

A Clinical Evaluation of Anatomic Features of Gingiva in Dental Students in Tabriz, Iran

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Abstract

Background and aims. The anatomical features of gingiva are important in appropriate periodontal treatment planning. This study was designed to determine the anatomic features of gingival in a group of dental students in Tabriz, Iran.

Materials and methods. One-hundred healthy subjects (aged 20-24 years old) with no history of periodontal or orthodontic treatment and a gingival index of zero or one were included. The following measurements were made using a periodontal probe: the distance between the gingival margin and base of gingival sulcus (depth of sulcus); the distance between the gingival margin and mucogingival junction (keratinized gingiva); and the distance between base of gingival sulcus and mucogingival junction (attached gingiva). Existence of free gingival groove was also recorded by observation. Mean values of collected data were calculated.

Results. The widest attached gingiva and keratinized gingiva on the buccal aspect was seen in upper lateral incisor and their minimum in lower premolars. The maximum depth of sulcus on the buccal surface was recorded in upper right molar and its minimum on the buccal surface was found in lower left canine. All of the studied students had free gingival groove on the buccal or oral aspect of at least one tooth.

Conclusion. The anatomic features found in this study were similar to those of the previous studies. However, mild variations with regard to race differences were observed.

Key words: Attached gingiva, free gingival groove, gingival sulcus, keratinized gingival.

Introduction

The gingiva is the part of the oral mucosa that covers the alveolar processes of the jaws and surrounds the necks of the teeth and is divided anatomically into marginal, attached, and interdental areas. The marginal, or unattached, gingiva is the terminal edge or border of the gingiva surrounding the teeth in collar like fashion.¹ In about 50% of cases, it is demarcated from the adjacent attached gingiva by a shallow linear depression, the free gingival groove. Usually about 1 mm wide, it forms the soft tissue wall of the gingival sulcus. It may be separated from the tooth surface with a periodontal probe.² The attached gingiva is continuous with the marginal gingiva. It is firm, resilient, and tightly bound to the underlying periosteum of alveolar bone. The facial aspect

of the attached gingiva extends to the relatively loose and movable alveolar mucosa, from which it is demarcated by the mucogingival junction.¹

The width of the attached gingiva on the facial aspect differs in different areas of the mouth. It is generally greatest in the incisor region (3.5 to 4.5 mm in the maxilla and 3.3 to 3.9 mm in the mandible) and less in the posterior segments, with the least width in the first premolar area (1.9 mm in the maxilla and 1.8 mm in the mandible).³ Width of the keratinized gingiva includes marginal and attached gingiva and differs in different areas of the mouth.¹ The amount of attached gingival is increased with age.^{4,5}

The anatomical features of the gingiva are im-

portant in appropriate periodontal treatment planning. Therefore, this study was designed to determine the width of the attached gingiva, keratinized gingiva, and depth of sulcus and existence of free gingival groove in a group of dental students.

Materials and Methods

The study population consisted of 100 subjects (aged 20-24 years old) selected from dental students of Tabriz University of Medical Sciences, Tabriz, Iran in 2006. Inclusion criteria included good general health, presence of all natural teeth (except for third molars), and no history of periodontal surgery or orthodontic treatment. The nature of the study was explained in detail to the subjects and they signed an informed consent form. First the gingival index (Silness & Loe⁶) was determined upon the selected individuals and the subjects with zero and one score were selected. The location of gingival margin on enamel or cementum was recorded. A gingival groove was considered present when a distinct groove could be observed on the entire facial and oral gingiva of tooth. The following measurements were made to the nearest millimeter by means of a Willams periodontal probe (PWD, Hu-Friedy Immunity, USA):

- The depth of sulcus: the distance between the gingival margin and base of gingival sulcus
- Width of keratinized gingiva: the distance between the gingival margin and mucogingival junction
- Width of attached gingiva: the distance between base of gingival sulcus and mucogingival junction

Prior to the study, five students, each with ten teeth with probing depths of < 5 mm on at least one aspect of each tooth, were examined for calibration. The examiner evaluated the subjects

on two occasions, 48 hours apart. Calibration was accepted if > 90% of the recording could be reproduced within a 1-mm difference.

