



: (US  
vascular mapping)

: 2001 1 2003 4 66  
( : =34:32, 58.8 )

Fischer exact test, Log - rank test ,  
Fischer exact test  
: 11.8% 28.1%  
( $p=0.09$ ). 가  
가 7.4% (25.9%)  
( $p=0.06$ ). 8 , 2 (33.3%)  
, 6 (46.3%) ( $p= 0.37$ ).  
1 가 92.6%,  
71.4% ( $p= 0.10, p=0.79$ ).  
가  
16.6%, 22.2%  
( $p=0.01, p=0.03$ ).  
:  
가

(2, 3), 1 가  
가 가 (4).  
, 가  
(1). 가  
가 (5). ,  
가

1 23 3 , 가  
(6).

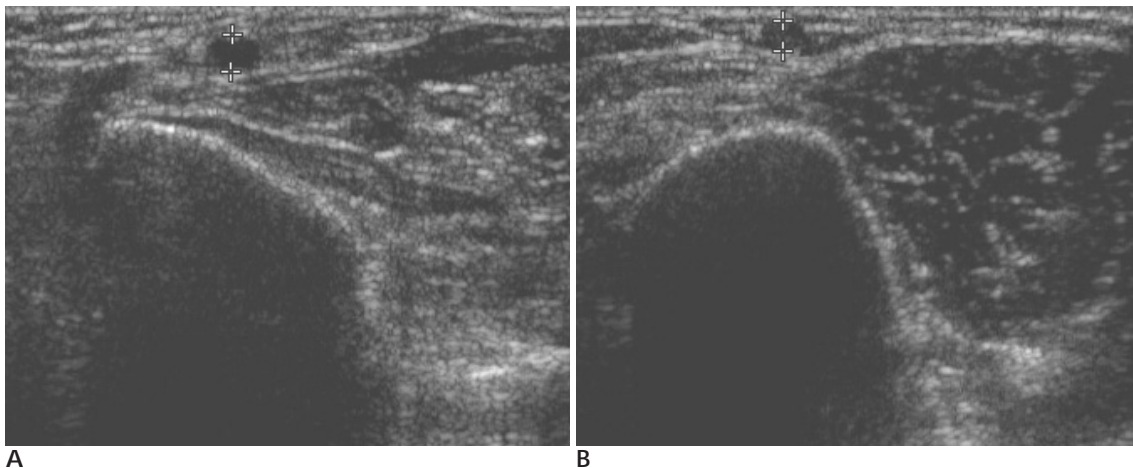
2006 3 4 2006 10 20 .

2001 1 2003 4  
135  
8 가 66  
2002 7  
2003 4 64 가  
34 ( : =15:19,  
57.8 )  
2001 1 2002 6  
32 ( : =20:12, 60.3 )  
Student t - test  
( $p=0.45$ ).  
가 17 (50.0%)  
17 (53.1%)  
( $p = 0.80$ ).  
가 I  
II I  
27 , II 7 , I 27 , II 5  
(Table 1). 가  
19 11

I 4 , II  
I 3 , II 4 7  
HDI 5000 (Advanced  
Technology Laboratory, Bothell, WA, U.S.A.) 5 - 12  
MHz  
2.0 mm  
가  
2.5 mm , 4.0 mm  
(6). 45  
2.0 mm 2.0 mm  
(Fig. 1).  
(cephalic vein) 2.5 mm  
가  
1.0 mm

**Table 1.** Control Group vs Vascular Mapping Group

	Control Group	Vascular Mapping Group
M:F	20:12	15:19
Mean age	60.3	57.8
Number of diabetic patients	27	27
Number of the patients with native arteriovenous fistula	27	27
Number of the patients with synthetic arteriovenous graft	5	7
Total	32	34



**Fig. 1.** Preoperative US vascular mapping in a 68-year-old woman. The radial artery (A) and cephalic vein(B) were demonstrated and measured as 2.3 mm and 2.8 mm respectively. Native arteriovenous fistula was performed between radial artery and cephalic vein at his forearm and the patency was kept for more than 2 years after the operation.

(antecubital fossa) (brachial artery)  
 (basilic vein), (brachial vein), 2 52  
 , 48  
 ,  
 ,  
 가 30  
 66 11  
 I 2 , II 2 4  
 5 , II 2 7  
 11.8%, 28.1%  
 (percutaneous ballooning angioplasty) ( $p = 0.09$ ).  
 I II  
 가 2 (7.4%), 5 (25.9%)  
 Chi - square test 2 (28.6%), 2 (40.0%)  
 ( $p = 0.06$ ), II  
 ( $p = 0.42$ ) (Table 2).  
 가  
 I II  
 Fischer exact test  
 4 1 11 ,  
 , 7 2 , 3  
 8 , 5  
 19 ,  
 11 8  
 2  
 I 3 , II 3 6  
 (Fig. 2). 33.3%,  
 46.3%  
 Fischer exact test  
 ( $p = 0.37$ ).

