

I. nicotine

,1-5)

Bergstr m^{7,20)}

6-

8)

가

9-13)

가

14,15)

nicotine

. Clarke^{21,22)}

가

nicotine

16)

mistor

marginal ear vein nicotine

17),

18).

Baab Oberg²³⁾ laser Doppler flowmetry (LDF)

nicotine

19),

가

가

d. :

가

가

2)

LDF

9

3 30

, 1

4

, 5 , 6

II.

1.

3)

가

laser Doppler flowmetry(floLAB ,
Moor Instruments Ltd, England ; wave
length = 780nm, Max. power= 1.6mW)

가 20

50 (22 -

29 , 25.36)

50 (23 - 29

, 26.64)

5

1

Hanau

transfer rod floLAB

probe tip

plate

bite fork

transfer rod

가 0

3mm

bite fork

2.

tip

floLAB

bite

fork

transfer rod

1)

tip

가

a. :

0.5

6

floLAB

b. :

flux

c. :

4)

Table 1. Mean ± S.D. and comparison of blood flow between smokers and non - smokers(N=600)

	Smoker /Non - smoker	Mean ± S.D.	p value
IP	Smoker Non - smoker	33.7900 ± 12.7003 31.1275 ± 12.3496	p<0.05
MG	Smoker Non - smoker	29.0732 ± 15.5564 25.2638 ± 11.3996	N.S
AG	Smoker Non - smoker	30.8708 ± 13.6595 27.9058 ± 10.0946	p<0.05
AM	Smoker Non - smoker	49.4845 ± 27.2862 57.4495 ± 45.4618	p<0.05

p<0.05 : Statistically significant difference

N.S : not significant

N : number of cases

IP : interdental papilla

AG : attached gingiva

MG : marginal gingiva

AM : alveolar mucosa

one way ANOVA
Tukey test
independent t - test

III.

1.

(49.5 ± 27.3) 가 , (33.8 ± 12.7), (30.9 ± 13.7), (29.1 ± 15.6)

(p<0.05), (p>0.05).

(33.8 ± 12.7, 30.9 ± 13.7)가 (31.1 ± 12.3, 27.9 ± 10.1) 가 (57.4 ± 13.7)가 (25.3 ± 11.4) 가 (45.5 ± 12.3), (27.9 ± 10.1), (31.1 ± 25.3) (p<0.05), (29.1 ± 15.6)가 (25.3 ± 11.4) (p>0.05). (57.4 ± 45.5)

(p<0.05), (49.5 ± 27.3)

(p>0.05). (p<0.05) (Table 1).

Table 2. Change of blood flow according to time course in interdental papilla of smokers (N=600)

Time course	Mean ± S.D.
before smoking	33.7900 ± 12.7003
imm. after smoking	31.9708 ± 11.5360
1h - after smoking	31.3665 ± 12.6207
2h - after smoking	31.0095 ± 10.9813
3h - after smoking	30.0522 ± 10.9906*
4h - after smoking	29.3738 ± 32.9235*
5h - after smoking	31.7062 ± 12.3161
6h - after smoking	31.9502 ± 13.1513

Significant difference(p<0.05) by ANOVA

S.D.: standard deviation N : number of cases

imm.: immediately h : hour

*Significant difference(p<0.05) from before smoking

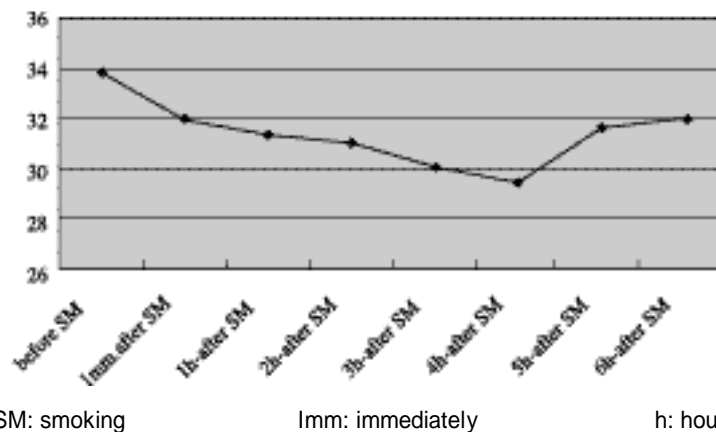


Figure 1. Change of blood flow according to time course in interdental papilla of smokers

Table 3. Change of blood flow according to time course in marginal gingiva of smokers (N=600)

