

일차적 스텐트 삽입술 후 시행한 보조 풍선요법이 경색 유발 동맥 혈류에 미치는 영향

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Effect of Adjuvant Balloon Inflation on Infarct Artery Flow after Primary Stenting

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ABSTRACT

Background and Objectives : Slow flow or no-reflow during the primary angioplasty is associated with a poor prognosis. The impact of adjuvant balloon inflation on infarct artery flow after successful primary stenting has not yet been studied. Therefore, we investigated the effect of adjuvant balloon inflation on infarct related artery flow after successful stenting in patients with acute myocardial infarction. **Subjects and Methods :** The changes in infarct artery flow before and after adjuvant balloon inflation were assessed in 46 patients with a first episode of acute myocardial infarction (pain duration 12 hr) who underwent adjuvant balloon inflation after successful primary stenting. Infarct artery flow was evaluated by corrected TIMI frame count (CTFC). **Results :** After adjuvant balloon inflation, 20 patients (43%) showed a slower flow. The minimal lumen diameter became greater (3.0 ± 0.5 mm vs. 3.2 ± 0.5 mm, $p = 0.002$) and the residual stenosis lessened ($12.2 \pm 9.6\%$ vs. $6.4 \pm 8.1\%$, $p < 0.001$). There was no change in reference vessel diameter. CTFC was significantly increased after adjuvant balloon inflation (21.6 ± 11.5 frames vs. 26.9 ± 20.5 frames, $p = 0.005$). On multivariate analysis, only pre-adjuvant balloon CTFC was a predictor of a slower flow after adjuvant balloon inflation (odds ratio 1.148, 95% CI : 1.014 - 1.301). **Conclusion :** Adjuvant balloon inflation after successful primary stenting reduced residual stenosis but deteriorated the infarct artery flow. Further studies are required to define the clinical impact of the positive and negative effects of adjuvant balloon inflation. (**Korean Circulation J 2002;32(5):427-432**)

KEY WORDS : Myocardial infarction ; Stents ; Balloon dilatation ; Coronary circulation.

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서 론

3가

2가

스텐트 시술

unt(CTFC)
ading

¹⁻⁶⁾ Corrected TIMI frame co -
가
TIMI flow gr -

aspirin ticlopidine
10,000

(ACT : activated clotting time) 300

7 F 8 F

⁷⁾⁸⁾

⁹⁻¹¹⁾ CTFC

0.4 mm 10.7 ± 4.8

3.5 ±

30%

¹²⁾ TIMI flow가 2

가

noncom -

pliant semi - compliant

/ 1.04 ± 0.09

13.5 ± 3.3

CTFC

관상동맥 조영상 분석 및 TIMI frame count(TFC) 측정
가

대상 및 방법

대 상

1998 1 2000 12
12
148

(ANCOR
Version 2.3, Siemens, Germany)

Gibson ⁷⁾

TFC 30
frames/sec

가 1

2

2

adeno -

1.9 ± 2.2 frames

sine verapamil

0.93 CTFC

가

TFC

¹³⁾

CTFC

TFC

23.3 ±

111

4.9 frames

(17.6 ± 3.5 frames)

46

(20.8 ± 4.0 frames)

1.3

2

TFC

1.3

CT -

1 mm

ST

FC

* : Pre-infarction angina : the presence of typical angina within 24hr before the onset of acute myocardial infarction

SPSS 9.0

paired t - test unpaired t - test

Chi square test

logistic regression test

p 0.05

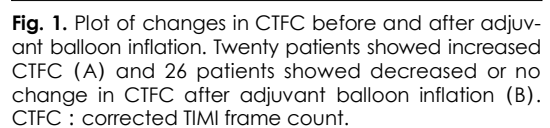
61.0 ± 11.0

5.2 ± 4.9 . 6 (13%) ab -
ciximab (Table 1), abciximab

가 .

CTFC 20 (43%) 가 15
(33%) 11 (24%) 가

(Fig. 1).



