

대동맥판 대치술을 시행한 대동맥판 협착증에 대한 임상적 고찰

이수금 · 김정경 · 고경환 · 윤재형 · 조성제 · 이상훈 · 홍석근
현민수 · 황홍곤 · 이영탁* · 홍승록* · 김명아** · 박성훈***

= Abstract =

A Clinical Study of Adult Aortic Stenosis Treated with Aortic Valve Replacement

Su-Geum Lee, M.D., Cheung-Kyung Kim, M.D., Kyung-Whan Ko, M.D.,
Jae-Hyung Yoon, M.D., Sung-Jae Cho, M.D., Sang-Hoon Lee, M.D.,
Suk-Keun Hong, M.D., Min-Su Hyun, M.D., Hweung-Kon Hwang, M.D.,
Young-Tak Lee, M.D.,* Sung-Nok Hong, M.D.,*
Myung-A Kim, M.D.,** Seong-Hoon Park, M.D.***

Department of Internal Medicine, Department of Thoracic Surgery, * Sejong General Hospital,
Puchon, Korea

Department of Internal Medicine, ** College of Medicine, Dankook University, Cheonan, Korea

Department of Internal Medicine, *** College of Medicine, Ewha Womans University,
Seoul, Korea

Background : Significant aortic stenosis of various underlying etiologies presents with similar clinical characteristics and is usually treated with aortic valve replacement. We performed a clinical study to evaluate the clinical characteristics, changes of echocardiographic parameters before and after aortic valve replacement in adult aortic stenosis patients.

Method : From January 1991 through December 1995, 159 patients underwent aortic valve replacement at Sejong General Hospital. Sixty-two cases (39%) of those patients were pure or predominant aortic stenosis. We observed the clinical characteristics, etiology, operative procedure, perioperative complication and mortality. And we observed the changes of echocardiographic parameters such as mean and peak pressure gradients at aortic valve, ejection fraction, systolic and diastolic left ventricular internal dimensions, left ventricular wall thickness, left ventricular mass index retrospectively at preoperative and postoperative periods regularly within 1 month, 1 yr, 3 yrs after operation (mean follow up period : 16 months, 1 -36 months).

Results :

- 1) The age of patients ranged from 31 to 71 years (mean 55 ± 11), and 60% (37 cases) of them were men.
- 2) Regarding underlying heart diseases, the most common etiology of aortic stenosis was

rheumatic valvular heart disease(32 cases, 52%), followed by congenital bicuspid aortic valve(16 cases, 25%) and degenerative change(14 cases, 23%).

3) 44 cases(77%) of the patients had dyspnea, 12 cases(19%) had chest pain, and 5 cases(8%) had history of syncope at the time of operation. Asymptomatic patient was only 1 case.

4) Seven patients(11%) had associated coronary artery disease, and only 1 case(about 2%) underwent concomitant coronary bypass surgery.

5) Post-operative complications which developed within 1 month were bleedings(8 cases, 13%), arrhythmias(7 cases, 11%) and infections(4 cases, 6%). After 1 month, bleedings related with anticoagulation were most common(7 cases, 11%). Other complications were hemolytic anemia(1 case), and aortic dissection(1 case). There was one surgery related mortality(2%) which happened during operation due to myocardial ischemia.

6) The size of implanted prosthetic valves ranged from 19 to 25mm(mean 22 ± 2 mm). Larger valves(23 -25mm) showed lower peak($p = 0.839$) and mean pressure gradients($p = 0.019$) than smaller valves(19 -21mm).

7) We observed that peak and mean pressure gradient, left ventricular internal dimension, and left ventricular mass index had decreased significantly after aortic valve replacement.

8) The average preoperative functional class(2.3) had improved significantly at 1 month after surgery(1.2), and 1 year after surgery(1.0).

Conclusion : In our series, the most common etiology of aortic stenosis was rheumatic valvular disease(52%). The incidence of combined coronary artery disease was 11%, lower than other reports. And only 1 case(2%) underwent concomitant coronary artery bypass graft surgery. The average size of implanted valves was 22mm, and the larger size had lower transaortic peak and mean pressure gradients after operation. The most common perioperative complication was bleeding and mortality rate was about 2%. Echocardiography was useful for evaluation of postoperative changes, such as transaortic peak and mean pressure gradient, left ventricular internal dimension and left ventricular mass index.

KEY WORDS : Aortic stenosis · Aortic valve replacement · Echocardiography.

