厚生労働科学研究費補助金（難治性疾患克服研究事業）
分担研究報告書

Brugada 症候群と早期再分極症候群の遺伝子検査に関する研究

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研究要旨　Brugada 症候群は遺伝性不整脈症候群の一つであり、心電図にて胸部誘導 V1-V3 の ST 上昇を特徴とし心室細動を引き起こす疾患として、遺伝子異常や臨床的特徴に関して研究が進んでいる。一方、心室細動を引き起こす特発性心室細動の中に心電図の下壁（Ⅱ,Ⅲ,aVF)、側壁（Ⅰ,aVL, V4,V5,V6）誘導に J 波を伴うものが多く存在することが近年になって報告され、早期再分極（J 波）症候群として注目を集めている。本研究では Brugada 症候群と早期再分極症候群の遺伝子検査の意義と有用性を明らかにすることを目的としている。本年度は当院で集積された、心室細動を伴う両症候群の遺伝子検査結果を検討した。その結果、早期再分極症候群では遺伝子検査を施行した 14 例中全例で SCN5A 遺伝子変異はみつからなかったが、7 例で多型が同定され、Brugada 症候群では 26 例中 9 例において SCN5A 遺伝子変異が同定された。

A. 研究目的

近年、明らかな心疾患を伴わないにも関わらず、心室細動を引き起こす特発性心室細動として、心電図の前胸部誘導で奇異な ST 上昇を呈する Brugada 症候群と、下壁（Ⅱ,Ⅲ,aVF)、側壁（Ⅰ,aVL, V4,V5,V6）誘導に J 波を伴う早期再分極（J 波）症候群が注目されている。

本研究では当院における早期再分極症候群と Brugada 症候群に遺伝子検査を施行し、どの程度の頻度で遺伝子変化が発見されるかを検討した。

B. 研究方法

当院における 40 例の心室細動を伴う早期再分極症候群（16 例）と Brugada 症候群（24 例）において、末梢白血球から抽出したゲノム DNA を用いて SCN5A 遺伝子のコドン領域を PCR で増幅し、直接シークエンス法で検索した。早期再分極症候群では、Na チャネル遮断薬を投与して高位肋間（第 2, 3 肋間）を含めた V1-V3 誘導で coved 型 ST 上昇が出現していないことを確認した。また Brugada 症候群では、全例で Type1 の ST 上昇と T 陰転が認められることを確認した。

C. 研究結果

早期再分極症候群では全例でSCN5A遺伝子変異が見つからなかったが、Brugada症候群では24例中9例で変異が同定された。ただ、早期再分極症候群では7例にSCN5Aの遺伝子多型が指摘された。

D. 考察

早期再分極症候群の原因遺伝子として、これまでに KCNJ8、CACNA1C、CACNB2B、CACNA2D1、SCN5A などが知られている。しかしながら、これらの遺伝子はすべて Brugada 症候群の原因遺伝子でもある。また、これまで報告された症例の多くでは、下側壁誘導に J 波を有するものの、Na チャネル遮断薬投与後等に T 陰転を伴わない 2mm 以上の coved 型 ST 上昇が前胸部誘導で認められている。さらに coved 型 ST 上昇を有さない例においては、高位肋間での記録がなされていない。

欧米ではT陰転を伴わないcoved型ST上昇はBrugada症候群とは見なされず、高位肋間での心電図記録も一般に施行されない。しかしながら、通常肋間でT陰転を有さないcoved型ST上昇例では、高位肋間でV1-V3誘導を記録する、または心電図を複数回記録すると、T陰転を示すcoved型ST上昇が出現する場合が極めて多い。このため、遺伝子変異が同定された従来の早期再分極症候群はすべてBrugada症候群、またはBrugada症候群の亜型であった可能性を否定できない。

本研究では、早期再分極症候群において、高位肋間記録と、薬物負荷を徹底し、すべての誘導であらゆる種類のcoved型ST上昇が生じていないことを確認した。その結果、早期再分極症候群の全例でSCN5A遺伝子変異を指摘できなかった。一方、Brugada症候群でのSCN5A遺伝子陽性率は34%と、通常のBrugada症候群の陽性率（15-30%）に比べ、高かった。これは検査対象全例が心室細動を伴う重症例であったためかもしれない。

