Research Article

COMPARISON OF TWO METHODS FOR CLINICAL ASSESSMENT OF THE WIDTH OF THE ATTACHED GINGIVA IN DIFFERENT REGIONS OF MOUTH IN VARIOUS AGE GROUPS

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A R T I C L E I N F O	A B S T R A C T

Background: The width of the attached gingiva is the distance between the mucogingival junction to the projection of the external surface of the bottom of the sulcus or the periodontal pocket. It varies from tooth to tooth and also among individuals of different age groups.

Aim: The aim of this study is to assess the full mouth mid-buccal width of attached gingiva and evaluate the difference in visual and histochemical method in identification of the mucogingival junction to calculate the width of the attached gingiva.

Material and Methods: A sample of 80 patients divided in four age groups were included and each group was assessed for mid-buccal width of attached gingiva either by Visual or Histochemical method utilizing stain for identification of mucogingival junction.

Results: It was seen that the width increases with age and there was no significant difference in the width by the two methods.

Conclusion: Width of attached gingiva varies in different areas of the mouth with maximum in incisors and minimum in premolars and also increases with age with no significant difference in the method of its assessment.

INTRODUCTION

Normal gingiva covers the alveolar bone and tooth root to a level just coronal to the cementoenamel junction and is anatomically divided into marginal, attached and interdental areas. The attached gingiva is continuous with the marginal gingiva and is firm, resilient and tightly bound to the underlying periosteum of the alveolar bone. The facial aspect of the attached gingiva is relatively loose and movable alveolar mucosa and is demarcated by mucogingival junction(Fiorellini JP et. at., 2006). The width of the attached gingiva is an important clinical parameter (Orban B, 1948) and is recorded as the distance between mucogingival junction and the projection on the external surface of the bottom of the gingival sulcus or the periodontal pocket. Mucogingival junction is the line separating the alveolar mucosa from the attached gingiva (Ainamo J and Talari A, 1976). Because the mucogingival junction remains stationery throughout adult life(Ainamo A, 1978), changes in the width of the attached gingiva are caused by the modifications in the position of its coronal portion. The width of the attached gingiva on the facial aspect differs in different areas of mouth (Bowers GM, 1963)

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Various methods have been employed for demarcating the mucogingival junction like the Visual Method which involves visualization by naked eye by identifying the difference in colour of gingiva and alveolar mucosa, histochemical method utilizing stain like Schiller's iodine (Ainamo J and Talari A, 1976), functional method in which mucogingival junction is determined as the borderline between movable and immovable tissues by running a periodontal probe horizontally from the vestibule towards the gingival margin using light pressure(Hilming F andJervoe P, 1970), the radiographic method utilizing wire on the mucogingival junction seen in orthopantomography (Talari A andAinamo J, 1976) and the use of orthodontic records (Trentini CM et. at., 1995).

Identification of the mucogingival junction has posed difficulty for authors which has led to the use of different methods for the its identification. The histochemical staining method utilizing Lugol's Iodine for demarcating mucogingival junction is based on the concept of glycogen content differences in the alveolar mucosa and keratinized mucosa. The alveolar mucosa gives Iodo-positive reaction and gets stained as it is high in glycogen, acid phosphatase, esterase and elastic fibre content (Weinmann JP et. at., 1959, Lozdan J andSquier CA, 1969, Tencate AR, 1963, Kapur KK et. at., 1963)

Aim and objective

The aim and objective of the present study was to compare two methods i.e. Visual Method and Histochemical Method for identification of the mucogingival junction for calculating and assessing thefull mouth mid-buccal width of the attached gingiva in patients of different age groups.

MATERIALS AND METHOD

Source of Data

A total of 80 patients were selected from the Out Patient Department of Periodontology from SMBT Dental College and Post Graduate Research Centre, Sangamner, Maharashtra. Patients till the age of 60 years with healthy gingival tissues, willing to participate in the study and not under any medications that may affect the periodontium were included in the study. Patients with systemic illness, pregnant and lactating females, patients with known allergy to intraoral stain and those with absence of any tooth except third molar were excluded from the study.

