

대동맥판질환에서의 개심술의 장, 단기 성적

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Short and Long-term Results of Open Heart Surgery in Aortic Valve Disease

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ABSTRACT

Background and Objectives : This study sought to investigate operative and late mortality in aortic valve surgery and to identify risk factors for operative and late mortality. **Materials and Methods :** We examined operative mode, operative and late mortality, and survival rate of aortic valve surgery performed at Asan Medical Center between June 1989 and December 1996. **Results :** 227 patients (148 men) with a mean age 49 ± 15 years underwent aortic valve surgery. Aortic valvular lesions were classified as dominant stenosis ($n=66$), dominant regurgitation ($n=133$), and balanced stenoin insufficiency ($n=28$) according to the echocardiographic findings. Surgical procedures were aortic valve replacement with mechanical prosthesis in 180 (79%) and with bioprosthesis in 27 (12%) and aortic valve repair in 20 (9%). The overall operative mortality was 4.8%. Bacterial endocarditis and long bypass time were independent factors associated with high operative mortality ($p < 0.05$). During follow up (mean 33 ± 24 months) of operative survivors, there were 9 late deaths, 12 redo operations, and 11 clinical events (bacterial endocarditis, stroke, major bleeding, and admission for heart failure). There was no single identifiable risk factor for late mortality but age was significantly associated with development of clinical event and late mortality ($p < 0.05$). One-, Three-, and Seven-years survival rate after successful operation were $98 \pm 1\%$, $96 \pm 2\%$, and $92 \pm 3\%$, respectively. Late clinical event-free survival rate was $67 \pm 8\%$ at seven years after aortic valve surgery. **Conclusions :** Aortic valve surgery could be done with low operative and late mortality. Complications related with bacterial endocarditis and long-term anticoagulation therapy following valve replacement surgery still remained high, which needs further improvement. (Korean Circulation J 1998; 28(9):1509-1517)

KEY WORDS : Aortic valve surgery · Mortality · Survival rate.

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: 1998 9 25
: , 138 - 736 388 - 1
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(availability)

서 론 Saint Jude Duromedics
Carpentier - Edward
(valve repair)
(annuloplasty)

1970 (artificial heart - lung
machine) (myocardial preserv -
ation)
(valve replacement surgery)

(operative mortality) 1
(morbidity) ¹⁾²⁾

추적 관찰
10%
1 - 19) 2 - 10)
9 - 12) 가
2~9.2% 가
13 - 16)
(late mortality) (su -
rival rate) (International Normalized Ratio : INR)
6~12

재료 및 방법
대 상 (1) (2) (clinical event)
1989 6 1996 12 on), (3) (가 2 g/dl (redo operati -
(4) (5) (6)
(New York Heart Association : NYHA)
III 가
an -
nuloectasia Bentall
자료 분석
수술 방식
4
가
K⁺
(ice solution)
Student t - test Mann - Whitney U test
exact test Fisher's
가

multiple logistic regression
event - free survival Kaplan - Meier
p 0.05
가
결 과
2%) 가 , 43
(19%) , 35 (15%), 33
(15%), (aortic root pathology)
8 (4%)
(prosthetic valve failure)
7 (3%)
가 5 (2%) (Table 2).

환자들의 기본 특성

49 ± 15 (17~84) 60
54 (24%) , 148 , 79
NYHA I 28 (12%), II
83 (37%), III 83 (37%), IV 33 (14%)
149 (66%),
78 (34%)
(dominant stenosis : AS) 66 (29%),
(dominant regurgitation : AR)
133 (59%)
(balanced steno - insufficiency :
ASR) 28 (12%)
57 ± 13%(20~84),
42 ± 10 mm(28~73) (Table 1).

