

# 가

1 . 1 . 1 . 1 . 2 . 1 . 1

1  
2

## I.

arachi -

donic acid

1).

가 가

가

flurbiprofen, ibuprofen, naprox -

en

10).

2-4).

10).

가

5,6),

가

가

7).

가

가

가

가

8,9).

2,3, 11,12).

가

가 13,14).

가

가

30).

가  
가

가

15,16).

31,32). Addy (1982)<sup>17)</sup> acrylic strip

ethylene vinyl acetate, hollow fiber

metronidazole<sup>17,18)</sup>, chlorhexidine<sup>19)</sup>,  
tetracycline, minocycline 가

, Goodson (1979)<sup>20)</sup>

tetracycline

cellulose

acetate hollow fiber 20% tetracycline

가

가

, polyglycolide - lactide,  
collagen film, oxidized cellous, calcium sul -  
fate, polycaprolactone film, polylactide,  
hydro - carbon gel

17,33,34).

가 tetracycline

21 - 23).

Minocycline tetracycline

tetracycline

polycaprolactone polylactide

가 minocycline strip

가

가 , 가

hydro - carbon gel

minocycline gel

가

24,25).

25 - 27),

## II.

가 가

21,22, 28).

1.

(1991)<sup>29)</sup> 30% minocycline polycapro -  
lactone film

가

가 5mm

20                    40                    41.6                    40

가 11 ,            가 9                    .20                    0, 2, 4

가 ,                    ,가

,                    , 6                    .

,                    3                    (2)

(Silness & L e, 1964)

tetracycline                    William's probe

phenytoin, nifedipine, cyclosporin

0 :            가

1 :

2.                    가

30% minocycline                    2 :

strip (            ?                    ,                    ) 2%

minocycline gel (            ?                    ,

,                    )                    (                    )                    3 :

,                    12% minocycline strip(                    가

)                    . 30% minocycline

strip                    poly -                    (Saxer &

caprolactone                    , 2%                    M hlemann, 1975)

minocycline gel(hydro - carbon gel; plas -                    William's probe

tibase)                    sodium alginate, chitosan                    가

gel                    , 12%

minocycline strip                    minocycline                    .

                  polylactide                    microsphere                    0 :

sodium alginate                                       1 :                    20 - 30

                  .                    2 :

                  3 :

3.                    4 :

(1)

                  ,                    50g                    William's probe

Table 1. Mean plaque index (mean  $\pm$  SD)

Group \ Weeks	Control	Minocycline strip	Minocycline gel	Minodent
baseline	2.00 $\pm$ 0.33	1.80 $\pm$ 0.42	2.55 $\pm$ 0.53	2.25 $\pm$ 0.87
2weeks	0.89 $\pm$ 0.33*	0.80 $\pm$ 0.42*	1.56 $\pm$ 0.53*	0.83 $\pm$ 0.58*
4weeks	0.56 $\pm$ 0.53*	0.50 $\pm$ 0.53*	0.56 $\pm$ 0.53*	0.75 $\pm$ 0.45*

\*: Significantly different from baseline ( $p < 0.05$ )

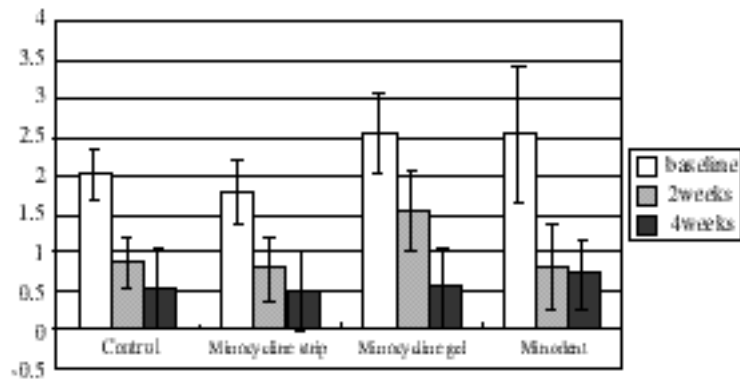


Figure 1. Schematic illustration of mean plaque index

Table 2. Mean papillary bleeding index (mean  $\pm$  SD)

