

# 가

1

. . . . .<sup>2</sup> . . . . .

: 가

: 1997 3 2001 9 가 가

56 , 67 . 59 가 48

8

11 .

3

: 59 , 84

54 , 가 17 , 13 . 51

14 . 가 13 , 6 . 8

7 , 가 1 . 79.1% (53/67) .

59 85.4% (41/48), 6

83.1%, 12 67.4% 54.5% (6/11), 6 83.3%, 12

62.5% . 8 75% (6/8) 6

80%, 12 30% . 가

가 1 , 1 , 3 , 가 2

: 가

가 가 가 (1-3).

. 가 가 가 , ,

(arteriovenous fistula) 가 가 ,

가 가 가 ,

(1-3). 가 가 (4).

가 가 ( PTA )

, 가 가 가

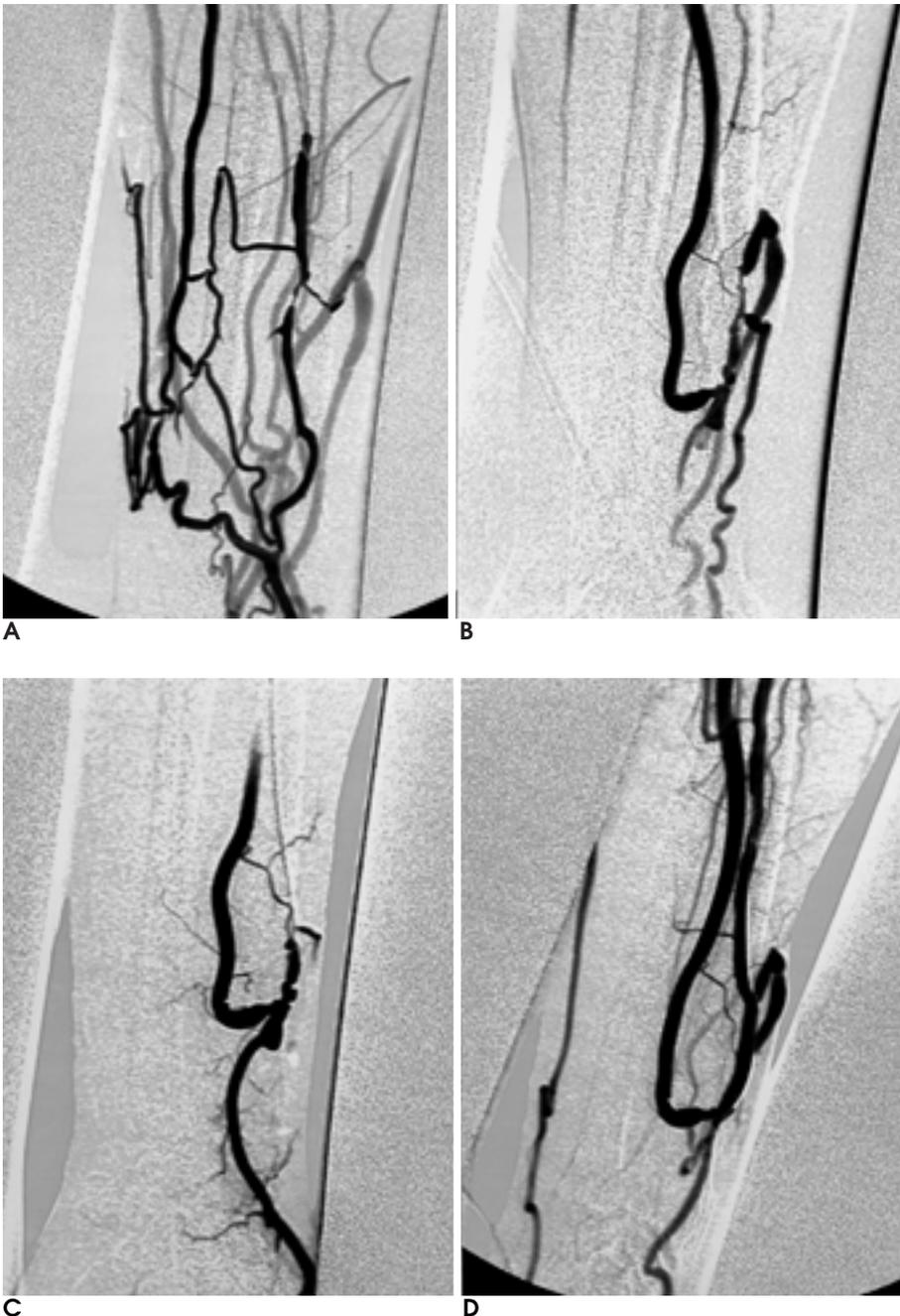
가 가 (3, 5, 6).