METHOD

Every patient was explained in detail the procedure that was to be carried out and also both, verbal and written consent was obtained from the patients.

From the total of 80 patients, four groups were made depending upon the age of the patient, each of which comprised of 20 patients, as follows:

Group A: Below 14 years of age
Group B: 15-30 years of age
Group C: 31-45 years of age
Group D: Above 45 years of age

Each of the 20 patients were assessed for the width of the attached gingiva by both methods:

Method 1: Visual method in which the Periodontal Probe was used to measure the total width of the keratinised gingiva and also the probing depth. (Fig. 1)

Fig 1 Visual Method

Method 2: Histochemical staining method utilizing Lugol's iodine which was freshly prepared by adding 2 gm of potassium iodide to 1 gm of iodine crystals and diluting it with 100 ml of distilled water. The stain was used to clearly demarcate mucogingival junction using cotton pellet. (Fig.2)

Fig 2 Histochemical Method

The width of the attached gingiva was measured as the difference between the probing depth and the total width of the keratinized gingiva i.e. the distance from the gingival margin to the mucogingival junction. The measurement was taken from the mid-buccal region of every tooth except the third molars.

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 areas with different age groups by Method 1 showed increase in width wherein the mean width in maxillary teeth in Group A was 1.88, Group B was 2.92, Group C was 3.04, Group D was 3.13[Table 1]. In mandibular teeth, it was 1.85 for A, 2.86 for B, 2.92 for C and 3.07 for [Table 2]. The assessment by Method 2 also showed increase in width wherein the mean width in maxillary teeth was 2.14 for A, 2.83 for B, 2.91 for C and 3.04 for D[Table 3]. In mandibular teeth, it was 2.11 for A, 2.8 for B, 2.88for C and 2.99 for D [Table 4]. The ANOVA F value was 19.42 for maxillary teeth by Method 1 and 14.04 by Method 2. It was 16.89 for mandibular teeth for Method 1 and 12.96 for Method 2. Tukey's Post Hoc Test for multiple pair wise comparison among the individual groups revealed highly significant differences (p value < 0.001) between Group A vs Groups B,C and D by Method 1 whereas significant differences (p value < 0.05) between Group A vs Groups B, C and D. There was no significant difference in the width in maxillary and mandibular teeth for Group A irrespective of the method used [Table 5(a)].For Group B, there was no significant difference in the width between the two methods with the maximum width seen in incisors (3.93-method 1; 3.88-method 2) and least width seen in premolar region (1.70-method 1; 1.64-method 2), similar trend was seen in mandibular teeth [Table 5(b)]. For groups C and D, similar results were seen with maximum width recorded for incisors and minimum width for premolars and no significant difference seen between the two methods [Table 5(b)]

Table 1 Assessment of width of maxillary attached gingiva in differentage groups by visual method 1

Age groups	Mean (SD)	Anova F value	P value, Significance
Group A (<14 years)	1. 89 (0.38)		
Group B (15-30 years)	2.92 (0.68)	19.42	p < 0.001, highly significant
Group C (31- 45 years)	3.04 (0.47)		
Group D (45-60 years)	3.13 (0.51)		

Tukey's post hoc test to find out multiple pair wise comparison among individual group

Comparison	Mean difference	p value, Significance
Group A vs Group B	1.03	p < 0.001, highly significant
Group A vs Group C	1.15	p < 0.001, highly significant
Group A vs Group D	1.24	p < 0.001, highly significant
Group B vs Group C	0.12	p = 0.24, not significant
Group B vs Group D	0.21	p = 0.097, not significant
Group C vs Group D	0.09	p = 0.48, not significant

p > 0.05 – not significant,   p < 0.05 - significant,   p < 0.001 – highly significant

Table 2 Assessment of width of mandibular attached gingiva in different age groups by visual method 1

