

I.

e - PTFE(expanded polytetra
fluoroethylene)가

4 - 10)

3 - 6

2

Melcher(1976)¹⁾

2

(1980)²⁾

. Caton

가

(1980)³⁾

. Nyman

가

(1982)⁴⁾ Millipore filter

. Nyman

, Gottlow (1986)⁵⁾ Teflon

, 2

20).
 , polylac-
 tic acid(PLA), polyglycolic acid(PGA)
 가
 , 4 가 8
 가 6, 11 - 12). PLA
 citric acid ester 가
 가 , 가
 가 , 6
 6 - 12
 가 21). PLA/PGA
 , 가
 가 , 4 - 6 가
 8 가 15, 18).
 ,
 가 ,
 가
 가 ,
 가 .
 가 .
 가 .

II.

1.

(Biomend extend ,
 Calcitek,), (Lyoplant , B.Braun,

), (CollaTape , Calcitek,
) PLA/PLGA (Biomesh ,
 Samyang. Co,) .

2.

5 - 6 150g
 12
 (,)

3.

1)
 Sodium pentobarbital(40mg/Ml) 0.5cc
 , # 15 blade
 dean scissor 4
 . 4
 5mm x 5mm
 , 4 - 0 Blue nylon

2)

1, 2 Gentamycin 0.1cc
 , 1

3)

3, 6, 8
 Sodium pentobarbital 4

. 10% neutral buffered formalin
 , . 8µm
 , Hematoxylin - Eosin

III.

(Figure2 - 1a).

1.

1) 3

2) 6

3

가

가 ,

가 .

가

가 .

(Figure2 - 2).

가

가

(Figure2 - 2a).

가 .

3) 8

3, 6

가

(Figure 1 - 1).

가

(Figure 1 - 1a).

(Figure2 - 3).

2) 6

3

가

(Figure 2 - 3a).

가

3

3.

가

(Figure 1 - 2).

(Figure 1 - 2a).

1) 3

3

가

가

3) 8

3, 6

가

(Figure 3 - 1).

(Figure 1 - 3).

6

3 - 1a).

(Figure

(Figure 1 - 3a).

2) 6

가

(Figure 3 - 2).

2.

(Figure 3 - 2a).

1) 3

가

3) 8

(Figure 3 -

가

3),

6

(Figure 3 - 3a).

가

(Figure2 - 1).

가

4. PLA/PLGA

4-10). e - PTFE

1) 3

2

. 2

(Figure 4 - 1).

e - PTFE

가

2

(Figure 4 - 1a).

가

11 - 20).

2) 6

가?

가

(Figure 4 - 2).

3 - 6 가

가

가

가

(Figure 4 - 2a).

3) 8

Fleisher (1988)²²⁾

가

가

가

가

(Figure 4 - 3).

가

가

(Figure 4 - 3a).

가

. Dahlin (1988)²³⁾

IV.

. Blumental(1991)²⁴⁾

가

e - PTFE가 가

Gottlow(1993)²⁵⁾

. Zellin (1995)²⁶⁾

Wang (1994, 1996)¹¹⁻¹²⁾ type bovine collagen membrane 2

4

8

. Minabe(1991)²⁷⁾

3-4 가

. Brunel(1996)²⁸⁾ type calfskin collagen membrane 6mm

가

cross - linking

)

. slightly cross - linked(0.02% DPPA), moderately cross - linked(0.1% DPPA), strongly cross - linked(0.5% DPPA)

cross - linking technique

3

cross linking

가

PLA/PLGA

3-6

가

가,

가

. Blumental (1993)⁶⁾ highly purified bovine collagen

2

4

가

가

Miller (1996)²⁹⁾ cross - linked type collagen membrane

, 2

2

가

, 3

2

가

. Kay (1997)¹³⁾

가

type .

