

# e - PTFE

I.

GBR

6). Dahlin 7)

가

1).

8,9).

가

10 - 12)

(Guided Bone Regeneration:GBR)

13,14)

가

2).

가

Melcher 3), Gottlow 4) Dahlin 5)

가

가

(Guided

Tissue Regeneration: GTR)

가

miniscrew<sup>9)</sup>, gold

\* 1999

frame<sup>15)</sup>, 11,12) 16)

DFDB, e-PTFE  
e-PTFE DFDB

가 가

가 17,18) 가 가 가  
가 가  
가 ,  
14,18 - 20)

Urist<sup>21)</sup>

(Bone Morphogenetic Protein : II.

BMP)

1.

(Deminerlized freeze dried bone : 3.3mm, 8.0mm Titanium  
DFDB) plasma - sprayed implant\* 16 DFDB\*\*

, 22),  
23),

e-PTFE\*\*\*

expanded polytetrafluoroethylene  
(e-PTFE) DFDB

2.

17,24 - 27)

가

Becker 18)

, 20Kg 2

DFDB e-PTFE

DFDB

3.

, Aspenberg 28)

1)

Shanaman 29) 237

Pentobarbital † 30mg/kg  
, 2% Lidocaine HCl

DFDB

1

, Bur Chisel

3, 4

\*: IMZ, Friedrichfeld, Germany

\*\* : American Red Cross Co., USA

\*\*\*: Gore - Tex Augmentation Materials, GTAM,  
WL Gore & Assoc, Flagstaff, Arizona, USA

† : Entobar, Hanlim Pharmaceuticals, Seoul, Korea

Bur Chisel

Table 1. Experimental Design

Group	Treatment
Control	no Treatment
Group 1	DFDB
Group 2	ePTFE membrane
Group 3	DFDB + ePTFE membrane

2) (Control), DFDB (Group 1), e-PTFE (Group 2), DFDB + e-PTFE (Group 3) (Table 1, Figure 2).

3)

3mm

suture, vertical mattress 가 1, 2, 3, 4).

4)

30).

Kg 20mg . Oxytetracycline hydrochloride 3 8, Calcein 4, Arizarin red S 3

: Teramycin, Pfizer Co., Korea  
 : Sigma Co., Japan  
 : Junsei Chemical Co.,Japan

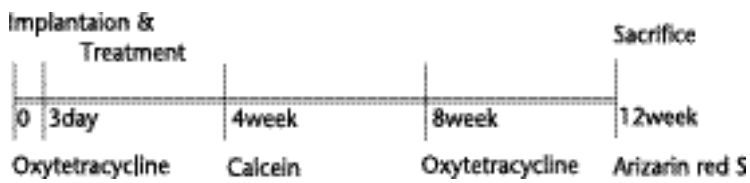


Figure 1. Flow diagram showing the experimental procedure

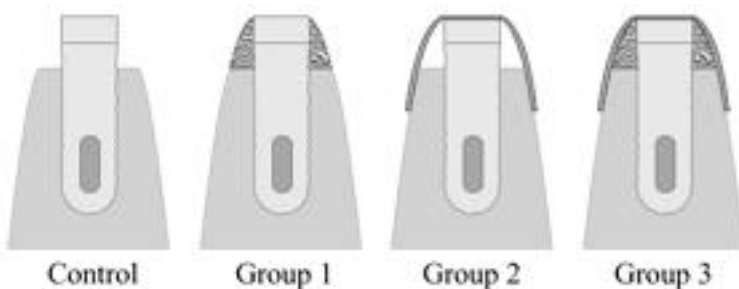


Figure 2. A schematic diagram depicting the experiment design

(Figure 1).

5) 12 , 70%  
 DFDB 가  
 DFDB  
 Villanueva bone ,  
 3 DFDB  
 , polymethylmethacrylate ,  
 . 40 37  
 Crystal cutter . DFDB  
 200um Hard 가  
 tissue grinding system 30um  
 ( 7).

PTFE , DFDB , e - 3) 2  
 가  
 Lamellar bone Woven bone  
 III .  
 1. 1 2  
 1) 가 가  
 가  
 4가 가  
 가

( 5).

