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Case Report

Unexpected Lethal Complication of Ventricular Fibrillation in Symptom Free Variant Angina Pectoris

Yashiro Nogami MD*[1], Bonpei Takase MD*[2], Ryuichi Kato MD*[3], Susumu Isoda MD*[1], Masafumi Shimizu MD*[1], Isamu Kawase MD*[1], Fumitaka Ohsuzu MD*[3], Masayuki Ishihara PhD*[2], Tadaaki Maehara MD*[1]

*[1]National Defense Medical College, Department of Surgery-2
*[2]National Defense Medical College Research Institute, Division of Biomedical Engineering
*[3]National Defense Medical College, Department of Internal Medicine-I

We report an unexpected sudden cardiac death due to variant angina complicated by ventricular fibrillation occurring during routine ambulatory electrocardiographic monitoring. The patient had one previous episode of ventricular fibrillation before the lethal event. He had no significant coronary artery disease and was asymptomatic throughout his illness. In clinical practice, when an episode of ventricular fibrillation is noted, one should be aware of the risk of sudden cardiac death, even if the patient's vasospastic angina is relatively stable and asymptomatic.
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Key words: Sudden death, Silent myocardial ischemia, Ambulatory electrocardiographic monitoring, Implantable cardioverter-defibrillators

Introduction

Patients with vasospastic angina (variant angina) typically have angina symptoms at rest and show ST-segment elevation on the electrocardiogram (ECG). The symptoms and ST-segment elevation are caused by coronary artery spasm. Generally, isolated coronary spasm not related to coronary artery obstruction has a favorable prognosis.[1–3] However, ventricular arrhythmia is frequently recognized as a complication of variant angina.[4] Variant angina without fixed coronary obstruction may rarely trigger lethal ventricular arrhythmia.[1,2] For patients with variant angina, medical treatment with calcium channel antagonists with and without nitrates appears to offer a good prognosis. The prognosis for patients with vasospastic angina complicated by lethal ventricular arrhythmias and/or having refractory anginal symptoms is also reported to be relatively good. However, a recent report shows that ventricular fibrillation complicating vasospastic angina identifies a patient population at risk for sudden cardiac death, and that these patients should be considered for implantable cardioverter-defibrillators (ICD).[5,6] Thus, the necessity for more aggressive anti-arrhythmic treatments such as an ICD implant is currently the subject of much debate. We report a patient who had a poor prognosis

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Address for correspondence: Bonpei Takase MD, Division of Biomedical Engineering, National Defense Medical College Research Institute, 3-2 Namiki, Tokorozawa, Saitama, Japan, 359-8513. Phone: 011-81-42-995-1597 Fax: 011-81-42-925-0967 e-mail: bonpeit@ndmc.ac.jp dui1577@db3.so-net.ne.jp

with symptom-free variant angina pectoris complicated by ventricular fibrillation. A more aggressive treatment strategy including ICD implantation might have been effective in this case.

Case Report

A 60-year-old man presented with symptoms of lower abdominal discomfort of about two weeks duration. He visited the outpatient clinic of the gastroenterology section of the National Defense Medical College Hospital Internal Medicine department in April 2003. He denied any sleep disorders. His past history was unremarkable except for a light heat stroke three years earlier. His family history revealed that his mother had angina pectoris. With respect to coronary risk factors, he had smoked one pack daily for 35 years, and there was a family history of coronary artery disease. The physical examination of the patient in the outpatient clinic was unremarkable (height 167 cm, body weight 65 kg, blood pressure 137/72 mmHg, pulse rate 82 beats/min and regular). The laboratory findings were also normal. His chest X-ray (cardiothoracic ratio = 48%) and electrocardiogram (ECG) were normal (**Figure 1**). Thus, ECG showed no findings suggesting idiopathic ventricular fibrillation, Brugada, long QT and/or short QT syndromes.

