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The Effect of Reoperation on the Patency Rate of Arteriovenous Fistula for Hemodialysis

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Purpose: We designed this study to find out the risk factors affecting the patency rate after creation of an arteriovenous fistula (AVF) for hemodialysis.

Methods: Between March 1997 and December 2001, a total of 397 AVF operations in 314 patients were performed by a single surgeon using the same surgical technique and principles. One hundred and forty cases (35.3%) were reoperations due to previous AVF failure. Artificial vessels (=PTFE, polytetrafluoroethylene) were used for the AVF in 39 cases (9.8%). The sex, age, diabetes mellitus, previous operation history and type of dialysis center were considered as a possible risk factors affecting the patency rate.

Results: After a mean follow-up of 18.3 months, there were 63 cases of patient death, 15 of kidney transplantation, and 104 of AVF failure identified. The overall patency rates of 1, 2 and 3 year were 76.2, 70.9, and 66.9%, respectively. From the multivariate analysis, the previous operation history was the only significant factor affecting the patency rate of AVF ($P=0.001$, odd ratio=2.58). Although the diabetic patient (odd ratio=1.43) and artificial vessel groups (odd ratio=1.678) showed high odd ratios, these factors were not statistically significant ($P>0.05$). From the univariate analysis, the reoperation cases also showed a significantly inferior patency rate compared to the first operation cases (1 year patency rate was 65.2% and 83.7%, $P=0.001$). However, the diabetes and types of vessel showed no significant differences in patency rates.

Conclusion: A reoperation of an AVF creation was the most significant risk factor affecting the patency rate after its original creation. The first attempt AVF creations showed favorable patency rates. To improve the overall patency rate of an AVF creation, a more delicate preoperative study and accurate surgical technique will be required at the time of the first AVF operation. (*J Korean Surg Soc* 2003;64:243-250)

Key Words: Arteriovenous fistula (AVF), Patency rate, Reoperation

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(1,2) 1999
가 (3)
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(4-7)
가 (8)
(9,10)

		Proportional Hazard ratio)	Life-table	Cox (odd Wilcoxon
1997 3	2001 12			
	314			0.05
	397			
1) (non-dominant)		314	397	
(radiocephalic fistula, RCF), 2)		215 (54.2%),	182 (45.8%)	
(brachiocephalic fistula, BCF), 3)		51.6 (17~87)		
, 4)		101 (25.4%),		
, 5)		158 (39.8%),		
(brachio-brachial fistula with PTFE (polytetrafluoroethylene), BB-PTFE), 6)		138 (34.8%)		
(axillo-axillary fistula with PTFE, AA-PTFE), 7)		124 (31.2%),	가 273 (68.8%)	가
(femoral-saphenous fistula with PTFE, FS-PTFE)		가 85 (21.4%)	가 312 (78.6%),	
가		(radiocephalic)	가 250 (63%),	
(loop configuration)		(brachiocephalic)	가 103 (25.9%),	
가		가 44 (11.1%)	가	
		358 (90.2%),		
		39 (9.8%)		
1997		가 308 (77.6%),	가 89 (22.4%)	
1998		257 (64.7%)	, 140 (35.3%)	
(Table 1).				
2)		18.3	, 63 (15.9%)	
		15 (3.8%)	, 104	
			38 (36.6%), (thrombosis) 33 (31.7%),	
			(venous stenosis) 15 (14.4%),	
		7 (6.7%),	4 (3.9%),	
			2 (1.9%),	

Table 1. The previous arteriovenous fistula operation history

Previous operation number	No.	%
0	257	64.7
1	71	17.9
2	33	8.3
> 3	36	9.1
Total	397	100.0

5 (4.8%) , 가 3)
 (Table 2).
 가 1, 2 3 (patency
 rate) 76.2%, 70.9% 66.7% .
 1 18 (4.5%), 1 4)
 15 (3.8%) 8.3%
 (), (60), (
), (PTFE),
 (Table 3). (), (1),

Table 2. Causes of arteriovenous fistula failure according to the post-operative months

Causes	< 3 months	3~12 months	12 months	Total
Failure of growth	38 70.4%			38 36.6%
Thrombosis	8 14.8%	15 48.4%	10 52.6%	33 31.7%
Venous stenosis		11 35.5%	4 21.1%	15 14.4%
Infection	4 7.4%	2 6.5%	1 5.3%	7 6.7%
Trauma	4 7.4%			4 3.9%
Hypotensive attack		1 3.2%	1 5.3%	2 4.8%
Other failure		2 6.5%	3 15.8%	5 4.8%
Patient death*	22	15	26	63
Kidney transplantation*	2	7	6	15
Total	78	53	51	182

*considered as censored data.