Group \ Weeks	Control	Minocycline strip	Minocycline gel	Minodent
baseline	2.56 $\pm$ 0.53	2.20 $\pm$ 1.03	3.56 $\pm$ 0.89	2.25 $\pm$ 0.87
2weeks	2.22 $\pm$ 0.67	0.40 $\pm$ 0.52 <sup>a</sup>	1.89 $\pm$ 1.36*	1.08 $\pm$ 0.99 <sup>a</sup>
4weeks	1.67 $\pm$ 0.50*	0.70 $\pm$ 0.82*	1.11 $\pm$ 0.93*	0.67 $\pm$ 0.49*

\*: Significantly different from baseline ( $p < 0.05$ )

<sup>a</sup>: Significant difference compared to baseline at 2weeks ( $p < 0.05$ )

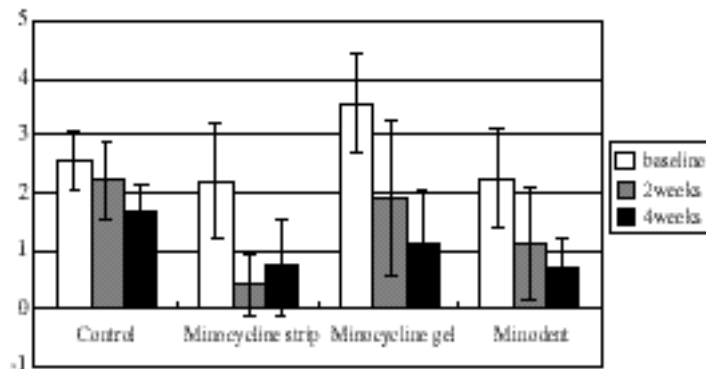


Figure 2. Schematic illustration of mean papillary bleeding index

mm

1.

(3)

가

2, 4

SPSS program(ver 8.0, SPSS Inc., Chicago, USA) (one - way ANOVA, p<0.05)

(p<0.05, 1, 1).

2.

2

( - base - line/baseline)

minocycline strip  
minocycline gel

, 4

III.

Table 3. Mean probing pocket depth(mean ±SD)

Group Weeks	Control	Minocycline strip	Minocycline gel	Minodent strip
baseline	5.78 ± 0.67	6.20 ± 1.31	5.00 ± 0.33	5.67 ± 1.07
2weeks	5.33 ± 0.67	4.50 ± 1.43 <sup>a</sup>	4.00 ± 0.50 <sup>*</sup>	4.50 ± 1.09 <sup>a</sup>
4weeks	5.06 ± 0.58 <sup>*</sup>	4.10 ± 1.20 <sup>ab</sup>	3.67 ± 0.87 <sup>*</sup>	3.75 ± 0.87 <sup>ab</sup>

\* : Significantly different from baseline(p<0.05)

<sup>a</sup> : Significant difference compared to baseline at 2 weeks(p<0.05)

<sup>b</sup> : Significant difference compared to baseline at 4 weeks(p<0.05)

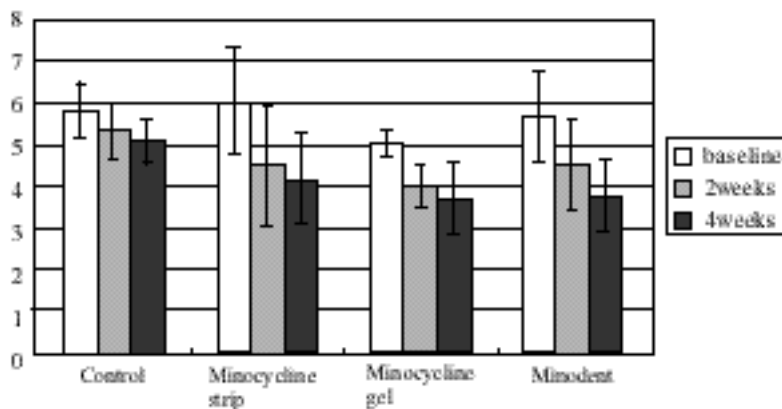


Figure 3. Schematic illustrations of mean probing pocket depth

( $p < 0.05$ , 2, 2).

가

3.

가

2, 4

4

가

2 4 minocycline  
minocycline strip

gel

가 2 - 4

( $p < 0.05$ , 3,

가

3).

