

## 경피적 승모판 교련술의 초기 및 장기 결과\*

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= Abstract =

### Immediate and Late Outcomes after Percutaneous Mitral Commissurotomy\*

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**Background** : Percutaneous mitral commissurotomy (PMC) has been known as an effective therapeutic modality for moderate to severe mitral stenosis. However, long-term results and factors influencing late outcome after PMC remain to be elucidated.

**Materials and Methods** : Three hundred and forty-six patients received PMC at Seoul National University Hospital between August, 1988 and March, 1996. We evaluated long-term results of these patients and assessed demographic, clinical, echocardiographic and hemodynamic variables in order to identify predictors of immediate and late outcomes.

**Results** : PMC was completed without major complication or technical failure in 339 (98%) out of 346 cases. A good immediate result was obtained in 67% of cases. Multivariate study identified echocardiographic score ( $P = 0.004$ ) and left atrial volume ( $P = 0.009$ ) as independent predictors of immediate outcome. The estimated 3-year and 5-year event-free survival rates were  $95.8 \pm 2.5\%$  and  $90.6 \pm 4.3\%$ , respectively. According to multivariate analysis, the independent predictors of late outcome were pre-PMC left atrial volume ( $P = 0.03$ ), post-PMC mitral valve area ( $P = 0.01$ ), and severity of mitral regurgitation after PMC ( $P = 0.03$ ).

**Conclusion** : Percutaneous mitral commissurotomy as a treatment for patients with mitral stenosis is safe, and achieves good long-term results. Pre-procedural echocardiographic score, left atrial volume, post-procedural mitral valve area, and severity of mitral regurgitation affect the immediate and late outcomes after PMC.

**KEY WORDS** : Mitral stenosis · Percutaneous mitral commissurotomy.

서 론

missurotomy, PMC)

(Percutaneous Mitral Com -

PMC

1996

1-3), PMC  
 가 4-7).  
 6.7)  
 24  
 , PMC  
 major event - free survival rate  
 ,  
 PMC  
 , event - free survival rate

,  
 가 .  
 Doppler color  
 flow map .

### 3) PMC 성적의 평가

(1)  
 PMC  
 1.5cm<sup>2</sup> , PMC  
 25% 가 ,  
 (2)  
 PMC  
 3 ,  
 PMC 가 50%

## 연구대상 및 방법

### 1. 환자군

1988 8 1996 3  
 PMC 3 346  
 가 69 , 가 277  
 1 : 4 39 ± 11 ( : 17 71 ) . 가 가 239 (69%), 가 107 (31%) .

(3)  
 , PMC ,  
 7 96 ) . 38 ± 26 ( :

### 2. 방 법

#### 1) 경피적 승모판 교련술

/ (EBDA/BSA) 3.5 4.0  
 가  
 PMC (3 Inoue  
 ). PMC Swan - Ganz

#### 4) 통계 분석

±  
 , PMC paired t -  
 test . PMC  
 ,  
 t - test  
 Chi - square test

, Gorlin

logistic  
 event - free survival rate

가 .

subgroup  
 event - free survival rate Kaplan - Meier

#### 2) 심초음파도 검사

PMC 1 , 1 3 , 3, 6, 12  
 12 ,

, log - rank test  
 , event가

lo -

gistic

event

(Table 2).

(EBDA/BSA)

가

(P=0.009)

(P=0.004)가 PMC

결 과

1. PMC의 초기 결과

346 339 (98%)  
가 PMC

18.0±7.3mmHg 5.5±3.0mmHg  
24.0±8.1mmHg 11.7  
±5.1mmHg 34.7±14.3mmHg  
22.5±9.4mmHg  
0.9±0.2cm<sup>2</sup>  
1.7±0.4cm<sup>2</sup> 가 (Table 1).

2. 성공적 PMC의 예견 인자

339 PMC  
223 (67%) . PMC가

PMC

PMC

Table 1. Echocardiographic mitral valve area and hemodynamic parameters before and after PMC

	Before	After
MV area(cm <sup>2</sup> )	2-D 0.9± 0.2	1.7±0.4
	Gorlin 1.0± 0.3	2.3±0.9
MV gradient(mmHg)	18.0± 7.3	5.5±3.0
LAP(mmHg)	24.0± 8.1	11.7±5.1
PAP(mmHg)	34.7± 14.3	22.5±9.4
C.O. (liter/min)	4.7± 1.3	5.0±1.2
LVEDP(mmHg)	7.4± 3.8	9.4±4.8

p<0.001 each

2-D denotes mitral valve area measured by 2-D echocardiography, Gorlin ; mitral valve area measured by Gorlin formula, LAP ; mean left atrial pressure, PAP ; mean pulmonary artery pressure, C.O ; cardiac output, LVEDP ; left ventricular end-diastolic pressure

