

## The prevalence of gingival recessions and its association with the width of attached gingiva, oral hygiene status, gingival conditions and toothbrushing

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### ABSTRACT

This study highlights on examining 100 dental students within the clinical years program. The oral hygiene status and gingival conditions were diagnosed by using the plaque index score (Silness and Løe, 1964) and the gingival index score (Løe and Silness, 1963). On this basis, the width of the attached gingiva and the depth of the gingival pockets were evaluated. The gingival recessions were recorded and their heights measured from the cementoenamel junction to the gingival margin. Questionnaires about method, time and frequency of toothbrushing and type of toothbrush used were recorded.

The results showed that 33 students have one or more gingival recession, 18 students had one and 15 students had two or more; among them 5 had 3 and 2 had 4 recessions, and no significant correlation was found between oral hygiene and gingival recession, oral hygiene and width of attached gingiva, gingival conditions and gingival recession, gingival conditions and width of attached gingiva, width of attached gingiva and number of gingival recessions. No statistically significant differences were observed in oral hygiene status and gingival conditions among three groups of students (without, with one and with two or more recessions, respectively). No correlations were shown between different methods of toothbrushing, time of brushing and type of toothbrush used and gingival recessions. Only correlation was found between frequency of brushing and gingival recessions.

**Key Words:** Gingival recession, attached gingiva, oral hygiene status.

### الخلاصة

تسلط هذه الدراسة الضوء على فحص ١٠٠ طالب في مرحلة الدراسة السريرية في كلية طب الأسنان، حيث تم تشخيص حالة الفم واللثة من خلال مؤشر الصفيحة الجرثومية ( Silness and Løe, 1964) ومؤشر التهاب اللثة ( Løe and Silness, 1963). وعلى هذا الأساس تم احتساب عرض اللثة المرتبطة وعمق الجيوب اللثوية وسُجِّل فيها عناصر انحسار اللثة وقياس إرتفاعه من منطقة التقاء الميناء مع طبقة الملاط المغطية للجذر إلى حافة اللثة. وطرحت استمارة استبيان أسئلة متعلقة بطريقة ووقت وعدد مرات فرش الأسنان ونوعية فرشاة الأسنان المستخدمة.

أظهرت النتائج أن ٣٣ طالب وطالبة لديهم انحسار واحد أو أكثر في اللثة و١٨ طالب وطالبة لديهم انحسار لثة واحد بينما ١٥ طالب وطالبة لديهم انحسار لثة في منطقتين أو أكثر من بينهم خمسة لديهم ثلاثة انحسارات واثنان لديهم أربعة انحسارات. توصلت النتائج أيضاً إلى مسألة عدم وجود علاقة معنوية بين صحة الفم وانحسار اللثة وصحة الفم وعرض اللثة المرتبطة وحالة اللثة وانحسار اللثة وحالة اللثة وعرض اللثة المرتبطة وعرض اللثة المرتبطة وعدد انحسارات اللثة؛ بالإضافة إلى عدم وجود فرق معنوي في صحة الفم وحالة اللثة بين مجاميع الطلاب الثلاثة (مجموعة بدون انحسار ومجموعة مع انحسار واحد ومجموعة بانحسارين وأكثر في اللثة على التوالي). كذلك عدم وجود علاقة بين الطرائق المختلفة في الفرش وطول فترتها ونوعية الفرشاة المستخدمة مع انحسار اللثة؛ فقط هناك علاقة بين عدد مرات فرش الأسنان وانحسار اللثة.