가 가

<sup>1</sup>

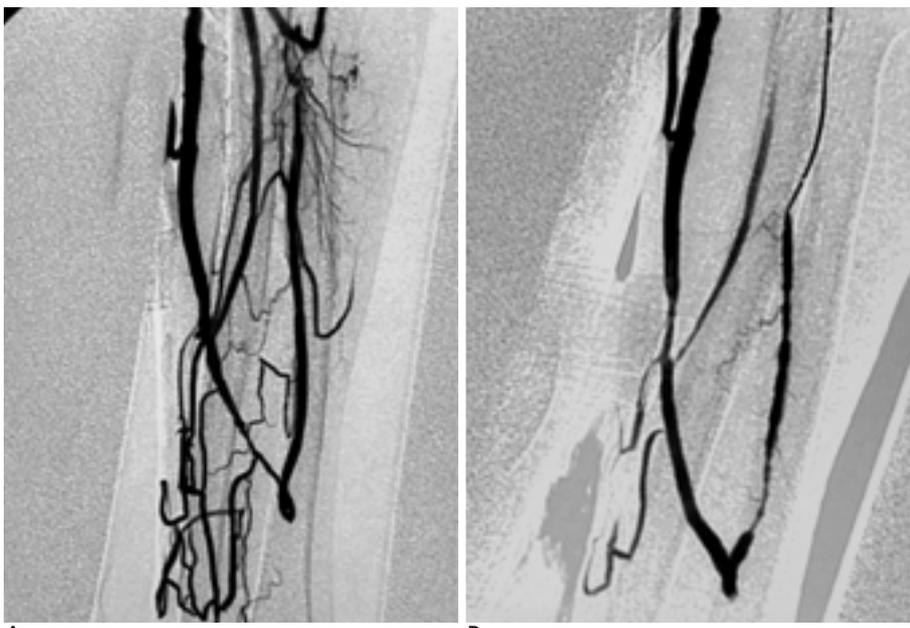
<sup>2</sup> 2002 6 24 2002 10 7 .

가 : 가  
 가 , 40 , 14  
 , 2 가 . 51  
 (91%)  
 (side - to - end Brescia -  
 Cimino fistula), 5 (9%)  
 가 . 가  
 56 , 11 ,  
 , 67 . 45 , 2 , 가 ,  
 가 25 , 가 31 ,  
 20 - 79 ( 52.5 ) . (Digital subtraction angiogram) ,



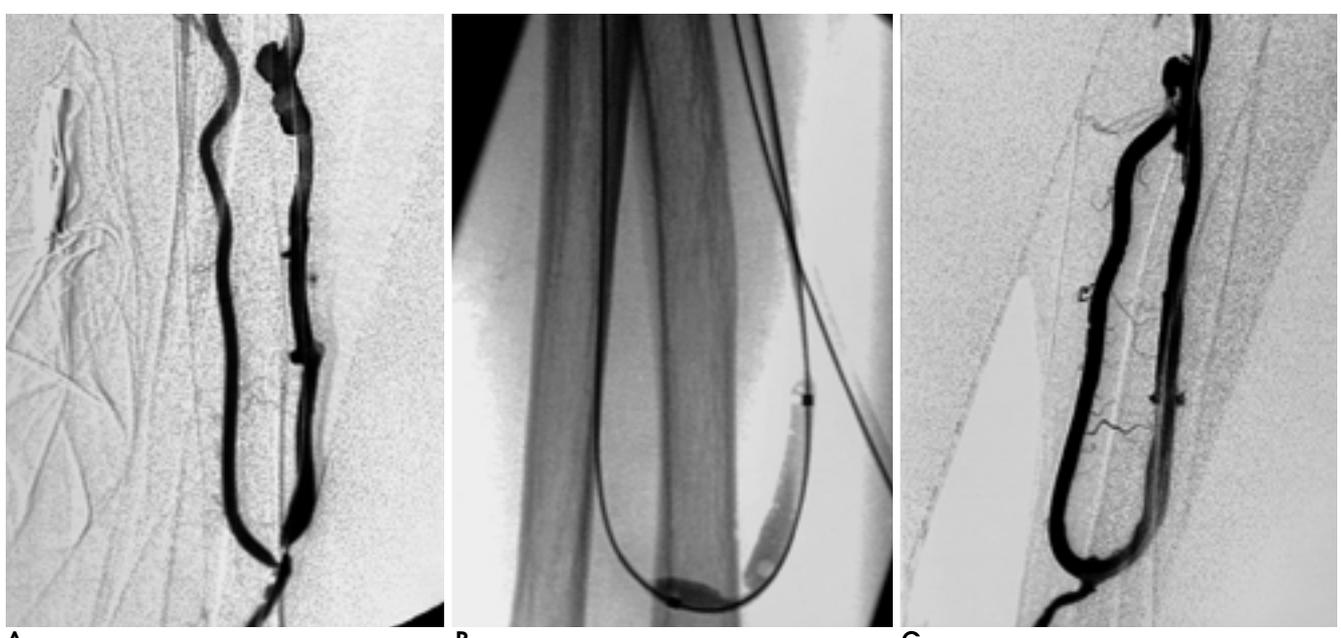
**Fig. 1. A.** Digital subtraction angiogram (DSA) obtained from retrograde venous approach shows multiple stenosis in venous limb of native AVF. But DSA failed to reveal arterial limb of native AVF.  
**B.** After femoral artery puncture, left brachial angiogram demonstrates multiple stenosis at the anastomosis site and venous limb of native AVF.  
**C.** Digital subtraction angiogram (DSA) was obtained from retrograde venous approach once again and PTA was performed through this (not shown).  
**D.** After PTA, there is significant dilation of the stenosis.

