Original Research Paper



NIDDACDECTAL CINCINAL TICCHE IN HIMAN

Periodontology

MEASUREMENT OF SUPRACRESTAL GINGIVAL TISSUE IN HUMAN PERIODONTIUM AND ITS VARIATION WITH RESPECT TO TOOTH TYPES AND CLASSES- AN INVIVO STUDY.

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ABSTRACT BACKGROOND: Biological width (BW) is used as clinical guideline in periodontal, restorative and prosthetic procedures. The BW is a histological term and it cannot be used in routine clinical procedures so it is considered with the sulcus depth, which is called supracrestal gingival tissue (SGT). Often the clinicians tend to violate the BW causing various problems. The purpose of this study was to measure the SGT in healthy periodontium and look for its variation with respect to tooth types and classes.

METHODS: A total of 563 teeth were examined from 133 subjects. Teeth examined were anaesthetized, and transsulcular probing (TSP) was done. Supracrestal gingival tissue measurements (SGTM) were made using UNC15 periodontal probe and standard probing technique. The data obtained was statistically analyzed.

RESULTS: The SGTM varied with different tooth types and arches. The overall SGTM was found to be 3.41 mm. It increased from anterior to the posterior teeth. The SGTM of various tooth type groups, incisors, canines, premolars and molars were 3.159, 3.321, 3.474 and 3.700mm respectively. Mandibular values were less than maxillary values in all tooth types. Intra-arch group comparison showed that a significant difference among all the groups except incisor-canine of maxillary arch.

CONCLUSIONS:The SGTM vary among the individuals and within an individual in different tooth types. The SGTM increased from anterior to posterior teeth. In a single individual maxillary incisors and canine SGTM are similar.

KEYWORDS : Gingiva, Crown Lengthening, Dental Margin Adaptation, Crowns, Epithelial Attachment, India

INTRODUCTION

The theory of biological width has been used as clinical guideline in periodontal, restorative and prosthetic procedures. The dentogingival junction comprises of supracrestal connective tissue attachment and an epithelial attachment (junctional epithelium). The dimension of dentoginigival junction was determined from autopsy jaw specimens by Gargiulo AW et al(1) in the year 1961. The combined dimension of epithelial attachment and connective tissue has been described as biologic width and was introduced as an important concept in periodontics and restorative dentistry.

Gargiulo et al established that there was definite proportional relationship between the alveolar crest, the connective tissue attachment, the epithelial attachment, and the sulcus depth. They reported the following mean dimensions: a sulcus depth of 0.69mm, an epithelial attachment of 0.97mm, and a connective tissue attachment of 1.07mm. Based on this work, the BW is commonly considered to be 2.04mm. Various subsequent studies added more information on the magnitude of the soft tissues coronal to the alveolar crest and found that the tissue dimensions were significantly greater in posterior sextant than anterior sextant (2,3) Kois et al(4) revealed dentogingival complex dimensions of 3mm on the facial aspect and a range of 3 - 4.5 mm in interproximal depth, however only maxillary central incisors were considered in the study. Perez et al.(5) measured the SGT dimensions in all four tooth types in both arches with relatively less number of sample size. In another study by Barbosa et al.(6) measured and compared SGTM in contralateral sites in posterior teeth and found that SGTM ranged from 1.0 to 6.0mm (mean, 3.3 \pm 0.8mm).

reestablished, the junctional epithelium generally migrates to the apical level of root planing, and there is an overall reduction in SGT dimension, ranging from 0.51 to 0.61 mm, 6 months post surgically compared to the presurgical measurements (7,8,9). The importance of the BW in relation to gingival health while using it as a guide for placing restorations and crowns has been studied. Newcomb GM. (10), noticed severe gingival inflammation when the crown was placed subgingivally closer to the base of the sulcus. The least inflammation was observed when subgingival margins were placed at the gingival crest or just into the gingival crevice. Maynard JG and Wilson RDK (11) classified crevicular violation as quantitative and qualitative where quantitative violation is defined as excessive material being placed within the crevice and the qualitative violation is defined as poor adaption and roughness of the margin of the restoration. Nevins and Skurow (12) recommended limiting subgingival margin extension to 0.5-1.0 mm and not disrupt the JE or connective tissue apparatus during preparation and impression taking. Tal H et al (13) demonstrated that BW violation results in loss of periodontal support with respect to class V cavities with amalgam restorations. Gunay H et al (14) demonstrated that restorative margin placement within the BW, was detrimental to periodontal health. There was increase in papillary bleeding score and probing depths at sites where the restorative margin was <1 mm from the alveolar crest.

