2- Variations In Gingival Biotype Based On Age

Age	Transgingival Probing (T.P.)		Probe Transperancy(P.T.)	
	Thick	Thin	Positive	Negative
20-30	21	25	14	32
31-50	28	26	11	43
P-value	0.537		0.247	

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 22.54.
b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.50. .

Graph-1. Frequency Of Gingival Recession

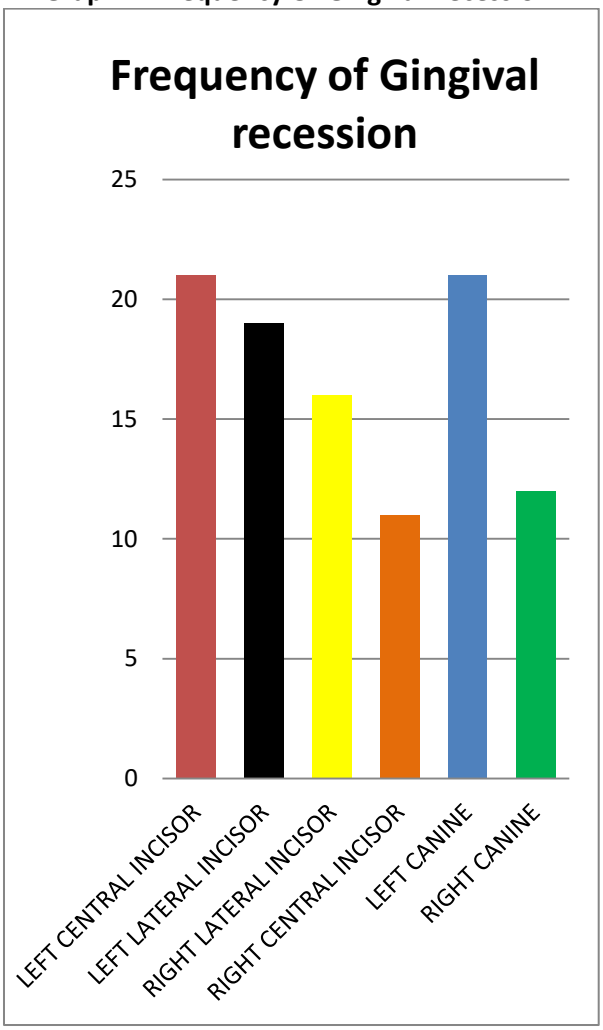

Table-3-Prevelance of Gingival Recession & its co-relation with Gingival Biotype							
Teeth With Maximum Gingival Recession Defect Total Sites/Teeth=100				**Transgingival Probing (Tp)**		**Probe Transperancy (Pt)**	
	N	RD(mm) Mean ± std. Deviation	RW (mm) Mean ± std. Deviation	THICK N	THIN N	POSITIVE N	NEGATIVE N
Left Central Incisor	21	3.10±1.86	2.38±0.89	9	12	6	15
Left Lateral Incisor	19	2.79±2.32	2.08±1.29	10	9	5	14
Left Canine	21	2.38±1.39	2.38±1.46	7	14	6	15
Right Lateral Incisor	16	2.94±1.56	1.88±1.14	8	8	5	11
Right Central Incisor	11	2.27±2.28	1.82±1.87	6	5	3	8
Right Canine	12	2.33±.778	1.67±0.651	9	13	0	12
4 cells (33.3%) have expected count less than 5. The minimum expected count is 2.75. b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.39.				p<0.05*		P<0.05*	

Discussion: The identification and evaluation of the gingival biotype may be critical in treatment planning and determining the prognosis since differences in gingival and osseous architecture have been shown to exhibit a significant impact on the outcome of periodontal, restorative orthodontic therapy and implants. Studies have shown that quality of the periodontal tissue could vary according to Age and Gender[12], The gingival biotype in this study revealed considerable Gender variability, also the results of the present study supports the hypothesis of higher prevalence of gingival recession in mandibular anterior teeth with thin biotype, This observation is in accordance with the study by Olsson and Lindhe (1991)[12] who also demonstrated a positive relation between gingival recession and thin biotype, possible explanation for such results could be the reason that thick biotypes offers greater dimensional stability during bone remodeling as compared to thin biotypes. Studies have suggested the presence of lamina bone adjacent to the buccal cortical plates in thick biotypes, which provides the foundation for metabolic support of the cortical bone and hence its sustainability and stability, whereas in thin biotypes, where the lamina bone is considered to be thin or absent thus facilitating rapid resorption, this has been confirmed by various other studies which have shown that the thickness of bone and gingival tissue directly influences the stability of osseous crest and soft tissue.[7,13].