PTA Heparin ( ) 3,000 - 5,000  
 5 - F Multipurpose catheter  
 hunter, COOK, Bloomington, U.S.A.) Cobra catheter (COOK,  
 (head 가 (COOK, Bloomington, U.S.A.)  
 가 (COOK, Bloomington, U.S.A.)  
 PTA  
 가 (Fig. 1).  
 가  
 가 (n=8) (Fig. 2), 0.035 - inch  
 3 - F  
 ) (n=20).  
 PTA (Fig. 3),  
 가 (Fig. 3, 4). PTA PTA  
 가 (n=6). 4 cm Ultra - thin Diamond 4 - 6 mm, 2 -  
 (Galway, U.S.A.) (Boston Scientific,  
 4 cm, 8 - 12 mm 가  
 PTA  
 가 inflator (Encore 26:  
 Boston Scientific, Galway, U.S.A.) 6 - 15  
 30 - 1 , 2 - 4  
 가 가 가 25  
 가 가 Blue max (Boston Scientific,  
 Galway, U.S.A.)  
 PTA lidocaine lidocaine  
 18 - G angiocath needle  
 lidocaine  
 5 - , 6 - , 7 - F

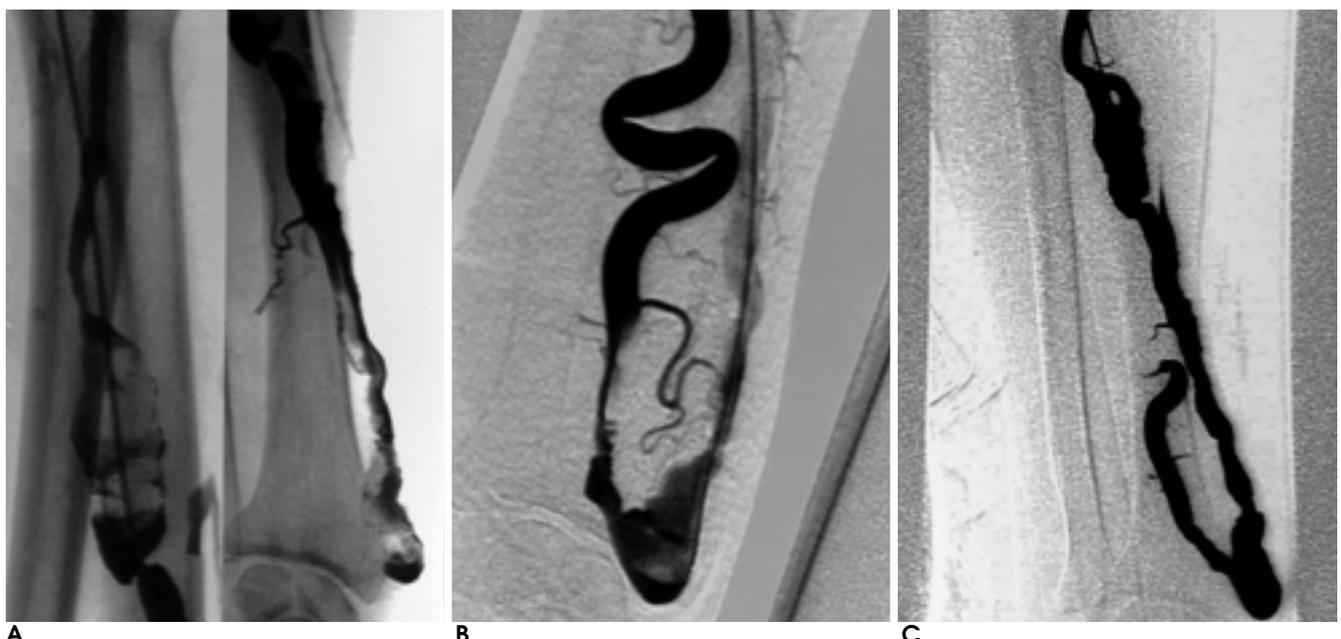


**Fig. 2. A.** Digital subtraction angiogram (DSA) obtained from brachial artery puncture shows diffuse stenosis in proximal venous limb of native AVF. **B.** After PTA, DSA reveals no residual stenosis in the luminal narrowing and diffuse spasm of radial artery, which was relieved spontaneously (not shown).

가 : 가  
 가 PTA 1 - 2 mm  
 , (sideport) PTA 8 PTA  
 5 - F (elastic recoil) 3 10 -  
 가 가 20 mm (Easy Wallstent; Boston Scientific,



**Fig. 3. A.** Digital subtraction angiogram (DSA) shows two focal stenosis in proximal venous limb and anastomotic site of native AVF.  
**B.** After balloon catheter was inserted by retrograde venous approach, angioplasty was performed.  
**C.** After PTA, the stenosis of native AVF completely resolved.



**Fig. 4. A.** Fistulogram obtained from retrograde venous approach shows a filling defect within a aneurysmal dilatation and multiple filling defects in venous limb of native AVF.  
**B.