今後は、早期再分極症候群の遺伝子検査を進め、高位肋間を含む前胸部誘導でcoved型波形を伴わない例、またはsaddleback波形を含むJ波を伴わない例における原因遺伝子の検索が必要と思われる。

E. 結論

本研究では早期再分極症候群でSCN5Aの遺伝子変異が認められなかった。

F. 健康危険情報

特になし。

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特になし

H. 知的財産権の出願・登録状況（予定を含む）

1. 特許取得

特になし

2. 実用新案登録

特になし

3. その他

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分担研究報告書

遺伝性不整脈疾患の遺伝子基盤に基づいた病態解明と診断・治療法の開発に関する研究

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研究要旨　Brugada症候群（BS）は右側胸部誘導のST上昇と心室細動を主徴とする症候群であるが、無症候例に対する戦略は定まっていない。植込み後の初回適切作動と合併症発生状況から、ICD治療の有用性と問題点を検証した。対象は当院でICDが植込まれたBS49例であった。植込み前の症候により、蘇生群（17例）、失神群（23例）、無症候群（9例）の3群に分けた。適切作動は蘇生群で10例（59%）、失神群で9例（39%）、無症候群で1例（11%）に認め、無症候群と蘇生群間に統計学的有意差を認めた。家族歴の有無、EPSでの誘発性は、いずれも適切作動の予測因子とはならなかった。経過中16症例、18事象の合併症を認めた。BSに関して、蘇生例では早期かつ高率に適切作動し、早急なICD治療が必要と思われた。一方無症候例の適切作動率は低く、かつ比較的高率に合併症を伴うため、その植込みは慎重に行うべきと思われた。家族歴の有無やEPSでの陽性所見は、その後の適切作動に関して有用な指標とはなっておらず、新たな予測因子の検討や検査方法の開発が必要と考えられた。

A．研究目的

Brugada症候群（BS）は右側胸部誘導のST上昇と心室細動を主徴とする症候群である。本研究の目的は、ICD植込み後の初回適切作動と合併症発生状況から、ICD治療の有用性と問題点に関して、遺伝子解析結果を含めて検証した。

B．研究方法

対象は当院でICDが植込まれたBS49例。男性46例（94%）、平均年齢47±13歳であった。平成12年6月以降に植込み術が施行された28例はDual-chamber ICDであった。植込み前の症候、突然死の家族歴、電気生理検査(EPS)の施行状況と結果を確認した。EPSでは右室2点から、２つの基本周期で3連までの期外刺激と、200msecまでの高頻度刺激を行い、致死性不整脈の発生を陽性とした。植込み前の症候で蘇生群（17例）、失神群（23例）、無症候群（9例）の3群に分けた。病歴や検査所見、ICDの記録解析から適切作動の有無と不適切作動を含めた合併症の発生を確認した。

C．研究結果

平均観察期間は84ヶ月であった。適切作動は蘇生群で10例（59%）、失神群で9例（39%）、無症候群で1例（11%）に認め、無症候群と蘇生群間に統計学的有意差を認めた(p<0.05)。ICD植え込み後初回適切作動の時期は、失神群に比べ蘇生群で早期に生じていた。家族歴の有無、EPSでの誘発性は、いずれも適切作動の予測因子とはならなかった。また、遺伝子解析を行った30例のうちSCN5A変異を認めた症例は7例であった。SCN5A変異を有する症例と、SCN5A変異を有さない症例とで、適切作動の発生割合に有意さは認められなかった。経過中16症例、18事象の合併症を認めた。不適切作動を14例（29%）に認め、最多の原因は心房細動であった。3群の比較では合併症発生率に有意差はなかった。

D．考察

BSに関して、蘇生例では早期かつ高率に適切作動し、早急なICD治療が必要と思われた。一方無症候例の適切作動率は低く、かつ比較的高率に合併症を伴うため、その植込みは慎重に行うべきと思われた。家族歴の有無やEPSでの陽性所見は、その後の適切作動に関して有用な因子とは認められなかった。SCN5A変異に関する評価を行ったが、今回解析を行った症例では、致死性不整脈予測に対する有意な因子としては認められなかった。今後、遺伝子検査も含めた新たな予測因子の検討や検査方法の開発が必要と考えられた。