## INTRODUCTION

The past concept suggested that minimal width of attached gingiva was required for optimal gingival health to be maintained, as Lang and Löe<sup>(1)</sup> reported that plaque-free areas with less than 2 mm of keratinized gingiva were inflamed despite the existence of the effective oral hygiene. They concluded that 1 mm or more of attached gingiva is necessary to maintain gingival health. However, several studies have criticized the view that the wide attached gingiva is more protective against the accumulation of plaque than a narrow or non-existent zone. No minimum width of attached gingiva has been elaborated as a standard necessary for gingival health. Person who practices excellent oral hygiene may maintain healthy areas with almost no attached gingiva.<sup>(2-4)</sup>

However, those individuals whose oral hygiene practices are less than optimal can be aided by the presence of keratinized gingiva and vestibular depth that provide a room for easier placement of the toothbrush and to avoid brushing on mucosal tissue.<sup>(2)</sup>

The attached gingiva is not necessarily synonymous with keratinized gingiva because the latter also includes a free gingival margin within the structures, the width of the attached gingiva can be identified via subtracting the depth of the sulcus or pocket from the distance between the crest of the gingival margin to the mucogingival junction.<sup>(2)</sup>

Studies on the etiological factors of marginal tissue recession concluded that the most common cause for these defects is abrasive and traumatic toothbrushing habits that cause wear at the cemento-enamel junction resulting in the destruction of the supporting periodontium with subsequent recession.<sup>(5)</sup> Teeth positioned buccally tend to have greater recession in its nature.<sup>(6)</sup>

Periodontal inflammation and the resultant loss of attachment results in the reduced attached gingiva, advanced periodontal involvement in area of minimal attached gingiva are resulted in the base of the pocket extending close to, or apical to, the mucogingival junction.<sup>(7, 8)</sup>

Frenal and muscle attachment that encroach on the marginal gingiva distend the

gingival sulcus, fostering plaque accumulation, increasing the rate of progression of periodontal recession and finally causing their recurrence after treatment. The problem is more common with facial surface but it may also occur on the lingual surface. Various iatrogenic factors such as orthodontic tooth movement through a thin buccal osseous plate lead to a dehiscence beneath a thin gingival tissue and possibly cause recession and / or loss of the gingiva, rubber dam clamps, faulty removable partial dentures and improper flap design during surgery may also cause recession.<sup>(2, 9, 10)</sup>

The purposes of the present investigation are to study the width of the facial attached gingiva, the prevalence and the amount of gingival recessions, and to intercept the recessions with the oral hygiene status, gingival conditions and the oral hygiene measure (toothbrushing).

## MATERIALS AND METHODS

One hundred clinical years dental students between 20–26 years of age (mean age was 23 years) were examined; 69 males and 31 females. Plaque deposits were scored by using the plaque index score (Silness and Löe, 1964),<sup>(11)</sup> and the gingival conditions were determined by using the gingival index score systems (Löe and Silness, 1963).<sup>(12)</sup> To evaluate a possible correlation between oral hygiene status, toothbrushing, gingival conditions and gingival recessions, separate plaque index and gingival index scores were also calculated for facial surfaces. The width of keratinized gingiva was measured to the nearest 0.5 mm from the gingival margin to the mucogingival junction on the mid-facial aspect of the teeth using a calibrated flat periodontal probe (Goldman probe). Iodine solution 7.5% was used to stain the keratinized gingiva and make it demarcated from the oral mucosa.<sup>(13)</sup>

The depth of the gingival pocket was also measured to the nearest 0.5 mm with the same probe on the mid-facial aspect of the teeth. The width of attached gingiva was calculated throughout subtracting the pocket depth from the width of keratinized gingiva. The amount of the gingival recession was determined by measuring the

distance from the cemento–enamel junction to the gingival margin to the nearest 0.5 mm.

Additionally, the following data were collected for each student: Presence of Stillman’s clefts, prosthetic restorations, frenum and muscle attachments, as well as the information about brushing include methods of toothbrushing, time and frequency of brushing and the type of brush used.

The data were collected as mean and standard deviation and frequency distribution. A correlation test and t–test used to evaluate the effect and the differences among different variables.

