

대동맥내 풍선펌프를 응급 삽입한 허혈성 심질환 환자의 임상적 특성 및 생존율 결정인자

박대균¹ · 오동진¹ · 홍경순¹ · 두영철¹ · 한규록¹ · 유규형¹
임종윤¹ · 이광학¹ · 이영¹ · 지현근² · 이원용² · 김응중²

Emergent Use of Intraaortic Balloon Pump in Patients with Ischemic Heart Disease : Clinical Characteristics and Determinants of Survival

Dae Gyun Park, MD¹, Dong-Jin Oh, MD¹, Kyung-Soon Hong, MD¹, Young-Cheoul Doo, MD¹,
Kyoo-Rok Han, MD¹, Kyu-Hyung Ryu, MD¹, Chong-Yun Rim, MD¹, Kwang-Hack Lee, MD¹,
Yung Lee, MD¹, Hyun Keun Chee, MD², Weon Yong Lee, MD² and Eung Joong Kim, MD²

¹Department of Internal Medicine, ²Thoracic and Cardiovascular Surgery, College of Medicine, Hallym University, Seoul, Korea

ABSTRACT

Background and Objectives : The purpose of this study is to examine clinical characteristics and outcome in patients with cardiogenic shock or ongoing cardiogenic shock by acute coronary syndrome who underwent intraaortic balloon pump (IABP) support, and to identify factors predictive of in-hospital mortality. **Materials and Methods** : Thirty-two consecutive patients with IABP support from 1994 to 1997 were analyzed retrospectively. **Results** : The causes for insertion of IABP are cardiogenic shock (31%), unstable hemodynamics during angiography or angioplasty (31%), ventricular tachycardia (15%), mechanical complications (15%), and ongoing chest pain (6%). The overall survival rate was 47%. Revascularization procedures were done in 23 cases (72%) in whom inhospital survival rate was 52%. The mortality rate was significantly higher in patients with cardiogenic shock (80%) and mechanical complications (100%) including ventricular septal defect and acute mitral regurgitation, but lower with intractable ventricular tachycardia. Differences between survivors and non-survivors were not significant in regard to clinical characteristics, extent of coronary artery disease, time to IABP, time to coronary artery bypass graft, and clamping time, but only duration of IABP is longer in nonsurvivors. **Conclusions** : Emergent uses of IABP in patients with intractable ventricular tachycardia may be effective in maintaining hemodynamics before revascularization procedures, but patients with pump failure by cardiogenic shock or mechanical complications have higher mortality rates. (**Korean Circulation J 2000; 30 (10):1213-1219**)

KEY WORDS : Intraaortic balloon pump · Ischemic heart disease.

: 2000 4 25
: 2000 9 25
: , 150 - 071 1 948 - 1
: (02) 829 - 5293 · : (02) 2181 - 5082
E - mail : dgpark4@chollian.net

서 론

clamping time, Datascope system, 85%, 50%, 1), (hemodynamic de-compensation), 30 50 cc, Student's t test, chi-squared test, p value가 0.05

가 cardiac performance 2), cardiac performance, 임상양상, Q, 17 (53.1%), 12 (37.5%), Q, 3 (9.4%), 3, 2, (Table 1).

결 과

관동맥 조영술

30

Table 1. Baseline characteristics

	Survivor (n = 15)	Non-Survivor (n = 17)	p value
Age(year)	63	62	NS
Men(%)	8 (53.3)	8 (47.0)	NS
Hypertension(%)	8 (53.3)	5 (29.4)	NS
Diabetes(%)	5 (33.3)	10 (58.8)	NS
Q AMI(%)	6 (40.0)	11 (64.7)	NS
Unstable angina(%)	7 (46.6)	5 (29.4)	NS
NQ AMI(%)	2 (13.3)	1 (5.8)	NS
CAD			NS
1 VD(%)	3 (21.4)	5 (31.2)	
2 VD(%)	3 (21.4)	3 (18.7)	
3 VD(%)	6 (42.8)	8 (50.0)	
Left main(%)	2 (21.4)	0 (0)	

Q AMI = Q wave acute myocardial infarction ; NQ = nonQ wave ; CAD = coronary artery disease ; VD = vessel disease ; NS = not significant.

재료 및 방법

1994 9 1997 7, 32, 16 (50%), 63 ± 11, 16 (50%), 63 ± 11, 방 법, (, ,),

8 (26.7%), 22 (73.3%) (Table 1).

대동맥내 풍선펌프 삽입 시 임상상황

10 (1)가 , 7 (5), (1), 80% , 3 , 5 , 2 (Table 2).

(Table 2).

(Table 3).

47%(15/32) 52%

(12/23) 53%(10/19)

5 50%(2/4) 0%(0/6)

5 80%

4 (Table 3).

pump failure가 가 , extracorporeal membrane oxygenator (Table 4).

(Table 2).