가

porcine collagen membrane

4

Peleg (1999)¹⁴⁾ freeze - dried human dura mater
 type bovine collagen cross - link - 6 가 3 73%
 membrane ing 가 3 - 8 0.5mm가 , 0.275mm , 0.47mm
 가 3 - 8 가 가 0.47mm
 cross linking 가 , 3 - 8 가
 가 가 27 - 가
 28). 가 가
 가
 Freeze - dried (lyophilized) human dura mater 1956
 30). 가
 31 - 32), 33), Galgut (1990)³⁸⁾
 34) , oxidized cellulose mesh
 가 35). 1 ,
 freeze - dried human dura mater가
 6 , oxi -
 34, 36). Unsal dized cellulose mesh 가
 (1997)³⁷⁾ type colla - 39). (1993)⁴⁰⁾ collagen
 gen, fascia lata, fascia temporalis, dura mater membrane matrix
 4 . collagen
 matrix 가
 dura mater membrane 6 가 , 가

. 4 가 . PLA/ PGA

4 PLA+citric acid ester

3 , citric acid softener 가

가 가 Gottlow(1994)²¹⁾ 21, 29)

가 . 6

Robert (1993)⁴¹⁾ 0. 10. 20. 30% , 6

PLA50p PLA50P 15, 21, 6

30, 60 가 . 가

PLA 가 , 3 가 가

가 . 6

가 , 12 가

가 Miller (1996)²⁹⁾ . PLA

. Piatelli(1998)⁴²⁾ PLA 가 , 12

(1-4) 가 가

가 가 . Caffesse (1994)¹⁸⁾ 가

가 PLA/PGA 4

. Araujo(1988)¹⁵⁾ 가 3, 6

PLA/PGA PLA+ citric acid ester 6

. Simion

(1996)¹⁹⁾

가
가

PLA/PGA

6

. 6

V.

Lekholm (1993)⁴³⁾

PLA/PLGA

3

가

5 - 6

, 가
150g

, 6 - 8

12

PLA/PLGA

5mm x 5mm

가

3, 6, 8

가

3 - 8

가

PLA

PLA/PGA

1.

3 가
PLA/PLGA

가

가

2.

PLA/PLGA

3 - 8

, 가

가

8

21, 42, 44). Miller (1996)²⁹⁾

3.

PLA

PLA/PLGA

3

3 - 6

가

가

가

가

가

PLA/PLGA

3 -

6

가

VI.

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Figure 1 - 1. Dense collagen membrane group, 3 weeks(× 40. H&E stain) Membrane resorption didn't happen. The morphology of membrane is evident and distinguished from surrounding connective tissue. Moderate Inflammatory cell infiltration was observed in membrane and surrounding connective tissue.

Figure 1 - 1a. Higher magnification of the area " a " shown in Fig. 1 - 1(× 400. H&E stain) Note moderate inflammatory cell infiltration was observed in membrane and surrounding connective tissue.

Figure 1 - 2. Dense collagen membrane group, 6 weeks(× 40. H&E stain) Membrane resorption didn't yet happen. The morphology of membrane is evident like 3 weeks' findings. Severe Inflammatory cell infiltration in membrane and surrounding connective tissue.

Figure 1 - 2a. Higher magnification of the area " a " shown in Fig. 1 - 2(× 400. H&E stain) Note the severe inflammatory cell infiltration in membrane and surrounding connective tissue.

