

## 심방세동환자에서 전기적 심율동전환 후 좌심방이의 기능변화에 관한 연구

고현우 · 김원호 · 고재기

= Abstract =

### The Influence of Electrical Cardioversion for Atrial Fibrillation on Left Atrial Appendage Function : A Transesophageal Echocardiography Study

Hyeon Woo Koh, M.D., Won Hoh Kim, M.D., Ph.D., Jae Ki Ko, M.D., Ph.D.

Department of Internal Medicine, Chon Buk University, College of Medicine, Chon Buk, Korea

**Objectives** : This study evaluates the change of the left atrial appendage function before and after electrical cardioversion to understand the mechanism involved in systemic thromboembolism of atrial fibrillation.

**Background** : Systemic thromboembolism associated with electrical cardioversion of atrial fibrillation is thought to originate from the left atrium or left atrial appendage, or both. However, the mechanism involved is poorly understood.

**Method** : We studied left atrial appendage function with transesophageal echocardiography in 15 patients with atrial fibrillation before and after successful electrical cardioversion. We measured left atrial appendage emptying and filling velocities and left atrial appendage areas. Also we analysed the characteristic Doppler flow pattern of LAA.

**Result** : Left atrial appendage emptying velocities before cardioversion were greater in patients without ( $32.0 \pm 13.2$  cm/sec) than in those with ( $21.4 \pm 7.6$  cm/sec) spontaneous echo contrast (SEC). Furthermore emptying velocities after cardioversion were significantly reduced than those before cardioversion ( $15.1 \pm 9.9$  vs  $26.7 \pm 10.4$ ,  $p < 0.05$ ), as well as in both the group with ( $21.4 \pm 7.6$  vs  $12.2 \pm 9.6$ ,  $p < 0.05$ ) and the group without ( $32.0 \pm 13.2$  vs  $18.1 \pm 10.2$ ,  $p < 0.05$ ) SEC.

**Conclusion** : After electrical cardioversion for atrial fibrillation left atrial appendage function is impaired. These observations suggest that stunned left atrial appendage after cardioversion may predispose to thrombus formation, which may play a role in the mechanism involved in the occurrence of thromboembolism after cardioversion.

**KEY WORDS** : Atrial fibrillation · Electrical cardioversion · Transesophageal echocardiography.

서 론

350 600

가

1).

가 가

가

2

(cardiovesion)

0.6 5.6%

(source of embolism)

(left atrial appendage)

Spontaneous echo contrast

(Transthoracic echocardiography ; TTE)

(left atrial appendage)

가

(Transesophageal echocardiography ; TEE)

가

6,7).

가

TEE

가

대상 및 방법

## 1. 대 상

1994 3 1 1995 11 30

1

, 6

, TEE

18 TTE TEE

15

5

1 3 1

2

11 4

62.2±7.9 (Table 1).

## 2. 전기적 심율동전환(Electrical cardioversion) 전후 심초음파검사

### 1) 전기적 심율동 전환전 심초음파 검사

Hewlett - Packard Sonos 1,000

TTE 2.5 3.5MHz

TEE 5MHz

12 2 10% Lidocaine

, Midazolam 2 5mg

Pulse oxymetry

**Table 1.** Clinical characteristics of patients with atrial fibrillation undergoing electrical cardioversion related to the presence of spontaneous echo contrast

	All patients (n=15)	SEC (n=9)	No SEC (n=6)
Age	62.2± 7.9	62.1± 9.8	62.5± 4.7
Gender(M/F)	11/4	5/4	6/0
AF duration(month)	18.5±21.6	22.8±25.8	12.0±12.2
Hypertension	5	2	3
CHD	1	0	0
Valvular disease	3	3	0
IHSS	1	1	0
Idiopathic	2	1	1
CMP	1	1	0
Non Valvular	2	0	2