** Digital subtraction angiogram (DSA) reveals a filling defect in proximal arterial limb of native AVF.  
**C.** After thrombolysis with PTA, the flow of AVF was markedly improved with minimal residual stenosis.

Galway, U.S.A.) . 가 51 , 14 . 가 13 , 6 . 34 가 25 가 (Table 1). 8 7 , 가 1 4 가 (aspiration thrombectomy) , 4 가 . 1 . maceration . 1 . , 5 - F 13 ( 23.6 ) , Urokinase ( , , ) 8 10 - 24 20 - 30 cc , 1 - ml 2 24 ( 7.5 ) 10,000 - 20,000 . 가 가 39 가 5 , PTA Urokinase (Fig. 4). 가 8 가 5 - F Urokinase 가 2 24 , 2 12 , 7 . (n=8) 6 가 2 가 6 , 79.1% (53/67) . 가 PTA , 79.7% (47/59) (Society of Cardiovascular and Interventional Radiology) 85.4% (41/48), 54.5% (6/11) 가 (p < 0.05). 가 가 6 , PTA 30% , 가 2 , 가 (clinical success) PTA 가 (hemodynamic success) 가 (procedural success) 가 Kaplan - Meier method (n=59) (n=8)

**Table 1.** Angiographic Characteristics of the 84 Lesions in Insufficient AVFs (n = 59)

Lesion characteristics	No. of lesions (n = 84)
Type	
Stenosis	54
Total occlusion	17
Thrombosis	13
Location	
Artery	6
Arteriovenous anastomosis	13
Proximal vein	51
Distal vein	14
Multiplicity No. of cases (n = 59)	
Multiple	34
Single	25

**Table 2.** The Success Rate in Insufficient AVFs Treated by Endovascular Intervention

	All cases (n = 67)	PTA (n = 48)	Thrombolysis (n = 11)
Anatomic success	56 (83.6%)	44 (91.7%)	6 (54.5%)
Clinical success	54 (80.6%)	42 (87.5%)	6 (54.5%)
Hemodynamic success	53 (79.1%)	41 (85.4%)	6 (54.5%)
Procedural success	53 (79.1%)	41 (85.4%)	6 (54.5%)

가 67 59 AVF 8 59 , 84 54 , 가 17 , 13

가 : 가

가 1 , 2 , 가 가 , , 1 -

6 83.1%, 12 67.4% 2 (1, 5, 9). Chazan (10)

6 83.3%, 12 62.5% 가 58 - 70 ,

6 80%, 12 30% . 75% (6/8) 1/200/yrs 18 - 22 ,

(n=8) 1/13.5/yrs .