Upper gastrointestinal tract and colonic endoscopies revealed cancer of the stomach and of the transverse colon. Abdominal computed tomography showed no signs of abdominal invasion and no liver or lymph node metastases. He was referred to the First Department of Surgery in our hospital for radical resection of the stomach and colon. General anesthesia with nitrous oxide, oxygen, and sevoflurane, combined with epidural anesthesia was planned for his first operation in June 2003, but ventricular fibrillation developed during the induction of anesthesia. Induction of anesthesia consisted of 5 mg vecuronium bromide and 70 mg propofol given intravenously. Immediately after intra-tracheal intubation following induction of anesthesia, incessant ventricular tachycardia developed and was followed by ventricular fibrillation. DC defibrillation was necessary to restore sinus rhythm. The first operation was abandoned due to inability to find the cause of ventricular fibrillation. The monitoring ECG (modified bipolar CM5 lead) showed no significant ischemic changes and the anesthesiologist noted no problems related to the induction of anesthesia and intubation.

The cardiology section was asked to consult on the case and perform further evaluation. Two-dimensional echocardiography showed normal findings, and an exercise treadmill stress test was negative for ischemia with 6 METs. Ambulatory ECG monitoring (NASA lead) revealed marked ST-segment elevation (**Figure 2**) at night accompanied by atypical angina symptoms, such as lightheadedness. The CM5 lead, which was identical to the ECG

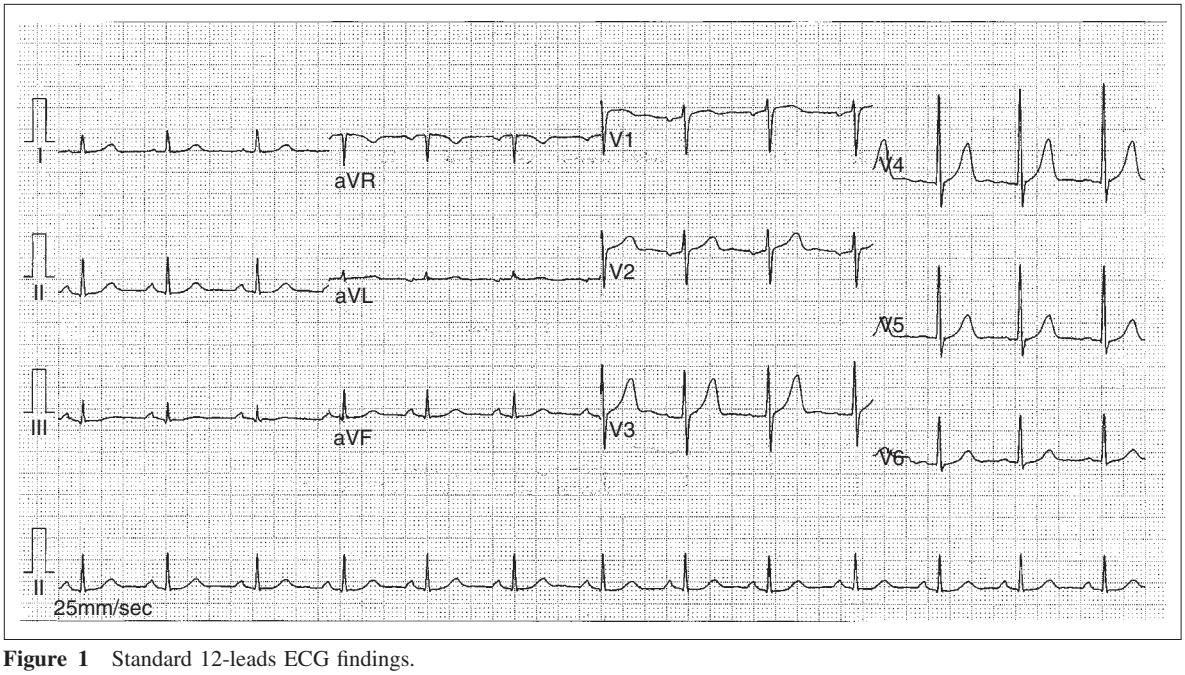

Figure 1 Standard 12-leads ECG findings.
No signs of idiopathic ventricular fibrillation, Brugada, long QT and/or short QT syndrome were observed.

