

## 급성 심근경색증에서 요골접근법에 의한 일차적 관상동맥 중재술의 안전성과 가능성

차광수 · 김무현 · 양두경 · 김광진 · 오일환  
김종기 · 김현숙 · 김혜진 · 김영대 · 김종성

### The Safety and Feasibility of Transradial Primary Coronary Intervention in Acute Myocardial Infarction

Kwang Soo Cha, MD, Moo Hyun Kim, MD, Doo Kyoung Yang, MD, Kwang Jin Kim, MD,  
Il Hwan Oh, MD, Jong Gi Kim, RT, Hyun Sook Kim, RN,  
Hye Jin Kim, RN, Young Dae Kim, MD and Jong Seong Kim, MD

Department of Internal Medicine, Dong-A University College of Medicine, Pusan, Korea

#### ABSTRACT

**Background and Objectives** : Aggressive antithrombotic therapy and transfemoral primary intervention during acute myocardial infarction (AMI) restricts the patient's movement and may increase the risk of access site bleeding complications, and lengthen the duration of movement restriction and hospital stay. Transradial approach provides less bleeding complications and early ambulation. The purpose of this study is to know whether transradial primary intervention is safe and feasible in the patients with AMI. **Materials and Method** : From April 1998 to December 1998, transradial primary interventions were performed in the consecutive 28 patients (24 male, 57  $\pm$  7 years) by two experienced operators. The results were compared to the results of 44 (15 patients during same period, 29 during previous year) transfemoral primary interventions. **Results** : 1) The success rates of transradial primary interventions was 93% (26/28) and comparable to 95% (42/44) of transfemoral primary interventions. 2) In transradial group, the time from the arrival of catheterization laboratory to arterial access and to reperfusion, the time from the arrival of emergency room to reperfusion were 8.1  $\pm$  3.4 minutes, 22.0  $\pm$  5.3 minutes, and 71.7  $\pm$  9.2 minutes, respectively and comparable to 9.0  $\pm$  3.1 minutes, 21.7  $\pm$  5.3 minutes, and 68.9  $\pm$  8.1 minutes of transfemoral group, respectively. 3) The complications of the procedure were treated successfully during transradial interventions. 4) In transradial group, puncture site bleeding complications were absent though heparin was continued and mild ambulation was possible early after the procedure. The hospital stay of transradial group was 5.3  $\pm$  1.3 days and shorter than 7.7  $\pm$  4.2 days of transfemoral group. **Conclusion** : In the low risk patients with AMI, transradial primary intervention might be safe and feasible with acceptable time delay by the experienced operators. It might be effective to reduce access site bleeding complications and to initiate early ambulation, resulting in the shortened hospital stay. (*Korean Circulation J* 1999;29(2):153-160)

**KEY WORDS** : Transradial approach · Primary coronary intervention · Acute myocardial infarction · Bleeding complications.

: 1999 1 11

: 1999 3 15

: , 602 - 715

371

: (051) 240 - 5620, 5621 · : (051) 242 - 1449

E - mail : kwangsoo@damc.dauhosp.or.kr

## 서 론

3

28

15

(Table 1).

Killip class

1)2)

3)4)

가

(Allen test)

가

(

10

가

가

)

가

가 10

Kiemeneij<sup>5)6)</sup>

1997 4

1998 3

29

가

7)

8)

가

요골동맥의 천자 및 일차적 관상동맥 중재술

11)

가

가

60 70

9)

(radial styloid

3

10)

process) 0.5 1 cm

(learning curve)

(#11)

20

gauge

(D&B - cath , Shindongbang

medical corp., Korea)

6 French(F) 12 cm

가

(Cordis, USA

DAIG, USA)

## 재료 및 방법

heparin 5000 Unit, nitroglycerin 150 ug, verapamil

2 mg

10 ml

(side arm)

대상 환자의 선택

1998 4

1998 12

63

가

6

5 F

(Multipurpose,

Judkins

[JL, JR],

Amplatz

[AL, AR])