Data were presented using descriptive statistics (mean \pm SD). SPSS 14.0 computer software was used for this purpose.

Results

In this descriptive study, 100 dental students, aged 20-24 years old, were included.

The width of attached gingiva

On the buccal aspect, the greatest width of attached gingiva was found in relation to the upper lateral incisors (right: 5.86 mm, left: 5.45 mm) and the narrowest zone was observed on the first lower premolars (right: 2.37 mm, left: 2.42 mm) (Table 1).

On the oral aspect of mandibular teeth, the highest width of attached gingiva was found in relation to lower second molars (right: 5.74 mm, left: 5.48 mm) and the narrowest zone was observed in the area of central incisors (right: 3.41 mm, left: 3.32 mm) (Table 1).

The depth of gingival sulcus

On the mesiobuccal aspect, the highest and the lowest depths of gingival sulcus were found in right upper second molar (1.96 mm) and lower left canine (1.14 mm), respectively (Table 2).

On the distobuccal aspect, the highest depth of the sulcus was seen in left upper first molar (1.71 mm) and the lowest was found in left lower first premolar (1.13 mm) (Table 2).

On the buccal aspect, the highest depth of the sulcus was seen in upper right molars (1.37 mm) and the lowest was found in the left lower canine (0.86 mm) (Table 3).

On the oral aspect, the highest depth of the sulcus was seen in right upper second molar

Table 1. Mean (\pm SD) values of the width of the attached gingiva of the buccal and oral aspect of the teeth evaluated

Tooth	Buccal aspect of maxillary teeth		Buccal aspect of mandibular teeth		Oral aspect of mandibular teeth	
	Right	Left	Right	Left	Right	left
Central incisor	5.20 \pm 1.96	5.11 \pm 1.90	3.53 \pm 1.69	3.64 \pm 1.75	3.41 \pm 1.68	3.32 \pm 1.65
Lateral incisor	5.86 \pm 1.22	5.45 \pm 1.92	3.52 \pm 1.86	3.90 \pm 1.72	3.56 \pm 1.65	3.42 \pm 1.75
Canine	4.98 \pm 1.97	5.01 \pm 2.01	3.17 \pm 1.83	3.11 \pm 1.56	4.15 \pm 1.61	3.82 \pm 1.94
First premolar	3.76 \pm 1.47	3.83 \pm 1.68	2.37 \pm 1.45	2.42 \pm 1.62	4.44 \pm 1.83	4.15 \pm 1.60
Second premolar	4.08 \pm 1.53	3.85 \pm 1.35	2.50 \pm 1.19	2.72 \pm 1.51	5.10 \pm 1.80	4.61 \pm 1.69
First molar	4.50 \pm 1.43	4.83 \pm 1.60	2.91 \pm 1.32	3.01 \pm 1.47	5.73 \pm 1.98	5.45 \pm 2.04
Second molar	4.52 \pm 1.64	4.42 \pm 1.73	2.80 \pm 1.29	3.01 \pm 1.59	5.74 \pm 2.07	5.48 \pm 2.19

(1.31 mm) and the lowest was found in right lower incisors (0.79 mm) (Table 3).

The width of keratinized gingiva

On the buccal aspect, the highest width of keratinized gingiva was found in relation to the upper lateral incisors (right: 6.93 mm, left: 6.50 mm) and the narrowest zone was observed in the area of the mandibular first premolars (right: 3.43 mm, left: 3.31 mm) (Table 4).

However, on the oral aspect, the highest width of keratinized gingiva was found in relation to the lower left first and second molars (6.69 mm and 6.72 mm, respectively) and the narrowest

zone was observed in lower central incisors (right: 3.92 mm, left: 3.90 mm) (Table 4).

The percentage of gingival groove

On the buccal aspect, the right lower canine and premolars had the highest percentage of gingival groove (54% and 55%, respectively), and the least was seen in left upper molars (15%). The highest percentage of gingival groove on the oral aspect was found in relation to the right upper premolars (31%), and the least was found in the right lower molars (4%).

Overall, in 100% of samples, we observed a gingival groove on buccal or oral aspects of at least one tooth.