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Table 2. Differences in angiographic parameters and CTFC (n = 45)

	Pre-adjuvant*	Post-adjuvant	p
CTFC	21.6 ± 11.5	26.9 ± 20.5	0.005
Reference vessel diameter (mm)	3.5 ± 0.5	3.4 ± 0.5	0.442
Residual stenosis (%)	12.2 ± 9.6	6.4 ± 8.1	<0.001
Minimal lumen diameter (mm)	3.0 ± 0.5	3.2 ± 0.5	0.002

* : pre-adjuvant balloon inflation, CTFC : corrected TIMI frame count

Table 3. Differences in angiographic parameters and CTFC in patients with TIMI 3 flow after stenting (n = 41)

	Pre-adjuvant*	Post-adjuvant	p
CTFC	15.6 ± 5.3	18.4 ± 10.4	0.036
Reference vessel diameter (mm)	3.5 ± 0.5	3.5 ± 0.5	0.315
Residual stenosis (%)	12.1 ± 10.1	6.2 ± 8.3	<0.001
Minimal lumen diameter (mm)	3.0 ± 0.5	3.2 ± 0.5	0.004

* : pre-adjuvant balloon inflation, CTFC : corrected TIMI frame count

23.4 ± 13.1 frames

가 (p=0.01). CT - FC , abciximab , TIMI flow ,

CT - FC

가 (Odds ratio : 1.148, 95% confidence interval : 1.014 - 1.301).

고 찰

no - reflow 1-3) 가 4-6) Hamada 14)

Table 4. Results of univariate analyses

	Group 1 (n=26)	Group 2 (n=20)	p
Pre-adjuvant balloon CTFC	15.1 ± 5.2	23.4 ± 13.1	0.01
Pre-adjuvant balloon MLD (mm)	3.1 ± 0.6	2.9 ± 0.4	0.08
Post-adjuvant balloon MLD (mm)	3.3 ± 0.6	3.1 ± 0.3	0.36
Pain onset to catheterization room (hr)	4.9 ± 3.9	5.5 ± 6.2	0.70
Stent diameter (mm)	3.5 ± 0.4	3.5 ± 0.4	0.6
Adjuvant balloon pressure (atm)	14.2 ± 3.1	12.8 ± 3.4	0.18
LAD lesion	65%	70%	0.74
Multivessel disease	27%	50%	0.11
Use of abciximab	7.7%	20%	0.38
Collateral flow grade 2	25%	29%	0.75
Initial TIMI flow grade 2	19%	15%	0.71

Group 1 : patients with decreased or no change in CTFC after adjuvant balloon inflation, group 2 : patients with increased in CTFC after adjuvant balloon inflation, CTFC : corrected TIMI frame count, MLD : minimal lumen diameter, LAD : left anterior descending coronary artery

CTFC가 가 CTFC가 가 15) CTFC가 12) Edep 12) 가가 가 가

가 가 가

가

가

abciximab

요약

가

ab -

ciximab

가

배경 및 목적 :

가

abcixmab

abciximab

CTFC

(odds ratio 1.148, 95% CI : 1.014 1.301)

CTFC가 30 frames

가

방 품 :

12

(30% TIMI 2 가) 46

가

corrected TIMI frame count(CT -
가 .

결 과 :

CTFC가

가 20

(43%)

가

, CTFC가

(3.0 ± 0.5 mm vs. 3.2 ± 0.5 mm, p=0.002)

. CTFC

(12.2±9.6% vs. 6.4±8.1%, p<

0.001) 가 . CT - FC 가 (21.6 ± 11.5 frames vs. 26.9 ± 20.5 frames, $p=0.005$).

CTFC

(odds

CTFC

ratio 1.148, 95% CI : 1.014 1.301).

74 : 75

가

, CTFC

중심 단어 : ; ;