3. 재협착의 예견인자

PMC 3  
184 (83%) 30%(55 )

(P=0.02)

Gorlin

(P=0.04)

4. 임상적 경과 관찰

339 PMC 5  
334 38±26  
2 , 1 . 1  
65

PMC

PMC

7

1

40

PMC

PMC

48

PMC

가 5

PMC

20±14 ( : 12 24 )

2

12

48

PMC

17

. 7

PMC

50±24

( : 12 72 )

1

PMC

가 5 가

2

PMC

38±23

( : 12 72 )

5

PMC

**Table 2.** Predictive factors for the immediate outcome after PMC

Variables		Success(n=223)	Suboptimal(n=108)	P-value
Age(years)		38 ± 10	41 ± 11	0.01
Female(%)		79.8	78.3	NS
Af(%)		22.7	43.4	0.0002
LA volume(ml)		83.5 ± 39.0	114.3 ± 71.0	0.0001
Echo score	Mobility	1.55 ± 0.58	1.89 ± 0.59	0.02
	Thickening	1.81 ± 0.59	2.01 ± 0.57	NS
	Calcification	1.57 ± 0.74	1.91 ± 0.81	0.05
	Subvalvular thickening	1.89 ± 0.59	2.01 ± 0.82	NS
	Total	6.70 ± 1.91	7.79 ± 2.05	0.0002
MV area(cm <sup>2</sup> )	2-D	0.94 ± 0.20	0.87 ± 0.28	0.02
	Gorlin	1.05 ± 0.32	0.94 ± 0.32	0.004
MV gradient(mmHg)		18.5 ± 7.4	17.6 ± 7.2	NS
LAP(mmHg)		24.2 ± 8.1	23.8 ± 8.0	NS
PAP(mmHg)		38.1 ± 20.1	37.7 ± 18.7	NS
C.O. (liter/min)		4.8 ± 1.4	4.4 ± 1.4	0.007
LVEDP(mmHg)		7.1 ± 3.7	7.4 ± 3.4	NS
EBDA/BSA		3.85 ± 0.34	3.84 ± 0.33	NS

Af denotes atrial fibrillation, LA volume : left atrial volume, Echo score : echocardiographic score, EBDA/BSA : effective balloon dilating area/body surface area

**Table 3.** Event-free survival rates(% ± S.D) stratified by factors

Variables			No. of patients	No. of events	Predicted event-free survival		P-value*	
					3YR	5YR		
Base-line variables	Age(years)	40	186	11	96.7 ± 3.3	92.6 ± 5.7	NS	
		> 40	148	14	92.0 ± 4.9	87.8 ± 6.5		
	Sex	Male	68	8	94.8 ± 5.9	89.8 ± 8.6	NS	
		Female	266	17	94.5 ± 3.4	90.6 ± 4.9		
	Rhythm	Sinus	230	11	96.2 ± 2.9	93.0 ± 4.7	0.001	
		Af	104	14	90.9 ± 6.1	84.7 ± 8.8		
	Atrial volume(ml)	100	207	7	97.8 ± 2.5	92.8 ± 5.5	0.001	
		> 100	93	14	89.2 ± 6.7	85.1 ± 8.4		
	Echo score	8	223	12	95.9 ± 2.9	92.5 ± 4.9	0.01	
		> 8	56	9	88.0 ± 9.2	79.2 ± 12.5		
MV area(cm <sup>2</sup> )	2-D	0.75	245	12	97.2 ± 2.5	93.0 ± 4.7	0.01	
		<0.75	80	11	88.3 ± 4.7	84.1 ± 9.2		
	Gorlin	0.75	260	16	94.8 ± 3.1	92.2 ± 4.3	NS	
		<0.75	71	9	93.3 ± 6.3	84.7 ± 11.3		
Postprocedure variables	MV area(cm <sup>2</sup> )	2-D	1.5	210	11	95.8 ± 3.1	92.8 ± 4.5	NS
		<1.5	97	9	96.0 ± 4.5	88.7 ± 9.2		
	Gorlin	2.0	1778	8	97.1 ± 2.9	95.3 ± 4.5	0.02	
		<2.0	152	17	91.5 ± 5.1	84.5 ± 7.6		
	Mitral regurgitation	<Moderate	315	18	96.8 ± 2.2	93.0 ± 4.0	<0.0001	
	moderate	19	7	63.4 ± 23.7	55.5 ± 25.4			

The numbers of patients do not total 334 for all variables because complete echocardiographic and hemodynamic data were not available for all patients

\*For the predictive variable, according to the log-rank statistics

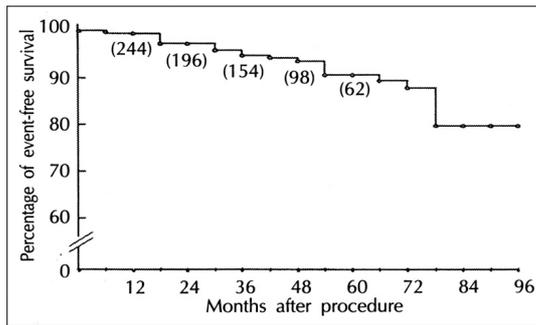


Fig. 1. Estimated event-free survival rates from life-table analysis. Numbers in parentheses represent patients alive and unsensored at the end of each of the 5 years.