**Table 2.** Reoperation Rate between Vascular Mapping Group and Control Group According to Operation Type

Group	Number of Reoperation (%)	p-value
I (n = 54)		
Mapping (n = 27)	2 (7.4)	$p = 0.06$
Control (n = 27)	5 (18.5)	
II (n = 12)		
Mapping (n = 7)	2 (28.6)	$p = 0.42$
Control (n = 5)	2 (40.0)	

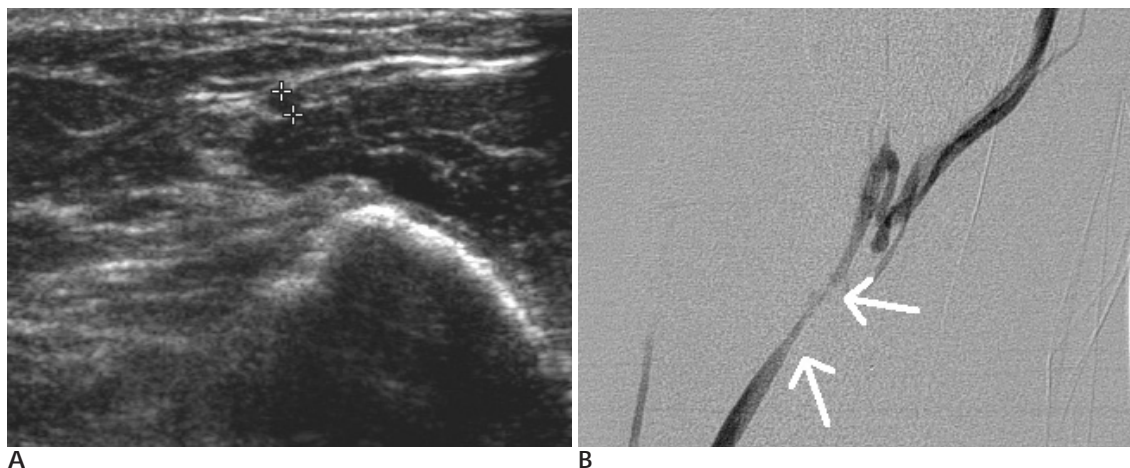
\*Statistically significant tendency was shown by Chi-square test ( $p < 0.05$ ).

I: The patient group with native arteriovenous fistula

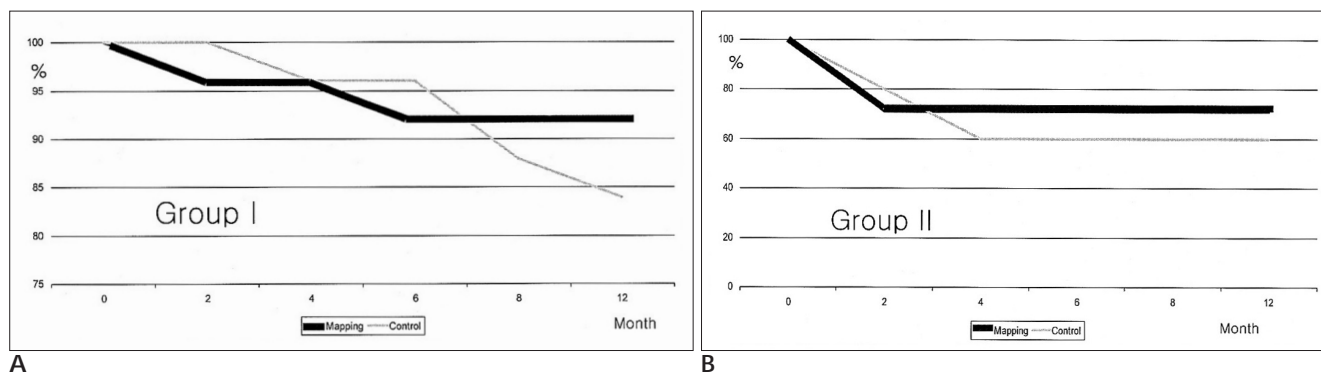
II: The patient group with synthetic arteriovenous graft

:  
 2.0 mm  
 2.5 mm  
 4.0 mm  
 A  
 3/22  
 A 3/22  
 (Table 3).  
 1/22, B 3/12  
 , A 2, B 1  
 (Fig. 4).  
 I A B 16.6%,  
 25.0% 66.6%  
 (p = 0.01, 0.03).  
 22.2%, II  
 가  
 92.6%, 81.5%, II  
 71.4%, 60.0% (Fig. 3). 가  
 I  
 (p = 0.10 in group I, p = 0.79 in group II).