15

5

5000 Unit 가 72  
low molecular heparin(Nadroparin [Fraxiparine ], 0.6 cc [15000 ICU] bid SC)  
6 F  
( 0.064", Cordis, USA)  
통계 및 분석  
SPSS 8.0 for Windows  
JL3.5, AL1 2 , ± ,  
JR4, AL1 2 (%)  
coaxial Independent Samples T Test  
alignment  
(predilation) over - Chi - square( $\chi^2$ ) test Fisher's  
the - wire system exact test . p 0.05  
premouted type bare  
stent hand crimping  
aspirin 500 mg tic -  
lopidine 250 mg unfractionated heparin 1) 28 ( 24 , 57 ± 7 )  
5000 Unit , unfractionated heparin 가 17 (61%),

**Table 1.** Clinical and angiographic features

	Transradial (n = 28)	Transfemoal (n = 44)	p
Age (yr)	57 ± 7	60 ± 9	.158
Male	24 ( 86%)	31 (70%)	.137
Hypertension	4 ( 14%)	11 (25%)	.275
Diabetes mellitus	5 ( 18%)	6 (14%)	.627
Smoking	23 ( 82%)	33 (75%)	.477
Hypercholesterolemia	8 ( 29%)	12 (27%)	.905
Infarct location			.374
Anterior MI	17 ( 61%)	22 (50%)	
Inferior MI	11 ( 39%)	22 (50%)	
Killip class I-II	28 (100%)	41 (93%)	.023
Peak CK (U/L)	2953.0 ± 1090.7	3002.3 ± 1321.1	.943
Peak CK-MB (U/L)	192.3 ± 70.2	113.5 ± 74.2	.823
LVEDP (mmHg)	19.3 ± 2.2	18.3 ± 4.3	.749
LVEF (%)	48.0 ± 5.2	47.3 ± 5.0	.400
Infarct related artery			.491
LAD	16 ( 57%)	22 (50%)	
RCA	11 ( 39%)	21 (48%)	
LCx	0 ( 0%)	1 ( 2%)	
Left main	1 ( 4%)	0 ( 0%)	
Pre-TIMI 0 - 1 flow	24 ( 86%)	40 (91%)	.417
Collaterals	2 ( 7%)	2 ( 5%)	.639
One or 2 vessel disease	24 ( 86%)	41 (93%)	.758

MI : myocardial infarction, CK : creatine kinase, CK-MB : creatine kinase-MB fraction, LVEDP : left ventricular end-diastolic pressure, LVEF : left ventricular ejection fraction, LAD : left anterior descending artery, RCA : right coronary artery, LCx : left circumflex artery, TIMI : thrombolysis in myocardial infarction

11 (39%) 22 (50%), (posterolateral branch)가  
 22 (50%) , CK CK - 1 가 가  
 MB , Killip  
 class - 가 .  
 (100% vs. 93%, p=.023). 2)  
 24 (86%) , ,  
 16 (57%), 8.1±3.4 , 22.0  
 11 (39%), 1 (4%) ±5.3 , 71.7±9.2 9.0±3.1 , 21.7  
 TIMI 24 (86%) 0 1 ±5.3 , 68.9±8.1 (Table 2).  
 (Table 1). 3)  
 28 , 11  
 1 , 4 (36%)  
 27 (Table 3).  
 4)  
 . 26 (93%) 가 가 .

**Table 2.** Several time intervals of both approaches

	Transradial (n = 28)	Transfemoal (n = 44)	p
Symptom onset to ER arrival (min)	211.9±7.9	265.0±150.0	.238
ER to Cath lab arrival (min)	49.4±9.3	51.8± 9.9	.153
Cath lab to Arterial access (min)	8.1±3.4	9.0± 3.1*	.459
Cath lab to Reperfusion (min)	22.0±5.3	21.7± 5.3	.770
ER to Reperfusion (min)	71.7±9.2	68.9± 8.1	.434

\* : 15 patients during same period, ER : emergency room, cath lab : catheterization laboratory

**Table 3.** Procedural and post-procedural details

	Transradial (n = 28)	Transfemoal (n = 44)	p
Overall success	26 (93%)	42 (95%)	.640
Crossover before arterial access	1 ( 4%)	0 ( 0%)	.389
Procedure type			.524
Stenting	23 (82%)	32 (73%)	
Balloon angioplasty	3 (11%)	10 (23%)	
post-TIMI 3 flow	26 (93%)	38 (86%)	.393
Death	0 ( 0%)	2 ( 5%)	.518
Defibrillation	2 ( 7%)	2 ( 5%)	.639
Transient hypotension	5 (18%)	8 (18%)	.972
Transient bradycardia	4 (14%)	7 (16%)	.852
Slow flow phenomenon	4 (14%)	7 (16%)	.852
Temporary pacemaker insertion	0 ( 0%)	9 (20%)	.011
IABP insertion	0 ( 0%)	0 ( 0%)	-
Severe bleeding at access site	0 ( 0%)	6 (14%)	.041
Hospital stay (days)	5.3±1.3	7.7±4.2	.003