대동맥판 질환의 선행 원인

가
96 (4

수술 방식

207 (91%)
20 (9%)
180 (180/207 : 87%) Saint Jude 175
, Duromedics 5 Carpentier -
Edward 27 (27/207 : 13%)
23 ± 3 mm 19 mm 37 (18%), 21 mm 61 (30%),
23 mm 54 (26%), 25 mm 37 (18%), 27 mm 13
(6%), 29 mm 3 (1%), 31 mm 2
(1%)
109 (4
8%) , 가 118 (52%)
. 82 (36%) , 1 (0.4%)
, 21 (9%) , 4
(1.8%) , 12 (5%)

Table 1. Preoperative patient characteristics

Preoperative variables	Overall patients (n=227)
Age(years)	49 ± 15
Sex(Male : Female)	148 : 79
Dyspnea : NYHA functional class I-II	111 (49%)
NYHA functional class III-IV	116 (51%)
Atrial fibrillation	78 (34%)
Valvular lesion : dominant AS	66 (29%)
dominant AR	133 (59%)
balanced ASR	28 (12%)
LVIDsystole (mm)	42 ± 10
LA diameter (mm)	49 ± 12
LV EF (%)	57 ± 13

NYHA, New York Heart Association ; AS, aortic stenosis ;
AR, aortic regurgitation ; ASR, aortic stenoin insufficiency ;
LVID, left ventricular internal dimension ; LA, left atrium ;
LV, left ventricle ; EF, ejection fraction

가 153 ± 65 (69~505),
96 ± 43 (27~269) (Table 3).

수술사망률 및 이에 영향을 미치는 인자

1 11 가

Table 2. Etiology of aortic valvular disease

Etiology	Overall patients (n=227)
Rheumatic	96 (42%)
Degenerative	43 (19%)
Infective endocarditis	35 (15%)
Congenital	33 (15%)
Aortic root pathology	8 (4%)
Prosthetic valve failure	7 (3%)
Undetermined etiology	5 (2%)

4.8% . 11 2 , =0.012), 가 (p<0.001),
 1 가 (cardiac death) (p=0.011)가
 3 3 가
 (fulminant hepatic failure)
 1 . (p=0.0222 ; odds ratio =9.18 ; 95% confidence
 interval = 1.38~61.32) 가 (p =
 0.0043 ; odds ratio =1.02 ; 95% CI = 1.01~1.023)
 가 (Table 4B).
 가 (p<0.001), 23 (10%)
 (p=0.001) 9 가 , 4
 가 (p=0.0037 ; odds ratio =1.02 ; 95% CI = 1.01~1.03) 2 , 4 , 3 ,
 (Table 4A). 1
 (p .

Table 3. Operative procedures in aortic valvular disease

Operative variables	Overall patients (n=227)	만기사망을 및 이에 영향을 미치는 인자		
Mode of operation		216	215	가
Replacement	207 (91%)		33 ± 24	(1~95)
Mechanical valve : Saint. Jude	175	9 가		4.2%
Duromedics	5		3	,
Bioprosthesis : Carpentier-Ed ward	227	1 가		5 (2%)
Repair	20 (9%)			
Size of prosthesis (mm)	22.5 ± 2.6 mm	2 가	1 가	(paravalv -
19 or 21 mm	98 (47%)	ular leakage)		
23 mm	109 (53%)		TV 가	,
Cardiopulmonary bypass time (min)	153 ± 65	가		
Aortic cross clamp time (min)	96 ± 43		(sudden cardiac death)가 2	.
Concomitant procedure	118 (52%)	6		
MV operation	82 (36%)			(p=0.037).
CABG	4 (2%)			
Other procedures	32 (14%)	,		가

MV, mitral valve ; CABG, coronary artery bypass grafting

Table 4A. Determinants of operative mortality in predominant aortic stenosis patients

Variables	Deceased Pt (n=4)	Survived Pt (n=62)	p value
Age (year)	58 ± 19	55 ± 11	0.664
LV EF (%)	53 ± 19	59 ± 15	0.480
LVIDsystole (mm)	44 ± 12	35 ± 11	0.129
Bypass time (min)*†	293 ± 123	147 ± 58	0.000
Aortic cross-clamp time (min)*	164 ± 76	91 ± 36	0.001
Concomitant MV op, n(%)	2 (50%)	14 (23%)	0.245

*p<0.05 in univariate analysis ; †p<0.05 in multivariate analysis

LVID, left ventricular internal dimension

EF, ejection fraction

(Table 5).

