

## 특발성 좌심실빈맥(Idiopathic Left Ventricular Tachycardia)의 성공적인 전극도자절제술을 위해 단극전기도(Unipolar Electrogram)가 유용한가?

최기준 · 남기병 · 강덕현 · 홍명기 · 송재관  
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### Does Unipolar Recording Predict Successful Ablation Site in Idiopathic Left Ventricular Tachycardia?

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#### ABSTRACT

**Background :** Unipolar electrogram was reported to be useful for localization of manifest accessory pathway conduction during surgical or transcatheter ablation. However, it is not clear whether the unipolar electrogram would also be useful for localizing the origin of idiopathic left ventricular tachycardia (ILVT) in which pace mapping, activation time and recording of Purkinje (P)-potential have been used for guiding the successful ablation. **Methods :** In patients who underwent catheter ablation for ILVT, bipolar and unipolar electrograms were recorded at the sites of current delivery. We analysed the time from P-potential to QRS onset (P-QRS time), time from local ventricular electrogram to QRS onset (V-QRS time) and the morphology and slope of rapid downstroke of unipolar electrograms (Uni-slope) during induced ILVT both at successful and unsuccessful sites. **Results :** In 14 consecutive patients (11M/3F, mean age 29.3) with ILVT and successful ablation, QRS morphology of ventricular tachycardia was of right bundle branch block (RBBB) with left axis deviation and right axis deviation in 11 and 3 patients, respectively. The average number of current delivery was 4.5 (range 2-42). P-potential was observed in 10/14 (71%) successful sites and 37/47 (79%) unsuccessful ablation sites. The morphology of unipolar electrogram was QS pattern in 12 and QrS pattern in 2 successful sites but rS pattern was not observed at successful sites. P-QRS time was  $26.5 \pm 12.4$  and  $26.6 \pm 14.9$  msec ( $p = ns$ ), V-QRS time  $3.9 \pm 7.7$  and  $0.2 \pm 8.9$  msec ( $p = ns$ ), Uni-slope  $7.1 \pm 3.1$  and  $7.3 \pm 4.5$  mV/10 msec ( $p = ns$ ) at successful and unsuccessful sites, respectively, showing no significant differences between successful and unsuccessful sites. **Conclusions :** The slope of rapid downstroke in unipolar electrogram was not useful as a guide for localization of successful ablation in patients with ILVT. However, absence of initial  $\delta$  ' wave in

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unipolar electrogram may be helpful in conjunction with other conventional criteria for successful ablation.  
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**KEY WORDS :** Unipolar electrogram · Idiopathic left ventricular tachycardia · Catheter ablation.

가 .

서 론

전극도자절제술

가 .

(inferoposterior septum) fascicle 4 ,

가 .<sup>1-5)</sup> 6 .

midazolam 2 4 mg fen -

Pukinje po - tanyl 25 50 µg ,

tential(P - potential),<sup>6)</sup> pace mapping,<sup>5)7)8)</sup> ventricu - 가 .

lar activation mapping<sup>9)10)</sup> , 4

P - potential 가 . , , His

P - potential 가 가 ,<sup>5)</sup> .

P - EP Lab(Pruka

potential Co., USA) 100 200 mm/sec

Medtronic programmable electrical stimu -

lator(model 5328, Medtronic Co., USA)

(unipolar 2 msec diastolic threshold 2

electrogram)가 A1A2, A1A2A3, V1V2, V1V2V3

incremental pacing

30 500 Hz filtering .

가 4 mm

7F 4 (EPT : Boston Scientific Co, Cordis -

Webster : Johnson&Johnson Co, Elecath : Elec -

tro - Catheter Co, USA)

retrograde transaortic approach

EPT 1000

(Boston Scientific Co, USA) ,

가 3,000U

1,000U

thallium , 가 .