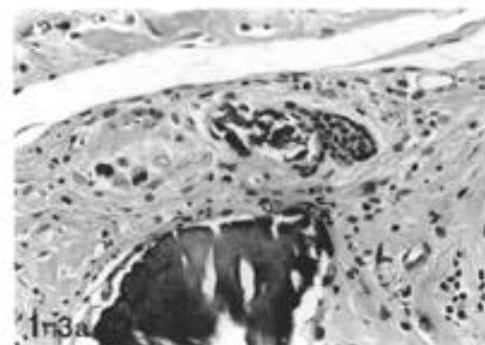
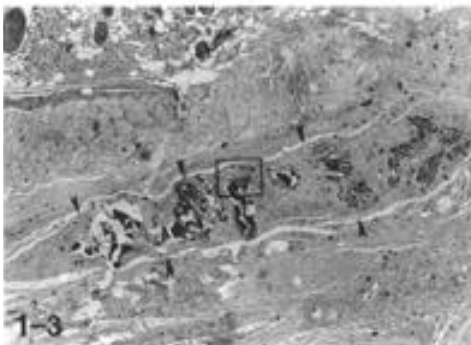
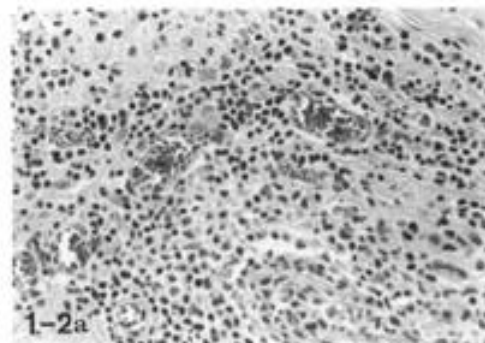
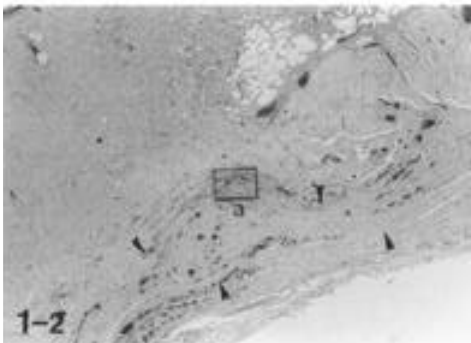
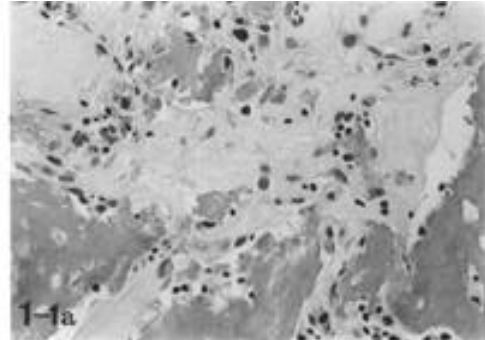
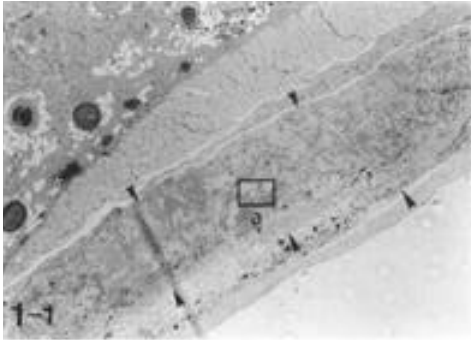
Figure 1 - 3. Dense collagen membrane group, 8 weeks(× 40. H&E stain) Membrane resorption didn't yet happen. The morphology of membrane is still evident like 3, 6 weeks' findings. Severe Inflammatory cell infiltration was decreased in membrane and surrounding connective tissue.

Figure 1 - 3a. Higher magnification of the area " a " shown in Fig. 1 - 3(× 400. H&E stain) Note the moderate inflammatory cell infiltration in membrane and surrounding connective tissue. The ectopic formation of calcified material were observed in membrane.

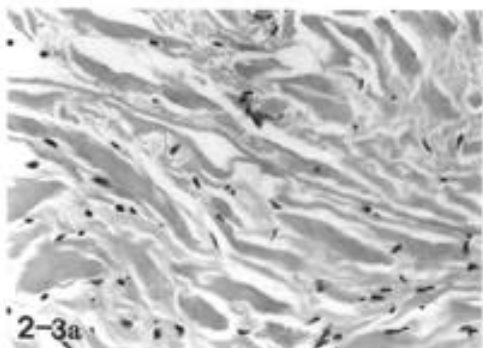
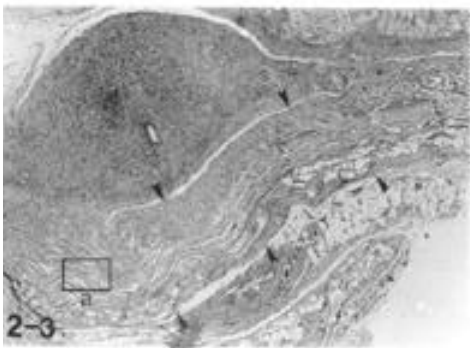
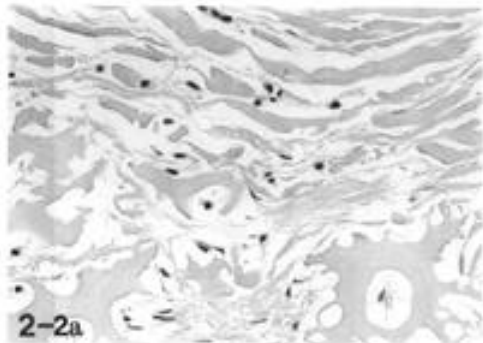
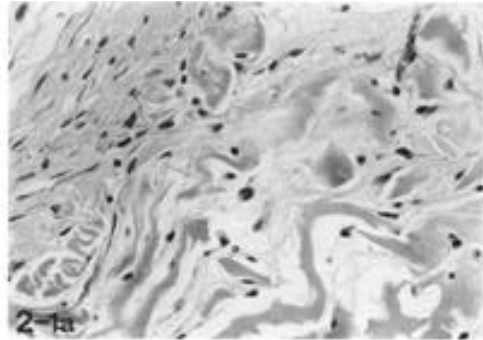
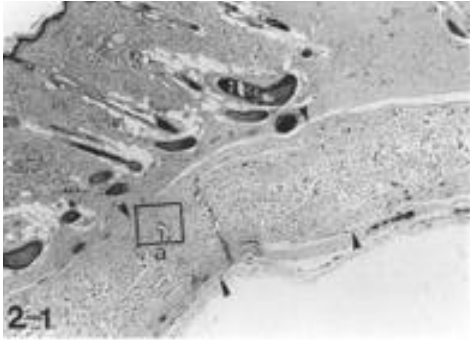
Figure 2 - 1 Freeze - dried bovine dura mater group, 3 weeks(× 40. H&E stain) Membrane resorption didn't happen. The morphology of membrane is evident and distinguished from surrounding connective tissue. A few inflammatory cells were observed in membrane.