Table 2. Mean (\pm SD) values of the depth of gingival sulcus on the mesiobuccal and distobuccal aspect of teeth evaluated

Tooth	Mesiobuccal aspect of maxillary teeth		Mesiobuccal aspect of mandibular teeth		Distobuccal aspect of maxillary teeth		Distobuccal aspect of mandibular teeth	
	Right	Left	Right	Left	Right	Left	Right	Left
Central incisor	1.71 \pm 2.04	1.55 \pm 1.61	1.20 \pm 1.04	1.23 \pm 0.96	1.47 \pm 1.40	1.44 \pm 1.31	1.14 \pm 1.07	1.23 \pm 1.05
Lateral incisor	1.83 \pm 2.08	1.55 \pm 1.50	1.34 \pm 1.15	1.27 \pm 1.12	1.62 \pm 1.80	1.53 \pm 1.77	1.36 \pm 1.37	1.18 \pm 1.01
Canine	1.67 \pm 1.59	1.57 \pm 1.41	1.41 \pm 0.10	1.14 \pm 0.74	1.54 \pm 0.99	1.51 \pm 1.32	1.19 \pm 0.73	1.15 \pm 0.86
First premolar	1.66 \pm 1.04	1.43 \pm 0.82	1.27 \pm 0.68	1.23 \pm 0.68	1.60 \pm 0.90	1.40 \pm 0.77	1.28 \pm 0.69	1.13 \pm 0.68
Second premolar	1.70 \pm 0.97	1.47 \pm 0.85	1.28 \pm 0.68	1.31 \pm 0.78	1.55 \pm 0.87	1.53 \pm 0.95	1.28 \pm 0.72	1.26 \pm 0.79
First molar	1.67 \pm 1.03	1.62 \pm 0.93	1.39 \pm 0.81	1.46 \pm 0.81	1.57 \pm 1.18	1.71 \pm 1.75	1.29 \pm 0.81	1.26 \pm 0.61
Second molar	1.96 \pm 1.25	1.74 \pm 1.51	1.43 \pm 0.80	1.48 \pm 0.85	1.54 \pm 0.89	1.52 \pm 1.51	1.49 \pm 1.18	1.36 \pm 0.74

Table 3. Mean (\pm SD) values of the depth of gingival sulcus on the buccal and oral aspect of teeth evaluated

Tooth	Buccal aspect of maxillary teeth		Buccal aspect of mandibular teeth		Oral aspect of maxillary teeth		Oral aspect of mandibular teeth	
	Right	Left	Right	Left	Right	Left	Right	Left
Central incisor	1.21 \pm 1.39	1.16 \pm 1.14	0.97 \pm 0.92	0.99 \pm 0.95	0.92 \pm 0.43	1.01 \pm 0.45	0.79 \pm 0.43	0.82 \pm 0.47
Lateral incisor	1.33 \pm 1.90	1.23 \pm 1.36	1.01 \pm 0.95	1.01 \pm 1.39	1.02 \pm 0.49	0.98 \pm 0.46	0.79 \pm 0.43	0.81 \pm 0.45
Canine	1.16 \pm 1.29	1.24 \pm 1.26	1.08 \pm 0.82	0.86 \pm 0.72	1.05 \pm 0.48	0.92 \pm 0.42	0.99 \pm 0.53	0.88 \pm 0.47
First premolar	1.23 \pm 1.01	1.13 \pm 0.75	1.11 \pm 0.76	1.02 \pm 1.20	1.28 \pm 1.46	1.04 \pm 0.52	0.98 \pm 0.45	0.95 \pm 0.47
Second premolar	1.22 \pm 1.04	1.16 \pm 0.89	1.07 \pm 0.70	1.03 \pm 0.71	1.26 \pm 1.17	1.11 \pm 0.60	1.15 \pm 0.67	0.96 \pm 0.46
First molar	1.37 \pm 1.08	1.18 \pm 0.91	1.10 \pm 0.67	1.04 \pm 0.67	1.23 \pm 0.54	1.11 \pm 0.54	1.12 \pm 0.48	1.01 \pm 0.47
Second molar	1.37 \pm 0.99	1.29 \pm 1.03	1.17 \pm 0.73	1.30 \pm 1.26	1.31 \pm 0.51	1.12 \pm 0.50	1.27 \pm 0.54	1.15 \pm 1.10