QRS sharp P - pot -

ential , 가 ,  
가 , 가 가  
ventricular acti -  
vation mapping mapping , P - potential His  
pace 14  
mapping . 11 , 3  
가 70 29.3 ( 19 47 ) .  
(temperature mode) 가 11 , 가  
(constant power 1 , (northwest axis)가 2 .  
mode) 4 2 , 1  
20 W 가가 1  
30 W 가 . 30 가 .  
60 가가 가  
가 가 .

#### 단극전기도의 기록 및 분석

reference  
0.05 500  
Hz filtering 100 200 mm/sec  
rS, QS, QR(r)S  
<sup>11)</sup> (down -  
stroke slope)  
mV/10 msec <sup>11)</sup>

#### 도자절제술의 결과 및 양극전기도의 분석

4.5 ( 2 12)  
(post -  
eroinferior septum) 가 9 가 ,  
(posterior mid - septum) 가 4 ,  
(basal anterior septum) 가 1 .  
1  
2

#### 통 계

$\pm$   
t - test ,  
linear regression analysis  
p 0.05 가

#### 결 과

#### 환자의 특성

20 ,  
16 (80%)  
16  
가 ,

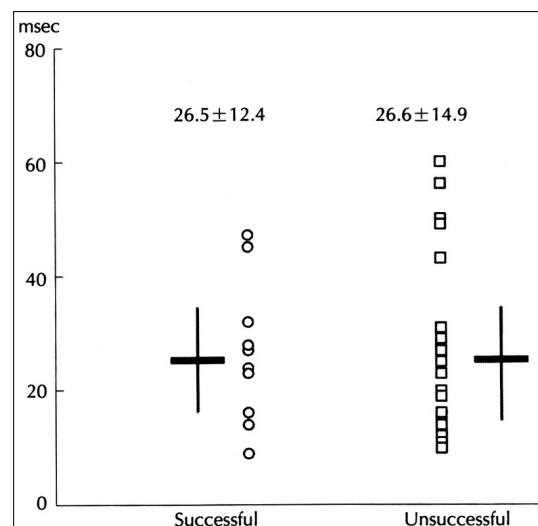
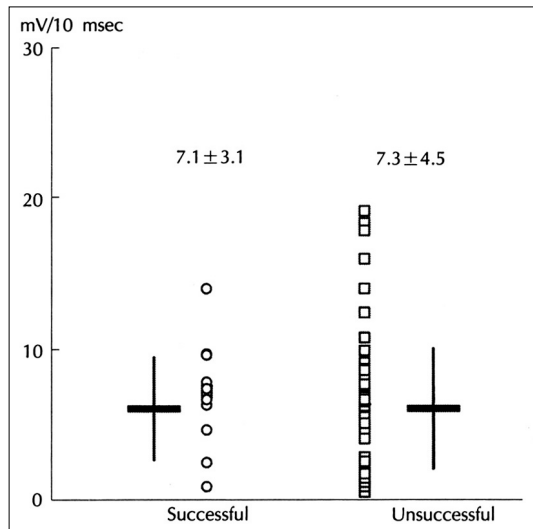
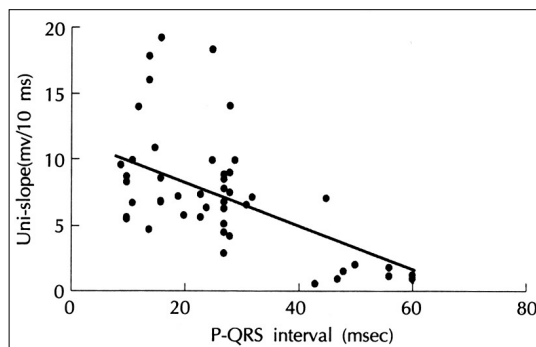


Fig. 1. P-QRS interval at successful and unsuccessful ablation site.



**Fig. 2.** Downstroke slope in unipolar electrogram at successful and unsuccessful ablation site.



**Fig. 3.** The relation of P-QRS interval and downstroke slope in unipolar electrogram at all ablation site ( $r < 0.1$ ,  $p = ns$ ).

