



가  
 , Barrier  
 oxidized rege-  
 nerated cellulose, sodium carboxymethyl cellulose (CMC), dex-  
 tran, sodium hyaluronate (HA)  
 polyethylene glycol-polypropylene glycol (PEG-PPG, Poloxa-  
 mer), polyethylene glycol (PEG), Gore-Tex

가

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**Table 1.** Anti-adhesion tested agents

Material	Molecular Wt. (dalton)	Conc.	Remarks
Alginate	Low visco.	1%	Na salt
CMC	—	1%	Na salt
HA	1,100,000 1,600,000	0.5%	Na salt
PEG-PPG copolymer	14,000	1%	Poloxamer 407
PEG	4,000	1%	—

CMC = carboxymethyl cellulose; HA = hyaluronic acid; PEG = polyethylene glycol; PPG = polypropylene glycol.

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1)

sodium alginate (Alg), sodium carboxymethyl cellulose (CMC), polyethylene glycol-polypropylene glycol (PEG-PPG, Poloxamer), polyethylene glycol (PEG) phosphate buffered saline (PBS) 1% , sodium hyaluronate (HA) 0.5%

120°C 20

ketamine hydrochloride (Table 1).

2)

Sprague-Dawley rat (female, Sam: TacN(SD)BR, Samtako Co., Seoul, Korea)

, 4 250 300 g

30 , Alg, CMC, PEG-PPG, PEG 10

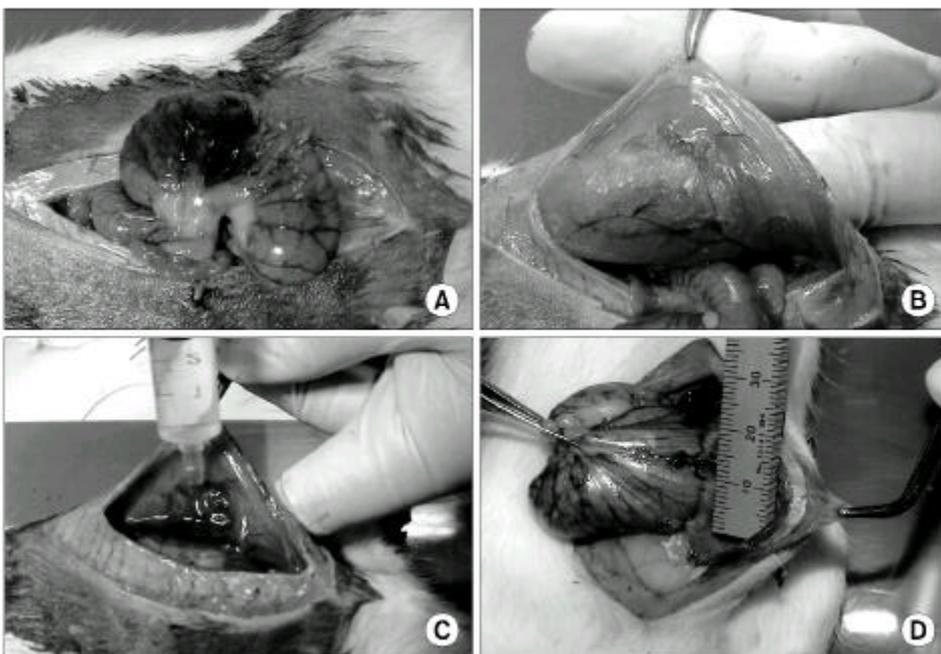
, HA 32

3)

ketamine hydrochloride

100 g 5 mg

, 가



**Fig. 1.** Method of rat experiment for adhesion. (A) Abrasion injury on cecal serosa was made. (B) Adjacent abdominal wall was abraded. (C) Tested solution material was applied. (D) Evaluation of adhesion degree was made.

100 g 2.5 mg 가 . 가

4 5 cm 가 . 가 가 가

1×2 cm bone burr 가 ,

bone burr 가

1 cm Student t-test

3 4-0 Nylon , p-value 0.05

5 ml 5)

20 , Alg, CMC, PEG-PPG, PEG 10

, HA 20

hematoxylin eosin

가 (Fig. 1)

4) 가

가 Vlahos (6)

0 5 , 0 =

, 1 = , 2 =

, 3 = , 4 =

, 5 =

1 4 ,

1 = , 2 =

, 3 =

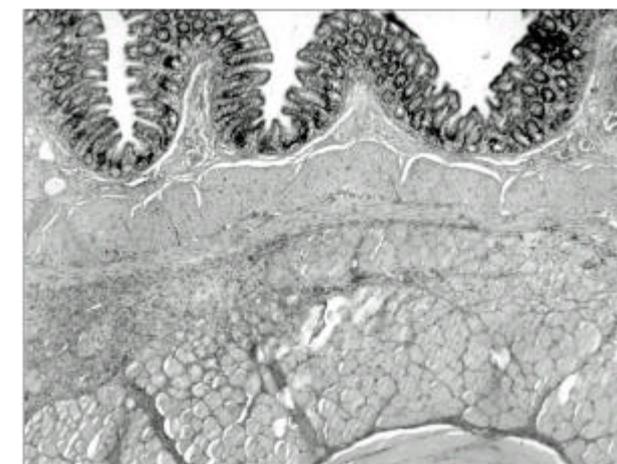
, 4 =

(Table 2).