REFERENCES

- 1) The GUSTO Angiographic Investigators. *The effects of tissue plasminogen activator, streptokinase, or both on coronary artery patency, ventricular function, and survival after acute myocardial infarction.* *N Engl J Med* 1993; 329:1615-22.
- 2) Anderson JL, Karagounis LA, Becker LC, Sorensen SG, Menlove RL. *TIMI perfusion grade 3 but not grade 2 results in improved outcome after thrombolysis for myocardial infarction: ventriculographic, enzymatic and electrocardiographic evidence from the TEAM-3 study.* *Circulation* 1993;87:1829-39.
- 3) Vogt A, von Essen R, Tebbe U, Feuerer W, Appel KF, Neuhaus KL. *Impact of early perfusion status of the infarct-related artery on short-term mortality after thrombolysis for acute myocardial infarction: retrospective analysis of four German multicenter studies.* *J Am Coll Cardiol* 1993; 21:1391-5.
- 4) Abbo KM, Dooris M, Glazier S, O'Neil WW, Byrd D, Grines CL, Safian RD. *Features and outcome of no-reflow after percutaneous coronary intervention.* *Am J Cardiol* 1995;75:778-82.
- 5) Piana R, Paik GY, Moscucci M, Cohen DJ, Gibson CM, Kugelmass AD, Carrozza JP Jr, Kuntz RE, Baim DS. *Incidence and treatment of no-reflow after percutaneous coronary intervention.* *Circulation* 1994;89:2514-8.
- 6) Morishima I, Sone T, Okumura K, Tsuboi H, Kondo J, Mukawa H, Matsui H, Toki Y, Ito T, Hayakawa T. *Angiographic no-reflow phenomenon as a predictor of adverse long-term outcome in patients treated with percutaneous transluminal coronary angioplasty for first acute myocardial infarction.* *J Am Coll Cardiol* 2000;36:1202-9.
- 7) Gibson CM, Cannon CP, Daley WL, Dodge JT Jr, Alexander B Jr, Marble SJ, McCabe BS, Raymond L, Fortin T, Poole WK, Braunwald E. *TIMI frame count: a quantitative method of assessing coronary artery flow.* *Circulation* 1996;93:879-88.
- 8) Gibson CM, Murphy SA, Rizzo MJ, Ryan KA, Marble SJ, McCabe CH, Cannon CP, van de Werf F, Braunwald E. *Relationship between TIMI frame count and clinical outcomes after thrombolytic administration.* *Circulation* 1999; 99:1945-50.
- 9) Grines CL, Cox DA, Stone GW, Garcia E, Mattos LA, Giambartolomei A, Brodie BR, Madonna O, Eijgelshoven M, Lansky AJ, O'Neill WW, Morice MC. *Coronary angioplasty with or without stent implantation for acute myocardial infarction.* *N Engl J Med* 1999;341:1949-56.
- 10) Suryapranata H, van't Hof AW, Hoorntje JCA, 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.
- 11) Maillard L, Hamon M, Khalife K, Steg PG, Beygui F, Guernonprez JL, Spaulding CM, Boulenc JM, Lipiecki J, Lafont A, Brunel P, Grollier G, Koning R, Coste P, Favereau X, Lancelin B, van Belle E, Serruys P, Monassier JP, Raynaud P. *A comparison of systematic stenting and conventional balloon angioplasty during primary percutaneous transluminal coronary angioplasty for acute myocardial infarction.* *J Am Coll Cardiol* 2000;35:1729-36.
- 12) Edep ME, Guameri EM, Teirstein PS, Phillips PS, Brown DL. *Differences in TIMI frame count following successful reperfusion with stenting or percutaneous transluminal coronary angioplasty for acute myocardial infarction.* *Am J Cardiol* 1999;83:1326-9.
- 13) Im JH, Kim YD, Park EH, Mun SH, Seo BG, Jee SR, Chang KY, Yang CH, Kim SG, Cha KS, Kim MH, Kim JS. *Analysis of Angiographic outcome by thrombolysis in myocardial infarction (TIMI) frame count for primary stenting in patients with acute myocardial infarction.* *Korean Circ J* 2000;30:1075-82.
- 14) Hamada S, Nishiue T, Nakamura S, Sugiura T, Kamihata H, Miyoshi H, Imuro Y, Iwasaka T. *TIMI frame count immediately after primary coronary angioplasty as a predictor of functional recovery in patients with TIMI 3 reperfused acute myocardial infarction.* *J Am Coll Cardiol* 2001; 38:666-71.
- 15) Vrachatis AD, Alpert MA, Georgoulas VP, Nikas DJ, Petropoulou EN, Lazaros GI, Michelakakis NA, Karavidis AI, Lakoumentas JA, Stergiou L, Zacharoulis AA. *Comparative efficacy of primary angioplasty with stent implantation and thrombolysis in restoring basal coronary artery flow in acute ST segment elevation myocardial infarction: quantitative assessment using the corrected TIMI frame count.* *Angiology* 2001;52:161-6.
- 16) Yang P, Gyongyosi M, Hassan A, Heyer G, Klein W, Luha O, Maurer E, Muhlberger V, Pachinger O, Sochor H, Sykora J, Wever H, Weidinger F, Glogar D. *Short- and long-term outcomes of Wiktor stent implantation at low versus high pressures.* *Am J Cardiol* 1999;84:644-9.
- 17) Caixeta AM, Brito FS Jr, Rati M, Perin MA, da Luz PL, Ramires JA, Ambrose JA, Martinez EE. *High versus low-pressure balloon inflation during multilink trade mark stent implantation: acute and long-term angiographic results.* *Catheter Cardiovasc Interv* 2000;50:398-401.