임상적 사건 및 이에 영향을 미치는 인자

32

12 (6%)

5

1

(do -

4

3 가

1

4

1

Table 4B. Determinants of operative mortality in predominant aortic insufficiency patients

Variables	Deceased Pt (n=7)	Survived Pt (n=126)	p value
Age (year)	45 ± 19	44 ± 14	0.880
Etiology			
Endocarditis* [†]	5 (71%)	29 (23%)	0.012
LV EF (%)	58 ± 6	57 ± 12	0.898
LVIDsystole (mm)	44 ± 6	45 ± 9	0.844
Bypass time (min)* [†]	234 ± 130	142 ± 55	0.000
Aortic cross-clamp time (min)*	134 ± 51	91 ± 42	0.011
Concomitant MV op	2 (29%)	49 (39%)	0.608

*p<0.05 in univariate analysis ; [†]p<0.05 in multivariate analysis

LVID, left ventricular internal dimension

EF, ejection fraction

Table 5. Determinant of late cardiovascular mortality

Variables	Deceased Pt (n=6)	Surviving Pt (n=206)	p value
Age (year)	45 ± 13	49 ± 14	0.521
Etiology			
Endocarditis*	3 (50%)	27 (13%)	0.037
LV EF (%)	56 ± 12	57 ± 13	0.803
LVIDsystole (mm)	42 ± 12	41 ± 11	0.923
Size of prosthesis (mm)	22 ± 2	25 ± 4	0.071
Bypass time (min)	170 ± 99	146 ± 55	0.585
Aortic cross-clamp time (min)	116 ± 68	92 ± 39	0.161
Concomitant MV op	2 (33%)	75 (36%)	0.898

LVID, left ventricular internal dimension

EF, ejection fraction

Table 6. Determinant of clinical event

Variables	No event (n=183)	Event (n=32)	p value
Age* [‡] (> 60 year)	37 (20%)	12 (83%)	0.043
Dyspnea* (NYHA III)	76 (42%)	20 (73%)	0.048
LV EF (%)	57 ± 13	58 ± 13	0.853
LVID systole (mm)	41 ± 11	43 ± 10	0.430
Bioprosthesis*	17 (9%)	7 (22%)	0.046
Bypass time (min)	146 ± 56	151 ± 61	0.545

*p<0.05 in univariate analysis ; [‡]p<0.05 in multivariate analysis

LVID, left ventricular internal dimension ; EF, ejection fraction

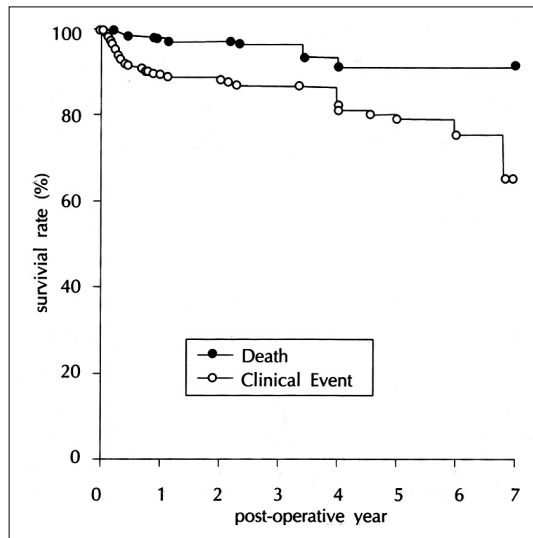


Fig. 1. Late survival curve and event-free survival curve among operative survivors, excluding operative deaths. Late survival and clinical event-free survival was $92 \pm 3\%$ and $67 \pm 8\%$, respectively, at 7 years after successful aortic valve surgery.

NYHA III
3 가 . 45%
가 60 (p=0.043),
가 NYHA III
(p=0.048) (p=0.046)
가
가 60 (p=0.049 : odds ratio=2.22,
95% CI = 1.003~4.920) (Table 6).

장기생존율 및 Event-free survival

1, 3, 7
98 ± 1%, 96 ± 2%, 92 ± 3% 7 가
late clinical event - free survival 67 ±
8% (Fig. 1).