Values are mean ± SD

AF : Atrial Fibrillation

CHD : Coronary Heart Disease

IHSS : Idiopathic Hypertrophic Subaortic Stenosis

CMP : Cardiomyopathy

SEC : Spontaneous Echo Contrast

TEE SEC 가 가 가 가 (Planimetry)

TEE Basal tra -  
nsverse Plane Longitudinal plane 가 ,  
, Pulsed wave Doppler (Emptying fraction)  
flow ; EF = LAA maximum - LAA  
minimum/LAA Maximum. TTE

TEE TTE  
(Ejection fraction) 5  
(DC defibrillation) TEE TTE

가  
Midazolam 5 10mg

#### 4. 통계자료

±  
Student's t - test p<0.05

200J  
200J

#### 결 과

#### 2) 전기적 심율동 전환후 경식도 초음파 검사

##### 1. 정상 심율동으로의 전환

18 15 (83.3%)  
206.6 ± 70.3J . 15  
SEC 9  
6 SEC

SEC 가  
Pulsed wave Doppler flow

가 15  
5

15 ,

##### 3. 심초음파 자료의 분석

Pulsed wave Doppler flow  
(Peak emptying velocity)  
(Peak filling velocity)  
Peak flow velocity

6 ,  
3

가

##### 2. 심율동 전환 전후 좌심방이의 심초음파 소견

Pulsed Doppler flow  
15 fibrillatory flow pa -  
ttern(Fig. 1) " sinuslike "  
flow pattern(Fig. 2)

##### 3. 심율동 전환 전 이미 존재하는 SEC와 좌심방이 크기 및 기능과의 관계

15 9 (60%) SEC  
,  
(Peak fibrillatory flow velocity)  
SEC (21.4 ± 7.6 VS  
32.0 ± 13.2, p<0.05)(Fig. 3).



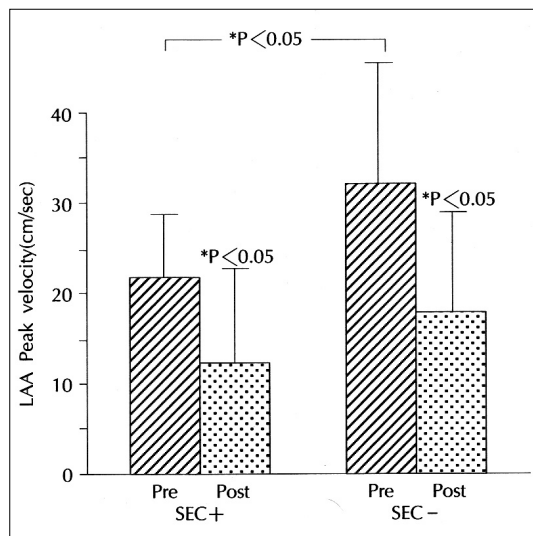


Fig. 3 LAA peak velocity before and after cardioversion of both groups with and without SEC.

(p<0.05) SEC  
 32.0 ± 13.2 18.1 ± 10.2 (p<0.05)  
 (Fig. 4).

## 고 안

1909 Rothenberger Witerberg  
 350 600  
 40 50  
 4% 가 40%

가

Table 2. Echocardiographic variables : Group Comparison before and after cardioversion

	SEC(n=9)		No SEC(n=6)	
	Pre	post	pre	post
LVEF(%)	57.7 ± 4.4		52.5 ± 12.5	
LA dimension(cm)	44.7 ± 4.8		42.6 ± 5.4	
LAA maximal area(mm 2)	49.1 ± 10.0	56.0 ± 11.1*	41.1 ± 10.4	42.1 ± 8.0**
LAA minimal area(mm 2)	39.6 ± 10.2	44.6 ± 8.2**	31.8 ± 7.5	33.1 ± 7.2**
LAA peak velocity(cm/sec)	21.4 ± 7.6	12.2 ± 9.6*	32.0 ± 13.2	18.1 ± 10.2*
LAAEF(%)	21.1 ± 15.4	19.3 ± 11.5**	24.0 ± 10.3	20.8 ± 13.1**

