



ORIGINAL RESEARCH ARTICLE

OPEN ACCESS

A CLINICAL STUDY FOR ATTACHED GINGIVA WIDTH ASSESSMENT USING VISUAL METHOD WITH OR WITHOUT HISTOCHEMICAL STAINING IN VARIOUS AGE GROUPS

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ARTICLE INFO

Article History:

Received 20th September, 2017
Received in revised form
19th October, 2017
Accepted 18th November, 2017
Published online 30th December, 2017

Key Words:

Mucogingival junction,
Different age
Group individuals.

ABSTRACT

Background: In the periodontium, attached gingiva is an important anatomic and functional landmark. For the maintenance of periodontal health the adequate amount of keratinized tissue necessarily required for is questionable. To determine the width of attached gingiva the mucogingival junction serves an important clinical landmark. The mucogingival junction is located by the functional method, the visual method with and without histochemical staining, which then aid in the assessment of the width of attached gingiva. This study was carried out to assess the full mouth width of attached gingiva mid buccally in different age group individuals.

Materials and methods: 80 subjects were included in the study and divided into four age groups: from 1-15 years, 16-30 years, 31-45 years and 45- 60 years. The width of the gingival was assessed by William's graduated probe with and without histochemical staining.

Results: It was observed that there was no significant difference in the width of attached gingival measured by both the methods and it increases with age.

Conclusion: It was concluded from the present study that width of attached gingiva increases with age with no significant difference between visual method with and without histochemical staining.

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Citation: Dr. Rashidat ul khairat, Dr. Tahira ashraf, Dr. Suhail Majid jan, Dr. Roobal behal, Dr. Abhima kumar and Dr. Rafia Nazir, 2017. "A clinical study for attached gingiva width assessment using visual method with or without histochemical staining in various age groups", *International Journal of Development Research*, 7, (12), 17998-18001.

INTRODUCTION

Oral cavity being lined by three different kinds of mucosa with each having its own clinical significance. These include masticatory mucosa covering of hard palate and gingiva of alveolar process, lining mucosa covering of lips, cheeks and vestibular fornix and specialized mucosa covering the dorsum of tongue (Malthi, 2013). The gingiva is divided anatomically into free, attached and interdental gingiva. Attached gingiva is the part of keratinized gingiva that aids in stabilization of gingival margin against frictional forces, increases resistance to external injury and dissipates physiological forces exerted by the muscular fibers of the alveolar mucosa on the gingival tissues (Malthi, 2013).

In 1948, Orban first tried to describe attached gingiva and divided it into free and attached gingiva that being demarcated by free gingival groove (FGG) (Orban et al., 1948). According to glossary of periodontal terms attached gingiva is described as firm, resilient and tightly bound to underlying periosteum of alveolar bone through connective tissue. The attached gingiva extends to relatively loose and movable alveolar mucosa on facial aspect and is demarcated by mucogingival junction. On the palatal aspect it blends imperceptibly with firm and resilient palatal mucosa in maxillary arch and in mandible on lingual aspect it terminates at the junction of lingual alveolar mucosa that is continuous with mucous membrane lining the floor of the mouth (Malthi, 2013). As the attached gingiva is one of the most important anatomic and functional landmark in the periodontium, its adequate width helps in maintaining esthetics and enhances plaque control. Thus adequate width restoration of attached gingiva is an important part of the periodontal plastic and esthetic surgery (Kolte et al., 2014). According to Hall, the width of attached gingiva is determined

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by subtracting the sulcus or pocket depth from total width of gingival (Hall, 1982). So the width of the attached gingiva is the distance between the mucogingival junction and the projection on the external surface of the bottom of the gingival sulcus or periodontal pocket (Fiorellini et al., 2006). For the assessment of the width of attached gingival, the mucogingival junction serves as an important clinical landmark (Wennstrom et al., 2008) as its position is genetically determined. The mucogingival junction maintains a constant distance from the base of the mandible in the lower jaw and from the anterior nasal spine in the maxilla. It is a discrete line that helps in distinguishing the movable and immovable mucosa during passive motion of the lip and cheek (Hilming, 1970).

The methods used for determining mucogingival junction location include visual method, functional method and visual method after histochemical staining. The mucogingival junction appears as scalloped line separating attached gingiva from the alveolar mucosa (Hall et al., 1948) in visual method. In functional method, mucogingival junction appears as a borderline between movable and immovable tissue (Hilming, 1970). In this a horizontally positioned probe runs from the vestibule toward the gingival margin using light force to assess the tissue mobility. Visual method after histochemical staining uses iodine solution for staining to assess mucogingival junction visually. There is difference in glycogen content, acid phosphatase and non-specific esterase content between keratinized attached gingiva and alveolar mucosa. There is also an increased amount of elastic fiber content in the latter (Weinmann, 1959; Lozdan, 1969; Kapur, 1963; Tencate, 1963). The Lugol's iodine solution used is based on the difference in the glycogen content.