Table 3. Incidence of complication after arteriovenous fistula operation

	Early complication (<=1 month)		Late complication (>1 month)		
	No.	%	No.	%	
Infection	8	2.0	Venous hypertension	7	1.7
Hematoma	4	1.0	Aneurysm	4	1.0
Seroma	3	0.8	Infection	3	0.8
Pseudoaneurysm	1	0.2	Steal syndrome	1	0.3
Others	2	0.5			
Subtotal	18	4.5	Subtotal	15	3.8
Total			33 (8.3%)		

Table 4. Risk factors affecting the patency of arteriovenous fistula (Multi-variate analysis)

Risk factors	P-value	Odd ratio	95% Confidence interval	
			Low	High
Female	0.907	0.974	0.630	1.507
Age >=60 years old	0.563	1.151	0.715	1.854
Diabetes mellitus	0.132	1.43	0.898	2.275
PTFE group	0.075	1.678	0.949	2.964
Reoperation	0.0001	2.580	1.590	4.186
Primitive dialysis center	0.133	0.695	0.433	1.118
Medical assistant	0.350	1.269	0.770	2.089

PTFE = polytetrafluoroethylene.

()
 (odd ratio=1.43), (odd ratio=
 1.678)
 (P=0.0001, odd ratio=2.580, Table 4).
 5)
 (1)
 (n=257) 1 83.9% , 2 3
 (n=104) 1 68.4% , 4 (n=36)
 47.2% 가
 (P<0.001, Fig. 1).
 가
 353
 (n=254) 1 3
 83.7% 77.0% , (n=99) 1
 3 65.2% 56.3%
 (P<0.001, Fig. 2A). 가
 (RCF, n=250)
 (n=211) 1 3 83.8%
 76.7% , (n=39) 61.1% 50.6%
 (P=0.003, Fig. 2B).
 39
 4 (n=20) 1 3
 77.3% 68.7% , 4 (n=19)
 1 3 47.3% 11.0%
 (P=0.038, Fig. 3).
 (2)
 : 가
 1 3 77.9% 70.1% ,
 (n=39) 62.1% 38.5%

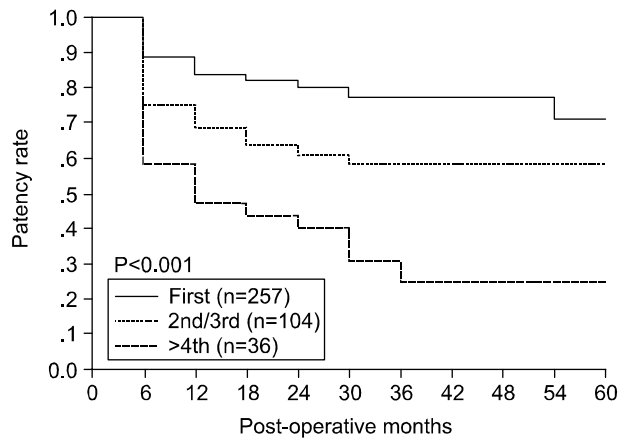
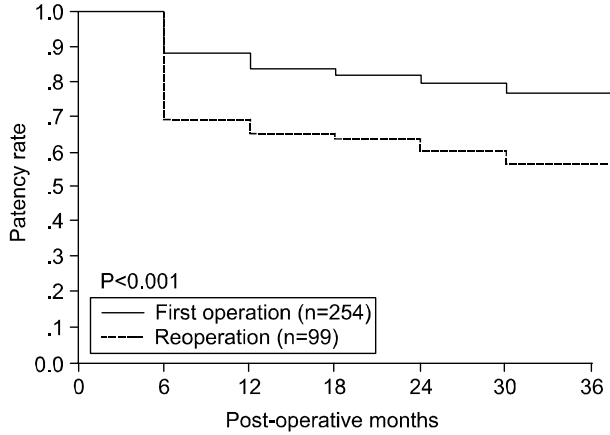


Fig. 1. Patency rate according to the previous operation history. The patency rate of reoperation group were significantly inferior to that of primary operation group (p<0.001).