#### IV.

가

가

tetracycline, minocycline, metronidazole,  
chlorhexidine  
minocycline tetracycline  
tetracycline

가

, 가

가

가

가

<sup>24,25)</sup> Porphyromonas gingivalis,  
Prevotella intermedia,

<sup>25 - 27)</sup>,

. 가

가

가 , Magnusson (1984)<sup>8)</sup>  
Lavanchy (1987)<sup>35)</sup>

가

가  
(1994)<sup>36)</sup> minocycline

<sup>21,22,28)</sup>,

가

가

. O'Conner 7  
 (1990)<sup>26)</sup> minocycline  
 (minimum inhibitory concentration) 0.03 -  
 32µg/Mℓ (minimum bacteri-  
 cidal concentration) 0.5 - 32µg/Mℓ  
 , 32µg/Mℓ minocy -  
 cline 가 , 2%  
 gel minocycline  
 가 .

31,32)  
 (insoluble, nondegradable  
 polymers) (biodegradable  
 polymer)가 , Addy  
 (1982)<sup>17)</sup> acryl strip ethylene  
 vinyl acetate, hollow fiber  
 , Goodson (1983)<sup>22)</sup> 25% tetracycline  
 monolithic fiber 643µg/Mℓ  
 가 10 .

Polyglycolide, polylactide, polycaprolactone,  
 collagen film, calcium sulfate, hydro - carbon  
 gel  
 poly -  
 caprolactone , , 2 , 4

(1992)<sup>38)</sup> 30% minocycline  
 polycaprolactone 가 ,

. Polylactide  
 polycapro -  
 lactone  
 39). (1999)<sup>40)</sup> minocycline  
 polylactide micros -  
 phere strip

Porphyromonas gingivalis, Prevotella  
 intermedia ,

polycaprolactone strip  
 polylactide strip .

Polycaprolactone film

syringeable gel 4),  
 Graca (1997)<sup>41)</sup> (1998)<sup>42)</sup> 2%  
 minocycline gel

gel minocycline  
 가 ,

lysozyme  
 hydro - carbon gel  
 2% minocycline gel

minocycline

2

4

. Minocycline

2 , 4

, 2 minocycline strip

가

가

, 4

minocycline

가

4

가

, minocycline strip

polylactide

가

2

4

. minocycline gel

가

minocycline strip

가

gel

가 1

가

V.

, 가

가

strip

가

가

minocycline strip

gel

가

가

minocy -

2 , 4

cline

,

1.

2 , 4

가

가



,  
(p<0.05).

2. 2

, minocycline strip

, 4

(p<0.05).

3. 2

, 4

2 4

minocycline strip

(p<0.05).

minocycline strip ,

가

가 .

VI.

1. Slots, J. : Subgingival microflora and periodontal disease. J Clin Periodontol 6 : 351 - 382, 1979.
2. Genco, R.J. : Antibiotics in the treatment of human periodontal disease. J Periodontol 52 : 545 - 558, 1981.
3. Slots, J. and Rams, T.E. : Antibiotics in periodontal therapy : advantages and disadvantages. J Clin Periodontol 17 : 479 - 493, 1990.

4. Goodson, J.M. : Antimicrobial strategies for treatment of periodontal disease. Periodontology 2000 5 : 142 - 168, 1994.
5. Christersson, L.A., Norderyd, O.M., Puchalsky, C.S. : Topical application of tetracycline - HCl in human periodontitis. J Clin Periodontol 20 : 88 - 95, 1993.
6. Adriaens, P.A., De Boever, J.A., Loesche, W.J. : Bacterial invasion in root cementum and radicular dentine of periodontally diseased teeth in humans. A reservoir of periodontopathic bacteria. J Periodontol 59 : 220 - 230, 1988.
7. Carranza, F.A. Jr., Saglie, R., Newman, M.G., Valentin, P.L : Scanning and transmission electron microscopic study of tissue - invading microorganism in localized juvenile periodontitis. J Periodontol 54 : 598 - 617, 1983.
8. Magnusson, I., Lindhe, J., Yoneyama, T. and Liljenberg, B. : Recolonization of a subgingival microbiota following scaling in deep pocket. J Clin Periodontol 11 : 193 - 207, 1984.
9. Rosenberg, E.S., Evian, C.I. and Listgarten, M.A. : The composition of the subgingival microbiota after periodontal therapy. J Periodontol 52 : 435 - 441, 1981.
10. David, L.J. and Sebastian, C.C. : Antimicrobial and other chemotherapeutic agent in periodontal therapy. Clinical Periodontology 8th edition : 511 - 522, 1996.
11. Gordon, J., Walker, C., Lamster, I., West, T., Socransky, S., Seiger, M., Fasciano, R. : Efficacy of clindamycin