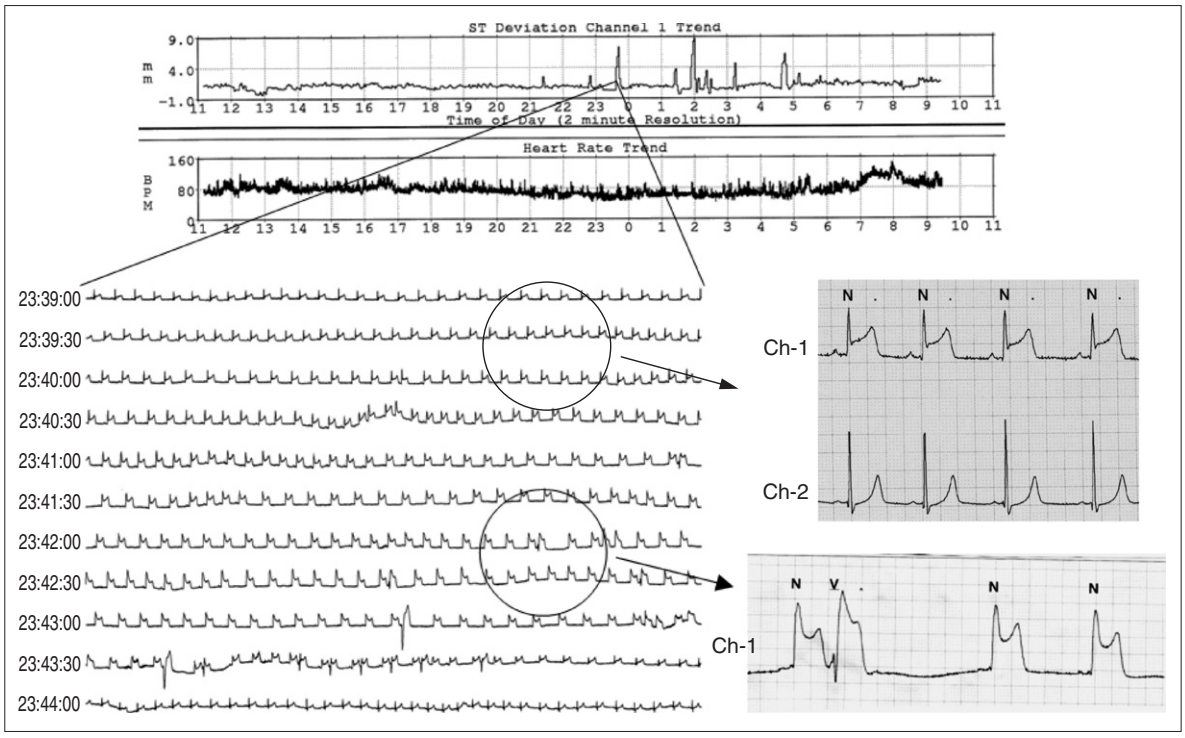

Figure 2 Ambulatory ECG monitoring findings.
ST-segment trend gram and real time electrocardiogram strip show marked ST-segment elevation compatible with vasospasm. The patient complained of dull-headedness, which is an atypical symptom of angina. Premature ventricular contractions were observed on this strip. Monitoring ECG was NASA lead. Please note, ST-segment was observed on NASA lead whereas no significant ST-segment changes were revealed on CM5 lead. Channel-1 (Ch-1) was NASA while channel-2 (Ch-2) was CM5 lead.

lead monitored during the first operation, showed no significant ST-segment changes. The coronary angiogram showed normal coronary arteries. Since ambulatory ECG findings combined with a normal coronary angiogram are compatible with coronary vasospasm, no pharmacological provocation test for vasospasm was performed.

During the second operation in July 2003, intravenous nitroglycerin, diltiazem, and nicorandil were given during anesthesia, and a radical resection of the cancerous stomach and colon was successfully and uneventfully performed without any serious arrhythmia. The patient was discharged having had an uneventful postoperative clinical course.

The patient was followed by the cardiology outpatient clinic, and was treated with nifedipine CR 40 mg daily and isosorbide dinitrate 20 mg b.i.d. Since the patient was asymptomatic, ambulatory ECG was repeated every six months to monitor for silent vasospastic anginal episodes and arrhythmias. The second and third ambulatory ECGs were unremarkable. Thus, no significant ST-segment changes and no arrhythmias were observed in these ambulatory ECGs. It had been confirmed that the patient was compliant regarding his medications so that he was considered to be properly treated during the follow-up periods. In October 2004, a routine ambulatory ECG was started. The next day, while ambulatory ECG monitoring was still ongoing, the patient was brought to our emergency room with a cardiopulmonary arrest. The ambulatory ECG revealed incessant marked ST-segment elevation with a spontaneous resolution that started around 01:00 AM (**Figure 3-1**). Around 04:00 AM, these ST-segment elevation episodes began to be complicated by incessant ventricular tachycardia and, finally, the development of ventricular fibrillation and cardiac arrest (**Figure 3-2** and **Figure 3-3**). According to the patient's spouse, the patient slept through these episodes, and when he was found unconscious in the morning he was brought to our emergency room by ambulance. He could not be resuscitated, and a request for autopsy was not granted. Before lethal ST-segment elevation started, any arrhythmias including premature ventricular contractions were recorded. In addition, his family reported that he had good compliance for medication and that he had no signs of acute illness suggesting myocarditis or gastroenteritis and no evidence of alcohol abuse or drug addiction.