2) 1 (

9). DFDB 가 .

4) 3 DFDB DFDB DFDB 가

2 DFDB 가

DFDB 가 ( 8).

DFDB , 3) 2

DFDB . 2 가

가 . 4 calcein

가 Tetracycline

가 . 12

Arizarin red

( 11). 2 가

2. 가 (

1) 10).

가 4) 3

가

2

2

가 ( 2). DFDB 가 DFDB

2) 1 ( 12).

가 IV.

DFDB, e-PTFE  
 DFDB e-PTFE 2 3

Becker<sup>14)</sup> 3mm  
 ePTFE 4.2mm

DFDB 3-4mm  
 3.8mm, 가 17,32)

5.0mm 2  
 Dahlin<sup>31)</sup> 3 가

4.7mm 3.6mm 가 DFDB가  
 Simion Cho<sup>33)</sup>

17,32) miniscrew  
 3-4mm  
 Becker<sup>18)</sup> 1995  
 5mm 30)

4.2mm, DFDB 가  
 3.8mm, 가  
 5mm  
 DFDB가  
 1998 Cho<sup>33)</sup>

DFDB 가  
 가

DFDB가

Zablotsky<sup>34)</sup> hydroxyapatite 2 3  
 가 cein 가 4 cal-

8 Tetracycline 4  
 가

1994 Nevin<sup>20)</sup> 8  
 1995 Mellonig<sup>27)</sup> GBR 12  
 Arizarin red

12 가 DFDB  
. 1998 Cho <sup>33)</sup>  
DFDB  
, DFDB  
DFDB  
가  
DFDB  
DFDB가  
DFDB  
DFDB  
DFDB  
DFDB  
2 3 DFDB  
. , 2 DFDB  
3  
Urist<sup>21)</sup> BMP가  
BMP가  
1 DFDB  
DFDB  
DFDB  
17,24 - 27), Becker  
<sup>18)</sup>Aspenberg <sup>28)</sup>Shanaman <sup>29)</sup> DFDB DFDB  
<sup>18)</sup>, 1998  
. DFDB Cho <sup>33)</sup> DFDB가  
가 1995 가  
Shigeyama <sup>35)</sup> DFDB가  
가  
DFDB  
1998 Simion <sup>32)</sup> DFDB  
(Scaffold)  
(blood clot)  
DFDB, DFDB Garraway <sup>39)</sup> murine  
model DFDB  
, 1995 Jovanovic <sup>40)</sup>  
가

41,42). Martin 43) 1995

DFDB

가

, Piattelli 44) 1997

hydroxyapatite

alkaline

DFDB 2 3

phosphatases 가

45).

DFDB titanium

Plasma spray - coating

DFDB

DFDB가

가 33,46 - 51). 1999

lamoni 52)

가

2 3

43.76%, 80.97% 2

GBR 가 12

가 70%,

70%, 95.01%

. Simion 17,32) minis - lamoni

crew 2

가

가 12 8

Simion

9 11

가 , 1.3mm minis - 가

crew 3.3mm

가



53 - 55). 가 , DFDB 2 3  
 , GBR 12  
 56,57). 2  
 3 1. 1 2 3  
 GBR DFDB 2. Titanium plasma sprayed  
 2 3 DFDB  
 DFDB 3.  
 DFDB가 4 8  
 1998 Cho 4. 1 3 가 3  
 33) 가 DFDB 가  
 가 GBR  
 GBR , 12  
 V. GBR  
 , DFDB  
 (Demineralized freeze dried bone, DFDB) (e - PTFE membrane, GTAM)  
 가

VI.

