

심방세동에서 전기적 재구도 현상과 동율동으로 전환 후 심방수축기능의 회복과 조기 재발과의 관계

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Electrical Remodeling in Human Atrial Fibrillation Influences Post-Cardioversion Atrial Mechanical Dysfunction and Early Relapse

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ABSTRACT

Background : It has been demonstrated that atrial fibrillation (AF) induces shortening of atrial refractory period, which was known as electrical remodeling, resulting in an increased vulnerability for reinduction of AF. Atrial mechanical function does not restore immediately after cardioversion, atrial stunning exists during this period in chronic AF. We hypothesized that electrical remodeling in chronic AF determines the atrial mechanical dysfunction after cardioversion and early relapse of AF. **Method :** Patients with chronic atrial fibrillation (CAF, n = 17) who have been done transthoracic DC cardioversion, paroxysmal AF (PAF, n = 11), and normal control (CON, n = 5) were studied. Using MAP (monophasic action potential) catheter, MAP duration 90% repolarization (MAPD₉₀) and atrial effective refractory period (AERP) were measured at 9 different sites in the right atrium. Magnitude of dispersion of these parameters was calculated by SD² (variance). Assessment of mitral inflow variables (peak velocities of A, E wave, and A/E ratio) was performed at immediately after DC cardioversion, 1st day, 3rd days, 1 week, 4 weeks and 8 weeks by transthoracic pulse wave Doppler. **Result :** MAPD₉₀ significantly shortened in patients with CAF (235.4 ± 38.1 ms) compared with that of PAF (270.9 ± 45.2 ms) and control (274.0 ± 51.9 ms), whereas AERP did not show significant differences. The magnitude of dispersion of MAPD₉₀ and AERP was not different among the groups. AF recurred in 9 of 17 (53%) patients with CAF particularly in whom A/E ratio was <0.4 immediately after cardioversion (positive predictive value ; 89%). MAPD₉₀ (229.3 ± 28.2 ms) in patients who recurred AF with small A/E ratio (<0.4) was shorter than that of maintained sinus rhythm with higher A/E ratio (>0.4) (250.9 ± 52.9 ms, p = 0.05). **Conclusion :** Electrical remodeling in chronic human AF characterized by shortening of monophasic action potential duration is one of the main factors that determines the atrial mechanical dysfunction after cardioversion and early relapse into AF. (Korean Circulation J 1999;29(8):788-795)

KEY WORDS : Atrial fibrillation · Electrical remodeling · Atrial mechanical function.

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서 론

(atrial refrac -
tory period)가
(ele -
ctrical remodeling)

1-5)

mi -

6-10)

11)

가

10 - bipole(Ha -

lo)

가

가

전기적 지표(Electrical parameter)

(action potential)

12)13)

1

가

(pacing)

ation 90%(MAPD₉₀),

MAP dur -

(AERP)

가

1)

가

1) MAPD 90 Fig. 1

phase 0

90%

2)

가

. MAP

Fig. 2

9

2)

(AERP)

S₁ 600 ms

가

8

S₁

S₂

가

(S₁

S₂ protocol)

S₂

연구대상 및 방법

대 상

1998 3

1999 2

17 (CAF ,

58.8±8.54),

11 (PAF ,

53.6±6.56

)

5 (CON ,

58.8±11.7)

S₁ S₂

400 ms

20 ms

S₁ S₂

250 ms

10 ms ,

8 ms

2

ms

3) MAPD 90 AERP

(SD²)

3

Cou -

(transesophageal

48

madin

echocardiography)

360 J 200 J 2
300 mg 600 mg propafenone

통계분석

Student's t - test ANOVA P
0.05

간헐적 도플러를 이용한 승모판 혈류의 추적관찰
CAF

결 과

(tran -
sthoracic echocardiogram, Hewlett - Packard Sonos
1000 1500)
, 1 , 3 , 1 , 4 8
apical 4 - chamber view
A, E A/E
7

각군에서 전기적 재구도 현상의 양상

MAPD 90 235.4 ± 38.1 ms
270.9 ± 45.2 ms 274.0
± 51.9 ms (p<0.05)

AERP 가 (Table
1). MAPD 90 AERP
가 (Table 2).

CAF군에서 동율동 전환 후 심방수축기능의 변화 양상

Fig. 3 8
1 (A)

1 A/E 0.77 8

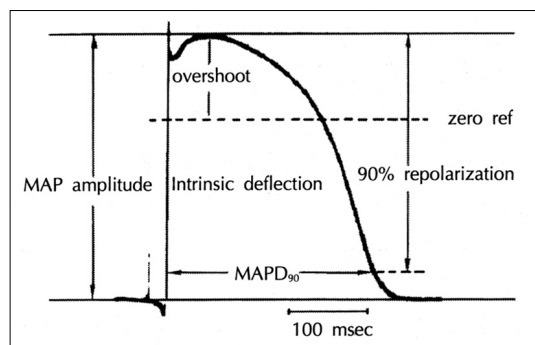


Fig. 1. Measurement of monophasic action potential duration 90% (MAPD₉₀).

