

# Prevalence of gingival biotype and its relationship to dental malocclusion

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## ABSTRACT

**الأهداف:** دراسة مدى انتشار أنواع اللثة المختلفة في عينة من المرضى وعلاقتها بسوء إطباق الأسنان.

**الطريقة:** شملت عينته البحث 200 من المرضى البالغين (100 من الذكور و100 من الإناث) الذين قدموا لتلقي العلاج في كلية طب الأسنان، جامعة الملك عبدالعزيز، جدة، المملكة العربية السعودية وذلك خلال الفترة من فبراير 2011م إلى فبراير 2012م. وقد جرى تقييم سماكة اللثة عند القواطع العلوية الوسطى وتم تسجيل تصنيف سوء الإطباق.

**النتائج:** لقد كان متوسط عمر المشاركين 32.1 (±11.0) عاماً. ولوحظ وجود نوع اللثة الرقيق في 44.5% من العينة، حيث كان 64% من الإناث، و25% من الذكور (p=0.011). وكانت نسبة انتشار نوع اللثة الرقيق لدى المدخنين الحاليين 31.4% فقط مقارنة مع الأشخاص الذين لم يدخنوا على الإطلاق 51.9% (p=0.011). كما دلت الدراسة على عدم وجود ارتباط كبير بين تصنيف سوء إطباق الأسنان وسماكة اللثة (الصنف 1=42.9%، الصنف 2=44.1%، الصنف 3=53.9%) (p=0.6).

**خاتمة:** لوحظ وجود ارتفاع في معدل انتشار نوع اللثة الرقيق خصوصاً بين الإناث، ولقد كانت لثة المدخنين سميكة، بينما لم يعثر على أي علاقة بين تصنيف إطباق الأسنان وسماكة اللثة.

**Objectives:** To study the prevalence of different gingival biotypes in a sample of patients and the association between gingival biotype and different dental malocclusions.

**Methods:** Two hundred adult patients (100 males and 100 females) who presented for treatment at the Faculty of Dentistry, King Abdulaziz University, Jeddah, Saudi Arabia were recruited from February 2011 to February 2012. Gingival thickness was assessed for the maxillary central incisors using the transparency of periodontal probe technique. Angle's classification of malocclusion and smoking habit were also recorded.

**Results:** The mean age was 32.1 (±11.0) years. Thin gingival biotype was observed in 44.5% of the sample, of which 64% were females and 25% were males (p=0.001). Only 31.4% of current smokers had thin gingival biotype compared to 51.9% of subjects who never smoked (p=0.011). No significant association between dental malocclusions and the presence of thin gingival biotype was found (Class I = 42.9%, Class II = 44.1%, and Class III 53.9%, p=0.6).

**Conclusion:** A high prevalence of thin gingival biotype especially among females was observed. Smokers had thicker gingival biotype. No relationship was found between gingival biotypes and Angle's classification of malocclusion.

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Healthy periodontal tissue was categorized into thin scalloped or thick flat. Later, the term "periodontal biotype" was introduced to describe the thickness of the gingiva in a bucco-lingual dimension (thick or thin). The clinical appearance of healthy marginal periodontium has been shown to be different between individuals and among different tooth types. Different factors contribute to these differences including genetics, tooth morphology, tooth position, age, gender and growth.<sup>1</sup> A healthy periodontal tissue is an essential factor to be considered prior to any orthodontic treatment.

The application of orthodontic forces without careful planning may lead to significant damage to periodontium. Several factors may play a critical role in the incidence of dehiscence and fenestration during orthodontic treatment, and it depends on several factors, such as the direction of movement, the frequency, and magnitude of orthodontic forces and the volume and anatomic integrity of the periodontal supporting tissues.<sup>2</sup> During orthodontic tooth movement, there are changes in the mucogingival complex with respect to the position of the soft tissue margin as well as gingival dimensions. Therefore, it is imperative to carefully estimate the direction of tooth movement. Moreover, determining the thickness of the gingival tissue plays an important role in treatment planning process for orthodontic therapy.<sup>3,4</sup> Gingival recession associated with orthodontic treatment is a controversial issue. It was shown that when thickness of the attached gingivae was more than 0.5 mm, the risk of gingival recession is reduced.<sup>5</sup> Accordingly, for patients with a thin attached gingiva, a correct diagnosis of bone support in the periodontal evaluation is deemed necessary. Few reports exist on the prevalence of gingival biotype in various populations.