Titanium  
 plasma sprayed  
 DFDB  
 1 ,  
 1. McCall R.A, Rosenfeld A.L. : The influence of residual ridge resorption patterns on fixture palce - ment and

- tooth position. Part I. *Int. J. Periodont. Res. Dent.*, 11;9 - 23.1991
2. Schenk R.K., Buser D., Harwik R., Dahlin C. : Healing pattern of bone regeneration in membrane - protected defects: A histologic study of the canine mandible. *Int. J. Oral. Maxillofac. Implants.*, 9:13 - 29. 1994
  3. Melcher A.H., Accursi G.E. : Osteogenic capacity of periosteal and osteo - periosteal flaps elevated from parietal bone of the rat. *Arch. Oral. Biol.*, 16:573 - 580.1971.
  4. Gottlow J., Nyman S., Karring T., Lindhe J.: New attachment formation as the result of controlled tissue regeneration. *J. Clin. Periodontol.*, 11(8):494 - 503.1984
  5. Dahlin C., Alberius P., Lindhe A.: Osteopromotion for cranioplasty. An experimental study in rats using a membrane technique. *J. Neurosurg.*, 74:487 - 491.1991
  6. Buser D., Bragger U., Lang N.P., Nyman S.: Regeneration and enlargement of jaw bone using guided tissue regeneration. *Clin. Oral Implants. Res.*, 1:22 - 32.1990
  7. Dahlin C., Andersson L., Lindhe A. : Bone augmentation at fenestrated implants by an osteopromotive membrane technique. A controlled clinical study. *Clin. Oral. Implants. Res.*, 2;159 - 165.1991
  8. Dahlin C., Lekholm U., Lindhe A.: Membrane induced bone augmentation at titanium implants. A report on ten fixtures followed from 1 to 3 years after loading. *Int. J. Periodont. Res.*, 11:273 - 281.1991
  9. Buser D. , Dula K.: Localized ridge augmentation using guided bone regeneration. Surgical procedure in the maxilla. *Int. J. Periodont. Rest. Dent.*, 13:29 - 45.1993
  10. Dahlin C. , Sennerby L., Lekholm U., Linde A., Nyman S. : Generation of new bone around titanium implants using a membrane technique: An experimental study in rabbits. *Int. J. Oral. Maxillofac. implants*, 4:19 - 25.1989
  11. Becker W., Becker B.E. : Guided tissue regeneration for implants placed into extraction sockets and for implant dehiscences: Surgical techniques and case reports. *Int. J. Periodont. Rest. Dent.*, 10:377 - 391.1990
  12. Becker W., Becker B.E., Handlesman M., Celletti R., Ochsenbein C., Hardwick R., Langer B. : Bone formation at dehisced dental implant sites treated with implant augmentation material: A pilot study in dogs. *Int. J. Periodont. Rest. Dent.*, 10:93 - 101.1990
  13. Lazzara R.: Immediate implant placement into extraction sites: Surgical and restorative advantages. *Int. J. Periodont. Rest. Dent.*, 9:333 - 343.1989.
  14. Becker W., Lynch S.E., Lekholm U., Becker B.E., Caffesse R, Donath K, Sanchez R. : A comparison of three methods for promoting bone formation around implant placed into immediate extraction sockets: e - PTFE membrane alone or with either PDGF and IGF - 1 or DFDB. *J. Periodontol.*, 63:929 - 940.1992
  15. Tinti C., Parma - Benfenati S.,