Age groups	Mean (SD)	Anova F value	P value, Significance
Group A (<14 years)	1.85 (0.48)		
Group B (15-30 years)	2.86 (0.74)	16.89	p < 0.001, highly significant
Group C (31- 45 years)	2.92 (0.59)		
Group D (45-60 years)	3.07 (0.63)		

Tukey's post hoc test to find out multiple pair wise comparison among individual group

Comparison	Mean Difference	P value, Significance
Group A vs Group B	1.01	p < 0.001, highly significant
Group A vs Group C	1.07	p < 0.001, highly significant
Group A vs Group D	1.22	p < 0.001, highly significant
Group B vs Group C	0.06	p = 0.731, not significant
Group B vs Group D	0.21	p = 0.093, not significant
Group C vs Group D	0.15	p = 0.14, not significant

p > 0.05 – not significant,   p < 0.05 - significant,   p < 0.001 – highly significant

Table 3 Assessment of width of maxillary attached gingiva in different age groups by histochemical method 2

Age groups	Mean (SD)	Anova F value	P value, Significance
Group A (<14 years)	2.14 (0.34)		
Group B (15-30 years)	2.83 (0.61)	14.04	p < 0.001, highly significant
Group C (31- 45 years)	2.91 (0.39)		
Group D (45-60 years)	3.04 (0.44)		

Tukey's post hoc test to find out multiple pair wise comparison among individual group

Comparison	Mean Difference	P value, Significance
Group A vs Group B	0.69	p = 0.02, significant
Group A vs Group C	0.77	p = 0.01, significant
Group A vs Group D	0.9	p = 0.003, significant
Group B vs Group C	0.08	p = 0. 612, not significant
Group B vs Group D	0.21	p = 0.098, not significant
Group C vs Group D	0.13	p = 0.19, not significant

p > 0.05 – not significant,   p < 0.05 - significant,   p < 0.001 – highly significant

Table 4 Assessment of width of Mandibular Attached Gingiva in Different age Groups by Histochemical Method 2

Age groups	Mean (SD)	ANOVA F value	P value, Significance
Group A (<14 years)	2.11 (0.42)		
Group B (15-30 years)	2.80 (0.33)	12.96	p < 0.001, highly significant
Group C (31- 45 years)	2.88 (0.71)		
Group D (45-60 years)	2.99 (0.36)		

Tukey's post hoc test to find out multiple pair wise comparison among individual group

Comparison	Mean Difference	P value, Significance
Group A vs Group B	0.69	p = 0.016, significant
Group A vs Group C	0.77	p = 0.008, significant
Group A vs Group D	0.88	p = 0.002, significant
Group B vs Group C	0.08	p = 0. 628, not significant
Group B vs Group D	0.19	p = 0.104, not significant
Group C vs Group D	0.11	p = 0.12, not significant

p > 0.05 – not significant,   p < 0.05 - significant,   p < 0.001 – highly significant

Table 5 (a) Comparison of two different methods in various tooth types in age group A

Teeth	Method 1 Mean (SD)	Method 2 Mean (SD)	p value	Significance
Maxillary	1.89(0.38)	2.14(0.34)	0.37	N.S.
Mandibular	1.85(0.48)	2.11(0.42)	0.45	N.S.

Table 5 (b) Comparison of two different methods in various tooth types in various age groups.