Discussion

Our case demonstrates that unexpected cardiac sudden death can occur in symptom-free variant angina patients even though they appear to be successfully treated with calcium channel antagonists and nitrates. A more aggressive treatment strategy, such as ICD implantation, could have been effective in this case. In our patient, ambulatory ECG was done every six months in order to determine if the patient had developed silent myocardial ischemia. Two ambulatory ECG recordings revealed no significant findings of silent myocardial ischemia. The last ambulatory ECG recording was performed as a scheduled examination. It documented repeat silent myocardial ischemia and incessant ventricular tachycardia that developed gradually and finally led to lethal ventricular fibrillation. During these episodes, the patient was sleeping, and his spouse did not recognize any abnormalities. Thus, the patient's final episodes were considered as being totally silent. Until the unexpected sudden death, the cardiologist in charge had considered that the patient's angina was stable and well controlled by medical treatment. In addition, two-dimensional echocardiography, exercise treadmill testing as well as ambulatory ECG monitoring were within normal limits, except the variant angina type of ST-segment elevation accompanying premature ventricular contractions in this case. No ECG signs of idiopathic ventricular fibrillation, or Brugada or long QT syndrome were observed so that ventricular fibrillation induced during operation is considered as ischemia-induced ventricular fibrillation.

The prognosis in patients with isolated coronary spasm is generally reported to be good. However, a few patients show a poor prognosis. Nevertheless, the overall long-term outcome for all vasospastic angina patients is favorable. With approximately 5–10 years of follow-up, the reported cardiac event rates are about 2%–4% for cardiac death and about 5%–6% for nonfatal myocardial infarction.[2,3] The