TIMI : thrombolysis in myocardial infarction, IABP : intraaortic balloon pump

5.3 ± 1.3 7.7 ± 4.2 ) accelerated  
(Table 3). care traditional care 3 (4.2 ±  
고 찰 2.3 vs. 7.1 ± 4.7 )  
. 6 (0.8% vs. 0.4%),  
(10.1% vs. 12.0%), (0.8% vs. 0.4%),  
(0.4% vs. 2.6%), (4.6% vs.  
4.3%), (15.2% vs. 17.5%)  
가  
가  
3  
가  
가  
20) 3 4 가  
45%<sup>10)</sup> 18%,<sup>21)</sup> 30%<sup>22)</sup>  
48 , 13-16) 3  
,<sup>17)</sup> 가 (0.9%), (0.3%), (2.4%),  
(8.9%)<sup>20)</sup>  
가  
( , 23-25) , 28)  
TIMI flow, , ( , 26)27) -  
ACC/AHA<sup>18)</sup> , (mo-  
nitoring), 가  
3 5 10%<sup>29)</sup> , b/ a  
가<sup>10)19)</sup> . Grines<sup>10)</sup>  
( , 70 ,  
lidocaine 가 22 45%  
, 70%  
, 45%  
(native)  
) 471 accele-  
rated care( 48  
full-dose heparin 12 half-  
dose heparin ,  
가 3 ) tradi-  
tional care(  
, 72 heparin 5 가

( , )

가

9) 가

30)31) Killip class - 28

3

10) 가

19) Saito

3

Saito 19)

가

가

1

2

3

가

가

28

가

29

48

37)

가

6

가 가

가

37)38)

ACC/AHA 18)

60

90

(routine policy)

요 약

연구배경 :

가 .

가

대상 및 방법 :

1998 4 12 28 ( 24 ,  
57 ± 7 )

44

결 과 :

1)  
93%(26/28) 95%  
(42/44)

2)

8.1 ± 3.4 , 22.0  
± 5.3 , 71.7 ± 9.2 9.0 ± 3.1 ,  
21.7 ± 5.3 , 68.9 ± 8.1

3)

, 11 4  
(36%)

4)

가 가  
5.3 ± 1.3 7.7 ± 4.2

결 론 :

가

중심 단어 :

## REFERENCES

- 1) Zijlstra F, de Boer MJ, Ottervanger JP, Liem AL, Hoorntje JC, Suryapranata H. Primary coronary angioplasty versus intravenous streptokinase in acute myocardial infarction: differences in outcome during a mean follow-up of 18 months. *Coron Artery Dis* 1994;5:707-12.
- 2) Tiefenbrunn AJ, Chandra NC, French WJ, Gore JM, Rogers WJ. Clinical experience with primary percutaneous transluminal coronary angioplasty compared with alteplase (recombinant tissue-type plasminogen activator) in patients with acute myocardial infarction: a report from the Second National Registry of Myocardial Infarction (NRM-2). *J Am Coll Cardiol* 1998;31:1240-5.
- 3) Stone GW, Brodie BR, Griffin JJ, Morice MC, Costantini C, St Goar FG, et al. Prospective multicenter study of the safety and feasibility of primary stenting in acute myocardial infarction: in-hospital and 30-day results of the PAMI stent pilot trial. *J Am Coll Cardiol* 1998;31:23-30.
- 4) Suryapranata H, van't Hof AW, Hoorntje JC, de Boer MJ, Zijlstra F. Randomized comparison of coronary stenting with balloon angioplasty in selected patients with acute myocardial infarction. *Circulation* 1998;97:2502-5.
- 5) Kiemeneij F, Laarman GJ, de Melker E. Transradial artery coronary angioplasty. *Am Heart J* 1995;129:1-7.
- 6) Kiemeneij F, Laarman GJ. Transradial artery Palmaz-Schatz coronary stent implantation: results of a single-center feasibility study. *Am Heart J* 1995;130:14-21.
- 7) Kiemeneij F, Laarman GJ. Bailout technique for failed coronary angioplasty using 6 French guiding catheters. *Cathet Cardiovasc Diagn* 1994;32:359-66.
- 8) Mann T, Cubeddu G, Bowen J, Schneider JE, Arrowood M, Newman WN, et al. Stenting in acute coronary syndromes: a comparison of radial versus femoral access sites. *J Am Coll Cardiol* 1998;32:572-6.
- 9) Steg PG, Aubry P. Radial access for primary PTCA in patients with acute myocardial infarction and contraindication to or impossible femoral access. *Cathet Cardiovasc Diagn* 1996;39:424-6.
- 10) Grines CL, Marsalese DL, Brodie B, Griffin J, Donohue B, Costantini CR, et al. Safety and cost-effectiveness of early discharge after primary angioplasty in low risk patients with acute myocardial infarction: PAMI- trial. *J Am Coll Cardiol* 1998;31:967-72.
- 11) Cha KS, Kim MH, Kim YD, Kim HJ, Son YK, Park SW, et al. Transradial approach for coronary angiography and interventions: practical applicability at a high-volume laboratory and safety in Korean patients. *Kor Circ J* 1998;9:1452-64.
- 12) Cha KS, Kim MH, Kim HJ, Jang SJ, Yang DK, Cho JW, et al. Transradial coronary stenting using 6 F guiding catheter: Feasibility and safety. *Kor J Int Med* 1998. In press.
- 13) Lee KL, Woodlief LH, Topol EJ, Weaver WD, Betriu A, Col J, et al. Predictors of 30-day mortality in the era of reperfusion for acute myocardial infarction: results from an international trial of 41,021 patients. *Circulation*