고 찰

3)
1)2)
3)

2)10), 2)5)
9)12), 5)8)9)
17)
He⁸⁾, Lytle⁹⁾ Scott⁵⁾
가
Magovern²⁾
9) Culliford¹²⁾ , Lytle
가
Magovern²⁾, Scott⁵⁾ Cohn¹⁸⁾
가
가
가

19)
13 - 16)
가 (42%)
가
19) 60
40

4.8% 5%
3)4)8 - 10)
2 - 10) 9 - 12)
(p=0.909)
(p=0.181)
Magovern²⁾ 70
4.4% 70
가 , Lytle
가 가
70
(0.5% Vs. 4.3%).
70 5%(12)

가 (19 21 mm)

가 . 30% (inappropriateness)

2)5)8) 2%(4) 가 21 mm 47.3%(98)

Kim¹⁴⁾ . 21 mm

23 mm (transaortic pressure gradient)

가 가

He⁸⁾ Fernandez²⁴⁾ 가

가 가 4.2%

(p<0.001). 3%

가 5)

가 9~30%

20 - 23) 33 ± 24

35 5

14%

3%

(p=0.012 ; odds ratio=5.98 ; 95% co - 15%(32)

nfidence interval = 1.48~24.15). 60

7 (20%)가

2 가 가

가 가 가

가 7 3 가 가 가

4

35 34 (97%)가

가

1%/ (person - year) 2)14)18)

(5) (30) 가 3%/ 7)10)

(206 ± 38 Vs. 158 ± 67 ; p=0.073)

(144 ± 47 Vs. 100 ± 45 ; p=0.050) 가 18)

2)

가

3.7%(8)
9%(4) , 1.4%(3)
가
가

1. 가

중심 단어 :

요 약

서 론 :

재료 및 방법 :

1989 6 1996 12

결 과 :

(66 , 133 , 28)
가 227 (49 ± 15 : 148)
180 (79%), 27
(12%), (repair) 20 (9%)
4.8%(11/227)
가

가 (p<0.05).
(216 215) 33 ± 24
(1~95) 9 (4.
2%), 12 11 (, ,
,)
,
(p<0.05). 1 , 3 , 7
98 ± 1%, 96 ± 2%, 92 ± 3% , 7
late clinical event - free survival rate 67 ± 8%

결 론 :

REFERENCES

- 1) Verheul HA, Brink RBA, Bouma BJ, Hoedemaker G, Molijn AC, Dekker E, et al. Analysis of risk factors for excess mortality after aortic valve replacement. *J Am Coll Cardiol* 1995;26:1280-6.
- 2) Magovern JA, Pennock JL, Campbell DB, Pae WE, Bartholomew M, Pierce WS, et al. Aortic valve replacement and combine aortic valve replacement and coronary artery bypass grafting: predicting high risk groups. *J Am Coll Cardiol* 1987;9:38-43.
- 3) Lytle BW, Cosgrove DM, Yaylor PC, Goormastic Marleno, Steward RW, Golding LAR, et al. Primary isolated aortic valve replacement; Early and late results. *J Thorac Cardiovasc Surg* 1989;97:675-81.
- 4) Arom KV, Nicoloff DM, Kersten TE, Northrup WFIII, Lindsay WG, Emery RW. Ten years' experience with the St. Jude Medical valve prosthesis. *Ann Thorac Surg* 1989;47:831-7.
- 5) Scott WC, Miller DC, Haverich A, Dawkins K, Mitchell RS, Jamieson SW, et al. Determinants of operative mortality for patients undergoing aortic valve replacement. Discriminant analysis of 1,479 operations. *J Thorac Cardiovasc Surg* 1985;89:400-13.
- 6) Meurs AA, Grundemann AM, Bezemer PD, Geldof WC, Zienkiewicz BS, Ong ST, et al. Early and 8-year results of aortic valve replacement: A clinical study of 232 patients. *Eur Heart J* 1985;6:870-81.
- 7) Reed GE, Sanoudos GM, Pooley RW, Moggio RA, McClung JA, Somberg ED, et al. Results of combined valvular and myocardial revascularization operations. *J Thorac Cardiovasc Surg* 1983;85:422-6.
- 8) He GW, Acuff TE, Ryan WH, Douthit MB, Bowman RT, He YH, et al. Aortic valve replacement: Determinants of operative mortality. *Ann Thorac Surg* 1994;57:1140-6.
- 9) Lytle BW, Cosgrove DM, Loop FD, Taylor PC, Gill CC, Golding LAR, et al. Replacement of aortic valve combined with myocardial revascularization: Determinants of early and late risk for 500 patients, 1697 -1981. *Circulation* 1983;68:1149-62.
- 10) Czer LSC, Chaux A, Matloff JM, DeRobertis MA, Nessim SA, Scarlata D, et al. Ten-year experience with the St. Jude Medical valve for primary valve replacement. *J Thorac Cardiovasc Surg* 1990;100:44-55.
- 11) Tsai TP, Matloff JM, Chaux A, Kass RM, Lee ME, Czer LSC, et al. Combined valve and coronary artery bypass procedures in septuagenarians and octogenarians: results in 120 patients. *Ann Thorac Surg* 1986;42:681-4.
- 12) Culliford AT, Galloway AC, Colvin SB, Grossi EA, Baumann FG, Esposito R, et al. Aortic valve replacement for aortic aortic stenosis in persons aged 80 years and over. *Am J Cardiol* 1991;67:1256-60.
- 13) Kim SH, Sun H. Clinical evaluation of aortic valve repla-