The aim of the present study was to assess the clinical SGT dimensions of different types of teeth in maxillary and mandibular arches among different individuals and to compare both interarch and intraarch SGT dimensions of all tooth types within an individual and in a group.

Following surgical interventions it is observed that BW is Materials And Methods (figure 1)

Source of data: The teeth examined were selected from patients coming to the Out Patient Department of a tertiary care hospital situated in southern region of India. The populations for research was mainly involving Indians who belong to Caucasoid race.

SAMPLE SIZE

The teeth selected for the study were grouped into 8 groups ie maxillary and mandibular incisors, canine, premolars and molars(ICPM). The sample size in each group was calculated on the 80% power and clinical difference of 0.5 and variability of 1 sample size per group. Based on the calculation the total sample size of 496 teeth (62 teeth/group x 8 groups) was arrived.

INCLUSION CRITERIA

Samples were selected from the subjects who were anaesthetized for various dental procedures like extraction, restorative, or any prosthetic treatment. The inclusion criterias are as follows:

- 1. Fully erupted teeth.
- 2. Age group 17 years or above.
- 3. No active periodontal disease or history of periodontal disease with respect to tooth involved in the study.
- 4. Absence of pathological migration.
- 5. Absence of tooth mobility.
- 6. Free from gingival enlargement and overt signs of inflammation.
- 7. Patients with good oral hygiene (OHI score within the range of 0 to 1.2).
- 8. Absence of altered or delayed passive eruption.

Exclusion criteria

The Following Were The Exclusion Criteria's:

- 1. Third molars were excluded.
- 2. Patient undergoing active orthodontic treatment.
- 3. Teeth that were used as abutment in partial dentures.
- 4. Pregnant and lactating women.
- 5. History of any systemic diseases.
- 6. Chronic smoker or any deleterious habits.

Before the commencement of the study synopsis was prepared, presented and ethical clearance was obtained from Institutional Ethical Committee. Written and verbal informed consent were taken from all the subjects prior to the examination. Based on the various inclusion and exclusion criteria's, a total of 563 teeth were examined from 133 different subjects selected for the study. The teeth to be examined were anaesthetized. Transsulcular probing was done at six sites on each tooth (Mesiofacial, Facial, Distofacial, Mesiolingual, Lingual and Distolingual)(Figure 2). The measurement was done from the crest of the marginal gingiva to the crest of the alveolar bone with a UNC15 (Hu-Friedy, Chicago, USA) periodontal probe using standard technique of probing. The probe was kept parallel to the long axis of the tooth. The probe was inserted with gentle pressure between the free gingival margin and the tooth surface and was directed towards the crest of the alveolar bone. Interproximally, the probe was angled to the minimum extent that would permit the probe tip to be centred under the contact allowing it to reach the bone crest at its junction with the tooth. The obtained data were tabulated based on the groups/tooth types (ICPM) and arches (maxillary and mandibular).

Fifty six subjects were examined for all teeth types. This consisted of 19 from maxillary and 37 from mandibular arches. An intergroup comparison was carried out in all these subjects to find out any variation and statistical significance. To avoid the selection bias only one operator evaluated all the cases. The operator undertook calibration training to keep the procedure standardised.

Package for Social Sciences(SPSS) 15.0 software. One way analysis of variance(ANOVA) was used to compare and analyse SGTM for different tooth types and arches. It was compared using students unpaired 't' test. The subgroups comparisons was done using Tuckey's test. Tuckey's test was used as a post hoc test only when there were observable differences seen during ANOVA test.

RESULTS

A total of 563 teeth were being examined in 133 subjects, 71 subjects were examined for maxillary and 62 subjects for mandibular arch. The age distribution among the subjects was 17-52years with the mean age distribution of 27years(Table1). Out of 133subjects examined, 72(54.1%) were females and 61(45.9%) were males.