서 론

159

15

5

62

2. 연구 대상

159

/

5

연구 대상 및 연구 방법

3. 연구 방법

1. 기 간

1991 1 1995 12

4

1, 3 (52%) 가 , 가 14
(23%) , 16
(25%) . 3
51 ± 12 (n=32), 가 57 ± 11 (n
= 14), 59 ± 12 (n=16) .
(p=0.021)(Table 1).
1 36 16

3. 임상 증상(수술시)
62
± 1 , 44
independent sample t - test paired (77%) 가 , 12
t - test , p 0.05 (19%), 가 5

결 과
4. 관상 동맥 조영술 및 관상 동맥 질환 합병례
62 45
가
1. 원인 질환(연령, 성별 비교)
55 ± 11 31
73 , 가 37 (60%),
가 25 (40%)
46
7 (15%,
62 11%)
1
62 32 6

Table 1. Age & sex distribution of etiology

Age	Sex	Rheum	Degen	Bicuspid	Subtotal	Total
30 - 39	M	3	2	0	5	8(13%)
	F	3	0	0	3	
40 - 49	M	2	0	1	3	11(18%)
	F	5	2	1	8	
50 - 59	M	4	3	3	10	17(27%)
	F	2	2	3	7	
60 - 69	M	8	4	5	17	23(37%)
	F	3	1	2	6	
Above 70	M	2	0	0	2	3(5%)
	F	0	0	1	1	
Subtotal	M	19	9	9	37(60%)	62(100%)
	F	13	5	7	25(40%)	
Total		32(52%)	14(23%)	16(25%)	62(100%)	

(Table 2).

5. 인공 판막

22 ± 2mm, 19 25mm

19mm 5, 21

mm 25, 23mm 21, 25mm 10

21 mm가 가

Table 3 - 1

19 21mm (A) 23 25mm (B)

Hg 31 ± 9 mmHg, 66 ± 15mm, B, 21 ± 6mmHg

59 ± 13mmHg

가 (p = 0.019).

106 ± 27mmHg, 43 ± 10mm

Hg, B 98 ± 25mmHg

34 ± 10mmHg

가 (p = 0.839) (Table 3 - 2).

Table 2. Associated coronary artery disease

No.	Age	Sex	Site of lesion	Chest pain		Management
				Preop.	Postop.	
1	48	M	Left main 40%	0	0	Medication
2	56	F	LAD 50%	2	1	Medication
3	51	M	RCA 50%	1	0	Medication
4	67	M	LAD 75%	1	0	CABG
5	56	M	RCA OS mild	0	0	Medication
6	64	M	LCx 75%, RCA 50%	1	0	Medication
7	64	M	Prox LAD calcification	1	0	Medication

Severity of chest pain was described as canadian cardiovascular classification of angina severity

0 : Absence of chest pain, 1 : CCCA 1, 2 : CCCA 2, 3 : CCCA 3, 4 : CCCA 4

LAD : left anterior descending artery, RCA : right coronary artery, LCx : left circumflex artery

Table 3-1. Canges of transaortic pressure gradients after AVR

Valve size	Preop MG	Postop MG (P value)	Preop PG	Postop PG (P value)
19mm(n = 5)	62 ± 28mmHg	31 ± 15mmHg (0.000)	107 ± 33mmHg	48 ± 6mmHg (0.000)
21mm(n = 25)	66 ± 14mmHg	31 ± 19mmHg (0.000)	105 ± 27mmHg	42 ± 11mmHg (0.000)
23mm(n = 21)	59 ± 14mmHg	19 ± 6mmHg (0.000)	99 ± 23mmHg	31 ± 13mmHg (0.000)
25mm(n = 10)	55 ± 11mmHg	23 ± 4mmHg (0.000)	93 ± 31mmHg	36 ± 7mmHg (0.000)

MG : mean pressure gradient, PG : peak pressure gradient, AVR : aortic valve replacement

Table 3-2. Comparision of transaortic pressure gradients between small & large sized valves

Valve size	Preop MG	Postop MG (P value)	Preop PG	Postop PG
Small(19 - 21mm)	66 ± 15mmHg	31 ± 9mmHg	106 ± 27mmHg	43 ± 10mmHg
Large(23 - 25mm)	59 ± 13mmHg	21 ± 6mmHg	98 ± 25mmHg	34 ± 10mmHg
(P value)	(0.019) by Levene's test		(0.839) by Levene's test	