- Manfrini F. : Spacemaking metal structures for nonresorbable membranes in guided bone regeneration around implants. Two case reports. *Int. J. Periodont. Res. Dent.*, 17(1):53 - 61.1997.
16. Cochran D.L., Schenk R., Buser D., Wozney J.M., Jones A.A. : Recombinant human bone morphogenetic protein - 2 stimulation of bone formation around endosseous dental implants. *J. Periodontol.*70(2):139 - 50.1999
  17. Simion M., Dahlin C. , Trisi P., Piattelli A. : Qualitative and Quantitative comparative study on different filling materials used in bone tissue regeneration :A controlled clinical study. *Int. J. Periodont. Rest. Dent.*, 14:199 - 215.1994.
  18. Becker W, Schenk R, Higuchi K, Lekholm U, Becker B.E. : Variations in bone regeneration adjacent to implants augmented with barrier membranes alone or with demineralized freeze - dried bone or autologous grafts: A study in dogs. *Int. J. Oral Maxillofac. Implants*, 10:143 - 154.1995
  19. Mellonig J.T.: Decalcified freeze - dried bone allografts as an implant material in human periodontal defects. *Int. J. Perio. Rest. Dent.*, 4:41 - 55.1984.
  20. Nevins M., Mellonig J.T.: Enhancement of the damaged edentulous ridge to receive dental implants: A combination of allograft and the Gore - Tex membrane. *Int. J. Periodont. Rest. Dent.*, 12:91 - 111.1992.
  21. Urist M.R.: Bone formation by autoinduction .*Science.*, 150:893 - 899.1965.
  22. Kim C.K., Cho K.S., Choi S.H., Prewett A., Wikesjo UME.: Periodontal repair in dogs: effect of allogenic freeze - dried demineralized bone matrix implants on alveolar bone and cementum regeneration. *J. Periodontol*, 69(1):26 - 33.1998
  23. Mellonig J.T.: Bone allografts in periodontal therapy. *Clin. Orthop.*, 324:116 - 25.1996
  24. Werbit M.J., Goldberg P.V. : The immediate implants: Bone preservation and bone regeneration .*Int. J. Periodont. Rest. Dent.*, 12:207 - 217.1992.
  25. Mellonig J.T, Triplett R.G.: Guided tissue regeneration and endosseous dental implants. *Int. J. Periodont. Rest. Dent.* 13:109 - 119.1993.
  26. Nevin M., Mellonig J.T: The advantages of localized ridge augmentation prior to implant placement :A staged event. *Int. J. Periodont. Rest ,Dent.*, 14:97 - 111.1994.
  27. Mellonig J.T, Nevin M.: Guided bone regeneration of bone defects associated with implants: An Evidence - Based Outcome Assessment. *Int. J. Periodont Rest. Dent.*, 5:168 - 185.1995.
  28. Aspenberg P., Lohmander L.S., Thorngren K.G. : Monkey bone matrix induces bone formation in the athymic rat, but not in adult monkeys. *J. Orthop. Res.*, 9(1):20 - 5.1991
  29. Shanaman R.H. : A retrospective study of 237 sites treated consecutively with guided tissue regeneration. *Int. J. Periodont. Rest. Dent.* 14(4):292 - 301.1994
  30. Pinholt E.M., Kwon P.H. : Triple

- bone labeling of canine mandibles. *Oral. Surg. Oral. Med. Oral. Pathol.*, 70(4):401 - 5.1990
31. Dahlin C., Lekholm U., Becker W., Becker B., Higuchi K., Callens A., van Steenberghe D. : Treatment of fenestration and dehiscence bone defects around oral implants using the guided tissue regeneration technique: A prospective Multicenter study. *Int. J. Oral. Maxillofac. Implants*, 10:312 - 318.1995
  32. Simion M., Jovanovic S.A., Trisi P., Scarano A., Piattelli A. : Vertical ridge augmentation around dental implants using a membrane technique and autogenous bone or allografts in humans. *Int. J. Periodont. Rest. Dent.* 18(1):8 - 23.1998
  33. Cho K.S., Choi S.H., Han K.H., Chai J.K., Wikesjo UME, Kim C.K. : Alveolar bone formation at dental implant dehiscence defects following guided bone regeneration and xenogeneic freeze-dried demineralized bone matrix. *Clin. Oral. Imp. Res.* 9:419 - 428.1998
  34. Zablotsky M, Meffert R, Caudill R, Evans G.: Histological and clinical comparisons of guided tissue regeneration on dehisced hydroxylapatite-coated and titanium endosseous implant surfaces: a pilot study. *Int. J. Oral. Maxillofac. Implants.* 6(3):294 - 303.1991
  35. Shigeyama Y., D'Errico J.A., Stone R., Somerman M.J. : Commercially-prepared allograft material has biological activity in vitro. *J. Periodontol.*, 66(6):478 - 87.1995
  36. Schwartz Z., Mellonig J.T., Carnes D.L., de la Fontaine J., Cochran DL, Dean D.D., Boyan B.D. : Ability of commercial demineralized freeze-dried bone allograft to induce new bone formation. *J. Periodontol.*, 67(9):918 - 26.1996
  37. Schwartz Z., Somers A., Mellonig J.T., Carnes D.L., Dean D.D., Cochran D.L, Boyan B.D. : Ability of commercial demineralized freeze-dried bone allograft to induce new bone formation is dependent on donor age but not gender. *J. Periodontol.*, 69(4):470 - 8. 1998
  38. Schwartz Z., Somers A., Mellonig J.T., Carnes D.L., Wozney J.M., Dean D.D., Cochran D.L., Boyan B.D. : Addition