### RESULTS

The mean individual plaque score was  $0.70 \pm 0.3$ , while the mean individual gingival score was  $0.95 \pm 0.43$ . The indices were slightly higher for male students (plaque index = 0.74, gingival index = 0.92) than for female students (plaque

index = 0.68, gingival index = 0.82). It is important to say that there is no significant difference whatsoever between them. The t–values for plaque and gingival indices were 0.335 and 0.400 respectively. The mean plaque index for facial surfaces was  $0.54 \pm 0.38$  on the one hand and the mean gingival index for the same facial surfaces was  $0.84 \pm 0.48$  on the other.

The total amounts of 2724 teeth were examined. So, the width of attached gingiva ranged from 0–8 mm. The mean width of attached gingiva per tooth is shown in Table (1). The mean sulcus (pocket) depth per tooth is presented in Table (2).

The attached gingiva was wider in the maxilla than in the mandible. The smallest width was found in the area of mandibular canines and the first premolars. The widest attached gingiva was noted in the areas of maxillary lateral incisors and maxillary second molars.

Table (1): Facial width of attached gingiva per tooth in millimeter

Width of Attached Gingiva (mm)			
Maxillary Teeth	Mean $\pm$ SD	Mandibular Teeth	Mean $\pm$ SD
17	$3.8 \pm 1.3$	37	$1.9 \pm 0.8$
16	$3.65 \pm 1.17$	36	$2.5 \pm 0.7$
15	$3.3 \pm 1.1$	35	$2.1 \pm 0.9$
14	$2.7 \pm 1$	34	$1.6 \pm 0.9$
13	$3.1 \pm 1.3$	33	$1.5 \pm 1$
12	$3.8 \pm 1.3$	32	$2.2 \pm 0.9$
11	$3.3 \pm 1.2$	31	$2.1 \pm 0.9$
21	$3.3 \pm 1.2$	41	$2.2 \pm 1$
22	$3.5 \pm 1.3$	42	$2.3 \pm 0.9$
23	$3.2 \pm 1.5$	43	$1.4 \pm 0.9$
24	$2.7 \pm 1.1$	44	$1.3 \pm 0.8$
25	$3 \pm 1.2$	45	$1.9 \pm 0.7$
26	$3.3 \pm 1$	46	$2.4 \pm 0.7$
27	$3.4 \pm 1.3$	47	$2 \pm 0.7$

SD: Standard deviation

The number, frequency and amount of gingival recessions are showed in Tables (3) and (4). Fifty eight teeth (2.12%) had gingival recessions; 33 students had one or more recessions (18 students had one and 15 students had two or more rec-

essions; 5 among them had 3 whereas 2 had 4). The differences between female and male students were slight and not significant ( $t = 0.065$ ). Also, there was no significant difference among various age groups ( $t = -0.043$ ). The right mandibular

first, second premolars and the mandibular central incisors were affected more frequently. The maxillary first molar exhibited recession mostly along with the mesio-buccal root. Among 58 defects, only 3 were typically so-called Stillman's clefts

and only seven were associated with frenum or muscle attachment. Thirty two recessions were associated with less than 2 mm of attached gingiva and 26 recessions were associated with more than 2 mm of attached gingiva.

Table (2): Sulcus (pocket) depth per tooth in millimeter at facial surfaces

Sulcus Depth (mm)			
Maxillary Teeth	Mean ± SD	Mandibular Teeth	Mean ± SD
17	1.3 ± 0.6	37	1.2 ± 0.5
16	0.99 ± 0.42	36	0.92 ± 0.44
15	1 ± 0.4	35	1 ± 0.5
14	1 ± 0.4	34	0.9 ± 0.5
13	1.3 ± 0.6	33	1.4 ± 0.7
12	1.4 ± 0.6	32	1.3 ± 0.5
11	1.3 ± 0.6	31	1.1 ± 0.5
21	1.3 ± 0.6	41	1.2 ± 0.5
22	1.5 ± 0.7	42	1.3 ± 0.5
23	1.2 ± 0.5	43	1.3 ± 0.6
24	1 ± 0.4	44	0.9 ± 0.4
25	1.1 ± 0.5	45	1 ± 0.4
26	1 ± 0.4	46	0.9 ± 0.5
27	1.2 ± 0.5	47	1 ± 0.4