Tooth	Arch	Age Group	Method 1 Mean (SD)	Method 2 Mean (SD)	p value	Significance
Incisor	Maxillary	B	3.93 (0.21)	3.88 (0.26)	0.82	N. S.
		C	4.03 (0.38)	3.93 (0.61)	0.8	N. S.
		D	4.05 (0.38)	4.0 (0.26)	0.68	N. S.
	Mandibular	B	3.89 (0.36)	3.88 (0.11)	0.98	N. S.
		C	3.94 (0.56)	3.93 (0.34)	0.79	N. S.
		D	4.02 (0.47)	3.98 (0.28)	0.73	N. S.
Canines	Maxillary	B	3.76 (0.47)	3.76 (0.18)	1	N. S.
		C	3.46 (0.35)	3.4 (0.43)	0.84	N. S.
		D	3.79 (0.41)	4.12 (0.27)	0.28	N. S.
	Mandibular	B	3.69 (0.26)	3.86 (0.38)	0.71	N. S.
		C	3.47 (0.67)	3.41 (0.24)	0.87	N. S.
		D	3.78 (0.34)	3.94 (0.45)	0.48	N. S.
Premolars	Maxillary	B	1.70 (0.18)	1.64 (0.15)	0.78	N. S.
		C	1.8 (0.27)	1.78 (0.46)	0.82	N. S.
		D	1.93 (0.27)	1.99 (0.31)	0.84	N. S.
	Mandibular	B	1.57 (0.07)	1.59 (0.11)	0.91	N. S.
		C	1.76 (0.35)	1.74 (0.51)	0.79	N. S.
		D	1.87 (0.35)	1.94 (0.19)	0.59	N. S.
Molars	Maxillary	B	2.72 (0.58)	2.66 (0.38)	0.84	N. S.
		C	2.92 (0.24)	2.52 (0.38)	0.25	N. S.
		D	3.1 (0.23)	2.61 (0.27)	0.26	N. S.
	Mandibular	B	2.70 (0.28)	2.41 (0.34)	0.24	N. S.
		C	2.8 (0.61)	2.53 (0.43)	0.36	N. S.
		D	2.97 (0.14)	2.6 (0.18)	0.53	N. S.

P > 0.05 – not significant (N.S.) , p < 0.05 – significant , p < 0.001 – highly significant

DISCUSSION

Assessing the width of the attached gingiva helps in determining the treatment plan which needs to be undertaken and also in analysing the prognosis of the periodontal disease. As already discussed, mucogingival junction serves as the demarcating line between the alveolar mucosa and keratinized gingiva. Fasske *et al* has suggested the use of stains like Lugol's iodine to aid in determining the mucogingival junction (Fasske E and Morgenroth K, 1958) The region chosen was mid-buccal for every tooth for better accessibility, visualization and convenience. All the measurements were carried out by a single examiner to avoid discrepancies which can be encountered due to differences in probing depth, probing regions and inflammation/conditions known to the examiner.

The results showed an increase in the width of the attached gingiva as the age progressed by both the methods. This is in accordance with the study conducted by Ainamo and Talari (1976), Vincent et. al. (1976), Tenenbaum H and Tenenbaum M (1986) and Bimstein E and Eidelman. E (1988). The study results also revealed different width of attached gingiva in different regions of the mouth in Groups B,C, and D as seen in studies by Bowers (1963) ranging between 1-9mm, 1-4mm (Jacob P and Zade RM, 2009) and 0-5mm (Subbaiah R and Manohar B, 2012) with the maximum width seen in the incisors and the least in the premolars (Tenenbaum H andTenenbaum M,1986). However, due to great variations in the tooth configuration in the mixed dentition period and younger patients, only the overall maxillary and mandibular

teeth were considered. The causes which might affect the width of attached gingiva maybe degree of tooth eruption, position of the tooth and also the muscle/frenum attachment levels(Bowers GM, 1963). The results of the present study showed no significant differences in the two methods for measurements which is in accordance with the study by GuglielmoniP et. al. (2001) but in contrast with the study by BernimoulinJP et. al. (1971) who stated that the functional method revealed the maximum width of the attached gingiva.

CONCLUSION

The comparison of the two methods for assessing the mid buccal width of the attached gingiva in different regions of the mouth revealed maximum width in the incisor region and the minimum width in the premolar region with no significant difference seen in the two methods. The width of the attached gingiva showed significant increase as the age progressed with both the methods. Further studies with more sample size need to be carried out to get a definitive range as to define an adequate and inadequate width to make help in determining the prognosis.

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