Time course	Mean ± S.D.
before smoking	29.0732 ± 15.5564
imm. after smoking	25.4180 ± 9.4310*
1h - after smoking	25.4043 ± 9.5743*
2h - after smoking	25.1902 ± 10.4002*
3h - after smoking	25.9238 ± 10.5090*
4h - after smoking	23.5795 ± 9.5291* †
5h - after smoking	25.5868 ± 11.0862* ‡
6h - after smoking	25.0597 ± 11.4563*

Significant difference(p<0.05) by ANOVA

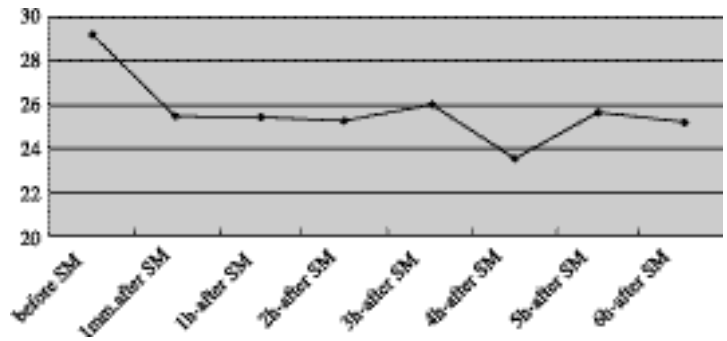
S.D.: standard deviation N : number of cases

imm.: immediately h : hour(s)

*Significant difference(p<0.05) from before smoking

†Significant difference(p<0.05) from 3 - h after smoking

‡Significant difference(p<0.05) from 4 - h after smoking



SM: smoking Imm: immediately h: hour

Figure 2. Change of blood flow according to time course in marginal gingiva of smokers

2.

1) 2 가 3
 가가 4
 가 5 가, 6
 , 4 가 5 , 1
 가 , 2 , 3 , 4 , 5 , 6
 3 4 (p<0.05), (p<0.05), 2 3 , 5 6

(p>0.05)(Table 2, Figure 1).

(p>0.05)(Table 3, Figure 2).

2)

Table 4. Change of blood flow according to time course in attached gingiva of smokers(N=600)

Time course	Mean ± S.D.
before smoking	30.8708 ± 13.6595
imm. after smoking	29.2243 ± 16.0614
1h - after smoking	27.6640 ± 16.3746*
2h - after smoking	28.5562 ± 15.2373*
3h - after smoking	27.2222 ± 9.3634*
4h - after smoking	25.8663 ± 11.3481**†
5h - after smoking	27.3457 ± 11.6588*
6h - after smoking	26.3117 ± 9.6094**‡

Significant difference(p<0.05) by ANOVA
 S.D.: standard deviation N : number of cases
 imm.: immediately h : hour(s)
 *Significant difference(p<0.05) from before smoking
 †Significant difference(p<0.05) from imm. after smoking
 ‡Significant difference(p<0.05) from 2 - h after smoking

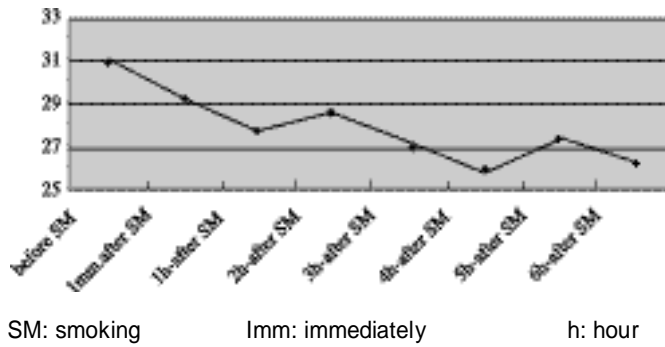


Figure 3. Change of blood flow according to time course in attached gingiva of smokers

Table 5. Change of blood flow according to time course in alveolar mucosa of smokers(N=600)

Time course	Mean ± S.D.
before smoking	49.4845 ± 27.2862*
imm. after smoking	52.6012 ± 37.0005*†
1h - after smoking	49.5198 ± 37.0118*
2h - after smoking	53.1235 ± 42.7821*†
3h - after smoking	49.0305 ± 43.1934*
4h - after smoking	44.6143 ± 25.3326
5h - after smoking	42.2670 ± 24.4771
6h - after smoking	50.1288 ± 31.7279*