Table 4. Complications

Complications (Early)	Frequency	Complication (Late)	Frequency
Reop. for bleeding	8(13%)	Anticoagulant related bleeding	7(11%)
Arrhythmia	7(11%)	Hemolytic anemia	1(2%)
Infection	4(6%)	Ascendin aorta dissection	1(2%)

Perioperative Mortality : 1case(2%), Early : within postoperative 1month

6. 수술 후 합병증

1

7. 수술 전후 심초음파도의 변화

1 (12 ± 10), 1

Table 4 , 3

, Table 5

8 (13%) 가 , (7 , Table 5-1
11%), (4 , 6%) .
(transaortic peak pressure gradient)
(transaortic mean pressure gradient),
(Left Ventricular Internal Dimension),
(Left Ventricular Mass Index),
(Ejection Fraction) 가
($p < 0.05$). 3 가
17 1
41 NYHA class 가 3 Table
5-2 . $93 \pm 25\text{mm}$
가 Hg $53 \pm 23\text{mmHg}$ (1), $46 \pm 27\text{mmHg}$
(3) ($p = 0.006, 0.002$),
 $66 \pm 13\text{mm Hg}$

Table 5-1. Early echocardiographic changes after AVR(within 1month)

Echocard. Parameters	Preop.	Postop.	(P value)
Peak PG (mmHg)	97.8 ± 26	36.9 ± 16.1	(0.000)
Mean PG (mmHg)	61.5 ± 14.3	25.2 ± 9.5	(0.000)
Ejection fraction (%)	61.4 ± 16.1	56.7 ± 16.0	(0.043)
LVIDd (mm)	54.4 ± 10.8	48.0 ± 10.0	(0.000)
LVIDs (mm)	37.9 ± 13.1	34.1 ± 10.6	(0.002)
IVS (mm)	15.3 ± 3.7	15.1 ± 3.5	(0.052)
PWT (mm)	15.0 ± 3.5	14.5 ± 3.8	(0.699)
LVMI (gram/M BSA)	234.0 ± 73.9	187.8 ± 66.8	(0.002)
LAD (mm)	42.3 ± 5.7	40.4 ± 7.5	(0.085)
AOD (mm)	31.5 ± 5.6	30.7 ± 6.0	(0.383)

PG : pressure gradient, LVID : left ventricular internal dimension, IVS : interventricular septum
LVMI : left ventricular mass index, LVmass(calculated as devereux equation)/body surface area
PWT : posterior wall thickness, AOD : aortic dimension, LAD : left atrial dimension

Table 5-2. Echocardiographic changes after AVR(3yrs follow up, n = 17)

Echocard. Parameters	Preop	Postop 1yr	(P value)	Postop.3yr	(P value)
Peak PG (mmHg)	92.9 ± 24.6	52.8 ± 23.1	(0.006)	45.8 ± 27.2	(0.002)
Mean PG (mmHg)	65.8 ± 13.8	30.8 ± 10.3	(0.003)	24.5 ± 11.1	(0.011)
Ejection fraction (%)	67.4 ± 16.7	66.6 ± 10.3	(0.733)	69.1 ± 9.7	(0.814)
LVIDd (mm)	52.9 ± 8.7	45.8 ± 5.1	(0.026)	46.6 ± 5.6	(0.019)
LVIDs (mm)	33.9 ± 10.7	28.6 ± 4.0	(0.222)	27.7 ± 5.5	(0.052)
IVS (mm)	15.9 ± 3.4	14.4 ± 3.0	(0.466)	13.4 ± 2.7	(0.087)
PWT (mm)	15.3 ± 2.6	14.1 ± 2.7	(0.159)	13.2 ± 2.5	(0.121)
LVMI (gram/M BSA)	226.5 ± 95.9	165.8 ± 53.6	(0.386)	149.3 ± 54.5	(0.048)
LAD (mm)	40.8 ± 7.5	41.8 ± 8.2	(0.918)	40.3 ± 6.9	(0.000)
AOD (mm)	31.8 ± 4.6	31.6 ± 3.9	(0.744)	32.9 ± 3.6	(0.256)

Table 6. The changes of NYHA functional class after AVR

	Preop. (n = 61)	Postop. 1M. (n = 60)	Postop. 1yr (n = 60)	Preop. 3yrs (n = 20)
NYHA 1	10	52	58	19
NYHA 2	25	8	2	1
NYHA 3	21	0	0	0
NYHA 4	5	0	0	0