SD: Standard deviation

Table (3): Maxillary gingival recessions per tooth, number, percentage, mean height in millimeter and range

Teeth	No. of Teeth Present	No. of Recessions	%	Height of Recession (mm)	
				Mean	Range
17	100	1	1	1	-
16	96	2	2.08	1	0.5-1.5
15	96	-	-	-	-
14	96	4	4.1	0.75	0.5-1
13	100	1	1	1	-
12	100	2	2	0.75	0.5-1
11	98	-	-	-	-
21	100	1	1.02	1	-
22	100	-	-	-	-
23	99	-	-	-	-
24	97	3	3.09	0.5	-
25	94	1	1.06	1	-
26	89	3	3.37	1.16	0.5-2
27	100	3	3	0.5	-

Table (4): Mandibular gingival recessions per tooth, number, percentage, mean height in millimeter and range

Teeth	No. of Teeth Present	No. of Recessions	%	Height of Recession (mm)	
				Mean	Range
37	99	-	-	-	-
36	88	-	-	-	-
35	97	2	2.06	1	0.5-1.5
34	99	4	4.04	0.87	0.5-1.5
33	100	-	-	-	-
32	99	1	1.01	1	-
31	100	5	5	1.1	0.5-2.5
41	97	7	7.2	1.07	0.5-2
42	99	4	4.04	1	0.5-2
43	100	1	1	1	-
44	100	5	5	1	0.5-2
45	97	6	6.18	1.41	0.5-2
46	88	1	1.13	1	-
47	96	1	1.04	1	-

The mean individual plaque index, facial plaque index, mean individual gingival index and facial gingival index for three groups of students (without, with one and with two or more recessions, respectively) are presented in Table (5). The results were analyzed statistically via using the correlation test (Table 6) and the t-test (Table 7). No correlation was calculated between oral hygiene status and gingival recession, oral hygiene status and

width of attached gingiva, gingival conditions and gingival recession, gingival conditions and width of attached gingiva, the mean width of attached gingiva and the number of gingival recessions. No statistically significant differences were found re-garding oral hygiene and gingival conditions among the three groups of students; i.e., without (1), with one (2) and with two or more recessions (3).

Table (5): Mean individual plaque index, facial plaque index, gingival index and facial gingival index for the three groups of students

		Group 1	Group 2	Group 3
Plaque Index	Mean ± SD	0.73 ± 0.41	0.65 ± 0.27	0.73 ± 0.22
	Range	0.06 – 1.82	0.34 – 1.33	0.37 – 1.01
Facial Plaque Index	Mean ± SD	0.6 ± 0.53	0.49 ± 0.35	0.55 ± 0.28
	Range	0 – 1.89	0.03 – 1.28	0.1 – 1
Gingival Index	Mean ± SD	0.84 ± 0.5	0.97 ± 0.45	1.06 ± 0.36
	Range	0.08 – 2.2	0.1 – 1.78	0.39 – 1.59
Facial Gingival Index	Mean ± SD	0.72 ± 0.56	0.83 ± 0.52	0.99 ± 0.36
	Range	0 – 2.28	0 – 1.71	0.28 – 1.48

Group 1: Students without recessions.  
 Group 2: Students with one recession.  
 Group 3: Students with two or more recessions.  
 SD: Standard deviation.