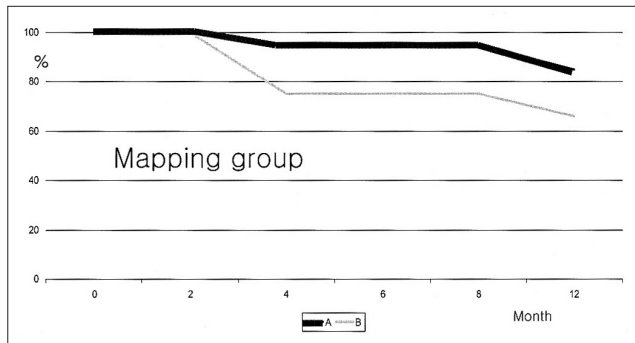
가



**Fig. 2.** Failure of patency maintenance due to selection of inappropriate vessel.  
 The US vascular mapping (A) reveals the diameter of cephalic vein as 1.6 mm in a 48-year-old woman with native arteriovenous fistula. After 2 months, the venography (B) shows diffuse stenosis at the operating vein(white arrows).



**Fig. 3.** Comparison of patency between vascular mapping group and control group according to operation type.  
 Group I is composed of the patients with native arteriovenous fistula (A) and Group II is composed of the patients with synthetic arteriovenous graft (B).



**Fig. 4.** Relation between the diameter of selected vein and patency with the passage of time in the patients of US vascular mapping group.

Group A is composed of the patients using preoperatively recommended vessel diameter. Group B is composed of the patients using not-recommended vessels. Group B came to the loss of patency faster than group A.

**Table 3.** Relation between the Diameter of the Selected Vessel and Reoperation Rate

Group	Number of Reoperation (%)	p-value
I (n = 27)		
A (n = 18)	3 (16.6)	p = 0.01*
B (n = 9)	2 (22.2)	
II (n = 7)		
A (n = 4)	1 (25.0)	p = 0.03*
B (n = 3)	2 (66.6)	

\*Statistically significant tendency was shown by Fischer exact test ( $p < 0.05$ ).

I: The patient group with native arteriovenous fistula

II: The patient group with synthetic arteriovenous graft

A: The patients using preoperatively recommended vessels

B: The patients using not-recommended vessels

가

가 12

가

가

가

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## Efficacy of Preoperative US Vascular Mapping for Arteriovenous Fistula in Patients with Hemodialysis<sup>1</sup>

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**Purpose:** The purpose of this study is to assess the efficacy of preoperative US vascular mapping to predict postoperative patency of the arteriovenous fistula for hemodialysis.

**Materials and Methods:** Sixty-six patients who underwent hemodialysis for end-stage renal failure (M:F = 34:32, mean age, 58.8 years) were observed prospectively from January 2001 to April 2003. The patients were divided into two groups: the vascular mapping group and the control group. A comparative analysis of the re-operation rate between the two groups was determined by use of the chi-square test, efficacy of preoperative US vascular mapping according to the type of surgery. A comparative analysis of the secondary patency after percutaneous transluminal angioplasty was determined by the use of Fischer exact test, and a comparative analysis of the diminution of patency during the follow-up periods was determined by the use of the Log-rank test. In the mapping group, the diameters of intraoperatively selected vessels were investigated and compared with the recommended diameter on preoperative US vascular mapping determined statistically by the use of Fisher's exact test.

**Results:** The preoperative US vascular mapping group had relatively lower re-operation rates (11.8%) than the control group (28.1%) ( $p=0.09$ ). The preventive role of US vascular mapping is more effective in decreasing the re-operation rate for a native arteriovenous fistula (7.4%) than for a synthetic arteriovenous graft (25.9%) ( $p=0.06$ ). For patients that had an interventional procedure, the failure rate to obtain a secondary patency was smaller than in the mapping group (33.3%), compared with the control group (46.3%) ( $p=0.37$ ). Patients in the mapping group had a higher patency than the control group patients for a native arteriovenous fistula (92.0%) and a synthetic arteriovenous graft (71.4%) at one year following surgery ( $p=0.10$ ,  $p=0.79$ ). The arteriovenous fistulas in the mapping group had a higher patency for both a native arteriovenous fistula (16.6%) and a synthetic arteriovenous graft (22.2%), which was statistically significant ( $p=0.01$ ,  $p=0.03$ ).

**Conclusion:** Preoperative US vascular mapping is considered to be a useful technique for the preoperative evaluation of an arteriovenous fistula and to contribute to maintaining its postoperative patency and reducing the rate of repeated surgery.

**Index words :** Dialysis  
Fistula, arteriovenous  
Veins, US

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