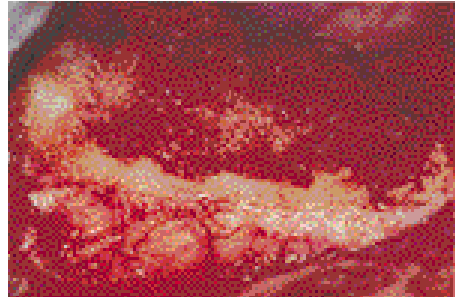
of human recombinant bone morphogenetic protein - 2 to inactive commercial human demineralized freeze - dried bone allograft makes an effective composite bone inductive implant material. *J. Periodontol.*,69(12):1337 - 45.1998

39. Garraway R., Young W.G., Daley T., Harbrow D., Bartold P.M. : An assessment of the osteoinductive potential of commercial demineralized freeze - dried bone in the murine thigh muscle implantation model. *J. Periodontol.*, 69(12) :1325 - 36.1998
40. Jovanovic S.A., Schenk R.K., Orsini M., Kenney E.B. : Supracrestal bone formation around dental implants: an experimental dog study. *Int. J. Oral. Maxillofac. Implants.*, 10(1):23 - 31.1995
41. Schwartz Z., Martin J.Y., Dean D.D., Simpson J., Cochran D.L., Boyan B.D. : Effect of titanium surface roughness on chondrocyte proliferation, matrix production, and differentiation depends on the state of cell maturation. *J. Biomed. Mater. Res.* 30(2):145 - 55. 1996
42. Cochran D.L., Nummikoski P.V., Higginbottom F.L, Hermann J.S., Makins S.R., Buser D. : Evaluation of an endosseous titanium implant with a sandblasted and acid - etched surface in the canine mandible: radiographic results. *Clin. Oral. Implants. Res.* ;7(3):240 - 52.1996
43. Martin J.Y., Schwartz Z., Hummert T.W., Schraub D.M., Simpson J., Lankford J., Dean D.D., Cochran D.L., Boyan B.D. : Effect of titanium surface roughness on proliferation, differentiation, and protein synthesis of human osteoblast - like cells(MG63). *J. Biomed. Mater. Res.* ;29(3):389 - 401.1995
44. Piattelli A, Scarano A, Di Alberti L, Piattelli M. : Histological and histochemical analyses of acid and alkaline phosphatases around hydroxyapatite - coated implants: a time course study in rabbit. *Biomaterials.* ;18(17):1191 - 4.1997
45. Sykaras N., Iacopino A.M., Marker V.A., Triplett R.G., Woody R.D. : Implant materials, designs, and surface topographies: their effect on osseointegration. A literature review. *Int. J. Oral. Maxillofac. Implants.* 15(5):675 - 90.2000
46. Titanium plasma sprayed Hydroxyapatite coated  
, 23(3)400 - 410,1993.
47. Titanium Plasma Sprayed Hydroxyapatite Coated  
, 8:149 - 161, 1993.
48. :IMZ implant., ,13:15,1993.
49. ; DFDB GTAM implant ,  
,14:156,1994.
50. ; TITANIUM PLASMA SPRAYED IMZ  
, 14:158, 1994.
51. : HYDROXYAPATITE

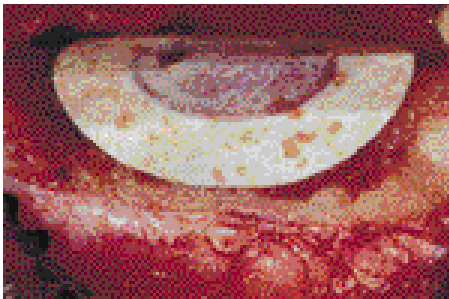
(1)