Values are mean ± SD, Pre=before cardioversion ; Post=after cardioversion

LVEF : Left Ventricular Ejection Fraction, LA : Left Atrium, LAA : Left Atrial Appendage, LAAEF : Left Atrial Appendage Emptying Fraction, SEC : Spontaneous Echo Contrast

\* : p<0.05, \*\* : Statistically, not significant

(inductor) (ca - Petersen <sup>8)</sup>  
 pacitor) , , ,  
 (Paroxysmal Atrial Fibrillation)  
 13,14)  
 50%  
 0.6% 5.6% 4)  
 가  
 2 TEE  
 15)  
 (Left atrial Pollic Taylor <sup>20)</sup>  
 TEE ,  
 appendage) TTE ,  
 가  
 TEE 가  
 가  
 가 6.7)  
 smoke like echo Doppler Flow Pattern  
 SEC(Spontaneous echo contrast)  
 . Leung  
 (Non valvular Atrial Fi -  
 brillation) SEC SEC SEC  
 17.5 12%  
 SEC Li <sup>16)</sup>  
 가 ing)  
 가  
 SEC (LAA Emptying Fraction)  
 Hwang <sup>17)</sup>  
 , low peak emptying  
 velocity SEC  
 가 SEC 가  
 ESR(eythrocyte sedimentation 가  
 , anticardiolipin antibody가 , 가,  
 SEC 가 Brieley <sup>18)</sup>  
 SEC (grading)가 가 fibrono -  
 gen, r - globuin, blood viscosity value 가  
 가  
 Stunning) (LAA 가  
 가 ,  
 가 TEE  
 SEC

1.6% 21-23)

TEE 24-25)

(15 )

가

Stunning,

4)

5) SEC (n=6)

SEC (n=9)

(32.0 ± 13.2cm/sec. 21.4 ± 7.6cm/sec,

p<0.05).

6)

(26.7 ± 10.4 vs 15.1 ± 9.9,

p<0.05).

결 론 :

(LAA stun -

ning)가 가

## 요약 및 결론

연구목적 :

(Left atrial appendage) 가

연구방법 :

15

pulsed wave doppler flow

(peak em -

ptying and filling velocity)

결 과 :

1) 18

15 ( 11 , 4 ),

9 SEC

SEC

2) 200J

83.3%(15/18)

3) fibrillatory flow

pattern sinuslike flow pattern

## References

- 1) Shapiro E : *The electrocardiogram and the arrhythmias ; Historical insights, In Cardiac Arrhythmias. Mandel WJ, 2nd Ed. p3, Philadelphia, Lippincott Co, 1987*
- 2) Stanton MS, Miles WM, Zipes DP : *Atrial fibrillation and flutter, In Cardiac Electrophysiology. Zipes DP, Jalife J, p735-742, Philadelphia, WB Saunders Co, 1990*
- 3) Pritchett ELC : *Management of atrial fibrillation. N Engl J Med 326 : 1264-1271, 1992*
- 4) Lown B : *Electrical reversion of cardiac arrhythmias. Br Heart J 29 : 469-489, 1967*
- 5) Treseder AS, Sastry BSD, Thomas TPL, Yates MA, Pathy MSJ : *Atrial fibrillation and stroke in elderly hospitalized patients. Age Ageing 15 : 89-92, 1986*
- 6) Ashenberg DM, W, Schulcher M, Kremer P, Schrodr E, Si Glow V, Bleifield W : *Transesophageal two dimensional echocardiography for the detection of left atrial appendage thrombus. J Am Coll Cardiol 7 : 163, 1986*
- 7) Mugge A, Daniel WG, Hausmann D : *Diagnosis of left atrial appendage thrombi by transesophageal echocardiography : Clinical implications and follow up, Am J Cardiac Imaging 4 : 173, 1990*
- 8) Petersen P, Godtfredsen J : *Embolie complications in paroxysmal atrial fibrillation. Stroke 17 : 622, 1986*
- 9) Kannel WB, Abbott RD, Savage DD, McNamara PM : *Epidemiologic features of chronic atrial fibrillation. The Framingham study. N Engl J Med 306 : 1018, 1982*
- 10) Coumel P : *Paroxysmal atrial fibrillation : A disorder of autonomic tone? Eur Heart J 15 (Supplement A) : 9, 1994*