The aims of this study were to assess the prevalence of gingival biotypes in a sample of patients seeking treatment at the Faculty of Dentistry, King Abdulaziz University, and to evaluate if the gingival biotypes were associated with different types of malocclusion.

**Methods. Patients and study.** This cross sectional study consisted of 200 consecutive patients (100 males and 100 females). They were presented for treatment at the Faculty of Dentistry, King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia. The study was reviewed and approved by the Research Ethics Committee at the Faculty of Dentistry, King Abdulaziz University, Jeddah, Kingdom of Saudi Arabia. Informed consent was obtained from participants prior to their enrollment in the study.

**Inclusion criteria.** Eighteen years old and above and the presence of all the maxillary anterior teeth.

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**Exclusion criteria.** 1) Patients with crowns or extensive restorations on their anterior maxillary teeth, 2) Pregnant or lactating female patients, 3) Patients who are taking certain medication with known effects on the periodontal soft tissues, 4) Patients who required antibiotic premedication prior to dental examination and 5) History of previous orthodontic treatment.

Gingival thickness was assessed in each patient by a single calibrated examiner. Intra-examiner reliability was assessed in 10 subjects not involved in the study and the reliability was more than 93%. Gingival biotypes were assessed using the method described previously by Kan et al.<sup>6</sup> Briefly, this evaluation was based on the transparency of a periodontal probe (Michigan "O" with Williams Markings, Hu-Friedy, Chicago, IL, USA) through the gingival margin while probing the sulcus at the mid facial aspect of both maxillary central incisors. Gingival thickness was classified as thin when the underlying periodontal probe can be seen through the gingiva; otherwise, it was considered thick. Dental occlusion was assessed clinically using Angle's classification of malocclusion.<sup>7</sup> When the maxillary and/or mandibular first molars were missing; the canine relationships were used. Subjects were also classified into 3 groups (current, former, and never smoked) based on their smoking habits.

**Statistical analysis.** Data were tabulated and analyzed using the Statistical Package for the Social Science for windows, Version 16 (SPSS, Chicago, IL, USA). Means and frequency distributions were calculated for continuous and categorical variables. To examine the association between gingival biotype, gender, Angle's classification of malocclusion and smoking status, chi square [ $\chi^2$ ] was used. Student's t-test was used for continuous data. A statistical significance was considered at  $p < 0.05$ .

**Results.** The study sample comprised 200 patients, 100 males (mean age: 32.4±11.0) and 100 females (mean age: 31.7±11.1). There was no significant difference in age between genders,  $t = 0.5$ ,  $p = 0.7$ .

The prevalence of thin gingival biotype for the studied sample was 44.5%. There was a significant difference in the prevalence of thin gingiva between genders. The frequency of males with thin gingiva was significantly less than females (25% and 64%, respectively,  $\chi^2 = 30.8$ ,  $p = 0.001$ ). The mean age of participants with thin gingiva (28.53±9.37 years) was significantly lower than those with thick gingiva (34.90±11.47 years),  $p = 0.001$ .

The prevalence of Angle's classification for the entire sample was: Class I = 70%, Class II = 17%, and Class

III = 13%. There were no significant differences in the distribution of malocclusion between genders,  $p=0.9$  (Table 1). Also, there were no differences between the gingival biotype and different malocclusions for the entire sample,  $p=0.6$  (Table 1). However, when studying the difference in distribution of malocclusion and gingival biotype among males, the results showed a higher prevalence of thick gingival biotype among those with Class I malocclusion but this difference approached but did not attain a significant value, ( $\chi^2=5.2, p=0.08$ ). For females, no significant difference was observed, ( $\chi^2=0.6, p=0.7$ ).

Current smokers comprised 25.5% while 8% were former smokers and 66.5% never smoked (Table 2). There was a significant difference in the smoking status between males and females, ( $\chi^2=49.6, p=0.001$ ). Also, there was a significant association between gingival biotype and smoking status for the total sample, ( $\chi^2=9.0, p=0.011$ ). Current smokers had significantly thicker gingival biotype (Table 2).

**Discussion.** In contemporary society, the esthetic view of the gingiva is an important picture framework for patient's smile and restorative treatment. Determining the thickness of the gingival tissue plays an important role in treatment planning process for orthodontics, root coverage, extractions and implant placement especially in the maxillary anterior area.<sup>2,8-11</sup> Therefore, it is important to take into consideration the differences

in gingival tissue during treatment planning. The association between gingival recession and orthodontic treatment is a controversial subject. Previously it was reported that when thickness of the attached gingivae is more than 0.5 mm, the risk of gingival recession was reduced.<sup>5</sup> Therefore, it was concluded that a thicker attached gingiva may play a significant function in avoiding gingival recession even when the alveolar bone is reduced or absent.