Significant difference(p<0.05) by ANOVA

S.D.: standard deviation N : number of cases

imm.: immediately h : hour

*Significant difference(p<0.05) from 5 - h after smoking

†Significant difference(p<0.05) from 4 - h after smoking

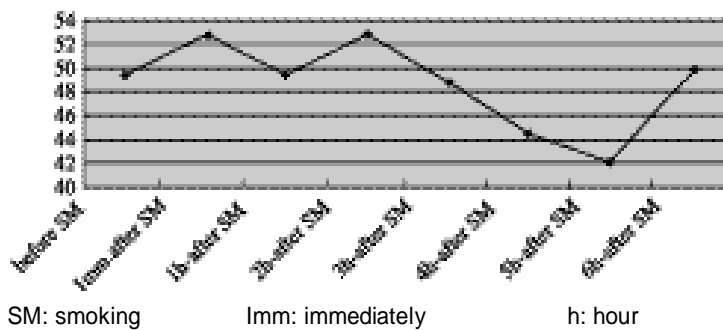


Figure 4. Change of blood flow according to time course in alveolar mucosa of smokers

3)

가가

4

가 5

가, 6

1

가 2

1

, 2

,

3, 4, 5, 6
 2, 4, 6
 (p<0.05),
 (p>0.05) (Table 4, Figure 3).

³⁰⁾, electrical impedance plethysmography
³¹⁾, microsphere infusion ³²⁾, high speed cinematography ³³⁾, radioisotope clearance
³⁴⁾, temperature clearance ²¹⁾

4) LDF
 가 가 1
 , 2
 가, 3 5 9
 , 6 3 30
 , 2 , 3 , 6 , 5 1 ³⁵⁾
 , 2 , 2 4 5 - 6) 가 (PM
 (p<0.05), (AM 9 - 10)
 (PM 1 - 2)

(p>0.05) (Table 5, Figure 4).
 IV.

LDF probe
 가 , Haber ²⁴⁾ 가
³⁵⁾,
 Ryder²⁵⁾ ,
²⁶⁾,
 , Miller²⁷⁾ 5
 , Bain Moy²⁸⁾ , Grossi ^{2,3)}
 , Bergstr m⁷⁾ 20 Kaldahl ³⁶⁾
 light smoker heavy smoker가
 20
^{20,29)}.

(6)

가 가

가 , 가 가 7,20)

가 가

LDF

가

LDF

가

20

40

35)

가 가 가

V.

가

가

가

20

100 (

: 50 , 22 - 29 , 25.36 , :

5 1

50 , 23 - 29 , 26.64)

, laser Doppler flowmetry (floLAB², Moor Instruments Ltd, England)

9 3 30

Baab Oberg²³⁾ 0.85mm laser Doppler probe(Periflux PF - 2, Perimed, Stockholm, Sweden) 1

1mm

one way ANOVA

가 가 10

Tukey test

independen -

1.3mm probe(floLAB , Moor Instruments Ltd, England)

dent t - test

1. $\chi^2 = 10.5$, $p < 0.05$.

2. $\chi^2 = 10.5$, $p < 0.05$.

3. $\chi^2 = 10.5$, $p < 0.05$.

VI.

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- Abstract -

Effect of Smoking on Gingival Blood Flow

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Recent studies have demonstrated that smoking may be one of the most significant risk factors in the development and progression of periodontal disease. Reports have indicated that smoking causes gingival blood flow to be decreased. However, studies on the effects of smoking on gingival blood flow have yielded contradictory results.

The purpose of the present study was to determine the effect of smoking on gingival blood flow. One hundred volunteers (fifty non - smokers and fifty smokers) with good general and periodontal health, aged twenties (non - smoker : 22 - 29 years, mean = 25.36, smoker : 23 - 29 years, mean = 26.64) were selected. Laser Doppler flowmetry (floLAB, Moor Instruments Ltd., England) was applied to measure the gingival blood flow of interdental papilla, marginal gingiva, attached gingiva and alveolar mucosa of left and right upper lateral incisors.

In smokers, following an overnight abstinence from smoking, gingival blood flow

was measured before smoking, immediately after smoking, 1 - , 2 - , 3 - , 4 - , 5 - and 6 - hour after smoking from 9 a.m. to 3:30 p.m.

The difference of blood flow in each tissue of non - smokers and that of each measuring time and each tissue of smokers were statistically analyzed by one way ANOVA and Tukey test. And the difference of blood flow between smokers and non - smokers in each tissue was statistically analyzed by t - test.

The results were as follows :

1. Mean blood flow was highest in alveolar mucosa, followed by interdental papilla, attached gingiva and marginal gingiva in both smokers and non - smokers. There was a statistically significant difference in each tissue ($p < 0.05$).
2. There was no consistent result between mean blood flow before smoking in smokers and that of non - smokers in each tissue.
3. There was a statistically significant difference between gingival blood flow at measuring time point and gingival blood flow of smokers in each tissue ($p < 0.05$).

The present study suggested that smoking could alter the gingival blood flow, thus might be partly contributed to periodontal destruction.