Table (6): Analysis of correlation between oral hygiene status and gingival condition with the number of recessions and mean width of attached gingiva

Parameters	Correlation Analysis	
	"r" Value	Significance
Plaque Index and Number of Recessions	-0.190	NS
Facial Plaque Index and Number of Recessions	-0.205	NS
Gingival Index and Number of Recessions	-0.191	NS
Facial Gingival Index and Number of Recessions	-0.240	NS
Plaque Index and Mean Width of Attached Gingiva	0.142	NS
Facial Plaque Index and Mean Width of Attached Gingiva	0.124	NS
Gingival Index and Mean Width of Attached Gingiva	0.176	NS
Facial Gingival Index and Mean Width of Attached Gingiva	0.108	NS
Number of Recessions and Mean width of Attached Gingiva	0.171	NS

NS: Not significant.

Table (7): Student's t-test analysis for the relation between group 2 and group 3 and group 1 and group 3 regarding the plaque score, facial plaque score, gingival score and facial gingival score

Parameters	t-test	d.f	Significance	p-value
Plaque Index/Group 2 vs Group 3	0.09	39	NS	0.932
Facial Plaque Index/Group 2 vs Group 3	0.57	39	NS	0.572
Gingival Index/Group 2 vs Group 3	1.91	27	NS	0.066
Facial Gingival Index/Group 2 vs Group 3	2.35	31	NS	0.225
Plaque Index/Group 1 vs Group 3	-0.24	7	NS	0.819
Facial Plaque Index/Group 1 vs Group 3	0.22	8	NS	0.829
Gingival Index/Group 1 vs Group 3	-1.36	6	NS	0.222
Facial Gingival Index/Group 1 vs Group 3	-1.33	8	NS	0.222

Group 1: Students without recessions.

Group 2: Students with one recession.

Group 3: Students with two or more recessions.

d.f: Degree of freedom.

NS: Not significant.

In relation to the oral hygiene measures, Table (8) showed the different ways of toothbrushing that performed by the students in relation to the method, time and frequency of brushing and the type of

brushes used. Regarding its effect on the gingival recession, only the frequency of toothbrushing shown to have a sort of correlation with the gingival recession were  $r = -0.170, p < 0.05$ .

Table (8): Distribution of the students according to toothbrushing techniques and its significant effect on the occurrence of gingival recessions

	Vertical	Horizontal	Mixed	Significance	
Methods	40	10	48	-0.024*	
	<5	≥ 5	Mean ± SD	Range	Significance
Time (Minutes)	75	23	3.41 ± 2.45	1-15	0.094*
	One Time	Two Time	Three Times	More	Significance
Frequency	41	53	2	2	-0.170**
	Soft	Medium	Hard	Significance	
Type of Toothbrush	25	57	16	-0.034*	

\* Not significant; \*\* Significant; SD: Standard deviation.

## DISCUSSION

The prevalence of gingival recession in this study is considered to be lower (33%) in comparison to other studies conducted to investigate the full mouth not only few teeth or units, as the study done by Tenenbaum<sup>(14)</sup> in France on a group of 19–26 years who found that the prevalence of gingival recession was 76%. In similar studies done on a group of young people (15–25 years), the prevalence of individuals exhibiting gingival recessions varied from 1% in a 15–year age group<sup>(15)</sup> to 15% in a 21–year group,<sup>(16)</sup> 41% in a 22–year male group<sup>(17)</sup> and 55% in a 16–25 year group.<sup>(18)</sup> While in the study done by Kassab and Cohen<sup>(19)</sup> on a group of people with age range between 18–64 years, the prevalence of gingival recession was 50%.

On this concept, the distribution of the gingival recessions, O'Leary *et al.*<sup>(17)</sup> reported that recession affected considerably more teeth in the maxilla than in the mandible, while in this study the mandibular teeth have more gingival recessions (37) than maxillary teeth (23) and that may agree with the study done by Sangnes and Gjermo<sup>(20)</sup> where they reported higher frequency of recessions in the mandible than in the maxilla.

