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Correlation between gingival thickness and gingival recession in humans

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Abstract
Introduction: Gingival recession is characterized by the apical migration of the gingival margin, exposing the root surface. Studies have demonstrated several etiological factors for gingival recession such as periodontitis, traumatic tooth brushing, use of oral piercing and post orthodontic therapy. It might not be possible to identify and quantify the influence of each factor, and gingival recession at some sites may be the result of the combination of these factors. Gingival recession affects individuals at all ages, with prevalence increasing as time passes.
Aim: The aim of this study is to observe whether there is correlation between gingival thickness and gingival recession.
Materials and methods: 70 subjects of both genders aged 18-35 years participated in the study. Buccal gingival thickness was measured on incisors, canines and bicuspids, under anesthesia, following inclusion and exclusion criteria.
Result: It may be concluded that gingival thickness is inversely correlated to gingival recession in young adults with lower degrees of gingival inflammation.

Keywords: gingival thickness, gingival recession

1. Introduction
Gingival recession is characterized by the apical shifting of the gingival margin, exposing the root surface. Numerous factors are involved in its etiology, including anatomical, physiological, pathological and traumatic factors which probably do not act at the same time or to the same degree, [1] and it is probably impossible to identify which the most main factor is. The development of gingival recession seems to be associated to inflammatory processes of different origins [2].
The occurrence of gingival recession varies widely, from 3 to 100%, depending of the population, diagnostic criteria and methods of analysis [3]. Gingival thickness seems to be an essential risk and prognostic factor for the occurrence of future gingival recession [6]. Studies have shown that the gingival biotype is also a determinant of esthetic results in different therapies [7]. A thick gingival unit is associated with better results, especially concerning the stability of the gingival margin over time. However, most studies do not look at gingival thickness, particularly in healthy individuals. The aim of this study was thus to correlate gingival thickness and gingival recession in adults without history of periodontitis.

2. Materials and Methods
A convenience sample of 70 adults (40 male and 30 female) aged 18-35 years participated in this cross-sectional study. The study included non-smokers, without history of periodontitis, under treatment. Diabetic patients, pregnant and lactating women, individuals under orthodontic therapy, with history of periodontal surgery, presenting cervical restorations or under medication affecting the periodontium such as cyclosporin A, calcium channel blockers and phenytoin were excluded. All participants were signed an informed consent form.

3. Clinical examination
Clinical periodontal parameters and gingival thickness were Evaluated in recession site. A previously trained examiner performed all clinical measurements. The following parameters were evaluated: a) Visible Plaque Index (VPI) [8]: absence or presence of visible plaque after drying was scored. b) Gingival Bleeding Index (GBI) [8]: absence or presence of gingival bleeding was scored after gentle probing of the gingival margin. c) Gingival Recession (GR): the distance from the cemento-enamel junction (CEJ) to the gingival margin was measured in millimeters and rounded to the nearest millimeter. When the CEJ was not clinically visible, the measurement was given a negative sign. d) Probing Depth (PD): the distance between the gingival margin and the most apical probeable part of the crevice was measured in millimeters and rounded to the nearest millimeter. A Williams's periodontal probe was used. f) Clinical Attachment Level (CAL): obtained by adding PD and GR.

4. Measurement of gingival thickness
Gingival thickness (GT) was evaluated by piercing with a needle with a rubber stent perpendicular to the root surface at the mid-point between the gingival margin and the muco-gingival junction. The stent was pressed until it touched the gingival surface. After removing the needle, the distance from the end of the needle to the stent was measured with a standard scale. All measurements were performed by the same examiner [9].

5. Results
Table shows periodontal clinical parameters at sites where gingival thickness was measured. At these sites, mean probing depth for thick and thin gingival biotype were 1.28 mm and 110 mm respectively. Gingival recession had a mean value of 1.50 mm and 1.20 mm for thin and thick gingival biotype respectively. Mean gingival thickness varied from thin to thick gingival biotype, with a mean of 1.40 mm and 2.12 mm respectively. Mean Papillary Bleeding Index in%

are 0.12 and 0.15 with thin and thick gingival biotype respectively. Mean Plaque Index in% are 0.09 and 0.11 with thin and thick gingival biotype respectively.

The main outcome of the present study and demonstrates the correlation between gingival thickness and gingival recession: the smaller the gingival thickness, the greater the gingival recession. The Pearson correlation coefficient was -0.22. The simple linear regression model demonstrates a statistically significant relationship (p= 0.02).

