

. . . * . .

*

I. 가

13,14),

,
15,16),

1).

가

가

hydrox -
yapatite(HA)¹⁷⁾
tricalcium
phosphate(TCP)^{18,19)}가

hydrox -
tricalcium
,
20 - 25)

2),

가

26,27)

(enamel matrix protein)

3,4)

가

porites

250 μ m

가

5,6),

7 - 12)

98%

(calcium carbonate)

가 , , 가 ,

, 가 ,

strontium fluoride

35), (1998)³⁶⁾
28). Guillemine 21,22)

가

8)

9)

, Lekovic

23)

가

가

11)

12)

가

HA

29).

HA

가

HA

가

30 - 33). Wetzel 34)

HA

HA

, Klinge 32)

HA

HA

HA

II.

가

1.

가

가

250g

3

Sprague - Dawly 24 (

7), 8 - 12)

,) , ,

(safflower seeds)

HA (Bio - Oss , Osteohealth Co.,
New York, USA),

가

(Biocoral 450 , Inoteb, France),

linoleic acid

1998

cholesterol

3g/

III.

2.

1.

(1)

(1)

Ketamine HCl(Ketalar, Yuhan Co., Seoul, Korea) 1.5 - 2mg

4

가

가

, 8mm

trepine bur(3i, FL, USA)

(Table 1, 2,

1 - 1).

8mm

8

HA

4

가

5 - 0

4

가

(Vicryl, Ethicon, England)

Goldner's

Masson trichrome

(Table 1, 2,

, kanamycin sulfate(Kanamycin, Scientific Feed Co., Seoul, Korea)

1 - 2).

(2)

(2)

HA

(Bio - Oss)

4

HA crystal

가

4 , 8

3

HA crystal

, 10%

2

가

formic acid -

sodium citrate

MT

, paraffin

, 4 μ m

(Table 1, 2,

Hematoxyline -

2 - 1).

Eosin

Goldner's Masson Trichrome

8

HA crystal

4

가

(-), (\pm), (+), (++)
(+++)

5

, HA crystal

Table 1. Histologic finding of inflammatory response according to experimental materials

	Control		Bio - Oss		Biocoral		SSF	
	4weeks	8weeks	4weeks	8weeks	4weeks	8weeks	4weeks	8weeks
Inflammatory cell	+	-	+	±	+	±	±	-
Angiogenesis	±	+	+	+	±	+	±	+
Fibrosis in defect	±	+	±	++	-	±	+	+++

- ; negative, ±; rare, +; mild, ++; moderate, +++; severe.
SSF; Group of safflower seeds feeding.

Table 2. Histologic finding of bone remodeling according to experimental materials

	Control		Bio - Oss		Biocoral		SSF	
	4weeks	8weeks	4weeks	8weeks	4weeks	8weeks	4weeks	8weeks
Osteoclastic activity		±	-	±	-	±	-	±
Osteoblastic activity		±	±	±	+	±	±	±
Osteoconduction around bone defect	±	±	±	±	+	±	±	±

가 가 (4)
(Table 1, 2, 2 - 2). 4
(3) (Biocoral 450) ,
4
HA crystal (Table 1, 2, 4 - 1).
8
가
MT 가 ,
가
(Table 1, 2, 3 - 1). ,
8 4 (Table 1, 2, 4 - 2)
HA crystal , crystal IV.
4 가
HA ,
, HA crystal ,
(Table 1, 2, 3 - 2). ,
가 ,

, 가 (autograft) (filler) ,
 (allograft), (heterograft),
 (synthetic graft)
 . 가 가 .
 가 ,
 가 (Biocoral 450²⁾ 가 ,
 13,14), 250 μ m 가 ,
 가 (bone 28). Yukna²⁰⁾
 morphogenic protein) 가
 , TCP 가 ,
 15,16).
 가 HA가 carbonate , 98%
 가 가
 . Guillemine 21,22)
 ,
 가 가
 가 , 4 8
 , HA
 , crystal Baldock 18)
 Uchida 38)
 ,
 hydroxyapatite¹⁷⁾ HA
 tricalcium phosphate^{18,19)}가 (Bio - Oss)
 20 - 25) , HA
 26,27) . 29 - 34). Klinge
 가 32) HA HA
 (matrix) HA
 가 37). HA 4

8

15 - 50 μ m , 150 μ m

가 (saf - HA 가

flower seeds) 2

가

linoleic acid

adenosine

diphosphate 21 - 23)

8 - 12)

9) 10) HA 4 8

가 ALP 가 가

11) 12) 8

가

(osteoconduction)

가 39) HA 18,38)

(local delivery) 가 가

가

가

HA Uchida 38)

HA

가

190 - 230 μ m White

Shore⁴⁰⁾

2.5mm 5mm

41), 12)

, 8mm

가

가

가

11,12), 가

8

가

HA가

HA

가

가

가

V.

HA

HA

HA

가

1. 4 8

, 4 8

가

2. HA 4

HA crystal

, 8

4 crystal

가

crystal

가

가가

3. 4

8 4

HA

4. 4 , 8

, 8

가

가

VI.