대동맥내 풍선펌프 삽입술 성공률 및 급성합병증

관동맥 재관류 시술, 사망률 및 사망원인

23 (72%) 19 17

, patch angioplasty가 2 4 6 3

Table 2. Clinical situations for Insertion of IABP

Cause for insertion	Total	Survivor (n = 15)	Non-Survivor (n = 17)	p value
Cardiogenic shock(%)	10 (31.2)	2	8	0.06
During PTCA(%)	7 (21.9)	5	2	NS
Hypotension	5	4	1	
Dissection	1		1	
VT	1	1		
During CAG(%)	3 (9.3)	2	1	NS
Hypotension	2	2		
Embolism	1		1	
Ventricular tachycardia(%)	5 (15.6)	4	1	0.16
Mechanical complications(%)	5 (15.6)		5	0.04
Ongoing chest pain(%)	2 (6.2)	2		NS

PTCA = percutaneous transluminal coronary angioplasty ; CAG = coronary angiogram ; NS = not significant

Table 3. Revascularization procedures after IABP

	Survivor (n = 15)	Non-survivor (n = 17)	p value
CABG	8	9	NS
With septal closure		2	
With MVR		3	
LM angioplasty	2		NS
PTCA	2	2	NS
None	3	6	NS
Time to IABP (min)	222	314	NS
Duration of IABP (hour)	45	81	p<0.01
Time to CABG (Hour)	11	7.2	NS
Clamping time (min)	94	113	NS

CABG = coronary artery bypass graft ; MVR = mitral valve replacement ; LM = left main

Table 4. Causes of Death in Non-Survivor group (n = 17)

Cause of Death	Number (%)
Pump failure	9 (52.9)
Multiple system failure	2 (11.7)
Severe infection	2 (11.7)
Ventricular tachycardia	2 (11.7)
Acute cerebrovascular events	1 (5.8)
Air embolism of ECMO	1 (5.8)

ECMO = extracorporeal membrane oxygenator

가 .

1 , 1 . 가 (wea -

사망 예측인자 ning), ¹⁾ 가 가

clamping time 58% 가

가 ⁷⁾ 가

가 가 가

가 ⁸⁾ 가 가

268±410 (: 110) 가 가

64±71 (가 가

: 45) 가

9.7±11 (: 6) .

고 찰 가

1967 Kantrowitz 가 (,

³⁾)

가

²⁾⁴⁾ 85%

가

¹⁾⁷⁾ 24

77% 24 10%

가 3 4 .

⁵⁾⁶⁾ Park

1981 1995 . (

322 50)

(15%)

⁵⁾ .

⁹⁾ Pi 가 가 ¹²⁾
 30% , NYHA IV, 가 가 ¹³⁾
 aortic occlusion , ,
¹⁰⁾¹¹⁾ mechanoelectrical feedback ^{14 - 16)}
 가 , , , 20% 30
 가 (defibrillator)가
 53% 가 ⁹⁾¹⁰⁾ (cardioversion)
 48% 가 72% 가
 3 가
 6 가 ⁶⁾¹³⁾
 가 가
 () 가 pump failure 가
 가 가 10 6 가 1%
 가 2 가 , ,
¹⁷⁻²¹⁾ 가 10 20% 5% 가
 5 가 1 가
 2
 (reentry)
 K_{ATP} channel K efflux가 가

9.7 (IABP)
가 .

:6)
GUSTO-1

22%

재료 및 방법 :

1994 9 1995 7

IABP 32 (

63±11 , : =16 : 16)

가 1,2

12 , (AMI)

15 , AMI (VSD) 3 ,

(MR) 2 .

가

결 과 :

가
1997

1968

4756

1) IABP 2 , 2

47%

(, ,

²²⁾

2) IABP

10 , (PTCA) 7 ,

3 , VSD MR AMI

5 , 5 , 2

가 ²³⁾²⁴⁾

3)

53%

²⁵⁾

5

50%(2/4)

0%(0/6)

80%

가 (4/5) 4

5) , ,

가 1,2

clamping time

가 가 ,

가

결 론 :

IABP

가

요 약

서 론 :

중심 단어 :