E．結論

BSに関して、蘇生例では早急な二次予防としてのICD治療が必要であった。一方無症候例の適切作動率は低く、かつ比較的高率に合併症を伴うため、その植込みは慎重に行うと同時に、新たな予測因子の開発が望まれる。

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1. 特許取得
なし
2. 実用新案登録
なし
3. その他
特になし

Ⅲ．研究成果の刊行に関する一覧表

研究成果の刊行に関する一覧表

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Ⅳ．研究成果の刊行物・別刷り

Effect of sodium-channel blockade on early repolarization in inferior/lateral leads in patients with idiopathic ventricular fibrillation and Brugada syndrome

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BACKGROUND A high incidence of early repolarization (ER) pattern in the inferolateral leads has been reported in patients with idiopathic ventricular fibrillation (IVF). Brugada syndrome (BS) is characterized by J-point or ST-segment elevation in the right precordial leads and ventricular fibrillation, and some patients with BS also have ER in the inferolateral leads.

OBJECTIVE To compare the clinical characteristics and effects of sodium-channel blockade on ER between IVF patients with ER (early repolarization syndrome [ERS]) and BS patients with or without ER.

METHODS Fourteen patients with ERS and 21 patients with BS were included in this study. ER was defined as an elevation of at least 0.1 mV from baseline in the QRS–T junction in the inferolateral leads. Provocative tests with sodium-channel blockers were conducted in all patients with ERS to distinguish ERS from BS.

RESULTS In the ERS group, all patients were male and most patients experienced ventricular fibrillation during sleep or low activity (79%). ER was attenuated by sodium-channel blockers in most patients with ERS (13/14, 93%) and BS (5/5, 100%), whereas ST-segment elevation was augmented in the right precordial leads in the BS group. The rates of positive late potentials were significantly higher in the BS group (60%) than in the ERS group (7%) ($P < .01$).

CONCLUSIONS Some similarities were observed between ERS and BS, including gender, arrhythmia triggers, and response of ER to sodium-channel blockers. Unlike the ST segment in the right precordial leads in BS, ER was attenuated in patients with both ERS and BS, suggesting a differential mechanism between ER in the inferolateral leads and ST elevation in the right precordial leads.

KEYWORDS Early repolarization; J wave; Idiopathic ventricular fibrillation; Brugada syndrome; Sudden death; Sodium-channel blocker

ABBREVIATIONS **BS** = Brugada syndrome; **ECG** = electrocardiogram; **ER** = early repolarization; **ERS** = early repolarization syndrome; **IVF** = idiopathic ventricular fibrillation; **LPs** = late potentials; **QTc** = corrected QT interval; **SAECG** = signal-averaged electrocardiogram; **SCD** = sudden cardiac death; **VF** = ventricular fibrillation; **VT** = ventricular tachycardia

Introduction

Early repolarization (ER) pattern is often found in the general population and has been considered a benign electrocardiographic finding. Its prevalence has been estimated to be between 1% and 5% of healthy adults.[1–4] Idiopathic ventricular fibrillation (IVF) presenting prominent ST-segment elevation in the inferior leads has been considered as a variant of Brugada syndrome (BS).[5,6] BS[7] is characterized by ST-segment elevation in the right precordial leads V1 to V3 and is considered to have a high propensity toward sudden cardiac death (SCD).[8,9] Recently, several reports have suggested the association of IVF with ER in the inferior and/or lateral lead in the electrocardiogram (ECG).[3,10–14] ER is reported to be found more frequently among patients with IVF than among healthy control subjects.[10,15] However, little is known about the clinical and electrocardiographic characteristics and the pharmacological response of ER in patients with IVF and BS associated with ER and their different re-

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sponse from that of ST elevation in the right precordial leads in patients with BS. The present study aimed to investigate the similarities and differences between IVF with ER (early repolarization syndrome [ERS]) and BS with or without ER.