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(1)

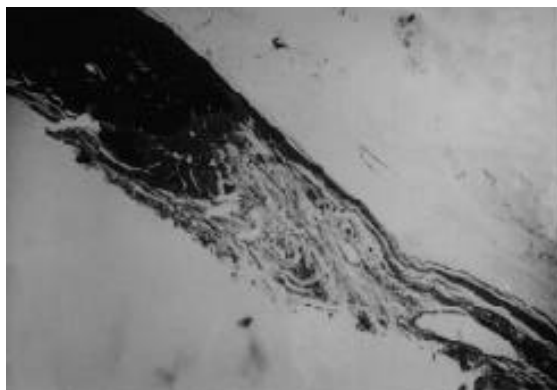


Photo 1 - 1



Photo 1 - 2



Photo 2 - 1

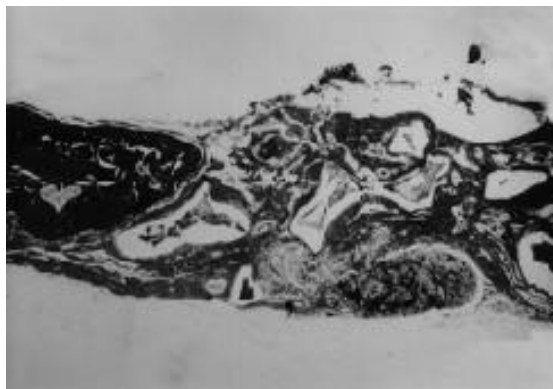


Photo 2 - 2

(II)



Photo 3 - 1



Photo 3 - 2

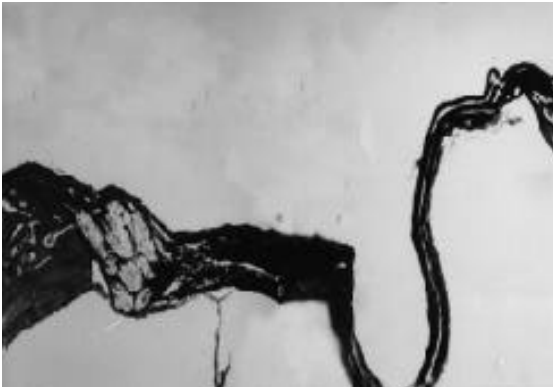


Photo 4 - 1



Photo 4 - 2

- Photo 1 - 1. Microphotography of bone remodeling in control groups at 4 weeks
(Goldner's Masson - Trichrome stain, ×25).
- Photo 1 - 2. Microphotography of bone remodeling in control groups at 8 weeks
(Goldner's Masson - Trichrome stain, ×25).
- Photo 2 - 1. Microphotography of bone remodeling in Bio - Oss groups at 4 weeks
(Goldner's Masson - Trichrome stain, ×25).
- Photo 2 - 2. Microphotography of bone remodeling in Bio - Oss groups at 8 weeks
(Goldner's Masson - Trichrome stain, ×25).
- Photo 3 - 1. Microphotography of bone remodeling in Biocoral groups at 4 weeks
(Goldner's Masson - Trichrome stain, ×25).
- Photo 3 - 2. Microphotography of bone remodeling in Biocoral groups at 8 weeks
(Goldner's Masson - Trichrome stain, ×25).
- Photo 4 - 1. Microphotography of bone remodeling in safflower seed feeding groups at 4 weeks
(Goldner's Masson - Trichrome stain, ×25).
- Photo 4 - 2. Microphotography of bone remodeling in safflower seed feeding groups at 8 weeks
(Goldner's Masson - Trichrome stain, ×25).

- Abstract -

Healing after Implantation of Bone Substitutes and Safflower Seeds Feeding in Rat Calvarial Defects

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Many synthetic bone materials have been studied for their potential of regenerative effects in periodontal tissue. Safflower seeds have been traditionally used as a drug for the treatment of fracture and blood stasis in oriental medicines. The purpose of this study was to assess and compare the osseous responses in rat calvarial defects between bone substitutes such as calcium carbonate and bovine - derived hydroxyapatite and feeding of safflower seeds. The calvarial defects were made with 8 mm trephine bur in 24 Sprague - Dawley rats. Two graft materials were implanted in each experimental groups, whereas the control and safflower seed feeding groups were sutured without any other treatment. And then the rats of safflower seed feeding group were supplied with 3 g/day of safflower seeds. Each group was sacrificed at

4 weeks and 8 weeks. To study a histopathology related to bone healing and regeneration, Goldner's Masson Trichrome stain was done at each weeks. The tissue response was evaluated under light microscope. There were more osteoblastic activity, new bone formation, dense bony connective tissues in bovine - derived hydroxyapatite group compared to other groups at 8 weeks. The osseous defect area of safflower seed feeding group was filled with prominent fibrous tissues, where less inflammatory infiltration and new capillary proliferation. In the early phase of bone healing, safflower seed feeding reduces the inflammatory response and promotes the proliferation of connective tissue. These results suggest that natural bovine - derived HA and safflower seed feeding could enhance the regenerative potential in periodontal defects.