가
 (P=0.051, Fig. 4).
 (3)
 :
 (n=259) 1 3 80.0%
 72.9% , (n=138)
 69.2% 55.6%
 (P=0.0042, Fig. 5A). ,
 138 2
 (n=80) 1 3 75.1% 62.7% ,
 (n=58) 1 3 61.5%
 45.3% (P=0.0883
 Fig. 5B).
 (4)
 : (n=123)

A. Autologous vein group (n=353)



B. Radiocephalic fistula group (n=250)

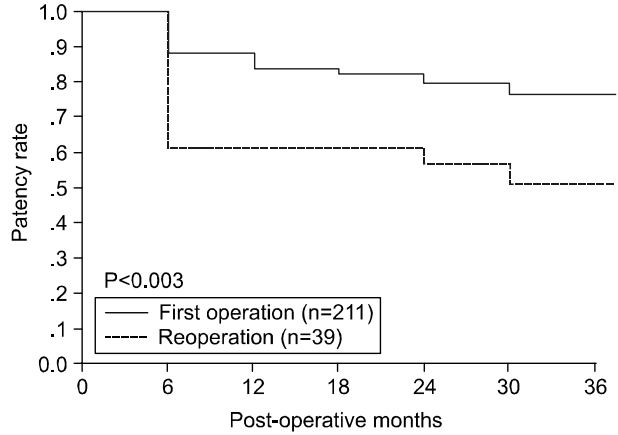


Fig. 2. Patency rate according to the previous operation history in autologous vein used group (A) and radiocephalic fistula group (B). In univariate analysis, the previous operation history was definitive risk factor affecting to the patency rate.

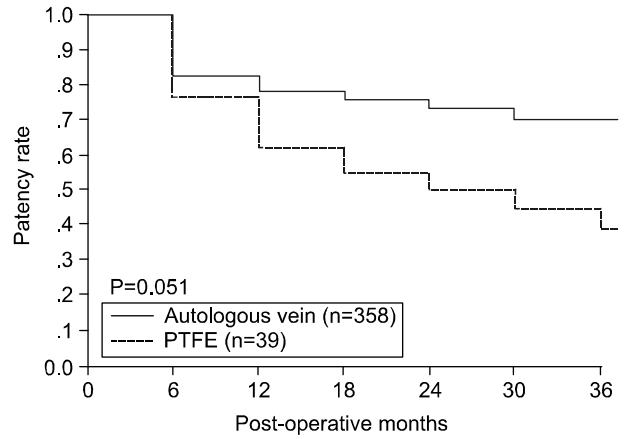
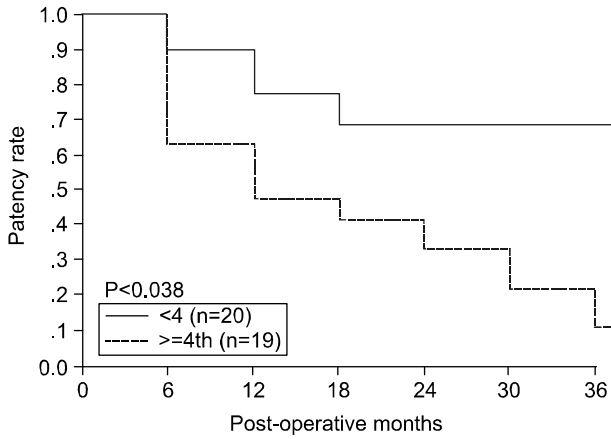


Fig. 3. Patency rate according to the previous operation history in PTFE used group. In univariate analysis, the previous multiple operation history(≥ 4) was definitive risk factor affecting to the patency rate.

Fig. 4. Patency rate according to the material of arteriovenous fistula. The long-term patency rate of PTFE used group was inferior to that of autologous vein, but it was not statistically significant ($p=0.051$).

1 3 70.7% 58.7% ,
78.7% 69.8% 가
($P=0.2388$, Fig. 6).

(5) :
(n=308) 1 3
79.0% 69.4% , (n=89) 가
65.2% 53.2% (P=0.641).
가 (n=127) 1
3 74.3% 62.2% , 1
(n=270) 77.2% 68.6%
($P=0.3678$).

(6) : 60 (n=129) 1 3
75.4% 63.4% 60 (n=283) 76.0% 60
66.4% (P=0.9022).



가

가

, 1 66 22

60 59.4%, 54.4% 1

가 .(8)