- 1995;91:1659-68.
- 14) The TIMI Study Group. Comparison of invasive and conservative strategies after treatment with intravenous tissue plasminogen activator in acute myocardial infarction: results of the Thrombolysis In Myocardial Infarction (TIMI) phase trial. *N Engl J Med* 1989;320:618-27.
- 15) Appleby P, Baigent C, Collins R, Flather M, Parish S, Peto R, et al. Indications for fibrinolytic therapy in suspected acute myocardial infarction: collaborative overview of early mortality and major morbidity results from all randomized trials of more than 1,000 patients. *Lancet* 1994;343:311-22.
- 16) Zaret BL, Wackers FJ, Terrin ML, Forman SA, Williams DO, Knatterud GL, et al. Value of radionuclide rest and exercise left ventricular ejection fraction in assessing survival of patients after thrombolytic therapy for acute myocardial infarction: results from Thrombolysis In Myocardial Infarction (TIMI) phase study. *J Am Coll Cardiol* 1995;26:73-9.
- 17) Goldstein JA, Butterfield MC, Ohnishi Y, Shelton TJ, Corr PB. Arrhythmogenic influence of intracoronary thrombosis during acute myocardial ischemia. *Circulation* 1994;90:139-47.
- 18) Ryan TJ, Anderson JL, Antman EM, Braniff BA, Brooks NH, Califf RM, et al. ACC/AHA guidelines for the management of patients with acute myocardial infarction: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on Management of Acute Myocardial Infarction). *J Am Coll Cardiol* 1996;28:1328-428.
- 19) Saito S, Hosokawa G, Miyake S, Yamamoto S. Successful reperfusion with transradial angioplasty safely result in early ambulation and shorten hospital stay in a selected subgroup of acute myocardial infarction: the results of Kamakura PASTA trial. *J Am Coll Cardiol* 1997;29(Suppl A): 235A (abstract).
- 20) Newby LK, Califf RM, Guerci A, Weaver WD, Col J, Horgan JH, et al. Early discharge in the thrombolytic era: An analysis of criteria for uncomplicated infarction from the Global Utilization of Streptokinase and t-PA for Occluded coronary arteries (GUSTO) trial. *J Am Coll Cardiol* 1996;27:625-32.
- 21) Topol EJ, Burek K, O'Neill WW, Kewman D. A randomized controlled trial of hospital discharge three days after myocardial infarction in the era of reperfusion. *N Engl J Med* 1988;318:1083-8.
- 22) Mark DB, Sigmon K, Topol EJ, Kereiakes DJ, Pryor DB, Candela RJ, et al. Identification of acute myocardial infarction patients suitable for early hospital discharge after aggressive interventional therapy. *Circulation* 1991; 83:1186-93.
- 23) Grines CL, Browne KF, Marco J, Rothbaum D, Stone GW, O'Keefe J, et al. A comparison of immediate angioplasty with thrombolytic therapy for acute myocardial infarction. *N Engl J Med* 1993;328:673-9.
- 24) Gobbons RJ, Holmes DR, Reeder GS, Bailey KR, Hopensperger MR, Gersh BJ. Immediate angioplasty compared with the administration of a thrombolytic agent followed by conservative treatment for myocardial infarction. *N Engl J Med* 1993;328:685-91.
- 25) Zijlstra F, Jan de Boer M, Moorntje JCA, Reijffer S, Reiber JHC, Suryapranata H. A comparison of immediate coronary angioplasty with intravenous streptokinase in acute myocardial infarction. *N Engl J Med* 1993;328:680-4.