The SGTM were different in all the four tooth types. The overall SGTM was 3.4126mm. The SGTM's of all the four tooth types (i.e. maxillary and the mandibular together) was 3.159mm (range2.5-4mm), 3.321mm (range2.67-4mm), 3.474mm (range2.83-4.5mm), and 3.7mm (range3-4.83mm) for ICPM respectively.

The SGTM's for maxillary teeth were 3.187(2.5-4)mm, 3.347(2.83-4)mm, 3.522(3-4.17)mm and 3.747(3-4.83)mm for ICPM respectively(Table 2). The SGTM's for mandibular teeth were 3.125(2.50-3.83)mm, 3.296(2.67-3.83)mm, 3.439(2.83-4.5)mm, 3.66(3-4.5)mm for ICPM respectively(Table 2).

Intergroup comparison was done between the various groups, it was found that there was significant difference among each of the groups. It was the similar result when it was analysed separately for both the arches too(Table3). When the maxillary groups were compared with their respective mandibular groups, it was found that there were no statistically significant differences. The mandibular values were lesser than maxillary groups(Table 2).

In the study 56 subjects were examined for all teeth types. When the inter-groups comparision was done between maxillary and mandibular arches, there was significant difference among all the groups except incisor-canine of maxillary arch(Table4).

DISCUSSION

In the present study the mean SGTM was found to be 3.41mm. Gargiulo et al (1) reported an overall SGTM of 2.73mm; which constituted of sulcus depth of 0.69mm, length of epithelial attachment 0.97mm and connective tissue attachment of 1.07mm. They had used the histological measurements of autopsy specimens with disc micrometer and the preservation of tissue with standard histologic methods has been shown to cause a measurement change of 15% in the soft tissue, even the decalcification of the hard tissue also causes a dimensional change in the tissue. In this study TSP was used which has shown to be accurate in measuring the alveolar bone level and supraosseous gingiva (15). This difference in the methodology could be the reason for a varied SGTM. Histologic study using the autopsy specimens by Vacek et al. (2) showed an SGTM of 3.23mm. Perez et al. (5) in their clinical study found that the SGT was 3.75mm. Barboza et al. (6) in their clinical study found that the SGTM for premolars and molars was 3.3mm which is comparable to our measurement (3.41mm).

In present study it was observed that dimensions of the SGTM varied and increased from anterior to the posterior teeth. Similar observation as seen by Vacek et al (2). SGTM in their study for anterior, premolars and molars was 2.93mm, 3.27mm and 3.65mm respectively. Our study (3.7mm) was in agreement with the result of Vacek et al i.e. 3.65mm.

STATISTICAL ANALYSIS

The obtained data was statistically analysed using Statistical

Guang-Yuan Xie et al (3) measured the BW in Chinese people using autopsy specimens, they even found that there was a

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difference in BW between anterior and posterior teeth. Biologic width in the anterior teeth was 2.10mm and in the posterior it was 2.22mm. Perez et al (5) too observed a similar trend, the SGTM for ICPM was 3.66mm, 3.67mm, 3.86mm and 4.2mm respectively.

In present study inter-group comparison was made in maxillary and mandibular arches and it was found that there was a statistically significant difference between the various groups. This was a similar observation by Perez et al (5) in his study.

When inter-arch comparison was made within the groups of teeth in this study, we found that there was no statistical difference between the maxillary and mandibular teeth. It was also found that the mandibular values were less than maxillary in all the four groups. Inter-arch comparison was not done by any other studies available. Clinical implications of this observation is that, the opposing tooth SGTM can be made use of, prior to crown lengthening/ restorative procedures as a guide to determine the amount of bone removal or tooth preparation into the sulcus.

In this study, intra-arch comparison was done in whose oral cavity all tooth types were examined. Fifty six such subjects fulfilled this criterion. Out of the 56 subjects, 19 were maxillary and 37 were mandibular. Previous literature did not reveal any attempt to compare the intra-arch variations among the four groups and to observe the trend in the variation in a single individual. There was significant difference among all the groups of teeth, both in maxillary and mandibular arches except maxillary incisor-canine group. It means that an individual SGTM values are similar between maxillary incisors and canines.