Figure 2 - 1a. Higher magnification of the area " a " shown in Fig. 2 - 1(× 400. H&E stain)

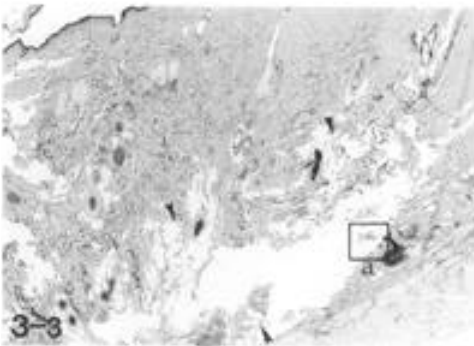
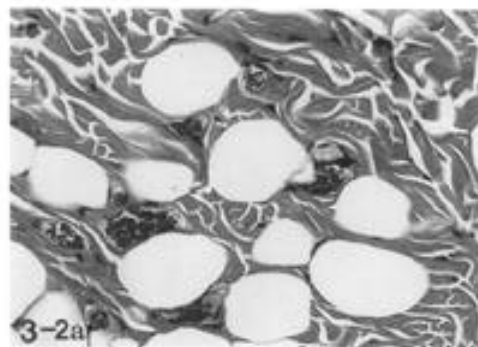
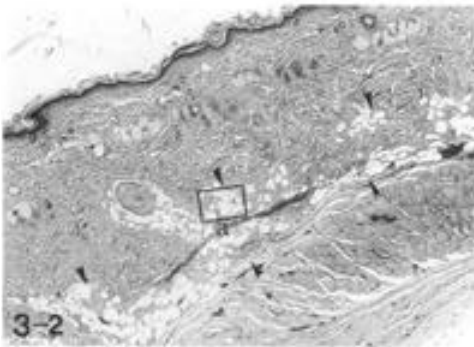
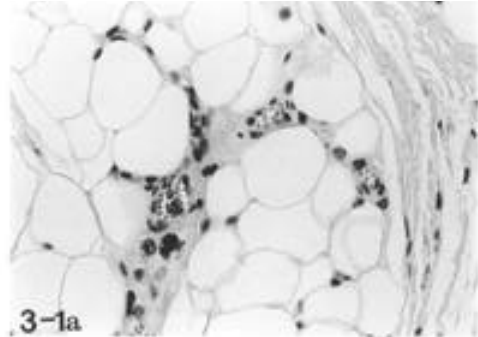
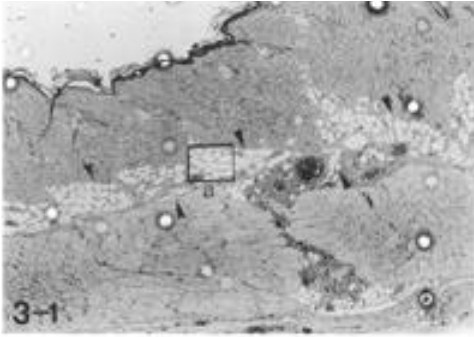
(1)