- 26) Michels KB, Yusuf S. Does PTCA in acute myocardial infarction affect mortality and reinfarction rates? A quantitative overview (metaanalysis) of the randomized clinical trials. *Circulation* 1995;91:476-85.
- 27) Weaver WD, Simes RJ, Betriu A, Grines CL, Zijlstra F, Garcia E, et al. Comparison of primary coronary angioplasty and intravenous thrombolytic therapy for acute myocardial infarction. *JAMA* 1997;278:2093-8.
- 28) Lieu TA, Jan Gurley MR, Lundstrom RJ, Ray GT, Fireman BH, Weinstein MC, et al. Projected cost-effectiveness of primary angioplasty for acute myocardial infarction. *J Am Coll Cardiol* 1997;30:1741-50.
- 29) Bittl JA, Strony J, Brinker JA, Ahmed WH, Meckel CR, Chaitman BR, et al. Treatment with bivalirudin (Hirulog) as compared with heparin during coronary angioplasty for unstable or postinfarction angina. *N Engl J Med* 1995; 333:764-9.
- 30) Blankenship JC, Hellkamp AS, Aguirre FV, Demko SL, Topol EJ, Califf RM. Vascular access site complications after percutaneous coronary intervention with abciximab in the Evaluation of c7E3 for the Prevention of Ischemic Complications (EPIC) trial. *Am J Cardiol* 1998;81:36-40.
- 31) Califf RM, Topol EJ, George BS, Boswick JM, Abbott-Smith C, Sigmon KN, et al. Hemorrhagic complications associated with the use of intravenous tissue plasminogen activator in treatment of acute myocardial infarction. *Am J Med* 1988;85:353-9.
- 32) Sulzbach LM, Munro BH, Hirshfeld JW Jr. A randomized clinical trial of the effect of bed position after PTCA. *Am J Crit Care* 1995;4:221-6.
- 33) Mayer DM, Hendrickx L. Comfort and bleeding after percutaneous transluminal coronary angioplasty: comparison of a flexible sheath and a standard sheath. *Am J Crit Care* 1997;6:341-7.
- 34) Keeling A, Taylor V, Nordt LA, Powers E, Fisher C. Reducing time in bed after cardiac catheterization (TIBS). *Am J Crit Care* 1996;5:277-81.
- 35) Kussmaul WG 3rd, Buchbinder M, Whitlow PL, Aker UT, Heuser RR, King SB, et al. Rapid arterial hemostasis and decreased access site complications after cardiac catheterization and angioplasty: results of a randomized trial of a novel hemostatic device. *J Am Coll Cardiol* 1995;25:1685-92.
- 36) Silber S, Dorr R, Muhling H, Konig U. Sheath pulling immediately after PTCA: comparison of two different deployment techniques for the hemostatic puncture closure device: a prospective, randomized study. *Cathet Cardiovasc Diagn* 1997;41:378-83.
- 37) Doorey A, Patel S, Reese C, O'Connor R, Geloo N, Sutherland S, et al. Dangers of delay of initiation of either thrombolysis or primary angioplasty in acute myocardial infarction with increasing use of primary angioplasty. *Am J Cardiol* 1998;81:1173-7.
- 38) Liem AL, van't Hof AWJ, Hoorntje JCA, de Boer MJ, Suryapranata H, Zijlstra F. Influence of treatment delay on infarct size and clinical outcome in patients with acute myocardial infarction treated with primary angioplasty. *J Am Coll Cardiol* 1998;32:629-33.