Methods

Patient characteristics

Among 38 patients with IVF, admitted to the National Cerebral and Cardiovascular Center between 1994 and 2009, ER in the inferior and/or lateral ECG leads was recorded in 14 patients (37%). These 14 patients were included in this study as an ERS group (all males, aged 27–64 years, mean age 44.7 ± 13.6 years). Twenty-one patients with BS with a history of ventricular fibrillation (VF) or aborted SCD were also included in this study. According to the published guidelines,[16,17] patients were diagnosed as suffering from IVF if they had no structural heart disease confirmed by noninvasive studies (physical examination, ECG, exercise stress test, echocardiogram, and cardiac magnetic resonance imaging or computed tomography) and invasive studies (coronary angiography and left ventricular cineangiography). Long QT syndrome (corrected QT [QTc] interval ≥440 millisecond), short QT syndrome (QTc interval <340 millisecond), and BS were also excluded to diagnose a patient as suffering from IVF. To exclude BS, all subjects in the ERS group were proven to be negative with a pharmacological challenge with pilsicainide.[8,18]

The BS group consisted of 21 patients (19 males, aged 20–64 years, mean age 39.7 ± 12.6 years) with an episode of documented VF or aborted SCD. Eleven had a spontaneous type 1 ECG, and in the remaining, it was induced by a sodium-channel blocker. Ethical approval of the present study was obtained from the Institutional Review Committee of the National Cerebral and Cardiovascular Center.

Electrocardiography

All available conventional ECGs (25 mm/s, 10 mm/mV) were investigated in the search for ER. ER was defined as an elevation of at least 1 mm (0.1 mV) in the J point (QRS–ST junction) in at least 2 leads (Figure 1), either as QRS slurring (smooth transition from QRS to the ST segment) or as notching (a positive J deflection inscribed on the S wave).[10] The inferior (II, III, and aVF) and lateral (I, aVL, and V4–V6) leads were evaluated. To exclude BS, no J-point elevation must exist in the right precordial leads (V1–V3).

All ECGs were interpreted blindly by 2 independent cardiologists (H.K., W.S.). The following parameters were assessed in lead II, which include P-wave duration and PQ and RR intervals. QRS duration and QT interval were assessed in leads II and V5. The QTc interval was calculated using Bazett's method. The amplitude of ER was assessed in the inferior leads (II, III, and aVF), the lateral leads (I, aVL, and V4–V6), or both, and the maximum ER amplitude was measured. We selected leads II and V5 as representative of inferior and lateral leads for the analysis of ER amplitude.

BS was diagnosed when a type 1 coved-type ST-segment elevation (≥0.2 mV at J point) was observed in >1 of the right precordial leads (V1–V3) in the presence or absence of