$31 \pm 10 \text{ mmHg}(1)$, $25 \pm 11 \text{ mmHg}(3)$)
 $(p = 0.003, 0.011)$.
 $53 \pm 9 \text{ mm}$ $46 \pm 5 \text{ mm}(1)$
 $)$ $\gamma(p = 0.026)$, $47 \pm 6 \text{ mm}$
 (3) $(p = 0.019)$,
 $34 \pm 11 \text{ mm}$ $29 \pm 4 \text{ mm}(1)$, $28 \pm 6 \text{ mm}$
 (3) $(p = 0.222, 0.052)$.
 $227 \pm 96 \text{ gram/M}^2$
 $166 \pm 54 \text{ gram/M}^2(1)$, $149 \pm 55 \text{ gram/M}^2(3)$)
 $(p = 0.048)$.

8. 수술 전후 심기능 군의 변화(NYHA functional Class changes after AVR)

Table 6	
NYHA Class	NYHA Class
10	NYHA Class
25	NY -
HA Class	,
NYHA Class	21 15 (70%)
NYHA Class	, 6 NYHA Class
	NYHA Class
5 2	NYHA Class , 2
NY - HA Class	
1 3	
NYHA Class	
가 , NYHA Class	8
6 NYHA Class	
3	
20	1 NYHA
Class	NYHA Class

NYHA Class

19

1, 2

3, 4

2.3

1 가 1.2, 1 1.0

3 1.1

고 안

1 - 6)

Anthony

74

, , 60

70

58

³⁾. Ariela

60%

61%가

75

가

⁵⁾.

,

가

가 가

^{3,6)}.

가

¹⁾

가

.
 .
 .
 가
 .
 8,12 - 16)
 62
 1 , 38
 가 88mmHg,
 54%
 50 가
 , , 4 - 6,9 - 11)
 가 55mmHg
 가
 61
 가 50mmHg
 - 5 , - 3 , - 2
 4 - 7)
 2/3 , 50%
 9)
 가
 9)
 ,
 , 12 - 16)
 가
 가
 15)
 5
 가 .
 가 가
 70 1%
 14 - 16)
 (NYHA)
 ,
 14 - 16)
 6 (44 38),
 가
 12 (62
 19%) 10 (83%)
 가 ,
 2 (17%)
 . Hakki
 2/3 ,
 50%
 9)
 (19% vs 66%, 17%
 vs 50%) ,
 가 ,

1 ,

48

1

가

23) - 30)

가

가

16 (1 36)

결 과 :

1) : 62 55
 ± 11 31 73 , 가 37
 (60%) .

2) : 32 (52%)
가 , 16 (25%),
가 14 (23%) .

 51 ± 12 , 57 ± 11 , 59 ± 12

12,15 - 18)

가

3) :
(44 ,77%), 12 , 5

1

4) 7

11% , 1

6

요약

5) : 22mm 19
25 mm .

연구목적 :

가 (23 25mm) (19

21mm)

6) : 1

8 (13%) 가 , ,

7

(11%) 가 ,

1, 1
 1 (2%)
 7)
 가
 8)
 NYHA class 10, 가 25,
 가 21, 가 5,
 : 2.3,
 1 : 1.2, 1 : 1.0, 3 : 1.1

결 론 :