- hydrochloride in refractory periodontitis - 12 month result. *J Periodontol* 56 : 75 - 80, 1985.
12. Kornman, K.S., Newman, M.G., Moore, D.J., Singer, R.E. : The influence of supragingival plaque control on clinical and microbial outcomes following the use of antibiotics for the treatment of periodontitis. *J Periodontol* 65 : 848 - 854, 1994.
  13. Braun, R.E., Ciancio, S.G. : Subgingival delivery by an oral irrigation device. *J Periodontol* 63 : 469 - 472, 1992.
  14. Mashimo P.A., Umemoto, T., Slots, J., Genco, R.J., Ellison, S.A. : Pathogenicity testing of *Macaca arc-toides* subgingival plaque following chlorhexidine treatment. *J Periodontol* 51 : 190 - 192, 1980.
  15. Kornman, K.S. : Controlled - Release Local Delivery Antimicrobials in periodontics; Prospects for the future. *J Periodontol* 64 : 782 - 791, 1993.
  16. Needleman, I.G., Martin, G.P., Smales, F.C. : Characterisation of bioadhesives for periodontal and oral mucosal drug delivery. *J Clin Periodontol* 25 : 74 - 82, 1998.
  17. Addy, M., Rawle, I., Handley, R., Newman, H.N. and Coventry, J.F. : The development and in vitro evaluation of acrylic strips and dialysis tubing for local drug delivery. *J Periodontol* 53 : 693 - 699, 1982.
  18. Hitzig, C., Charbit, Y., Bitton, C., Fosse, T., Teboul, M., Hannoun, L. and Varonne, R. : Topical metronidazole as an adjunct to subgingival debridement in the treatment of chronic periodontitis. *J Clin Periodontol* 21 : 146 - 151, 1994.
  19. Stabholz, A., Sela, M.N., Friedman, M., Golomb, G., Soskolne, A. : Clinical and microbiological effects of sustained release chlorhexidine in periodontal pockets. *J Clin Periodontol* 13 : 783 - 788, 1986.
  20. Goodson, J.M., Haffajee, A. and Socransky, S.S. : Periodontal therapy by local delivery of tetracycline. *J Clin Periodontol* 6 : 83 - 92, 1979.
  21. Golub, L.M., Goodson, J.M., Lee, H.M., Vidal, A.M., McNamara, T.F. and Ramamurthy, N.S. : Tetracyclines inhibit tissue collagenases effects of ingested low - dose and local delivery systems. *J Periodontol* 56 : 93 - 97, 1985.
  22. Goodson, J.M., Holborow, D., Dunn, R.L., Hogan, P.E. and Dunham, S. : Monolithic tetracycline - containing fibers for controlled delivery to periodontal pockets. *J Periodontol* 54 : 575 - 579, 1983.
  23. , , , , , : Tetracycline fiber . 28 : 389 - 399, 1998.
  24. Brogden, R.N., Speight, T.M., Avery, G.S. : Minocycline: A review of its antibacterial and pharmacokinetic properties and therapeutic use. *Drugs* 9 : 251 - 291, 1975.
  25. Ciancio, S.G., Slot, J., Reynolds, H.S., Zambon, J.J., McKenna, J.D. : The effect of short - term administration of minocycline HCl on gingival inflammation