- 11) Cobbe SM : *Incidence and risks associated with atrial fibrillation. PACE 17 (Part II) : 1005, 1994*
- 12) Kannel WB, Abbott RD, Savage DD, McNamara PM : *Epidemiologic features of chronic atrial fibrillation. The Framingham study. N Engl J Med 306 : 1018, 1982*
- 13) Lown B, Amarasingham R, Neuman J : *New method for terminating cardiac arrhythmias ; Use of synchronized capacitor discharge. JAMA 182 : 548, 1962*
- 14) Lown B, Perlroth MG, Kaidbey S, et al : *"Cardioversion" of atrial fibrillation ; A report on the treatment of 65 episodes in 50 patients. N Engl J Med 269 : 325, 1969*
- 15) Josephson ME, Buxton AE, Marchlinski FE : *The tachyarrhythmia, In Harrison's principles of Internal Medicine. Isselbacher KJ, Braunwald E, Wilson JD, Martin JB, Fauci AS, Kasper DL, 13th Edition P 1022-1023, New York, McGraw-Hill Inc, 1994*
- 16) Li YH, Lai LP, Shyu KG : *Clinical implications of left atrial appendage function : Its influence on thrombus formation. International Journal of Cardiology. 43(1) : 61-66, 1994 Jan*
- 17) Hwang JJ, Li YH, Lin JM : *Left atrial appendage function determined by transesophageal echocardiography in patients with rheumatic mitral valve disease. Cardiology 85(2) : 121-8, 1994*
- 18) Briley DP, Giraud GD, Beamer NB : *Spontaneous Echo Contrast and hemorheologic abnormalities in cerebrovascular disease. Stroke 25(8) : 1564-1569, 1994 Aug*
- 19) Fatkin D, Herbert E, Feneley MP : *Hematologic correlates of spontaneous echo contrast in patients with atrial fibrillation and implications for thromboembolic risk. American Journal of Cardiology 73(9) : 672-676, 1994 April*
- 20) Pollick C, Taylor D : *Assessment of left atrial appendage function by transesophageal echocardiography ; Implications for the development of thrombus. Circulation 84 : 223-231, 1991*
- 21) Bjerkelund CJ, Orning OM : *The efficacy of anticoagulant therapy in preventing embolism related to DC electrical conversion of atrial fibrillation. Am J Cardiol 23 : 208, 1969*
- 22) Weinberg DM, Mancini GBJ : *Anticoagulation for cardioversion of atrial fibrillation. Am J Cardiol 63 : 745, 1989*
- 23) Arnold AZ, Mick MJ, Mazurek RP, Loop FD, Trohman RG : *Role of prophylactic anticoagulation for direct current cardioversion in patients with atrial fibrillation or atrial flutter. J Am Coll Cardiol 19 : 851, 1992*
- 24) Shapiro EP, Effron MB, Lima S, Ouyang p, Siu CO, Bush D : *Transient atrial dysfunction after conversion of chronic atrial fibrillation to sinus rhythm. Am J Cardiol 62 : 1202, 1988*
- 25) Manning WJ, Leeman DE, Gotch PJ, Come PC : *Pulsed Doppler evaluation of atrial mechanical function after electrical cardioversion of atrial fibrillation. J Am Coll Cardiol 13 : 617, 1989*