- cement. *Korean J Thorac Cardiovasc Surg* 1992;25:871-6.
- 14) Kim CH. *Clinical results of the St. Jude medical valve in aortic position. Korean J Thorac Cardiovasc Surg* 1995;28:258-62.
 - 15) Na KJ, Oh JW, Ahn BH, Kim SH. *Clinical results of aortic valve replacement. Korean J Thorac Cardiovasc Surg* 1997;30:152-7.
 - 16) Lee SG, Kim CK, Ko KW, Yoon JH, Cho SJ, Lee SH, et al. *A clinical study of adult aortic stenosis treated with aortic valve replacement. Korean Circ J* 1997;27:1180-9.
 - 17) Nunley DL, Grunkemeier GL, Starr A. *Aortic valve replacement with coronary bypass grafting; Significant determinants of ten-year survival. J Thorac Cardiovasc Surg* 1983;85:705-11.
 - 18) Cohn LH, Allred EN, DiSesa VJ, Sawtelle K, Shemin RJ, Collins JJ Jr. *Early and late risk of aortic valve replacement; A 12-year concomitant comparison of the porcine bioprosthetic and tilting disc prosthetic aortic valves. J Thorac Cardiovasc Surg* 1984;88:695-705.
 - 19) Dare AJ, Veinot JP, Edwards WD, Tazelaar HD, Schaff HV. *New observations on the aortic valve disease: A surgical pathologic study of 236 cases from 1990. Human Pathology* 1993;24:1330-8.
 - 20) Croft CH, Woodward W, Elliott A, Commerford PJ, Barnard CN, Beck W. *Analysis of surgical versus medical therapy in active complicated native valve infective endocarditis. Am J Cardiol* 1983;51:1650-5.
 - 21) Richardson JV, Karp RB, Kirklin JW, Dismukes WE. *Treatment of infective endocarditis: A 10-year comparative analysis. Circulation* 1978;58:589-97.
 - 22) Jung JY, Saab SB, Almond CH. *The case for early surgical treatment of left-sided primary infective endocarditis. A collective review. J Thorac Cardiovasc Surg* 1975;70:509-18.
 - 23) Scott SM. *Early operative intervention in aortic bacterial endocarditis. Am Thorac Cardiovasc Surg* 1981;32:327-34.
 - 24) Fernandez J, Laub GW, Adkins MS, Anderson WA, Chen C, Bailey BM, et al. *Early and late-phase events after valve replacement with the St. Jude Medical prosthesis in 1200 patients. J Thorac Cardiovasc Surg* 1994;107:394-407.