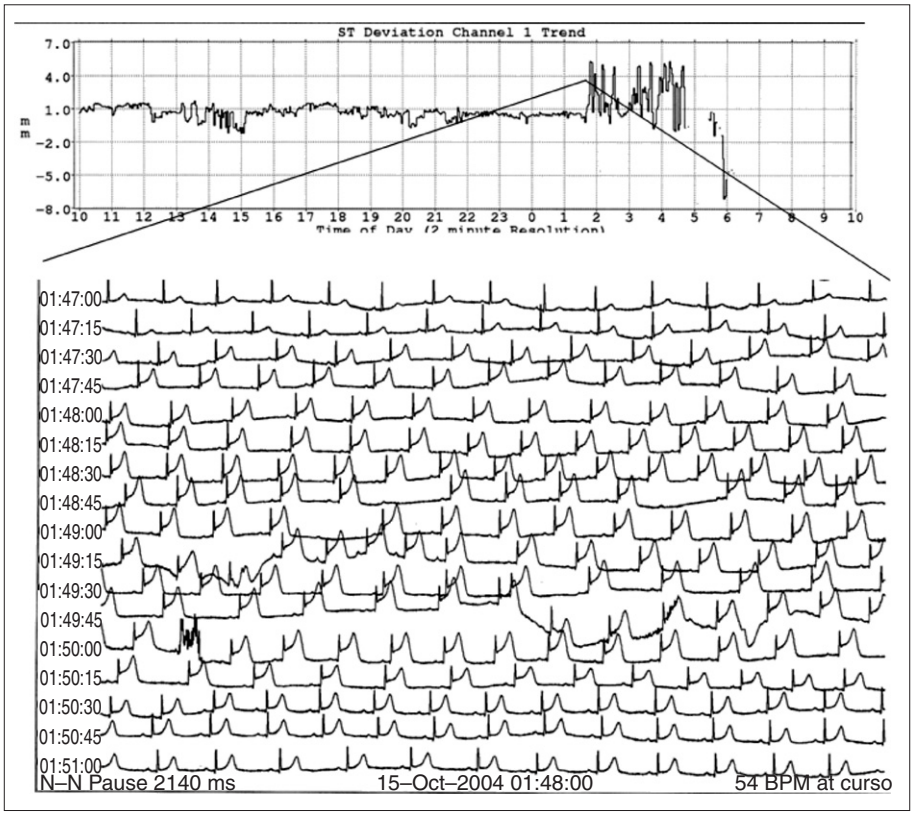

Figure 3-1

Figure 3-1 to 3-3 Ambulatory ECG monitoring findings during the lethal episode.
When the patient was asleep, episodes of marked ST-segment elevation were recognized in both ST-segment trend gram and real time electrocardiogram strips. At first, ST-segment elevation was spontaneously relieved. However, ventricular arrhythmias gradually complicated the situation, and finally ventricular fibrillation occurred.