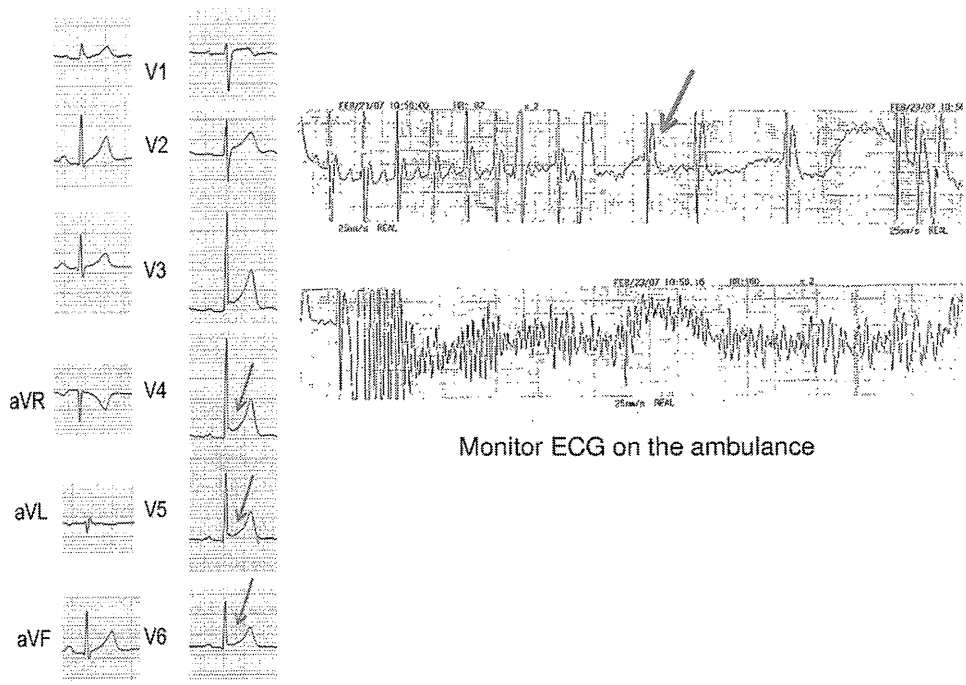

Figure 1 **A:** Twelve-lead ECG in a patient with early repolarization syndrome. ER (arrow) was seen in the lateral leads (V4–V6) under baseline conditions. **B:** Monitor ECG recorded during the arrhythmic periods in the same patient showed a consistent increase in the amplitude of ER, followed by initiation of ventricular fibrillation. ECG, electrocardiogram; ER, early repolarization.

a sodium-channel blocker in conjunction with documented VF or polymorphic ventricular tachycardia (VT).

Drug challenge test

The drug challenge test was performed with intravenous pilsicainide (1 mg/kg, maximum 50 mg, 5 mg/min) or flecainide (2 mg/kg, maximum 100 mg, 10 mg/min). The test result was considered positive if a type 1 Brugada ECG appeared in >1 right precordial lead (V1–V3). Once again, we excluded all patients with IVF but without sodium-channel blocker challenge test from our study to clarify the diagnosis of ERS.

Late potentials

Late potentials (LPs) were analyzed by using a signal-averaged electrocardiogram (SAECG) system (Arrhythmia Research Technology 1200EPX, Milwaukee, WI). Three parameters were assessed by using a computer algorithm: (1) total filtered QRS duration (f-QRS), (2) duration of low-amplitude signals <40 μV of the filtered QRS complex (LAS_{40}), and (3) root-mean-square voltage of the terminal 40 millisecond of the filtered QRS complexes (RMS_{40}). LPs were considered positive when at least 2 of the 3 parameters were abnormal: f-QRS >120 millisecond, LAS_{40} >38 millisecond, and RMS_{40} <18 μV.

Statistical analysis

Continuous variables were expressed as mean value ± SD. A comparison between the 2 groups was performed with Student's t test for paired data. Categorical variables were compared with Fisher's exact test. A P value of <.05 was regarded as being significant.

Results

Clinical and electrocardiographic characteristics

In the BS group, 9 of the 21 patients (43%) with BS showed ER in the inferior and/or lateral leads. A comparison of the clinical and electrocardiographic characteristics of the 14 ERS group patients, 21 BS group patients, and 9 BS patients with ER is shown in Table 1. The average age of 9 BS patients with ER was lower than that of the ERS group. Except for that, no significant differences were observed in baseline clinical characteristics with respect to age, gender, family history of SCD, and activity at the time of cardiac arrest. The number of premature ventricular complexes during 24-hour Holter ECG was not different between the 2 groups.

Regarding SAECG parameters, the values of f-QRSd, LAS_{40}, and RMS_{40} in 14 ERS group patients were 97.8 ± 8.1 millisecond, 29.8 ± 5.2 μV, and 50.0 ± 24.2 millisecond, respectively. The corresponding values in 21 BS group patients were 119.8 ± 17.3 millisecond, 47.0 ± 19.2 μV, and 17.8 ± 13.4 millisecond, respectively. All these parameters were significantly different between the 2 groups. LPs were positive in 1 of the 14 patients (7%) in the ERS group and in 12 of the 20 patients (60%) in the BS group. The rate of positive LPs was significantly higher in the BS group than in the ERS group (P <.01). We also compared the SAECG parameters and the rate of positive LPs between 14 ERS group patients and 9 BS patients with ER. The tendency was similar to the comparison between 14 ERS group patients and 21 BS group patients; however, there were no significant differences in the LAS_{40} and rate of LPs because of the small number of BS patients with ER.