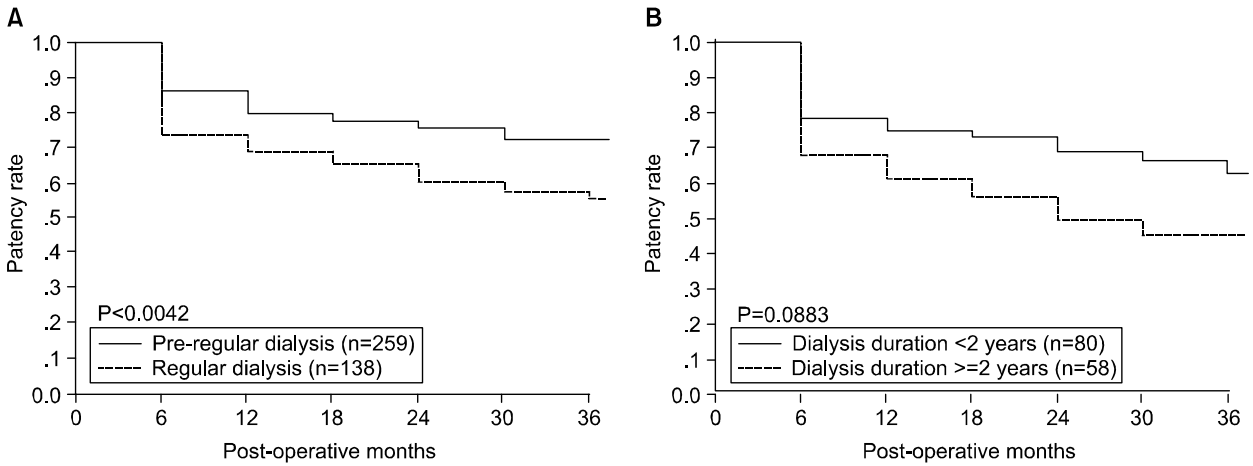


Fig. 5. Patency rate according to the dialysis status (A) at operation time and dialysis durations in regular dialysis subgroup (B). Among the primary operation group, early operation (=pre-regular dialysis) group showed superior patency rate (A). But the dialysis duration in regular dialysis group was not significant risk factor affecting the patency rate (B).

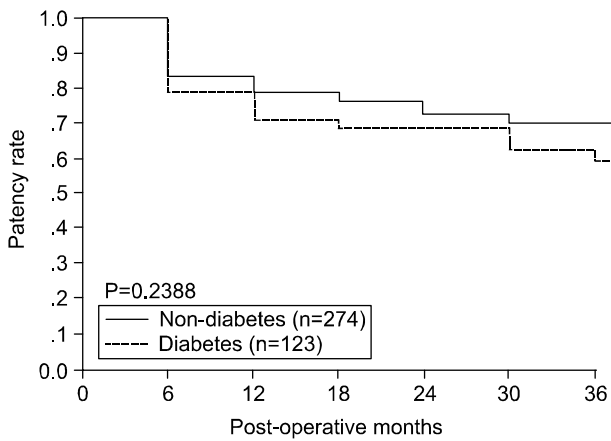
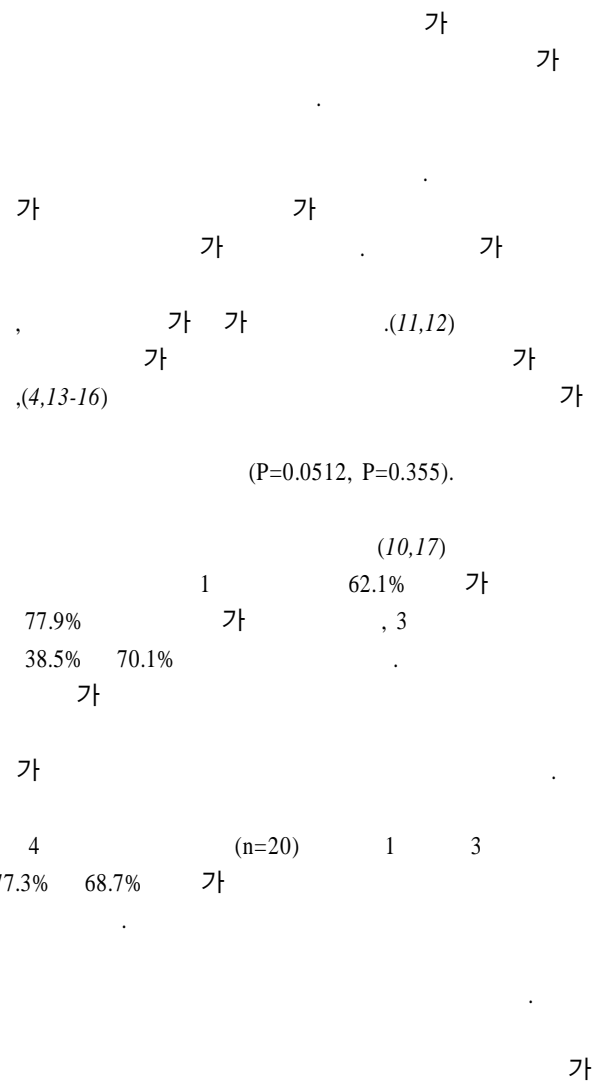


Fig. 6. Patency rate according to the presence of diabetes mellitus. The patency rate of diabetes patient was not difference from that of non-diabetes (P=0.2388).



(P=0.0001, Fig. 2).

(BCF) 가 (RCF)

가

(11,12,17)

가 가

가 가 50 60

가 (6)

(1,8,7) (10,18) 가

(36.5%)

70%

가

2 mm 6.3%

(5)

, palmar arch

가

(3,19)

가

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