Literature suggest that with flap surgery and regenerative procedures, there is at least 0.5– 0.8 mm of bone loss[14,15] which is unavoidable and can lead to gingival recession following surgery , limited gingival recession has been observed in thick biotypes than in thin biotypes[16], taking this into consideration and to achieve a predictable outcome with all periodontal procedures a flap thickness of 0.8–1.2 mm is recommended. Previously, multiple studies have demonstrated that in implantology, the gingival biotype is one of the key factor for a successful treatment outcome [17,18]. Biotype assessment in a periimplant tissue was performed in one study

where it was found that tissue biotype around implant was significantly associated with facial marginal mucosal level. Also, patients with a thin biotype had less papilla fill and had increased risk of peri-implant facial mucosal recession [6], in another study it was concluded that the stability of osseous crest and soft tissue is directly proportional to the thickness of bone and gingival tissues which significantly influence implant site preparation and treatment planning[7].

In the present study out of six mandibular anterior teeth only 1 tooth per subject with maximum recession defect (RD & RW) was included for the detection of Biotype, our data suggest that left central incisors and left canines are the most frequently involved mandibular anterior teeth (21%) with maximum recession defect, this finding may be attribute to the fact that majority of the subjects were right handed and faulty toothbrushing being the most common cause of gingival recession[19], so far no other study in the literature have ever mentioned the most frequently involved tooth in cases of gingival recession, the present study is first of its kind to report the prevelance of biotype, its variation with respect to age & gender, and the frequency of the involved teeth altogether.

Two different methods were used for biotype assessment, direct method or transgingival probing(T.P.) and probe transperancy method(P.T.), only 25% of the total subjects/sites showed a positive probe transperancy test whereas 51% of them revealed a thin biotype in transgingival probing method, this discrepancy might have arised due to the thick band of melanin pigmentation or presence of melanin patches which is a common clinical finding in indian race and had interfered with the reflection of the probe though the sulcus/pocket, however both the methods have demonstrated thin biotype to be more prevalent in females ($p<0.05$). Similar findings were reported by Kolliyavar et al.,[20] and Bhat et al [21]where the thicker biotype was more prevalent in male population whereas the female population consists of thin and scalloped biotype.

In the age group of 20–30 years, we found that 54 % of individuals have thin gingival biotype where in group of 31-50 years 48% revealed thin biotype which was statistically non-significant., Contrary to this, Anu Kuriakose and Saranyan Rajuin evaluated the thickness of palatal masticatory mucosa in Indian subjects between 17 to 49 years of age, using transgingival probing technique and concluded that the younger age group had significantly thinner masticatory mucosa than the older age group. They have also stated that females have thinner mucosa compared to males, but the difference was not statistically significant [22], later on, a number of other studies [23,24] found presence of thick biotype in the younger age group when compared to older subjects.

The differences in the results might have arised due to methodological issues and sample sizes achieved furthermore, presence of mucosal pigmentation or melanin pathches can interfere with the readings of transgingival probing technique for biotype assessment and give false negative results, another inherent limitation of this technique is variations in the dimensions of the probe tip, bleeding from the ulcerated sulcus which can obscure the view for the probe to be visible.

Furthermore, Studies with a larger sample size and including heterogeneous population are required to confirm the given hypothesis and substantiate the evidences, future research should focus on developing a more flexible classification system to classify gingival biotypes and biotype alteration (thin to thick) should be an integral part of treatment planning for any Periodontal, Restorative, Orthodontic or Prosthetic treatment including implants.

Conclusion: The different tissue responses obtained from different biotypes when they are subjected to pathological or surgical exposure dictate different treatment modalities therefore, a precise and careful assessment of the gingival biotype is necessary for adequate treatment planning and predicting treatment outcomes in periodontal orthodontic, restorative therapies including implants, in this study majority of the subjects with thin biotype were females with no difference in age groups and a positive co-relation was established between gingival biotype and recession.

Gingival augmentation techniques can improve the tissue quality in thin biotypes preventing or delaying progression of inflammatory process or recession. Furthermore, this study was probably one of the few attempts to analyze the correlation between gingival recession and

gingival biotype, most frequently involved tooth with gingival recession and distribution of gingival biotype among different age groups and genders, hence by taking these factors into consideration more appropriate treatment strategies for periodontal management may be developed, which can result in achieving more predictable treatment outcomes.

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