Table 1 Clinical and electrocardiographic characteristics in the early repolarization syndrome group, the Brugada syndrome group, and the Brugada syndrome with ER group

	Group			P value	
	ERS (n = 14)	BS (n = 21)	BS with ER (n = 9)	ERS vs BS	ERS vs BS with ER
Clinical characteristics					
Age (y), mean ± SD	44.7 ± 13.6	39.7 ± 12.6	33.3 ± 10.3	NS	.045
Male gender, n/N	14/14	19/21	7/9	NS	NS
Family history of sudden cardiac death, n/N (%)	0/14 (0%)	1/21 (5%)	1/9 (11%)	NS	NS
Activity at the time of cardiac arrest, n (%)					
Sleep	3 (21%)	9 (42%)	5 (55%)	NS	NS
Rest	8 (57%)	10 (48%)	3 (33%)	NS	NS
Others	3 (21%)	2 (10%)	1 (11%)	NS	NS
Electrocardiographic characteristics					
Presence of ER, n/N (%)	14/14 (100%)	9/21 (43%)	9/9 (100%)	<.01	NS
Holter ECG, PVC in 24 h, mean ± SD	49.4 ± 169.3	1.9 ± 4.2	2.3 ± 4.4	NS	NS
Signal-averaged electrocardiography, mean ± SD					
f-QRSd (ms)	97.8 ± 8.1	119.8 ± 17.3	111.6 ± 11.5	<.0001	<.01
LAS_{40} (μV)	29.8 ± 5.2	47.0 ± 19.2	33.8 ± 14.5	<.01	NS
RMS_{40} (ms)	50.0 ± 24.2	17.8 ± 13.4	23.4 ± 14.2	<.0001	<.01
Abnormal SAECG, n/N (%)	1/14 (7%)	12/20 (60%)	4/9 (44%)	<.01	NS

Percentages may not total 100 because of rounding.

BS, Brugada syndrome; ECG, electrocardiogram; ER, early repolarization; ERS, early repolarization syndrome; f-QRSd, filtered QRS duration; LAS_{40}, duration of low-amplitude signals <40 μV of QRS in the terminal filtered QRS complex; NS, not significant; PVC, premature ventricular contraction; RMS_{40}, root-mean-square voltage of the terminal 40 millisecond of the filtered QRS complex; SAECG, signal-averaged ECG.

Table 2 Baseline electrocardiographic parameters and their changes after administration of a sodium-channel blocker in the early repolarization syndrome group, the Brugada syndrome group, and the Brugada syndrome with ER group

	Mean ± SD			*P* value	
	ERS (n = 14)	BS (n = 12)	BS with ER (n = 5)	ERS vs BS	ERS vs BS with ER
RR II (ms)	951 ± 116	930 ± 116	1024 ± 46	NS	NS
ΔRR II (ms)	−71 ± 41	−12 ± 17	−32 ± 62	<.05	NS
P II (ms)	104 ± 19	110 ± 16	112 ± 13	NS	NS
ΔP II (ms)	10 ± 9	21 ± 13	24 ± 16	<.05	<.05
PQ II (ms)	179 ± 34	191 ± 33	178 ± 28	NS	NS
ΔPQ II (ms)	30 ± 9	28 ± 14	38 ± 8	NS	NS
QRS II (ms)	90 ± 13	97 ± 18	90 ± 20	NS	NS
ΔQRS II (ms)	10 ± 10	23 ± 21	14 ± 21	NS	NS
QRS V5 (ms)	84 ± 8	91 ± 19	82 ± 21	NS	NS
ΔQRS V5 (ms)	13 ± 8	29 ± 18	28 ± 8	<.05	<.01
QT II (ms)	377 ± 19	370 ± 14	374 ± 15	NS	NS
ΔQT II (ms)	10 ± 14	28 ± 18	16 ± 5	NS	NS
QTcII (ms)	388 ± 20	385 ± 24	370 ± 13	NS	NS
ΔQTcII (ms)	10 ± 14	29 ± 18	16 ± 5	<.05	NS
QT V5 (ms)	376 ± 26	372 ± 17	376 ± 15	NS	NS
ΔQT V5 (ms)	6 ± 18	38 ± 23	14 ± 11	<.01	NS
QTcV5 (ms)	387 ± 23	387 ± 24	372 ± 12	NS	NS
ΔQTcV5 (ms)	7 ± 19	40 ± 25	14 ± 11	<.01	NS

BS = Brugada syndrome; ER = early repolarization; ERS = early repolarization syndrome; P = P-wave duration; PQ = PQ interval; QRS = QRS duration; QT = QT interval; QTc = corrected QT interval; RR = RR interval.