Gingival thickness is assessed by an invasive and a non-invasive method. Invasive methods such as injection needle or probe, histologic sections or cephalometric radiographs while non-invasive methods included visual examination, the use of ultrasonic devices, probe transparency and cone beam computed tomography (CBCT).<sup>6,12-15</sup>

The visual assessment of the gingival biotype by itself is not sufficiently reliable and may not be considered as a valuable method as previous studies have found.<sup>13,14</sup> The ultrasonographic method of assessing gingival thickness is a non-invasive method but it has multiple drawbacks that includes but not limited to the non-reliability of results when the thickness of gingiva exceeds 2-2.5mm and the difficulty to determine the correct position and achieve a reproducible measurements.<sup>16</sup> The CBCT measurements were found to be an accurate representation of the clinical thickness of both labial gingiva and bone.<sup>12</sup> However,

**Table 1** - Frequency and percentages of gingival biotypes by different malocclusions in 200 patients.

Biotypes	Males		Females		Total	
	Thin	Thick	Thin	Thick	Thin	Thick
Class I (n=140)	13 (18.8)	56 (81.2)	47 (66.2)	24 (33.8)	60 (42.9)	80 (57.1)
Class II (n=34)	6 (33.3)	12 (67.7)	9 (56.2)	7 (43.8)	15 (44.1)	19 (55.9)
Class III (n=26)	6 (46.2)	7 (63.8)	8 (61.5)	5 (38.5)	14 (53.8)	12 (46.2)
Total (n=200)	25 (25.0)	75 (75.0)	64 (64.0)	36 (36.0)	89 (44.5)	111 (55.5)

Data are presented as number and percentage (%)

**Table 2** - Frequency and percentages of gingival biotypes with smoking status in 200 patients.

Biotypes	Males		Females		Total	
	Thin	Thick	Thin	Thick	Thin	Thick
Current (n=51)	11 (25.6)	32 (74.4)	5 (62.5)	3 (37.5)	16 (31.4)	35 (68.6)
Former (n=16)	2 (14.3)	12 (85.7)	2 (100.0)	0 (0.0)	4 (25.0)	12 (75.0)
Never (n=133)	12 (27.9)	31 (72.1)	57 (63.3)	33 (36.7)	69 (51.9)	64 (48.1)
Total (n=200)	25 (25.0)	75 (75.0)	64 (64.0)	36 (36.0)	89 (44.5)	111 (55.5)

Data are presented as number and percentage (%)

exposure to radiation and cost makes it less desirable. The transparency of a periodontal probe was chosen as it is considered atraumatic, rapid and with relatively low cost. Furthermore, this method was found to be an easy, reproducible, reliable and an objective method.<sup>13,15</sup> A decision to study the maxillary central incisors was made because previous studies have found that the differences between biotypes were more observable in these teeth.<sup>1,12</sup>

In the present study, a significant difference between male and female subjects in the gingival thickness was found. A thin gingiva was found in 64% of female participants and in only 25% of males. This finding is consistent with previous studies where thinner masticatory mucosa was found more among females.<sup>1,15,17</sup> The findings of this study were similar to what was shown previously where smokers had greater epithelial thickness and are less likely to have thin gingival biotype.<sup>18</sup>

The present study failed to demonstrate a relationship between gingival biotypes and Angle's classification. No significant differences were observed between classes I, II and III relationship and the gingival biotype. This could be due to the fact that this study only evaluated the inter-arch relationship without taking into account the angulation of the anterior teeth. The bucco-lingual tooth position within the bone housing may have an influence on the gingival thickness. Future studies that evaluate the angulation of the lower or upper anterior teeth and the amount of crowding in relation to the gingival biotype are warranted.

**Study limitations.** One of the limitations of this study is that only dental school patients' population was selected. Thus, the results of this report cannot be generalized to various patient populations. Another limitation is that only Angle's classification was used; thus future studies need to classify patients based on their skeletal profile as well as their cephalic index, since subjects with long face type tend to have thinner cortex compared to short or normal face types.<sup>19</sup>

In conclusion, a high prevalence of thin gingival biotype was observed especially among females. Smokers were more likely to have thick gingival biotype. No relationship was found between gingival biotypes and Angle's classification of malocclusion. Further studies are recommended to determine if there is a relation between gingival biotype, skeletal profile and facial type.

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