Table 4. Mean (\pm SD) values of keratinized gingival on the buccal and oral aspect of teeth evaluated

Tooth	Buccal aspect of maxillary teeth		Buccal aspect of mandibular teeth		Oral aspect of mandibular teeth	
	Right	Left	Right	Left	Right	Left
Central incisor	6.24 \pm 1.60	6.21 \pm 1.75	4.33 \pm 1.74	4.36 \pm 1.66	3.92 \pm 1.61	3.90 \pm 1.55
Lateral incisor	6.93 \pm 1.80	6.50 \pm 1.64	4.46 \pm 1.81	4.67 \pm 1.73	3.98 \pm 1.60	4.33 \pm 1.73
Canine	5.99 \pm 1.97	6.03 \pm 1.90	4.16 \pm 1.83	3.91 \pm 1.78	4.44 \pm 1.71	4.82 \pm 1.53
First premolar	4.77 \pm 1.48	5.01 \pm 1.71	3.43 \pm 1.56	3.31 \pm 1.45	5.17 \pm 1.72	5.22 \pm 1.72
Second premolar	5.04 \pm 1.34	4.88 \pm 1.42	3.64 \pm 1.45	3.67 \pm 1.46	5.82 \pm 1.89	5.88 \pm 1.64
First molar	5.70 \pm 1.49	5.33 \pm 1.38	4.02 \pm 1.21	3.87 \pm 1.22	6.33 \pm 1.97	6.69 \pm 1.82
Second molar	5.67 \pm 1.54	5.45 \pm 1.49	3.94 \pm 1.31	3.98 \pm 1.35	6.31 \pm 2.11	6.72 \pm 2.02

Discussion

This study was designed to determine the anatomic features of the gingiva in dental students in Tabriz, Iran. The results showed minimum variations with anatomic features of the gingiva in a previous study on dental students in Denmark.²

In our study, the widest attached gingival on the buccal aspect was found on the upper lateral incisor and the narrowest zone was observed on the lower first premolars. The studied teeth are the same as the study of Ainamo in Denmark,² but the widest attached gingival was found on upper central and lateral incisors (3.5 mm and 4.5 mm, respectively) and the narrowest attached gingival was found to be on the lower first premolar (1.8 mm). These data suggest that the amount of attached gingival was higher in the evaluated Iranian population compared to the subjects studied in the study of Ainamo.²

In the present study, the highest width of attached gingiva on the oral aspect of mandibular teeth was found in relation to the lower molars and the narrowest zone was observed in the area of the central incisors. These findings are in accordance with Ainamo's study;² however, the range of the attached gingival in our study (0.5–10.5 mm) is slightly wider than that of the mentioned study (1–9 mm).

On the buccal aspect, the highest width of keratinized gingiva was found in relation to the upper lateral incisor and the narrowest zone was observed in the area of the mandibular first premolars. On the oral aspect, the highest width of keratinized gingiva was found in relation to the mandibular first and second molars and the narrowest zone was observed in the area of the mandibular central incisors. This is similar to the pattern observed with the attached gingiva. Therefore, a wider keratinized gingiva is observed in the present study compared to that of

the Ainamo's,² which suggests different widths of keratinized gingiva between different races.

The highest percentage of gingival groove on the buccal aspect was found in relation to lower canine/premolars in the present study and in relation to incisors/first premolar in the Ainamo's.² The least gingival grooves were found in the upper second molar region in our study opposed to the upper and lower premolar regions found in a previous study.² Overall, in all of 100 dental students examined (100%), a gingival groove was observed on buccal or oral aspect of at least one tooth; however, previously, a 50-percent prevalence has been reported.² The pattern of gingival groove in our study is in accordance with a previous study, in which gingival groove was also seen mostly on the buccal aspect.²

With regard to the importance of knowledge of normal anatomic features of gingiva in diagnosis of disease conditions and treatment planning,⁷ studies on large samples of Iranian population deem necessary. Furthermore, future studies on the different age groups are also needed.

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