Sodium-channel blocker infusion test

The sodium-channel blocker infusion test was performed in 12 of the 21 patients with BS, and the test result was positive in all 12 patients. We compared the pharmacological responses of several ECG parameters to a sodium-channel blocker between 14 patients with ERS and 12 patients with BS (Table 2). There were no significant differences in the baseline ECG parameters, including RR interval, P-wave duration, PQ interval, QRS duration, and QT interval in any leads. Shortening of RR (ΔRR II) was significantly larger in the ERS group. Prolongation of P-wave duration (ΔP II), QRS duration (ΔQRS V5), and QTc interval (ΔQTc II, ΔQTc V5) was significantly larger in the BS group compared with that in the ERS group.

Among 9 BS patients with ER, the sodium-channel blocker test was performed in 5 patients. We also compared the ECG parameters between 14 ERS group patients and 5 BS patients with ER (Table 2). Prolongation of P-wave duration (ΔP II) and QRS duration (ΔQRS V5) was significantly larger in the BS with ER group compared with that in the ERS group.

The ER amplitude and its responses to sodium-channel blockers between 14 ERS group patients and 5 BS patients with ER are shown in Table 3. In the ERS group, ER was observed in the inferior leads (II, III, and aVF) in 9 patients, in the lateral leads (I, aVL, and V4–V6) in 8 patients, and in both the inferior and lateral leads in 3 patients. In the 9 BS patients with ER, ER was observed in the inferior leads in 6 patients, in the lateral leads in 8 patients, and in both the inferior and lateral leads in 5 patients. The baseline maximum ER amplitude among the inferolateral leads (pre-ER max) in the BS group tended to be higher than in the ERS group (0.244 ± 0.082 vs 0.162 ± 0.069 mV; $P = .057$). The baseline ER amplitude in the inferior lead (pre-ER II) was significantly higher in the BS group than in the ERS group (0.236 ± 0.081 vs 0.120 ± 0.033 mV; $P < .05$). After administration of a sodium-channel blocker, the ER ampli-

Table 3 Amplitude of ER in leads II and V5 before and after the administration of a sodium-channel blocker test in the early repolarization syndrome group and the Brugada syndrome with ER group

Maximum amplitude of ER in any inferolateral leads (mV)	Mean ± SD		
	ERS (n = 14)	BS with ER (n = 5)	*P* value
Pre-ER max	0.162 ± 0.069	0.244 ± 0.082	NS
Post-ER max	0.081 ± 0.061*	0.124 ± 0.096*	NS
ΔER	0.080 ± 0.067	0.120 ± 0.058	NS
Amplitude of ER in the inferior lead (II) (mV)	**ERS (n = 9)**	**BS (n = 5)**	
Pre-ER II	0.120 ± 0.033	0.236 ± 0.081	<.05
Post-ER II	0.091 ± 0.054*	0.104 ± 0.086*	NS
ΔER II	0.028 ± 0.051	0.132 ± 0.068	<.05
Amplitude of ER in the lateral lead (V5) (mV)	**ERS (n = 8)**	**BS (n = 5)**	
Pre-ER V5	0.116 ± 0.032	0.215 ± 0.092	NS
Post-ER V5	0.010 ± 0.022*	0.137 ± 0.094*	NS
ΔER V5	0.106 ± 0.026	0.077 ± 0.071	NS

BS = Brugada syndrome; ER = early repolarization; ERS = early repolarization syndrome; max = maximum; pre = before sodium-channel blocker test; post = after sodium-channel blocker infusion; Δ = change.
*P <.05 vs pre.