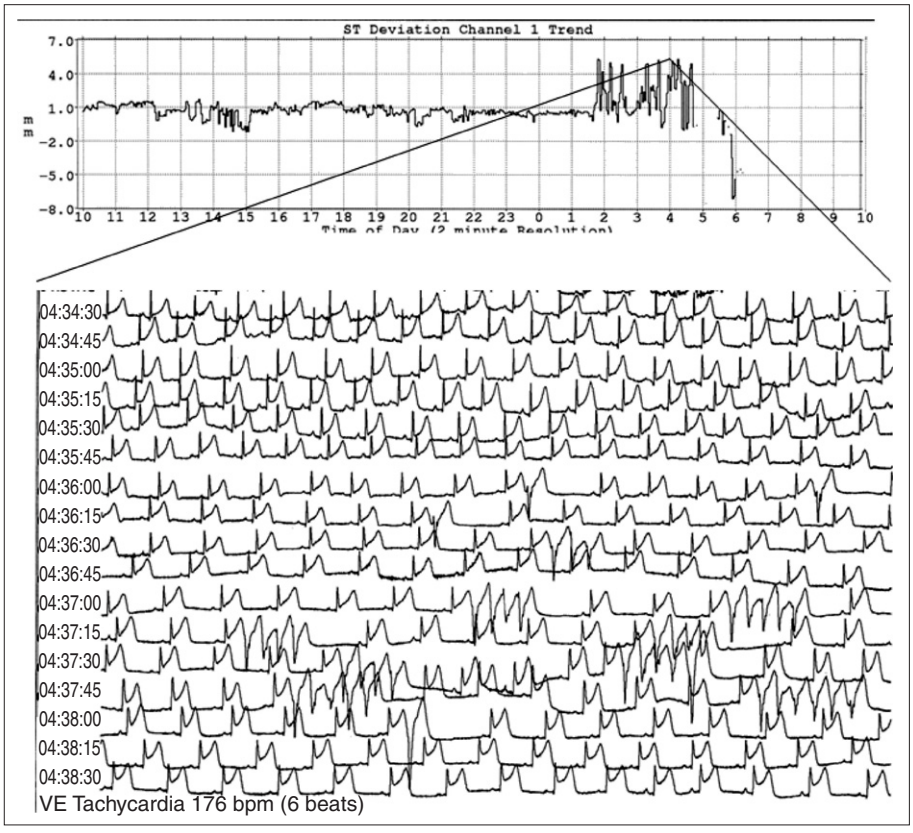

Figure 3-2

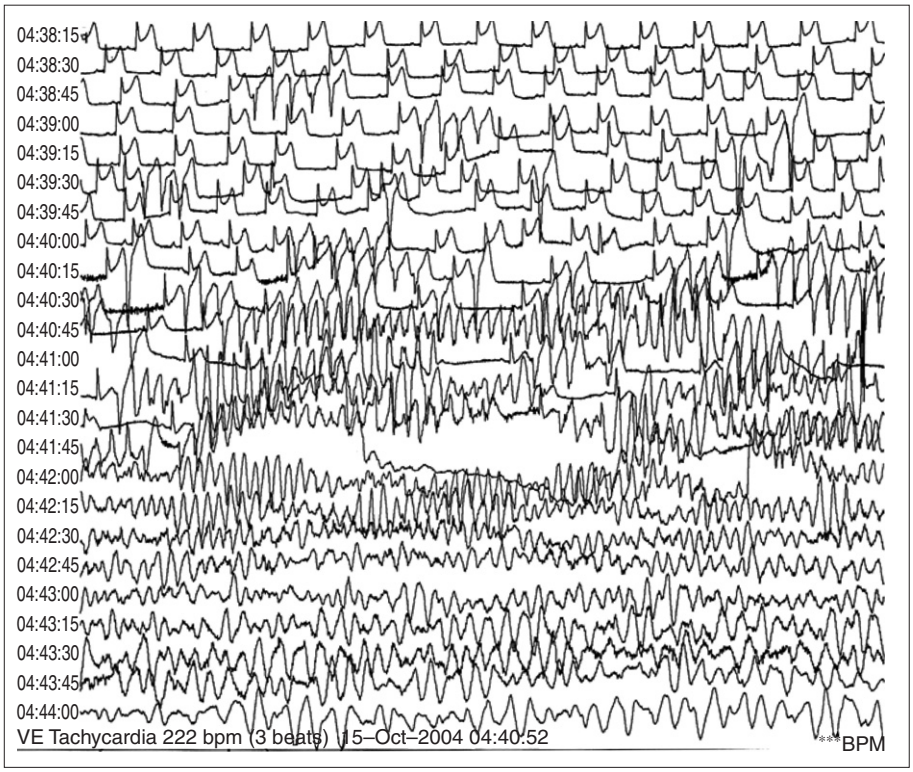

Figure 3-3

clinical characteristics that correlate with an untoward outcome in vasospastic angina pectoris patients are: organic coronary disease (obstruction);[7–9] frequent or refractory anginal symptoms;[6] multi-vessel spasm;[10] and serious arrhythmia, such as ventricular fibrillation, complicating vasospastic angina pectoris.[11,12] Our patient had ventricular fibrillation and may have possibly had multivessel spasm, though the latter was not confirmed.

One important point that should be made with respect to this case is that the index episode of ventricular fibrillation was not totally spontaneous but rather was provoked by anesthesia. Strictly speaking, this patient did not experience any truly spontaneous lethal arrhythmias. Under such circumstances, our patient would have been classified in a relatively low risk category for sudden cardiac death according to previous reports.[2,3] Despite this, sudden cardiac death occurred unexpectedly.

The novel finding of this case is that, even if silent myocardial ischemia is successfully treated, unexpected sudden cardiac death can still take place in well-controlled vasospastic angina pectoris patients. Since the physician in charge recognized that vasospastic angina has been well controlled by medication, the increase in dose of medicine could not be conducted as the treatment option in this case. However, it is possible that these patients could be rescued by more aggressive treatment such as ICD. It has been reported that with the onset of silent myocardial ischemia, a lethal arrhythmic event can occur in asymptomatic vasospastic angina pectoris patients.[13] Recent studies have shown that vasospastic angina pectoris patients whose course is complicated by lethal arrhythmia are prone to sudden cardiac death.[13,14] The lethal arrhythmia need not be spontaneous, but electrophysiological study-induced ventricular tachycardia or ventricular fibrillation could also be a risk factor for sudden cardiac death.[14] Since most of the ischemic episodes in vasospastic angina pectoris patients have been reported to be silent,[15] more aggressive assessment and/or treatment is necessary in vasospastic angina pectoris patients who have suspected lethal arrhythmias.

Reviewing this case, several criticisms may be raised. First, the patient was not assessed for multivessel spasm. The presence of multivessel spasm is one of the risk factors for sudden cardiac death. A provocation test should be performed in suspected high-risk vasospastic angina pectoris patients. Secondly, we did not confirm the efficacy of the medical treatment by using a catheter-based provocation test during medical therapy recommended by the previous reports.[12,13] This procedure would also have been beneficial in avoiding unexpected sudden cardiac death. Lastly, unfortunately we did not assess the efficacy of an ICD for this patient.

Taking all this into account, a more aggressive treatment strategy such as ICD implantation and/or catheter-based provocation studies would likely have been effective in this case. Thus, careful evaluation and an awareness of the possibility of sudden cardiac death are important in clinical practice, even if the vasospastic angina pectoris patient seems to be stable.

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