가 52%,
 25%, 23%
 가 11%
 1 (2%)
 22mm,
 2%
 가, 1,
 가,
 ,

References

- 1) 윤양구 · 유경중 · 강면식 외 : 성인 대동맥 판막 협착증에 대한 연구. 순환기 25 : 1183, 1995
- 2) Carys Passik, Douglas M Ackermann : Temporal changes in the causes of aortic stenosis. Mayo Clinic Proc 62 : 119-123, 1987
- 3) Anthony J Dare, John P Veinot : New observations on the etiology of aortic valve disease. Human Pathology 24 (12) : 1330-1338, 1993
- 4) Judy R Mangion, Dennis A Tighe : Aortic valvular disease in adults. Postgraduate Medicine 98 : 127-135, 1995
- 5) Ariela Pomerance : Pathogenesis of aortic stenosis and its relation to age. British Heart Journal 34 : 569-574, 1972
- 6) Arthur Selzer : Changing aspects of the natural history of valvular aortic stenosis. NEJM 317 (2) : 91-97, 1987
- 7) Elliot Rapaport : Natural history of aortic and mitral valve disease. The American Journal of Cardiology 35 : 221-227, 1975
- 8) Marshall L, Jacobs W, Gerald Austen : Acquired aortic valve disease. 1566-72, 1578-92. Surgery of the Chest. 5th ed. Philadelphia, Sabiston and Spencer
- 9) Hakki AH, Kimbris D : Angina pectoris and coronary artery disease in severe aortic stenosis. American Heart Journ 100 : 441, 1980
- 10) Patricia AP, Rick AN, Kent RB, AJ Tajik : The natural history of adults with asymptomatic hemodynamically significant aortic stenosis. JACC 15 (5) : 1012-7, 1990
- 11) Ole Lund, TT Nielsen, HK Pilegaard : The influence of coronary artery dis and bypass grafting on early and late survival after valve replacement for aortic stenosis. J Thorac Cardiovasc Surg 100 : 327-37, 1990
- 12) Villari B, Vassali G : Normalization of diastolic dysfunction in aortic stenosis late after valve replacement. Circulation 24 : 633, 1961
- 13) Grossman W : Profiles in valvular heart disease. Cardiac Catheterization and Angiography. 4th ed. Philadelphia, Lea and Febiger, 1991
- 14) Lund O : Preoperative risk evaluation and stratification of longterm survival after valve replacement for aortic stenosis. Circulation 82 : 124, 1990
- 15) Richard Thompson, M Yacoub : Influence of preoperative left ventricular function on results of homograft replacement of aortic valve for aortic stenosis. AJC 43 : 929-937, 1979
- 16) Kauzuhiko U, Masaya Kitamura, M Hachida : longterm outcome of left ventricular dysfunction after surgery for severe aortic stenosis. J Heart Valve Dis 4 (5) : 503-508, 1995
- 17) GT Christakis, RD Weisel, TE David : Predictors of operative survival after valve replacement. Circulation Supplement I 78 (3) : 25-33, 1988
- 18) ES Monrad, OM Hess, T Murakami, WJ Corin : Time course of regression of left ventricular hypertrophy after aortic valve replacement. Circulation 77 (6) : 1345-55, 1988
- 19) EL Jones, Stephen WS, William AC : Complications from cardiac prosthesis. 1539-63, Surgery of the Chest. 5th ed. Philadelphia, Sabiston and Spencer
- 20) J Ward Kennedy, John Doces, Douglas KS : Left ventricular function before and following aortic valve replacement. Circulation 56 (6) : 944-950, 1970
- 21) JF Obradia, A Eker, G Rescigno : Valvular replacement for aortic stenosis on patients in NYHA class III and IV. J Cardiovasc Surg 36 : 251-6, 1995
- 22) 서경필 · 노준량 · 안혁 외 : 심장 판막 대체술의 장기 성적 분석. 순환기 26 : 4. 769-779, 1996
- 23) William Grossman, E Braunwald, Tift Mann, Lambert P : Contractile state of the left ventricle in man as evaluated

- from end-systolic pressure-volume relations. *Circulation* 56 (5) : 845-852, 1977
- 24) Andreas Laske, Rolfjenni, Michel Maloigne : Pressure gradients across bileaflets aortic valves by direct measurement and echocardiography. *Ann Thorac Surg* 61 : 48-57, 1996
 - 25) John Ross : Applications and limitations of end-systolic measures of ventricular performance. *Federation Proceedings* 43 (9) : 2418-22, 1984
 - 26) Veronique L Rogers, AJ Tajik, Sharonne N Hyes, Charles JM : Effect of doppler echocardiography on utilization of hemodynamic cardiac catheterization in the preoperative evaluation of aortic stenosis. *Mayo Clin Proc* 71 : 141-149, 1996
 - 27) Kevin W Judge, Catherine M Otto : Doppler echocardiographic evaluation of aortic stenosis. *Cardiology Clinics* 8 (2) : 203-216, 1990
 - 28) Kenneth MB, Laurence HG, William Grossman : Left ventricular end-systolic stress-shortening and stress-length relations in humans. *AJC* 50 : 1301-6, 1982
 - 29) Nathaniel Reicheck, John Wilson, Martin S JS : Noninvasive determination of left ventricular end-systolic stress. *Circulation* 65 (1) : 99-108, 1982
 - 30) 권혁문 · 심원흠 · 박시훈 외 : 비류마티스성 대동맥관 협착증에서의 판막대치술후 좌심실 기능에 관한 연구. *순환기* 23 (5) : 787-794, 1993