- and subgingival microflora. J Periodontol 53 : 557 - 561, 1982.
26. O'Connor, B.C., Newman, H.N., Wilson, M. : Susceptibility and resistance of plaque bacteria to minocycline. J Periodontol 61 : 228 - 233, 1990.
  27. Bragd, L., Dahlen, G. Wikstrom, M., Slots, J. : The capability of Actinobacillus actinomycesetemcomitans, Bacteriodes gingivalis and Bacteriodes intermedius to indicate progressive periodontitis; a retrospective study. J Clin Periodontol 14 : 95 - 99, 1987.
  28. Freeman, E., Ellen, R.P., Tompson, G., Weinberg, S.E., Song, M., Lazarus, P.H. : Gingival crevicular fluid concentration and side effect minocycline : A Comparison of two dose regimens. J Periodontol 63 : 13 - 18, 1992.
  29. , , : 가 polycaprolactone film 28 : 279, 1990.
  30. Okuda, K., Wolff, L., Oliver, R., Osborn, J., Stotenberg, J., Bereuter, J., Anderson, L., Foster, P., Hardie, N., Aeppli, D. : Minocycline slow - release formulation effect on subgingival bacteria. J Periodontol 63 : 73 - 79, 1992.
  31. Goodson J.M, Offenbacher, S., Farr, D.H. and Hogan, P.E. : Periodontal disease treatment by local drug delivery. J Periodontol 56 : 265 - 272, 1985.
  32. Michalowicz, B.S., Pihlstrom, B.L., Drisko, C.L., Cobb, C.M., Killoy, W.J., Caton, J.G., Lowenguth, R.A., Quinones, C., Encarnacion, M., Knowles, M. : Evaluation of periodontal treatments using controlled - release tetracycline fibers: maintenance response. J Periodontol 66 : 708 - 715, 1995.
  33. Jones, A.A., Kornman, K.S., Newbold, D.A., Manwell, M.A. : Clinical and microbiological effects of controlled - release locally delivered minocycline in periodontitis. J Periodontol 65 : 1058 - 1066, 1994.
  34. Minabe, M., Takeuchi, K., Tomomatsu, E., Hori, T., Umemoto, T. : Clinical effect of local application of collagen film - immobilized tetracycline. J Clin Periodontol 16 : 291 - 294, 1989.
  35. Lavanchy, D.L., Bickel, M. and Baehni, P.C. : The effect of plaque control after scaling and root planing on the subgingival microflora in human periodontitis. J Clin Periodontol 14 : 295 - 299, 1987.
  36. , , : 가. 24 : 493 - 502, 1994.
  37. Woodward, S.C., Brewer, P.S., Moatamed, F., Schindler, A., Pitt, C.G. : The intracellular degradation of poly(epsilon - caprolactone). J Biomed Mater Res 19 : 437 - 444, 1985.
  38. , , , , : 30% Minocycline 16 : 169 - 174, 1992.
  39. Pitt, C.G., Chasalow, F.I., Hibionada, Y.M., Klimas, D.M., Schindler, A. : Aliphatic polyesters. 1. The degradation of poly - caprolactone in vivo. J Appl Polym Sci 26 : 3779 - 3787, 1981.
  40. , : 가 .

9 : 93 - 104, 1993.

41. Graca, M.A., Watts, T.L.P., Wilson, R.F. and Palmer, R.M. : A randomized controlled trial of a 2% minocycline gel as an adjunct to non - surgical periodontal treatment, using a design with multiple matching criteria. J Clin Periodontol 24 : 249 - 253, 1997.

42. :  
2% minocycline gel  
28 : 531 - 543,  
1998.

- Abstract -

## Effects of Several Biodegradable Controlled - Release Local Delivery Drugs on the Treatment of Periodontitis

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The present study was performed to evaluate the clinical effects following local application of 30% minocycline strip (polycaprolactone), 2% minocycline gel (hydrocarbon gel) and 12% minocycline strip (polylactide, Minodent) to augment scaling and root planing in patients with chronic adult periodontitis. Forty teeth with periodontitis were enrolled in the study and distributed into 4 groups including control group. All patients performed standardized oral hygiene instructions and mechanical debridement at the beginning of the study and then each local delivery drug was inserted into periodontal pocket in each group. Examinations regarding plaque

index (PI), papillary bleeding index (PBI), probing pocket depth (PPD) were carried out at 0, 2, 4 weeks. All experimental groups showed statistically significant differences between baseline and 2 and 4 weeks in every clinical indices. Especially, 30%minocycline strip and Minodent group showed a significant improvement in PBI at 2 weeks and in PPD at 2 and 4 weeks. In conclusion, highly bio - resorbable Minodent delivered subgingivally as an adjunct to scaling and root planing induces better clinical effects for periodontal health than 2% minocycline gel and control group.