Table 1. Difference of MAPD₉₀ & AERP in each group

Group	CAF	PAF	CON
MAPD ₉₀ (ms)	235.4 ± 38.1*	270.9 ± 45.2	274.0 ± 51.9
AERP(ms)	229.2 ± 26.3	235.8 ± 33.1	224.6 ± 18.0

*p<0.05 By ANOVA

Fig. 2. 9 different sites of MAP recording at the right atrium (left panel) and MAP characteristics in one ex-ample (right panel).

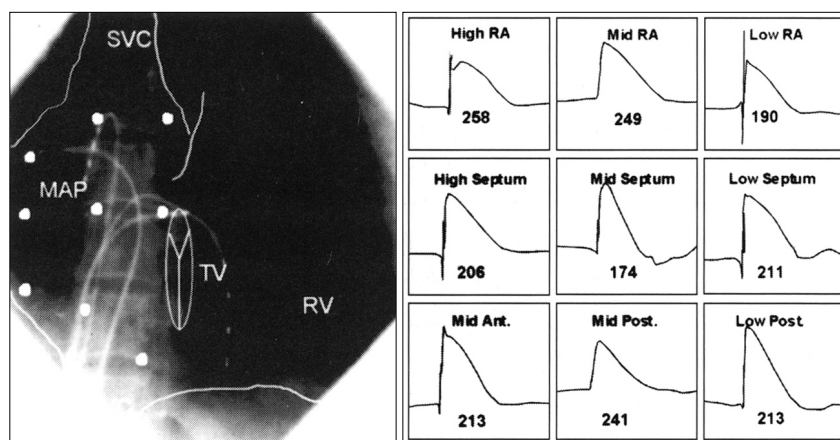


Table 2. Variation of MAPD₉₀ and AERP (Variance (SD₂))

Group	CAF	PAF	CON
MAP			
AERP _(ms)	403 ± 234	944 ± 1148	285 ± 95
MAPD _{90(ms)}	1385 ± 1618	1817 ± 1368	2100 ± 1268

Table 3. Serial changes in A/E ratio after cardioversion
R : Relapse

Pts	Time	Immediately	1st day	3rd day	1 week	4 week	8 week
1		0	0.31	0.36	0.36	0.46	1.16
2		0.82	0.80	1.08	0.76	0.82	0.98
3		0.77	0.78	0.66	0.77	1.06	1.17
4		0.77	R	R	R	0.37	0.66
5		0.33	0	0	0	R	0.74
6		0.38	0.46	0.44	0.98	1.46	1.11
7		0.50	0.44	0.43	0.67	0.91	
8		0.75	0.47	0.41	0.79	1.06	0.93
9		0	0.34	R	R	R	R
10		0.36	0.23	R	R	R	R
11		0	0	0	R	R	R
12		0	0	0	0.30	R	R
13		0	0.41	0.58	0.65	R	R
14		0.47		0.79	0.99	R	R
15		0	0	0.7	R	R	R
16		0.38	0.41	0.4	0.57	R	R
17		0	0	R	R	R	R

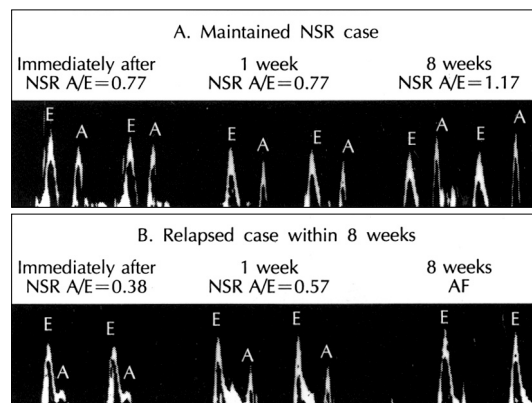


Fig. 3. Serial evaluation of atrial function using PW Doppler post-cardioversion.

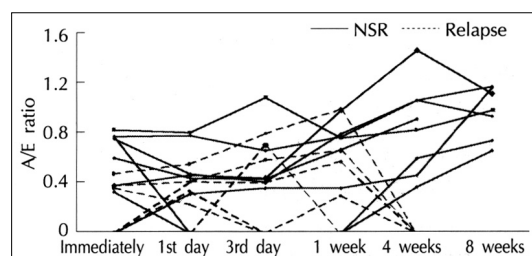


Fig. 4. Serial changes in A/E ratio after cardioversion.