2 2 6 , 50% ), (

1 , 1 , 2 , (7),

(elastic recoil) 가 15% 가, , ,

가 3 가 , , , 가

1 7 , , 75% (6/8) 가 (6, 7, 11).

Table 2

가 1 , 1 가 , , 가 (60 - 90%)

3 , 가 (4).

2 가 가 (12,

(median nerve) 13), (6,

3 2 13 - 17). 가 가 (4),

1 가 (1), 가

가

가 가 가

가 가

(8). 150 - 200 ml

가 가

가 가

2 - 3 (1 - 3). (21)

가 가 (22)

(18). PTA Brescia - Cimino fistula가 PTFE (19).

PTA Borndorf (20) PTA 90%

10 8

PTA가 1 . Schwartz

가 가 PTA , Marston

Polytetrafluoroethylene (PTFE)

Borndorf (20) 가 PTA 가 (tight stenosis) 가

가 (23). 가 가 가

Aruny (7) PTA 85 - 98%, 75 - 94% 85.4% , , , 가 가

54.5% 5 PTA (athero - occlusive process) 가 (2). 가 가 가

PTA 1 1

Aruny (7) 2

PTA 6 38 - 63%, 18 - 39% , 1 1

85.7%, 100%, 12 78.6%, 0% 가 가

83.3%, 12 6 83.1%, 가

67.4%, 62.5%

가 가 가 가 가 가

(24, 25). PTA 가 PTA

Beathard (19) 6 29% 54% 가

. Vorwerk (26)

, Vesely (25) 1 25 - 47%

1. Schwab SJ. Assessing the adequacy of vascular access and its relationship to patient outcome. *Am J Kidney Dis* 1994;24(2):316-320
2. Manninen HI, Kaukanen ET, Ikaheimo R, et al. Brachial arterial access: endovascular treatment of failing Brescia-Cimino hemodialysis fistulas-initial success and long-term results. *Radiology*



## Percutaneous Intervention in the Management of Insufficient Native Arteriovenous Hemodialysis Fistulae<sup>1</sup>

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**Purpose:** To determine the effectiveness and patency of percutaneous intervention in insufficient native arteriovenous hemodialysis fistulae (AVFs).

**Materials and Methods:** Between March 1997 and September 2001, 67 cases of insufficient native AVF in 56 patients were treated by endovascular intervention. Except eight cases of insufficient native AVFs resulted from central vein lesion, PTA was performed in 48 cases, and thrombolytic therapy with or without PTA in 11. In eight of the cases, in which central vein stenosis had led to the insufficiency, percutaneous transluminal angioplasty (PTA) was performed, and in three of the eight, a stent was inserted. Angiographic findings and complications, as well as success and patency rates in the non-thrombosis and thrombosis group, were evaluated; the central vein lesion group was analysed separately.

**Results:** Among 84 lesions observed at angiography, there were 54 cases of stenosis, 17 of occlusion, and 13 of combined thrombosis. The lesions were located in a proximal vein ( $n=51$ ), distal vein ( $n=14$ ), artery ( $n=6$ ), and at the site of anastomosis ( $n=13$ ). In the central vein lesion group ( $n=8$ ), seven cases of stenosis and one of occlusion were noted. The overall procedural success rate was 79.1% (53/67). That is, in patients with no central vein lesion, the procedural success rate of PTA of native AVFs was 85.4% (41/48) and the patency rates of this were 83.1% at 6 months and 67.4% at 12 months. In cases of thrombolysis with/without PTA, the procedural success rate was 54.5% (6/11) and the patency rates were 83.3% at 6 months and 62.5% at 12 months. Finally, in patients with a central vein lesion, the procedural success rate was 75% (6/8) and the patency rates were 80% at 6 months and 30% at 12 months. There was one case of pseudoaneurysm formation at the puncture site of the brachial artery, which was used as the access route for intervention; one embolism in the brachial artery; and three cases of vascular spasm and two of hematoma which did not require active treatment.

**Conclusion:** Percutaneous intervention offers effective and safe management of insufficient AVFs. The procedural success rate was higher for stenosis than for thrombotic occlusion.

**Index words :** Dialysis, shunts  
Fistula, arteriovenous  
Veins, transluminal angioplasty  
Thrombolysis

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