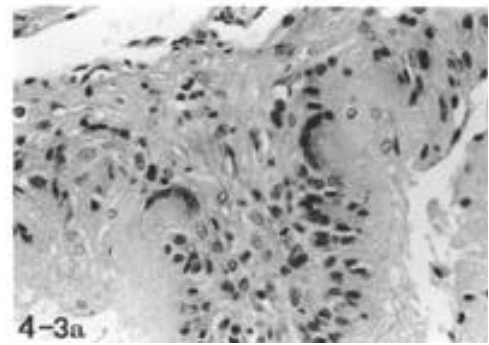
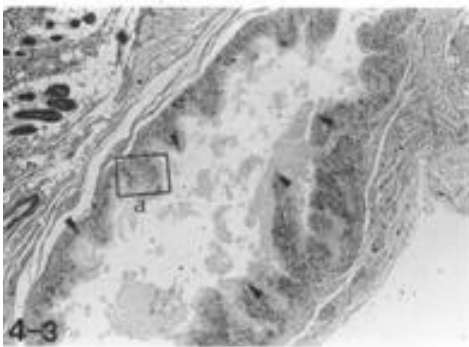
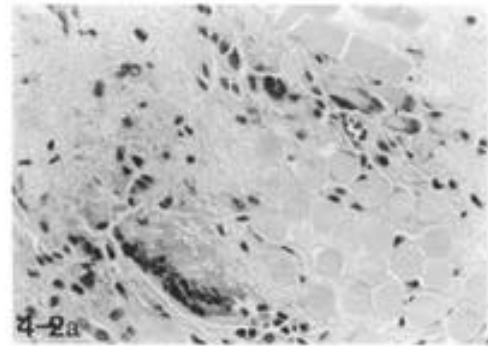
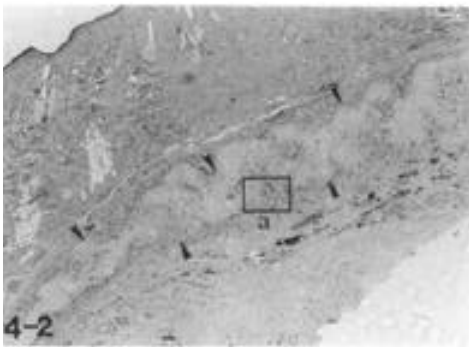
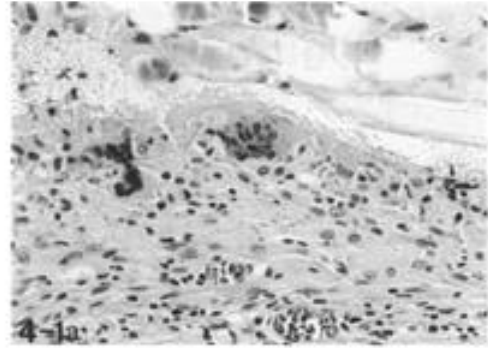
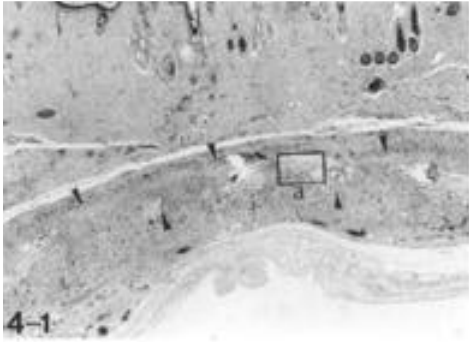
(II)



(III)



(IV)



Note neutrophils were observed.