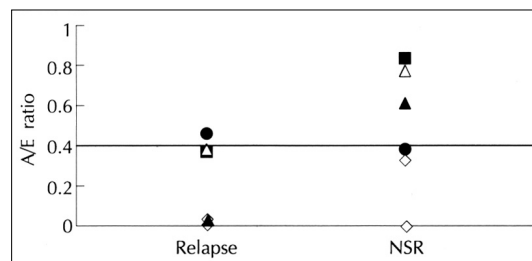


Fig. 5. Value of A/E ratio immediately after cardioversion.

1.17 가 .
(B) A/E 가
0.38 1
0.57 가 8
A 가 .
CAF A/E
Table 3 Fig. 4 . Table
3 A/E 가 0 E
A R
. Fig. 4 8
4
AF가 . CAF 17 9
(53%) AF가
A/E 가 8

가 A/E 가 4
AF가 .
A/E 가 0.4
89%(8/9) (Fig. 5).
동율동 전환후 심방세동 재발 유무에 따른 전기적 재구도
현상의 차이
A/E 가 0.
A/E 가 0.
4

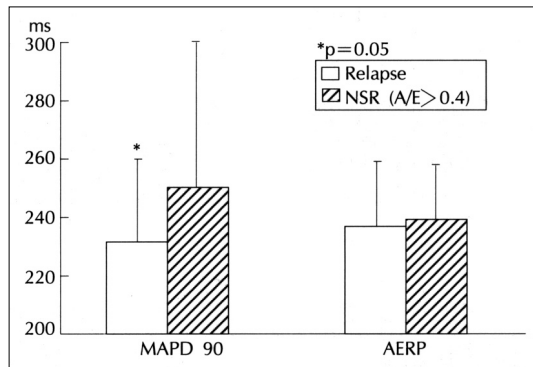


Fig. 6. Difference in electrical parameters between patients with relapse and maintained normal sinus rhythm.

4 MAPD₉₀가 (229 ± 28 ms vs. 251 ± 53 ms, p = 0.05). AE - RP 가 (235 ± 30 ms vs. 237 ± 26 ms, NS) (Fig. 6).

가 (48.1 ± 1.9 mm vs. 42.3 ± 4.4 mm, p < 0.05) (23.2 ± 29.7 months vs. 7.6 ± 11.1 months).

고 안

A/E 가 0.4

A/E 가 0.4

심방세동에서 전기적 재구도 현상
Wijffels¹⁾

cardiac memory²¹⁻²³⁾

가

rillo²⁴⁾

(right atrial appendage)

6 400

15

1

22 18 (82%)

45% 67%

가 가

가

가

가

¹⁾,
(intraatrial conduction time)

²⁵⁾

²⁶⁻³²⁾ Olsson²⁶⁾

(DC shock)

MAPD 90가 3

oud²⁹⁾

5 8

. Da -

Z

전기적 재구도 현상의 기전

Goette³⁰⁾ 가 L - type verapamil (atrial stunning) (thrombus)

33) verapamil K⁺ 2 3 , 4 38 - 40) 가 가

4 - aminopyridine T - type nickle chloride L - type 가 가 41)

4 - aminopyridine 가 . Yue³⁴⁾ transient outward current(I to) L - type Ca⁺⁺ current

35) crista terminalis, (appendage), (atrioventricular ring) , pectinate A/E 가 0.4 9 8 2

4 ionic current crista terminalis 가 가 가 가

ionic current 가 ionic A/E 가 0.4 MAPD⁹⁰가

current 가

가 Kv4.3(putative gene encoding transient outward K⁺ current) L - type

1c subunit, Na⁺ gene subunit mRNA L - type Ca²⁺ - ■ 본 연구의 제한점

ATPase gene mRNA 가 , MAP

동율동전환후 심방수축기능

2 24
2 6 1 , 6
1

propafenone
가 5
요 약

연구배경 :

가

가

연구대상 및 방법 :

17 MAP 11 MAPD 90 5
AERP 9
A, E
A/E , 1 , 3 , 1 , 4 ,
8
결 과 :
MAPD 90 (235.4 ± 38.1 ms)
(270.9 ± 45.2 ms)
(274.0 ± 51.9 ms) (p<
0.05) AERP 가 MAPD₉₀ AERP
가
17 9 가
8
A/E 가 0.4 가 (posi -
tive predictive value : 89%). A/E 가 0.4
A/E 가 0.4
MAPD₉₀가
(229.3 ± 28.2 ms vs 250.9 ± 52.
9 ms, p=0.05).

결 론 :

가

중심 단어 :

감사문 _____

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