As attached gingiva is keratinized and has no glycogen in the most superficial layer thus giving an iodo negative reaction. The Lugol's iodine solution stains only the alveolar mucosa due to its glycogen content and clearly demarcates the mucogingival junction (Bhatia et al., 2015).

The purpose of this study was to assess the full mouth mid-buccal width of attached gingival and evaluate the difference in visual with and without histochemical methods in identification of the mucogingival junction to calculate the width of attached gingiva.

MATERIALS AND METHODS

A total of 80 patients comprising of both sexes visiting the out-patient Department of Periodontology of Government Dental College and Hospital, Srinagar were considered for the present study after meeting the inclusion and exclusion criteria. The subjects included in the study were with good general health till the age of 60 years, healthy gingival tissues with no attachment loss and subjects not have undergone any sort of periodontal treatment in the last 6 months. The exclusion criteria included pregnant and lactating females, systemic illness and subjects taking medications that may have an influence on the gingiva.

METHODS

After being informed about the study protocol those patients who agreed for the study, were included in the study. The subjects were grouped into four groups based on their age

- 1-15 years

- 16-30 years
- 31-45 years
- 46-60 years

The width of attached gingiva was assessed by demarcating the mucogingival junction by the following methods:

Method 1: Visual method

Method 2: Visual method after histochemical staining.

The examination was carried by a single examiner on all the teeth in mid- buccal area. The width of keratinized gingiva was measured as the distance from the gingival margin to the mucogingival junction. Using a William's periodontal probe sulcus depth was measured from the gingival margin to base of the sulcus. Then using these values, the attached gingiva width was assessed as the difference of the sulcus depth from the width of the keratinized tissue.

The Lugol's iodine solution (Sheehan et al., 1980) was prepared by diluting 2 g of potassium iodide and 1 g of iodine crystals in 60 ml of distilled water and burnished on the subject's gingiva and alveolar mucosa till a sharp demarcation was distinct between them with a cotton pellet using light pressure. For comparison of the readings by both the methods all the data collected were subjected to statistical analysis.

RESULTS

A total of 80 subjects participated in the study with 20 subjects in each group. The assessment of width of attached gingiva in different age groups by visual method revealed that the width of gingiva increases with age where in the mean width in maxillary teeth in <15 years was 1.84 mm, which increased to 2.47 mm (16-30years), 2.63 mm (31 -45years) and 2.98 mm (46-60 years) in different age groups. Similarly, in the mandibular teeth the mean width in <15 years was 1.48mm, increased to 2.18 mm (16-30 years) ,2.23 mm (31-45 years) and 2.29 mm (46-60 years) in different age groups [Table I]. Assessment of width of attached gingiva in maxillary arch in different age groups by visual and histochemical staining showed a mean of 1.94 mm in 15 years, 2.41 mm in 16-30 years, 2.65 mm in 31-45 years and 3.03 mm in 46-60 years. In the mandibular teeth, the mean in <15 years was 1.57 mm ,2.19 mm in 16-30 years , 2.26 mm in 31-45 years and 2.33 mm in the age group of 46-60 years [Table 2]. There was no significant difference in the width of attached gingiva in both maxillary and mandibular teeth in age group of <15 year irrespective of the method used for its assessment [Table 3]. On comparison by two different methods in various tooth types in age group 16-30 years revealed no significant results in both maxillary and the mandibular teeth [Table 4]. Similar trends of maximum width in the maxillary incisors and least in the mandibular premolars were noticed in the other age groups, that is, 31-45 years and 46-60 years with no significant difference seen in the two methods[Tables 5 and 6].

DISCUSSION

The width of attached gingiva is vital in assessing the risk of periodontium being affected by disease. The mucogingival junction being genetically determined having constant position throughout the life serves as an important anatomical landmark, thus helping in assessment of width of attached gingiva. The mucogingival junction can be demarcated by various methods including visual method, functional method and visual method after histochemical staining.

Table 1. Assessment of width of attached gingiva in different age groups by visual method 1

Teeth	Age Group (years)	Mean	SD	Min	Max
Maxillary	<15	1.84	0.488	1.23	3.00
	16-30	2.47	0.312	2.25	3.03
	31-45	2.63	0.253	2.28	3.13
	46-60	2.98	0.189	2.38	3.50
Mandibular	<15	1.48	0.165	1.23	1.75
	16-30	2.18	0.302	1.66	2.35
	31-45	2.23	0.250	1.93	2.69
	46-60	2.29	0.128	1.84	2.81

Table 2. Assessment of width of attached gingiva in different age groups by visual after histochemical staining method 2