- Figure 2 - 2. Freeze - dried bovine dura mater group, 6 weeks(× 40. H&E stain) 6 weeks' findings were similar to 3 weeks' findings.
- Figure 2 - 2a. Higher magnification of the area “ a ” shown in Fig. 2 - 2(× 400. H&E stain) Note neutrophils, lymphocytes were observed.
- Figure 2 - 3. Freeze - dried bovine dura mater group, 8 weeks(× 40. H&E stain) 8 weeks' findings were similar to 3, 6 weeks' findings.
- Figure 2 - 3a. Higher magnification of the area “ a ” shown in Fig. 2 - 3(× 400. H&E stain) Note mild Inflammatory cell infiltration was still observed.
- Figure 3 - 1. Loose collagen membrane group, 3 weeks(× 40. H&E stain) Membrane was already resorbed at 3 weeks and membrane integrity was lost. Membrane was replaced by connective tissue. Mild Inflammatory cell infiltration was observed.
- Figure 3 - 1a. Higher magnification of the area “ a ” shown in Fig. 3 - 1(× 400. H&E stain) Membrane was replaced by connective tissue. A few inflammatory cells and fibroblasts were observed.
- Figure 3 - 2. Loose collagen membrane group, 6 weeks(× 40. H&E stain) Membrane was almost resorbed.
- Figure 3 - 2a. Higher magnification of the area “ a ” shown in Fig. 3 - 2(× 400. H&E stain) Inflammatory cells were not observed.
- Figure 3 - 3 Loose collagen membrane group, 8 weeks(× 40. H&E stain) 8 weeks' findings were similar to 6 weeks' findings.
- Figure 3 - 3a. Higher magnification of the area “ a ” shown in Fig. 3 - 3(× 400. H&E stain)
- Figure 4 - 1. PLA/PLGA membrane group, 3 weeks(× 40. H&E stain) Membrane resorption didn't happen. The morphology of membrane is evident. Severe inflammatory cell infiltration was observed in membrane and surrounding connective tissue.
- Figure 4 - 1a. Higher magnification of the area “ a ” shown in Fig. 4 - 1(× 400. H&E stain) Severe inflammatory cell infiltration was observed in surrounding connective tissue. Especially multinucleated giant cells were present in membrane.
- Figure 4 - 2. PLA/PLGA membrane group, 6 weeks(× 40. H&E stain) Peripheral connective tissue ingrowths in the depth the membrane. The resorption started with short, small outgrowths of connective tissue septa. Severe inflammatory cell infiltration was observed in septa and membrane.
- Figure 4 - 2a. Higher magnification of the area “ a ” shown in Fig. 4 - 2(× 400. H&E stain) Severe inflammatory cell infiltration was observed in septa and membrane. Multinucleated giant cells were present in membrane.
- Figure 4 - 3 PLA/PLGA membrane group, 8 weeks(× 40. H&E stain) Connective tissue septa progressively lengthened, broadened and the advanced hydrolysis was observed

in central portion of membrane. Severe inflammatory cell infiltration was observed in septa.

Figure 4 - 3a Higher magnification of the area " a " shown in Fig. 4 - 3 (x 400. H&E stain) Septa consisted of a blood capillary, surrounded by a few connective tissue cells and inflammatory cells. Note multinucleated giant cells were also present in septa.

- Abstract -

Histologic Study on Tissue Response of Various Resorbable Membranes in Rats

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Department of Periodontology, Division of Dentistry, Graduate school, Kyung Hee University

The purpose of this study is to evaluate histologically the resorption and tissue response of various resorbable membranes used for guided tissue regeneration procedures, using a subcutaneous model on the dorsal surface of the rat. In this study, 12 Sprague - Dawley male rats (mean BW 150gm) were used and the commercially available materials included dense collagen membrane, freeze - dried bovine dura mater, loose collagen membrane, PLA/PLGA membrane. Animals were sacrificed at 3, 6 and 8 weeks after implantation of various resorbable membranes. Specimens were prepared with Hematoxylin - Eosin stain for light microscopic evaluation.

The results of this study were as follows:

1. Resorption : Loose collagen membrane group was resorbed most rapidly. Dense collagen membrane group

and freeze - dried bovine dura mater group were rarely resorbed.

2. Inflammatory reactions : PLA/PLGA membrane group showed persistent and severe inflammatory reactions for 3 to 8 weeks. Moderate inflammatory reactions and the ectopic formation of calcified material were observed in dense collagen membrane group. Freeze - dried bovine dura mater group and loose collagen membrane group showed mild inflammatory reactions
3. In PLA/PLGA membrane group, multinucleated giant cells by foreign body reactions were observed.

In conclusion, the resorption of freeze - dried bovine dura mater didn't happen for 3 - 6 weeks, which showed the best bio - compatibility. Therefore, freeze - dried bovine dura mater was considered proper resorbable membrane for guided tissue regeneration.