1



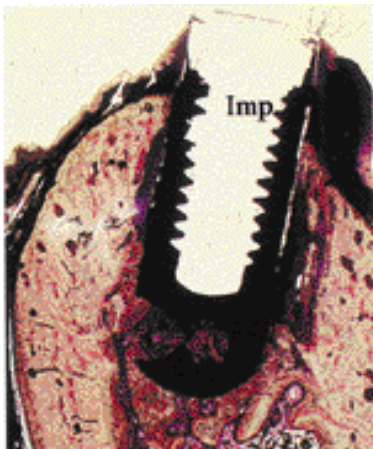
2



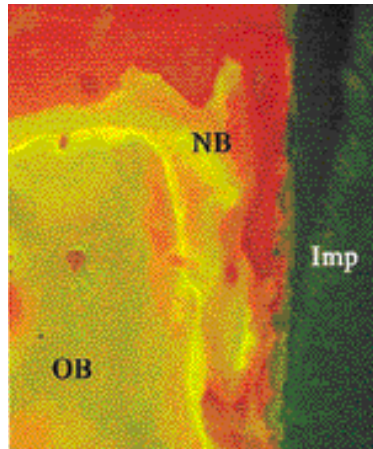
3



4

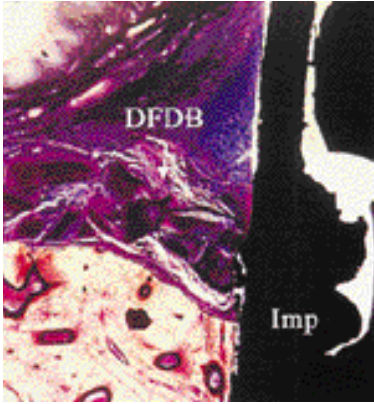


5

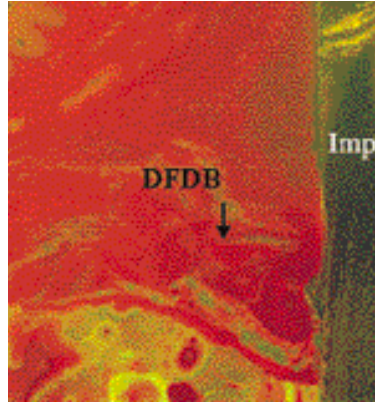


6

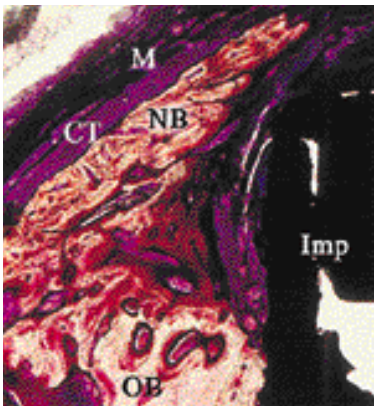
( II )