In this study the highest prevalence of recession in the lower incisors (17) which agreed with Akpata and Jackson,<sup>(16)</sup> while O'Leary *et al.*<sup>(17)</sup> observed that maxillary first molars were most frequently affected. Kitchin<sup>(21)</sup> and Gorman<sup>(18)</sup> reported that canines and the first premolars exhibited a greatest prevalence of recessions. Such increased gingival recession in the lower incisors indicated that the main cause of recession in this study is the positioning of the teeth buccally that lead to a bone dehiscence with subsequent recession of the overlying thin gingivae as observed in the many incisors teeth of the students, in addition to the role of frenum attachment that exert pulling action on the gingivae in the incisors on the one hand and the premolars region as seven of gingival recessions in this region on the other were associated with frenal attachment.

The mean width of the attached gingiva was slightly lower, but not significantly different, for students with two or more recessions (2.46 mm with the range

1.56–3.40) than for other students (2.63 mm with the range 1.57–4.9 whom the oral cavity without and with one recession). This difference may describe a narrow zone of attached gingiva either as an etiologic factor to or a resultant factor of the recession. As for the same number of recessions, they were associated with zones of less or more than 2 mm of attached gingiva. It is suggested that the narrow zone of attached gingiva is rather a sequence of the recession than the cause. The lack of correlation between oral hygiene status and gingival recessions as well as the absence of differences in oral hygiene status among the three groups of students do not however agree with previous studies,<sup>(17–19)</sup> that confirm individuals with good oral hygiene showed a higher frequency of recessions than the subjects of poor oral hygiene. This sort of difference may be due to the recent changes in oral hygiene procedures performed by the clinical dental students, while the recessions were pre-existent due to causes other than oral hygiene measures. Support this explanation, it is noted that the frequency of recessions is not significantly different in maxillary right and left canines and premolars (5 and 6 respectively) and only difference is observed obviously in mandibular right (12) compared with left canines and first premolars (6). So such recessions not related to toothbrushing as if it is so, the recessions should be observed more in the maxilla than mandible and are found more frequently on the left than on the right half of the dental arch as shown by many studies,<sup>(2, 22)</sup> which is suggested to be the cause of access and right or left handedness.

Although the frequency of brushing showed to have a correlation with the recessions in this study with no effect of toothbrushing methods or time and type of brush used on the prevalence of the recessions and this agreed with other studies which found that frequent brushers who use hard bristles have more recessions than those who use soft bristle with less frequency.<sup>(22, 23)</sup> Also, overzealous brushing can lead to gum recession, bacteremia especially in patients with pronounced gingivitis, wedge shaped defects in the cervical area of root surface and painful

ulceration.<sup>(9, 19, 24)</sup>

There is no correlation between oral hygiene status, gingival condition and the mean width of attached gingiva and this is agreed with all recent studies which they concluded that the width of attached gingiva have no effect on the accumulation of dental plaque and periodontal inflammation. Similarly, the oral hygiene status and gingival inflammation have no effect on the width of attached gingiva.<sup>(2-4)</sup>

### CONCLUSION

The results of the present study showed that only few teeth were associated with gingival recessions which is distributed mostly in the lower incisors teeth and the main causes of such gingival recessions are suggested to be buccally positioned teeth and high frenal attachment, while no significant effect of tooth-brushing, oral hygiene and gingival condition on the occurrence of gingival recession. Also, the width of attached gingiva play no significant role in the presence of gingival recession. In the same way it had no effect on plaque accumulation and periodontal health.