**Table 2.** Classification of adhesion severity and strength

Adhesion severity	
0	No adhesions
1	One thin filmy adhesion
2	Two or more thin filmy adhesion
3	Thick adhesion with focal point
4	Thick adhesion with planar attachment
5	Very thick vascularized adhesions
Adhesion strength	
1	Adhesion was filmy and easily torn with very light pressure
2	Adhesion was substantial and needed moderate pressure to tear
3	Adhesion was heavy and required significant pressure to rupture
4	Adhesion was very heavy and difficult to rupture

Table 3



**Fig. 2.** Histologic finding reveal dense fibrous adhesion between the intestine and peritoneal wall (H&E stain, ×40).

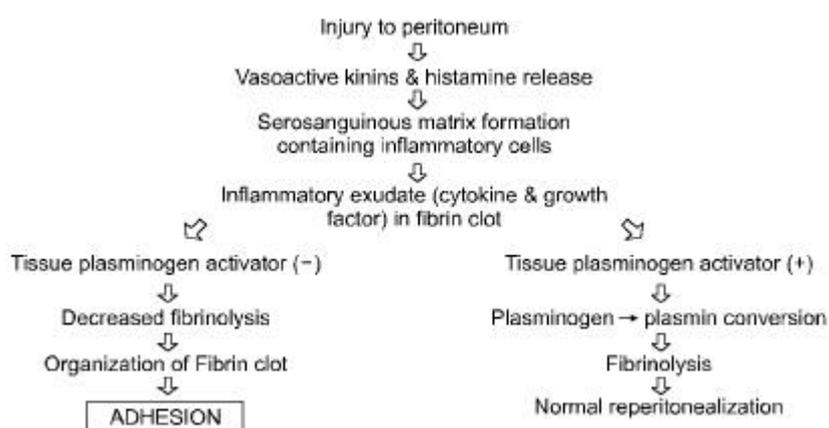
(Fig. 2).



**Table 4.** Histologic features of biopsies from adhesions

Material (n)	Granulation tissue	Giant cells	Fibrosis	Macrophages	Fat necrosis
Control (20)	1.45±0.66	1.50±0.67	1.85±0.85	1.35±0.57	0.05±0.89
Alginate (10)	1.80±0.87	2.50±0.50*	1.20±1.01*	2.00±0.77*	0.40±0.22
CMC (10)	1.42±0.49	2.14±0.63*	1.19±0.45*	2.00±0.53*	0
HA (20)	1.43±0.49	1.42±0.67	1.13±0.87*	1.26±0.54	0
Poloxamer (10)	1.52±0.92	1.00±0.44	1.82±0.96	1.18±0.44	0
PEG (10)	1.50±0.92	1.00±0.44	1.80±0.98	1.20±0.40	0

\*P value < 0.05 versus control.



**Fig. 5.** Proposed adhesion mechanism (Reference; Infertility and Reproductive Medicine 1994;5(3):391-404).

가 1, 2 가

Alg, CMC, HA

Alg,

CMC

가 Grainger(7)가

(Table 4).

kinins histamine

cytokine

interleukin-1 (IL-1) 가 IL-1

4

가

5 10 가 (3) 가 (5)

) 가 . 가  
 plasminogen plasmin tissue CMC Alg.  
 plasminogen activator (tPA)  
 가 (Fig. 4). 가  
 가 .  
 tPA 가 .(8) HA  
 HA  
 .(9) Barrier  
 가 HA 가  
 , Sawada (19) HA  
 가  
 oxidized regenerated cellulose,(10) sodium carboxy-  
 methyl cellulose (CMC), dextran, sodium hyaluronate (HA),  
 (11-14) heparin(15) , PEG, Poloxamer,(16,17) Gore-Tex(18)  
 160  
 HA 1934 Meyer Palmer가  
 . HA  
 D-glu-  
 cronic acid N-acetyl-D-glucosamine  
 (1- > 3) (1- > 4) glucosidic  
 HA  
 . CMC cellulose  
 , monochloroacetate  
 .(20) CMC  
 , mannuronic acid guluronic acid  
 , 2가  
 .(21) Alg  
 Poloxamer, PEG PBS 1%  
 , HA 0.5%  
 Vlahos 가 . PEG Poloxamer  
 (6) . Vlahos  
 5 가 4  
 가 4 5  
 가  
 tran  
 . CMC, Alg HA가  
 PEG, Poloxamer 가 가  
 가  
 . Burns (5) CMC sodium hyaluronate (HA)  
 HA  
 가 1 3

PEG  
 가  
 가  
 HA HA (hyaluronidase)  
 .(22)  
 가  
 HA가 PEG, Poloxamer  
 ,  
 가  
 가  
 Alg, CMC HA가  
 , Alg, CMC, HA, Poloxamer  
 . Alg, CMC, HA  
 Poloxamer  
 . PEG  
 가 , Poloxamer Pol-  
 , PEG 4,000 14,000  
 가  
 ,  
 . Alg, CMC HA가  
 ,  
 . Alg CMC  
 HA가  
 가  
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271-6.  
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