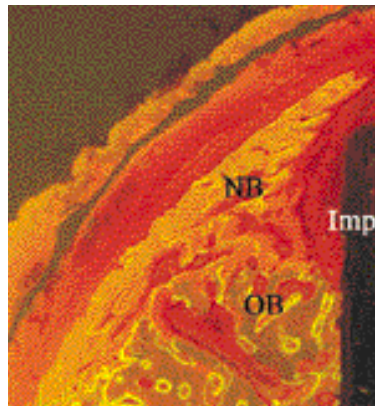
7



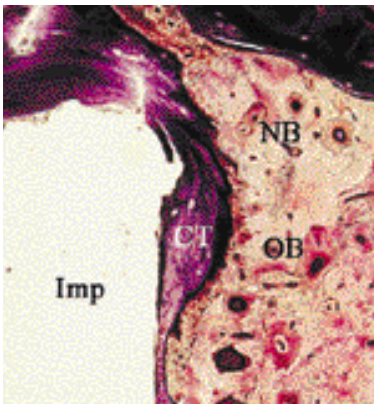
8



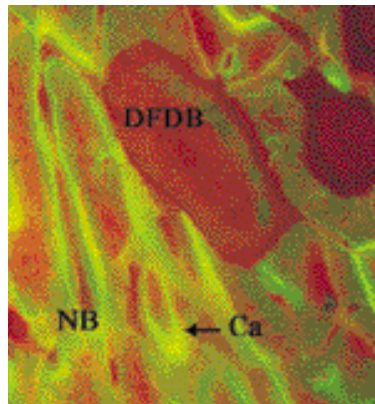
9



10



11



12

- , 8:127 - 148.1993
52. Iamoni F., Rasperini G., Trisi P., Simion M. : Histomorphometric analysis of a half hydroxyapatite - coated implant in humans: a pilot study. *Int. J. Oral. Maxillofac. Implants.* 14(5):729 - 35.1999
  53. Grunder U., Hurzeler M.B., Schupbach P., Strub J.R. : Treatment of ligature - induced peri - implantitis using guided tissue regeneration: a clinical and histologic study in the beagle dog. *Int. J. Oral. Maxillofac. Implants.*8(3):282 - 93.1993
  54. Hammerle C.H., Fourmouis I., Winkler J.R., Weigel C., Bragger U., Lang N.P. : Successful bone fill in late peri - implant defects using guided tissue regeneration. A short communication. *J. Periodontol.* 66(4):303 - 8.1995
  55. Hurzeler M.B., Quinones C.R., Morrison E.C., Caffesse R.G. : Treatment of peri - implantitis using guided bone regeneration and bone grafts, alone or in combination, in beagle dogs. Part 1: Clinical findings and histologic observations. *Int. J. Oral. Maxillofac. Implants.* 10(4):474 - 84.1995
  56. Jovanovic S.A., Kenney E.B., Carranza F.A., Donath K. : The regenerative potential of plaque - induced peri - implant bone defects treated by a submerged membrane technique: an experimental study. *Int. J. Oral. Maxillofac. Implants.* 8(1):13 - 8.1993
  57. Singh G, O'Neal RB, Brennan WA, Strong SL, Horner JA, Van Dyke TE. : Surgical treatment of induced peri - implantitis in the micro pig: clinical and histological analysis. *J. Periodontol.* 64(10):984 - 9.1993

1.									
2.			DFDB						
3.	DFDB								
4.									
5.			(X 40)						
6.			(X 100)						
		4			Calcein				
7.	1		(X 100)						
			DFDB		가				
8.	1		(X 100)						
		DFDB					가		
9	2		(X 100)						



- Abstract -

10. 2  
(X 100)

## The Effect of Demineralized Freeze - Dried Bone Allograft in

11. 3  
(X 100)

## Guided Bone Regeneration on Supra - Alveolar Peri - Implant Defects in Dogs

2

12. 3  
(X 200)

Chang - Sung Kim, Seong - Ho Choi, Kyoo - Sung Cho

Department of Periodontology, College of Dentistry, Yonsei University  
Research Institute for Periodontal Regeneration

DFDB

DFDB

Imp :

NB :

OB :

DFDB :

Tc : Tetracycline  
cein

Ca : Cal -

Az : Arizalin red

M :

CT :

The purpose of this study was to evaluate the adjunctive combined effect of demineralized freeze - dried bone allograft(DFDB) in guided bone regeneration on supra - alveolar peri - implant defect.

Supra - alveolar perio - implant defects, 3mm in height, each including 4 IMZ titanium plasma - sprayed implants were surgically created in two mongrel dogs. Subsequently, the defects were treated with 1 of the following 3 modalities: Control) no membrane or graft application, Group1) DFDB application, Group2) guided bone regeneration using an expanded polytetrafluoroethylene membrane, Group3) guided bone regeneration using membrane and DFDB. After a healing period of 12 - week, the animals were sacrificed, tissue blocks

were harvested and prepared for histological analysis.

Histologic examination were as follows;

1. New bone formation was minimal in Control and Group 1, but considerable new bone formation was observed in Group 2 and Group 3.
2. There was no osteointegration at the implant - bone interface in the high - polished area of Group2 and Group 3.
3. In fluorescent microscopic examination, remodeling of new bone was most active during week 4 and week 8. There was no significant difference in remodeling rate between group 2 and group 3.
4. DFDB particles were observed, invested in a connective tissue matrix. Osteoblast activity in the area was minimal.

The results suggest that guided bone regeneration shows promising results in supra - alveolar peri - implant defects during the 12 week healing period although it has a limited potential in promoting alveolar bone regeneration in the high - polished area. There seems to be no significant adjunctive effect when DFDB is combined with GBR.

Key words : Supra - alveolar peri - implant defects, Guided bone regeneration Demineralized freeze - dried bone allograft