### REFERENCES

- 1) Lang NP, Löe H. The relationship between the width of keratinized gingiva and gingival health. *J Periodontol.* 1972; 43: 623-627.
- 2) Newman MG, Takei HH, Carranza FA. Clinical Periodontology. 9<sup>th</sup> ed. WB Saunders Co. Philadelphia. 2002; p: 852.
- 3) Bowers G. A study of the width of attached gingiva. *J Periodontol.* 1963; 34: 201-209.
- 4) Miyasato M, Crigger M, Egelberg J. Gingival condition in areas of minimal and appreciable width of keratinized gingiva. *J Clin Periodontol.* 1977; 4: 200-209.
- 5) Litonjua LA, Andreana S, Bush PJ, Cohen RE. Toothbrushing and gingival recession. *Int Dent J.* 2003; 53(2): 67-72.
- 6) Andlin-Sobocki A, Marcusson A, Per-sson M. Three-year observation on gingival recession in mandibular inci-sors in children. *J Clin Periodontol.* 1991; 18: 155-159.
- 7) Löe H, Anerud A, Boysen H. The natural history of periodontal disease in man: Prevalence, severity and extent of gingival recession. *J Periodontol.* 1992; 63: 489-495.
- 8) Muller HP, Stadermann S, Heinecke A. Gingival recession in smokers and non smokers with minimal periodontal disease. *J Clin Periodontol.* 2002; 29(2): 129-136.
- 9) Gillette WB, Van House RL. Ill effects of improper oral hygiene procedures. *J Am Dent Assoc.* 1980; 101: 476-481.
- 10) Albandar JM, Kingman A. Gingival recession, gingival bleeding and dental calculus in adults 30 years of age and older in the United States, 1988-1994. *J Periodontol.* 1999; 70(1): 30-43.
- 11) Silness J, Löe H. Periodontal disease in pregnancy. II. Correlation between oral hygiene and periodontal condition. *Acta Odontol Scand.* 1964; 22: 121-135.
- 12) Löe H, Silness J. Periodontal disease in pregnancy. I. Prevalence and severity. *Acta Odontol Scand.* 1963; 21: 533-551.
- 13) Lindhe J. Clinical Periodontology and Implant Dentistry. 3<sup>rd</sup> ed. Munksgaard, Copenhagen. 1997; p: 24.
- 14) Tenenbaum H. A clinical study comparing the width of attached gingiva and the prevalence of gingival recessions. *J Clin Periodontol.* 1982; 9: 86-92.
- 15) Stoner JE, Mazdyasna S. Gingival recession in the lower incisor region of 15-year-old subjects. *J Periodontol.* 1980; 51: 74-76.
- 16) Akpata ES, Jackson D. The prevalence and distribution of gingivitis and gingival recession in children and young adults in Lagos, Nigeria. *J Periodontol.* 1979; 50: 79-83.
- 17) O'Leary TJ, Drake RB, Crump PP, Allen MF. The incidence of recession in young males: A further

- study. *J Periodontol.* 1971; 42: 264-267.
- 18) Gorman WJ. Prevalence and etiology of gingival recession. *J Periodontol.* 1967; 38: 316-322.
- 19) Kassab MM, Cohen RE. The etiology and prevalence of gingival recession. *J Am Dent Assoc.* 2003; 134(2): 220-225.
- 20) Sangnes G, Gjermo P. Prevalence of oral soft and hard tissue lesions related to mechanical tooth cleaning procedures. *Community Dent Oral Epidemiol.* 1976; 4: 77-83. Cited by: Gillette WB, Van House RL. Ill effects of im-proper oral hygiene procedures. *J Am Dent Assoc.* 1980; 101: 476-481.
- 21) Kitchin PC. The prevalence of tooth root exposure and the relation of the extent of such exposure to the degree of abrasion in different age classes. *J Dent Res.* 1941; 20: 565-581. Cited by: Tenenbaum H. A clinical study co-mparing the width of attached gingiva and the prevalence of gingival reces-sions. *J Clin Periodontol.* 1982; 9: 86-92.
- 22) Carlos MC, Muyco MM, Calivag MC, Fajardo JA, Uy HG. The prevalence and distribution of gingival recession among UE students with a high stan-dard of oral hygiene. *Dent Assoc.* 1996; 47(3): 27-48.
- 23) Khocht A, Simon G, Person P. Gin-gival recession in relation to history of hard toothbrush use. *J Periodontol.* 1993; 64: 900-905.
- 24) Pattison GA. Self-inflicted gingival injuries: Literature review and case report. *J Periodontol.* 1983; 54: 299.

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