PMC 33 ± 28 ( )  
 : 2 72 )  
 334 3-year event-free survival rate  
 95.8 ± 2.5% 5-year event-free survival rate  
 90.6 ± 4.3% (Fig. 1).

5. 예 후 인 자

event-free survival rate Table  
 3 . Logistic PMC  
 , PMC  
 , PMC  
 , PMC  
 , PMC  
 EBDA/BSA (Table  
 4, 5). PMC  
 (P=0.03), Gorlin  
 (P=0.01)  
 PMC

고 안

1. PMC 성적의 평가

PMC  
 Gorlin , Doppler

Table 4. Predictive factors for the late outcome after PMC(Base-line variables)

Variables	Event(-) (n=309)	Event(+) (n=25)	P-value
Age(years)	39 ± 11	42 ± 12	NS
Female(%)	80.6	69.0	NS
Af(%)	29.2	56.0	0.003
LA volume(ml)	90.9 ± 47.6	138.5 ± 93.8	0.0001
Echo score	6.9 ± 1.8	8.7 ± 3.0	0.0004
MV area(cm <sup>2</sup> )			
2-D	0.92 ± 0.23	0.83 ± 0.31	NS
Gorlin	1.02 ± 0.33	0.84 ± 0.29	0.02
MV gradient(mmHg)	17.9 ± 7.3	18.2 ± 8.5	NS
LAP(mmHg)	23.9 ± 8.2	25.3 ± 7.4	NS
PAP(mmHg)	34.4 ± 14.3	40.1 ± 16.7	NS
C.O.(liter/min)	4.7 ± 1.3	4.1 ± 1.1	0.007
LVEDP(mmHg)	7.4 ± 3.6	7.9 ± 5.4	NS

Table 5. Predictive factors for the late outcome after PMC(postprocedural variables)

Variables	Event(-) (n=309)	Event(+) (n=25)	P-value
MV area(cm <sup>2</sup> )			
2-D	1.71 ± 0.41	1.42 ± 0.52	0.001
Gorlin	2.30 ± 0.93	1.78 ± 0.50	0.002
MR(%)			
mod(Doppler)	3.9	28.0	0.0001
3+ (LVG)	1.9	24.0	0.001
MV gradient(mmHg)	5.4 ± 3.0	6.4 ± 3.1	NS
LAP(mmHg)	11.5 ± 5.0	13.6 ± 6.2	0.005
PAP(mmHg)	21.9 ± 9.0	29.7 ± 10.5	0.0001
C.O.(mmHg)	5.1 ± 1.2	4.7 ± 1.0	NS
LVEDP(mmHg)	9.3 ± 4.7	10.7 ± 5.7	NS

MR denotes patients who developed mitral regurgitation after PMC, LVG ; left ventriculography

PMC

8,9)

가

10)

PMC

10,11)

PMC

가

2. PMC 초기 결과의 예견 인자

PMC , 18 , 6  
 PMC , 5 -  
 PMC , , 12-18)  
 PMC ,  
 , EBDA/BSA PMC ,  
 가 19) PMC ,  
 , ,  
 가 PMC 59 ( : 39 ) ,  
 20) . Alfonso 가 (45%, : 31%),  
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 , Hung 18) PMC 가  
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3. 임상적 경과 관찰

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 PMC Cohen 17 6  
 21) PMC 146 36 PMC

year event - free survival rate 51%  
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 3 - year event free survival rate 70%  
 , Pan 23) 350  
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 rate 85% 26  
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 ( : 39 ) ,  
 가 (45%, : 31%),  
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 , Pa-  
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 36

4. 예후인자

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 PMC NYHA ,  
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 PMC

(P=0.01)  
(P=0.03) event

PMC  
Padial <sup>27)</sup> PMC  
31

결 론  
PMC

요 약

연구배경 :

(PMC)

방 법

1988 8 1996 3  
PMC 346

PMC

결 과

PMC 339 ( : 4 , 5case) PMC  
67%(223 )

가

=0.004)

(P=0.009)

(P

PMC

PMC

3

184 (83%) 30%(55 )

(P=0.02)

(P=0.04)

rate 334 3 5 event - free survival  
95.8 ± 2.5% 90.6 ± 4.3% .  
(P=0.03),

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