Clinical periodontal parameters at sites where gingival thickness was measured

Variable (mean)- Gingival Biotype	Probing Depth (mm)	Gingival Recession (mm)	Clinical Attachment Level (mm)	Gingival Thickness (mm)	Papillary Bleeding Index (%)	Plaque Index (%)
Thin gingival biotype (N=40)	1.28	1.50	2.78	1.40	0.12	0.09
Thick gingival biotype (N=30)	1.10	1.20	2.30	2.12	0.15	0.11

6. Discussion

This study evaluated possible association between gingival thickness and gingival recession, finding a statistically significant correlation between them. These results should be interpreted in the light of the literature and taking into account the strengths and limitations of the study. This is a cross-sectional study, therefore causality cannot be claimed. However, a series of methodological principles were taken into consideration in order to increase the validity of the results. The study comprises a sample of young adults aged 18- 35 years. The restriction to a specific age range relates to the fact that it has been demonstrated that the prevalence, extent and severity of gingival recession increase with age. [10, 11] Individuals with previous exposure to periodontitis were excluded in order to focus attention on recession unrelated to periodontal disease.

However, this potential confounder cannot be ruled out. On the other hand, even in individuals with loss of attachment due to periodontal disease, whether or not gingival recession occurred could have the gingival biotype as a predisposing factor. [9] Studies demonstrate that the presence of oral biofilms and periodontal breakdown are associated with gingival recession. In this study, approximately 18% of the examined surfaces without recession presented visible plaque, sites with gingival recession did not present visible plaque. Virtually no inflammation was observed at examined sites, suggesting that traumatic brushing could be part of the causal chain. Additionally, this study did not include smokers, in order to reduce the potential confounder, since smoking has been strongly associated with higher degrees of loss of periodontal attachment [4]. This finding is in accordance with the study by Susin *et al*. [4], where higher degrees of recession affected a very small proportion of individuals younger than 40 years of age. This study restricted the examination to non-molars because anterior teeth tend to present higher degrees of gingival recession [2, 3, 4] In addition, it is easier to measure gingival thickness on them, increasing the chances of higher reliability. Moreover, the sample size was estimated in order to ensure that the number of individuals included would be sufficient for drawing conclusions.

It should be noted that gingival recession is not an unavoidable physiological process due to aging, but may be explained by the cumulative effects of trauma and/or inflammation of the periodontium [3, 4]. In this context, gingival thickness could play a role that should not be ruled out. Vandana and Savitha [12] demonstrated that gingival thickness varies according to age, gender and dental arch. Younger individuals, men and upper jaws tend to present thicker gingiva. This would suggest a separate analysis for these factors. However, in this age range it was not possible to demonstrate differences in these aspects, therefore a combined analysis was performed [4]. Mean gingival thickness in our study was 1.40 mm, similar to that in the literature. [12] In the study by Vandana and Savitha12, for example, mean gingival thickness was 1.63 - 1.73mm (1.59-1.78mm in 16- to 24-year-olds and 0.93-1.07mm in 25- to 38-year olds). They suggest that alterations in the oral epithelium caused by aging may thin the epithelium and diminish keratinization. Gingival thickness may be measured by invasive and non-invasive methods, but there are few studies comparing them. Savitha and Vandana [13] demonstrated that trans-gingival probing and ultrasound are both reliable. In our study, reliability was ensured by double measurements with an excellent intra-class correlation coefficient both prior to and during the experiment.

Gingival recession as a multifactorial entity has been extensively studied. Among possible etiological/ predisposing factors, the amount of keratinized gingiva has been suggested. However, studies failed to demonstrate causality in this respect. [14] Evidence suggests that even in the absence of keratinized gingiva, gingival recession is not a natural consequence. [14] On the other hand, studies that associate gingival recession with gingival thickness are few and controversial. Our study found that the lower the gingival thickness, the higher the degree of gingival recession. On the other hand, the statistically significant correlation suggests a consistent association. The regression line demonstrated a statistically significant p-value (0.025). This means that even though the correlation could be interpreted as low, a negative linear relationship exists among gingival recession and gingival thickness.

The limitations of our study should be taken into consideration in the conclusion process. These limitations include the fact that the study was crosssectional and restricted to young adults. However, it is within the age range of our subjects that preventive strategies could be implemented. Follow-ups of cohorts starting early in adolescence could be an interesting way of overcoming these limitations. In conclusion, gingival thickness is inversely correlated to gingival recession in young adults with lower degrees of gingival inflammation.

7. References

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