In 1992, Brugada and Brugada reported 8 patients with sudden cardiac death characterized by right bundle branch block and persistent ST-segment elevation in the right precordial leads. Recently, to unmask or augment the ST-segment elevation, sodium channel blockers have been reported useful to identify the Brugada syndrome or the Brugada-type electrocardiogram (ECG). We present a rare case with a complication of coronary vasospasm induced by one of sodium channel blockers.

Case Report

A 65-year-old man was admitted to our hospital complaining of chest pain and palpitation in January 2004. He had been followed-up in another hospital with diagnosis of hyperlipidemia and premature ventricular complexes, and prescribed flecainide for the control of the arrhythmia for 1 year. Recently, the patient had often felt palpitation and faintness with some kind of a vague chest discomfort. On admission, the ECG showed sinus rhythm with Brugada-type QRST complexes (saddle back type) with ST-segment elevation in V1 and V2 (Fig 1). His chest discomfort persisted for approximately 12 h, and was accompanied by neither elevation of cardiac enzymes nor the left ventricular systolic dysfunction in the ultrasonic echocardiography and improved spontaneously. Even after oral flecainide was stopped, the ECG still showed the same saddle back type ST-segment elevation as before with frequent chest pain and palpitations after meals. The in-hospital ECG monitoring revealed that his chest discomfort with palpitations was always accompanied by ventricular premature beats, without further changes in ST-T waves in sinus beats, thereby being considered to result from the extrasystoles.

The ST-segment elevation in V1 and V2 in his ECG showed no circadian variation and no relationship with his chest discomfort and faintness. To stratify a risk of the patient, the cardiac electrophysiological study was performed. Neither sustained ventricular tachycardia nor ventricular fibrillation was induced by ventricular stimulation up to the triple extrastimuli either at baseline or after pilsicainide (50 mg) infusion. However, after intravenous administration of pilsicainide, he began to complain of strangling chest pain, which was of a different kind as he had previously felt, and the ECG showed exaggerated ST-segment elevation in V1–4 and conversion to the coved type in V1, accompanied by severe chest pain. Coronary angiography revealed the vasospasm of the right coronary artery was induced by pilsicainide, not by ergonovine. This is the first case report of coronary vasospasm induced by a pure sodium channel blocker in a patient with Brugada-type ECG. (Circ J 2005; 69: 858–860)

Key Words: Brugada-type ECG; Coronary spasm; Pilsicainide

Discussion

Brugada syndrome is characterized by ST-segment elevation in V1-3 with a right bundle branch block pattern and nocturnal sudden cardiac death presumably caused by ventricular fibrillation. The syndrome has been, in part,
Fig 1. The electrocardiogram on admission, showing sinus rhythm with Brugada-type QRS complexes (saddle back type) and ST-segment elevation in V1 and V2.

Fig 2. The electrocardiogram after intravenous administration of pilsicainide (50mg), showing exaggerated ST-segment elevation in V1-4 and conversion to the coved type in V1 and ST-segment depression in II, III, aVF.
linked to mutations in SCN5A, the gene encoding for the β subunit of the cardiac sodium channel. The ST-segment elevation and the arrhythmia in patients with Brugada syndrome have been explained by abnormal shortening of the epicardial action potential duration and phase 2 re-entry at the right ventricle. A sodium channel blocker has been reported to unmask or augment the ST-segment elevation. The mechanisms have been said that a strong sodium channel block facilitates the loss of the right ventricular epicardial action dome (plateau phase) by altering the balance of current at the end of phase 1 of the action potential from inward to outward.

Challenges of sodium channel blockers such as pilsicainide, which is classified as a class Ic antiarrhythmic drug and has been shown to have a pure sodium channel-blocking effect, are frequently used to identify the Brugada syndrome or the Brugada-type ECG. In patients with saddle back type ECG, conversion to a coved type ECG is also considered as a positive study. However, the specificity of the challenge test for uncovering patients at risk for sudden death has been an issue of concern.

After intravenous administration of pilsicainide, the patient’s ECG showed exaggerated ST-segment elevation and conversion to the coved type in the right precordial leads. However, he began to complain of chest pain, which actually resulted from the sodium channel blocker-induced vasospasm in the proximal site of the right coronary artery. Although the ST-segment elevation in V1–4 might be induced by the sodium channel blocking effect, ECG changes could be affected also by the spasm-induced myocardial ischemia. The ST-segment depression in II, III, aVR, although not remarkable, could be attributed possibly to vasospasm of the right coronary artery. In this case, ECG changes could be complex, resulting from the mixture of these 2 mechanisms. Therefore, we could not precisely correlate the multiple ECG changes to the sodium channel blocking effect and the spasm-induced myocardial ischemia. Surprisingly, in the current case, vasospasm was induced only by pilsicainide, not by ergonovine. This is the first case report of coronary vasospasm induced by a pure sodium channel blocker, which would be a very unlikely observation because sodium channels are not believed to exist in vascular smooth muscle cells nor in endothelial cells. Therefore, our case raised several new possibilities that require further studies in the future. They include abnormal expression of sodium channels in vasculature and/or indirect release of vasoconstrictor agents, such as thromboxane A2, angiotensin II, vasopressin, noradrenaline, and serotonin induced by pilsicainide.

In conclusion, applying the challenge test using sodium channel blockers in Brugada-type ECG, we should keep in mind that coronary vasospasm could be induced by pilsicainide, which might modify Brugada-type ECG, as seen in the present case. Moreover, this case would raise the new risk of this challenge test, unpredictable vasospasm by pilsicainide, in Brugada-type ECG.

References