REFERENCES

- 1) Willerson JT, Curry GC, Watson JT, Leshin SJ, Ecker RR, Mullins CB, *et al.* Intraaortic balloon counterpulsation in patients in cardiogenic shock, medically refractory left ventricular failure and/or recurrent ventricular tachycardia. *Am J Med Feb* 1975;58:183-91.
- 2) Urshel CW, Eber L, Forrester J, Matloff J, Carpenter R, Sonnenblick E. Alteration of mechanical performance of the ventricle by intraaortic balloon counterpulsation. *Am J Cardiol* 1970;25:546-51.
- 3) Kantrowitz A, Tjonneland S, Freed PS, Phillips SJ, Butner AN, Sherman JL Jr. Initial clinical experience with intraaortic balloon pumping in cardiogenic shock. *JAMA* 1968;203:113-8.
- 4) Hoffman JIE, Spaan JAE. Pressure-flow relation in coronary circulation. *Physiol Rev* 1990;70:331-90.
- 5) Park SS, Kim KB, Ahn H, Chae H, Rho JR. The role of Intraaortic pump in coronary artery bypass surgery. *Korean J Thorac Cardiovasc Surg* 1997;30:282-6.
- 6) Ok CS, Chee HK, Lee WY, Kim EJ. Clinical experience with IABP in cardiac surgery. *Korean J Thorac Cardiovasc Surg* 1997;30:34-9.
- 7) Homles DR Jr, Bates ER, Kleiman NS, Sadowski Z, Horgan JH, Morris DC, *et al.* for the GUSTO-1 Investigator. Contemporary reperfusion therapy for cardiogenic shock: the GUSTO-1 trial experience. *J Am Coll Cardiol* 1995; 26:668-74.
- 8) Williams DO. Intraaortic balloon counterpulsation: deciphering its effects on coronary flow. *J Am Coll Cardiol* 1996;27:817-8.
- 9) Bengtson JR, Kaplan AJ, Pieper KS, Wildermann NM, Mark DB, Pryor DB, *et al.* Prognosis in cardiogenic shock after acute myocardial infarction in the interventional era. *J Am Coll Cardiol* 1992;20:1482-9.
- 10) Pi K, Block PC, Warner MG, Diethrich EB. Major determinant of survival and nonsurvival of intraaortic balloon pumping. *Am Heart J* 1995;130:849-53.
- 11) Corral CH, Vaughn CC. Intraaortic balloon counterpulsation: an elevenyear review and analysis of determinants of survival. *Tex Heart Inst J* 1986;13:39-44.
- 12) Ehler F, Goldberger J. Cellular and pathophysiological mechanism of ventricular arrhythmias in acute ischemia and infarction. *Pacing Clin Electrophysiol* 1997;20:966-75.
- 13) Cowell RP, Paul VE, Ilsley CD. The use of intraaortic balloon counterpulsation in malignant ventricular arrhythmia. *Intern J Cardiol* 1993;39:219-21.
- 14) Levine JH, Guarnieri T, Kadish AH, Whitie RI, Calkins H, Kan JS. Change in myocardial repolarization in patients undergoing balloon valvuloplasty for congenital pulmonary stenosis: evidence for contraction-excitation feedback in humans. *Circulation* 1988;77:70-7.
- 15) Taggart P, Sutton P, John R, Lab M, Swanton H. Monophasic action potential recordings during acute changes in ventricular loading induced by the Valsalva manoeuvre. *Br Heart J* 1992;67:221-9.
- 16) Hansen DE, Craig CS, Hondeghem LM. Stretch-induced arrhythmia in isolated canine ventricle. Evidence for the importance of mechano-electrical feedback. *Circulation* 1990;81:1094-105.
- 17) Gottlieb SO, Brinker JA, Morkon AM, Kallman CH, Potter A, Gott VL, *et al.* Identification of patients at high risk for complications of intraaortic balloon counterpulsation: a multivariate risk factors analysis. *Am J Cardiol* 1984;53:1135-9.
- 18) Pennington DG, Swartz M, Codd JE, Merjavy JP, Kaiser GC. Intraaortic balloon pumping in cardiac surgical patients: a nineyear experience. *Ann Thorac Surg* 1983;36: 125-31.
- 19) Barnett MG, Swartz MT, Peterson GJ. Vascular complications from intraaortic balloons: risk analysis. *J Vasc Surg* 1994;19:81-9.
- 20) Martin RS, Moncure AC, Buckley MJ. Complications of percutaneous intraaortic balloon insertion. *J Thorac Cardiovasc Surg* 1983;85:186-90.
- 21) Kantrowitz A, Wasfie T, Freed PS, Rubenfire M, Wajszczuk W, Schork MA. Intraaortic balloon pumping 1967 through 1982 : analysis of complications in 733 patients. *Am J Cardiol* 1986;57:976-83.
- 22) Torchiana DF, Hirsch G, Buckley MJ, Hahn C, Allyn JW, Akins CW, *et al.* Intraaortic bolloon pumping for cardiac support: trends in practice and outcome, 1968 to 1995. *J Thorac Cardiovasc Surg* 1997;113: 758-69.
- 23) Kovack PJ, Rasak MA, Bates ER, Ohman EM, Stomel RJ. Thrombolysis plus aortic counterpulsation: improved survival in patients who present to community hospitals with cardiogenic shock. *J Am Coll Cardiol* 1997;29: 1454-8.
- 24) Stomel RJ, Rasak MA, Bates ER. Treatment strategies for acute myocardial infarction complicated by cardiogenic shock in a community hospital. *Chest* 1994;105:997-1002.
- 25) Stone GW, Marsalese D, Brodie BR, Griffin JJ, Donohue B, Costantini C, *et al.* A prospective, randomized evaluation of prophylactic intraaortic balloon counterpulsation in high risk patients with acute myocardial infarction treated with primary angioplasty. *J Am Coll Cardiol* 1997; 29:1459-67.