14 10 P -  
potential , QRS  
 $26.5 \pm 12.4$  msec(range 9 45)  
47 37  
P - potential QRS  
 $26.6 \pm 14.9$  msec(range 10 60)  
가 (Fig. 1).  
P - potential  
 $3.9 \pm 7.7$  msec( - 13 16),  
 $0.2 \pm 8.9$  msec( - 23 20) QRS  
( $p = ns$ ).

## 단극전기도의 분석

QS  
(12/14), QR(r)S 2 rS  
47  
QS, QR(r)S, rS 37, 5, 5 ( $p = ns$  vs  
).  
 $7.1$  mV/10 msec(range 0.9 14.0),  
 $7.3$  mV/10 msec(range 0.6 19.1)( $p =$   
ns) (Fig. 2). P - potential  
QRS  
가 (Fig. 3,  $r < 0.1$ ,  
 $p = ns$ ).

## 고 안

가 , P - potential ti -  
ming 가  
Q  
가  
,  
가  
가 가  
1979 Zipes <sup>12)</sup>  
,  
가 가  
triggered activity가  
,  
, entrainment가  
,  
verapamil  
triggered activity가 <sup>1)13)</sup>

80%  
 4-6)(14)(15)  
 pace mapping,<sup>5)(7)(8)</sup> ventricular ac-  
 tivation mapping,<sup>9)(10)</sup> P - potential<sup>6)</sup>  
 . Pace mapping  
 ,  
 pace mapping 50%  
<sup>9)(10)(14)</sup> 가  
 activation mapping 가  
 . Wen ,  
 QRS  
 30 msec .<sup>4)</sup> Nakagawa<sup>6)</sup>  
 Purkinje fiber  
 network ,  
 potential , potential<sup>16)</sup>  
 Purkinje fiber network Purkinje -  
 potential(P - potential)  
 . potential  
 saguerre<sup>11)</sup> DC shock<sup>11)(18)(19)</sup> Hais -  
 timing intrinsic deflection  
 , Simmers  
 ,<sup>5)</sup>  
 14<sup>19)</sup>  
 Kimber<sup>20)</sup>  
 10 P - potential mapping  
 P - potential mapping ,  
 QRS 가 . , Pein -  
 가 slow conduction zone ado  
 P - potential exit ,<sup>21)</sup> Me -  
 가 . rino  
 ' indifferent ' QS 가  
 ,<sup>22)</sup> Ch -  
 (remote activation) . ingman  
 가 ,  
 fractionation (local activation 2 mm R 가 가  
 time) 가 , 11 mm R 가 가 65%  
 (earliest activation site) 가<sup>23)</sup>  
 , filter setting 가 (dV/dt)  
 , low - frequency 가 R  
 . intrinsic deflection mapping  
 dV/dt가 ,<sup>24)</sup>

가 ,<sup>25)</sup> 가 가 .

16) ,

23) .

연구목적 :

가 .

Purkinje potential(P - potential), pace mapping, activation mapping

가 P - pot -

ential timing 가 ,

가 .

가 가

방 법 :

가

가 (30 500 Hz) (0.05 500 Hz) , P - potential , P - potential QRS (P - QRS time), QRS (V - QRS time), (Uni - slope) .

가 reentry circuit , fascicle 가 slow conducting zone Purkinje network exit 성 적 : 14 ( / 11/3, 29.3 )

network exits 가 , , , 11, 1, 2

slow conducting zone exit . 4.5

가 . (2 12 ) . 10 P - potential , 12 QS , 2 QrS

가 R 가 rS .

가 P - QRS time

R 가 , 26.5±12.4, 26.6±14.9 msec, V - QRS time 3.9 ±7.7, 0.2±8.9 msec, Uni - slope 7.1±3.1, 7.3 ±4.5 mV/10 msec 가 , P - QRS time Uni - slop 가 .

결 론 :

가 .

P - potential activa - r 가 .

tion mapping .

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