Teeth	Age Group (years)	Mean	SD	Min	Max
Maxillary	<15	1.94	0.314	1.51	2.75
	16-30	2.41	0.351	2.34	2.96
	31-45	2.65	0.263	2.33	3.20
	46-60	3.03	0.163	2.38	3.59
Mandibular	<15	1.57	0.155	1.35	1.85
	16-30	2.19	0.206	2.01	2.39
	31-45	2.26	0.227	1.75	2.52
	46-60	2.33	0.120	1.90	2.68

Table 3. Comparison of various tooth types by two different methods in the age group of <15 years

Teeth	Method	Mean	SD	P-value
Maxillary	1	1.84	0.488	0.446
	2	1.94	0.314	
Mandibular	1	1.48	0.165	0.094
	2	1.57	0.155	

Table 4. Comparison of various tooth types by two different methods in the age group 16-30 years

Arch	Tooth Type	Method	Mean	SD	P-value
Maxillary	Incisors	1	3.65	0.698	0.876
		2	3.62	0.537	
	Canines	1	3.51	0.436	0.812
		2	3.47	0.560	
	Premolars	1	1.88	0.179	0.550
		2	1.83	0.282	
	Molars	1	1.86	0.503	0.697
		2	1.79	0.514	
Mandibular	Incisors	1	3.30	0.699	0.524
		2	3.18	0.463	
	Canines	1	2.44	0.565	0.910
		2	2.46	0.429	
	Premolars	1	1.40	0.287	0.330
		2	1.49	0.292	
	Molars	1	1.56	0.301	0.663
		2	1.59	0.181	

Table 5. Comparison of various tooth types by two different methods in the age group 31-45 years

Arch	Tooth Type	Method	Mean	SD	P-value
Maxillary	Incisors	1	3.23	0.324	0.094
		2	3.42	0.350	
	Canines	1	2.74	0.317	0.418
		2	2.83	0.382	
	Premolars	1	2.03	0.415	0.830
		2	2.06	0.432	
	Molars	1	2.21	0.358	0.342
		2	2.30	0.247	
Mandibular	Incisors	1	3.19	0.329	0.559
		2	3.13	0.225	
	Canines	1	2.08	0.332	0.125
		2	1.94	0.216	
	Premolars	1	1.49	0.424	0.449
		2	1.40	0.355	
	Molars	1	1.95	0.462	0.956
		2	1.96	0.481	

In determining the exact point at which the keratinization ends, Fasske and Morgenroth suggested that the precise location of the mucogingival junction can be visualized after staining with stains like Lugol's iodine (Fasske, 1958). In this study for easy accessibility and convenience mid-buccal region of each tooth was chosen and probing was done using William's periodontal

Table 6. Comparison of various tooth types by two different methods in the age group 46-60 years

Arch	Tooth Type	Method	Mean	SD	P-value
Maxillary	Incisors	1	3.38	0.406	0.508
		2	3.48	0.524	
	Canines	1	2.76	0.210	
		2	2.65	0.295	
	Premolars	1	2.35	0.291	
		2	2.40	0.191	
	Molars	1	2.10	0.352	
		2	2.21	0.259	
Mandibular	Incisors	1	2.99	0.169	0.090
		2	3.11	0.146	
	Canines	1	2.17	0.317	
		2	2.11	0.420	
	Premolars	1	1.48	0.231	
		2	1.54	0.261	
	Molars	1	1.66	0.295	
		2	1.74	0.198	

probe by single examiner to eliminate probing discrepancies. In this study categorization into various tooth types in first group was not possible due to mixed dentition but was done in last three groups into different types. The width of attached gingiva varies in different areas of the mouth and have been given a range of 1-9 mm according to Bowers (Bowers, 1963), 1-4 mm according to Jacobs (Jacob, 2009) and 0-5mm by Subbaiah (Subbaiah, 2012). In the present study, the range of the mean width of attached gingiva varied between 1 mm to 4 mm. The dissimilar results being obtained may partially be due to different tooth and site selection. In this present study, the attached gingiva width assessment in different age groups by visual method revealed that the width of gingiva /0as suggested by authors like Ainamo and Talari (Ainamo, 1976) and Vincent et al. (Vincent, 1976). In this study, the widest zone of attached gingiva was found in the incisors and the least in the premolar region irrespective of the method used in the assessment, these variations were similar to that seen in Bower's study (Bowers, 1963). The results of the present study showed that there was no significant difference in the measurements whether the visual method alone or visual method after histochemical staining was used. These results are in accordance with the study conducted by Guglielmoni et al. (Guglielmoni, 2001).

Conclusion

In this study the assessment of full mouth mid - buccal width of attached gingiva suggested that there is increase in width with age with maximum width seen in maxillary incisors and least width seen in mandibular premolars. Irrespective of the method used for assessment, different widths were seen in various areas. Greater overall width of attached gingiva was seen in maxillary teeth than mandibular teeth.

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