During examination it was observed that SGTM in the interproximal areas was more than on the mid-facial and midlingual surfaces. This was a similar observation by Kois(4). This variation could probably be because of the amount of the gingival scallop and the level of gingival tissue normally mimics or follows the architecture of the underlying osseous crest on the facial aspect. Perez et al (5) also observed similar results.

Limitations of the study was that we used a UNC 15 manual probe, in which the markings were at a distance of 1mm each and all the measurements which were intermediate between the 2 markings had to be rounded off the nearest lower millimetre markings. Scope of the study is to make use of higher generation (II and III) of probes to evaluate the exact SGTM.

CONCLUSIONS:

The SGTM varies among the individuals and within an individual in different tooth types. The SGTM increased from anterior to posterior teeth. Based on the observations of present study, the opposing tooth SGTM can be made use of as a guide to determine the amount of bone removal during crown lengthening procedures. In a single individual incisor-canine SGTM of maxillary arch are almost similar.





Figure 2. Measurement Of Sgtm Using Unc 15 Probe.

Table.1. Total Number Of Subjects And Age Distribution Among The Subjects.

	Age
N	133
Mean	27.6917
Std. Deviation	7.62689
Range	35.00
Minimum	17.00
Maximum	52.00

Table.2 Intra-Group Comparisons Between The Maxillary And Mandibular Arches.

Groups	Arch	N	Mean	Std Deviation	Std. Error Mean	t	df	Sig. (2 tailed)
Incisors	Maxillary	74	3.1870	.27025	.03142	1.590	152	.114
	Mandibular	80	3.1251	.21133	.02363			
Canines	Maxillary	62	3.3468	.26359	.03348	.980	122	.329
	Mandibular	62	3.2957	.31419	.03990			
Premolars	Maxillary	68	3.5221	.28346	.03438	1.799	148	.074
	Mandibular	82	3.4348	.30515	.03370			
Molars	Maxillary	62	3.7473	.32465	.04123	1.488	133	.139
	Mandibular	73	3.6598	.35293	.04131			

Table3. Intergroup Variability In Maxillary And Mandibular Arches.

					-	-	
Arch	(I) groups	(J) groups	Mean	Standard	Sig.	95% Confidence Interval Lower	95% Confidence Interval
			Difference (I-J)	Error		bound	Upper bound
Maxillary	Incisors	Canines	15979	.04919	.007	2870	0326
		Premolars	33509	.04799	< 0.001	4592	2110
		Molars	56030	.04919	< 0.001	6875	4331
	Canines	Premolars	17530	.05016	.003	3050	0456
		Molars	40052	.05131	< 0.001	5332	2679
	Premolars	Molars	22522	.05016	< 0.001	3549	0955
Mandibular	Incisors	Canines	17064	.05046	.005	3010	0403
		Premolars	30979	.04687	< 0.001	4309	1887
		Molars	53479	.04827	< 0.001	6595	4101
	Canines	Premolars	13915	.05019	.030	2688	0095
		Molars	36414	.05151	< 0.001	4972	2311
	Premolars	Molars	22499	.04799	< 0.001	3490	1010

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Table.4. Inter- Group Comparison In The Subjects Where The Data Was Collected From All Four Groups In Single Patients From Maxillary And Mandibular Arches.

Arch	(I) groups	(J) groups	Mean Difference	Std. Error	Sig.	95% Confidence Interval	95% Confidence Interval	
			(I-J)			Lower bound	Upper bound	
Maxillary	Maxillary Incisors		14897	.07051	.159	3344	.0365	
		Premolars	35084	.07051	< 0.001	5363	1654	
		Molars	59203	.07051	< 0.001	7775	4066	
	Canines	Premolars	20187	.07051	.028	3873	0164	
		Molars	44305	.07051	< 0.001	6285	2576	
	Premolars	Molars	24118	.07051	.006	4266	0557	
Mandibular	Incisors	Canines	17331	.06198	.030	3344	0122	
		Premolars	32189	.06198	< 0.001	4830	1608	
		Molars	57200	.06198	< 0.001	7331	4109	
	Canines	Premolars	14858	.06198	.082	3097	.0125	
		Molars	39869	.06198	.000	5598	2376	
	Premolars	Molars	25011	.06198	.001	4112	0890	

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