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Case Report

Self-terminated long-lasting ventricular fibrillation: What is the mechanism?

Shozo Konishi (MD)[a], Hitoshi Minamiguchi (MD)[a], Masaharu Masuda (MD)[a], Takashi Ashihara (MD)[b], Yuji Okuyama (MD)[a,*], Tomohito Ohtani (MD)[a], Yasushi Sakata (MD)[a]

[a] Department of Cardiovascular Medicine, Osaka Graduate School of Medicine, Suita, Japan
[b] Department of Cardiovascular and Respiratory Medicine, Shiga University of Medical Science, Otsu, Japan

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ABSTRACT

A 60-year-old woman with dilated cardiomyopathy was referred to our hospital due to recurrent syncope. The electrocardiogram recorded by an implantable loop recorder during a syncopal episode revealed an episode of ventricular fibrillation lasting almost 3 min that terminated spontaneously. A detailed analysis of the rhythm strip showed that the chaotic rhythm became an organized ventricular rhythm with a cycle length of 220 ms for the last 14 s before it terminated.

<**Learning objective:** Ventricular tachyarrhythmias are one of the causes of syncope and have been observed in 1–3% of syncopal patients using an implantable loop recorder (ILR). However, long-lasting ventricular fibrillation (VF) as a cause of syncope is rare in clinical practice, because VF seldom terminates spontaneously. The long-lasting VF became an organized ventricular rhythm, and finally self-terminated as sinus rhythm was restored and this entire sequence of the arrhythmic events was recorded by an ILR.>

Introduction

Ventricular fibrillation (VF) is a life-threatening arrhythmia that requires immediate defibrillation. In general, it is rare for long-lasting VF to terminate spontaneously. However, we encountered an interesting case in which long-lasting VF became an organized ventricular rhythm, and finally self-terminated as sinus rhythm was restored. The electrocardiogram (ECG) during this arrhythmic episode was recorded by an implantable loop recorder (ILR).

Case report

A 60-year-old woman was referred to our hospital with recurrent syncopal episodes. A 12-lead ECG revealed a sinus rhythm without any evidence of an old myocardial infarction, J waves, or QT-interval abnormalities (Fig. 1). The head-up tilt test and Schellong test were negative. A Holter ECG showed only frequently isolated premature ventricular contractions (16,709/day), without any episodes of ventricular tachycardia (VT), VF, or bradycardia. The coronary angiogram was normal. She had no signs of heart failure; however, an echocardiogram revealed a reduced left ventricular ejection fraction (LVEF = 27%) without any local asynergy or valvular heart disease, and the findings of the endomyocardial biopsy specimens were compatible with dilated cardiomyopathy. Therefore, an oral administration of carvedilol was started.

While 1-year carvedilol therapy improved the patient's LVEF significantly (to 54%), she experienced a loss of consciousness at rest, without any preceding symptoms. Bystander cardiopulmonary resuscitation was initiated immediately. On arrival of the medical team, she had already regained consciousness and was free of symptoms. In the electrophysiological study, no ventricular tachyarrhythmias were induced even with three extrastimuli delivered from the right ventricular apex and right ventricular outflow tract, with or without isoproterenol. Sinus node function and atrioventricular nodal conduction were also normal. Considering her current cardiac function and the noninducibility of ventricular tachyarrhythmias in the electrophysiological study, and in view of the patient's recurrent unexplained syncopal episodes, she underwent an implantation of an ILR.

* Corresponding author at: Department of Cardiovascular Medicine, Osaka Graduate School of Medicine, 2-2 Yamadaoka, Suita 565-0871, Japan.
Tel.: +81 6 6879 3441; fax: +81 6 6879 3442.
E-mail address: yujicardiology@gmail.com (Y. Okuyama).

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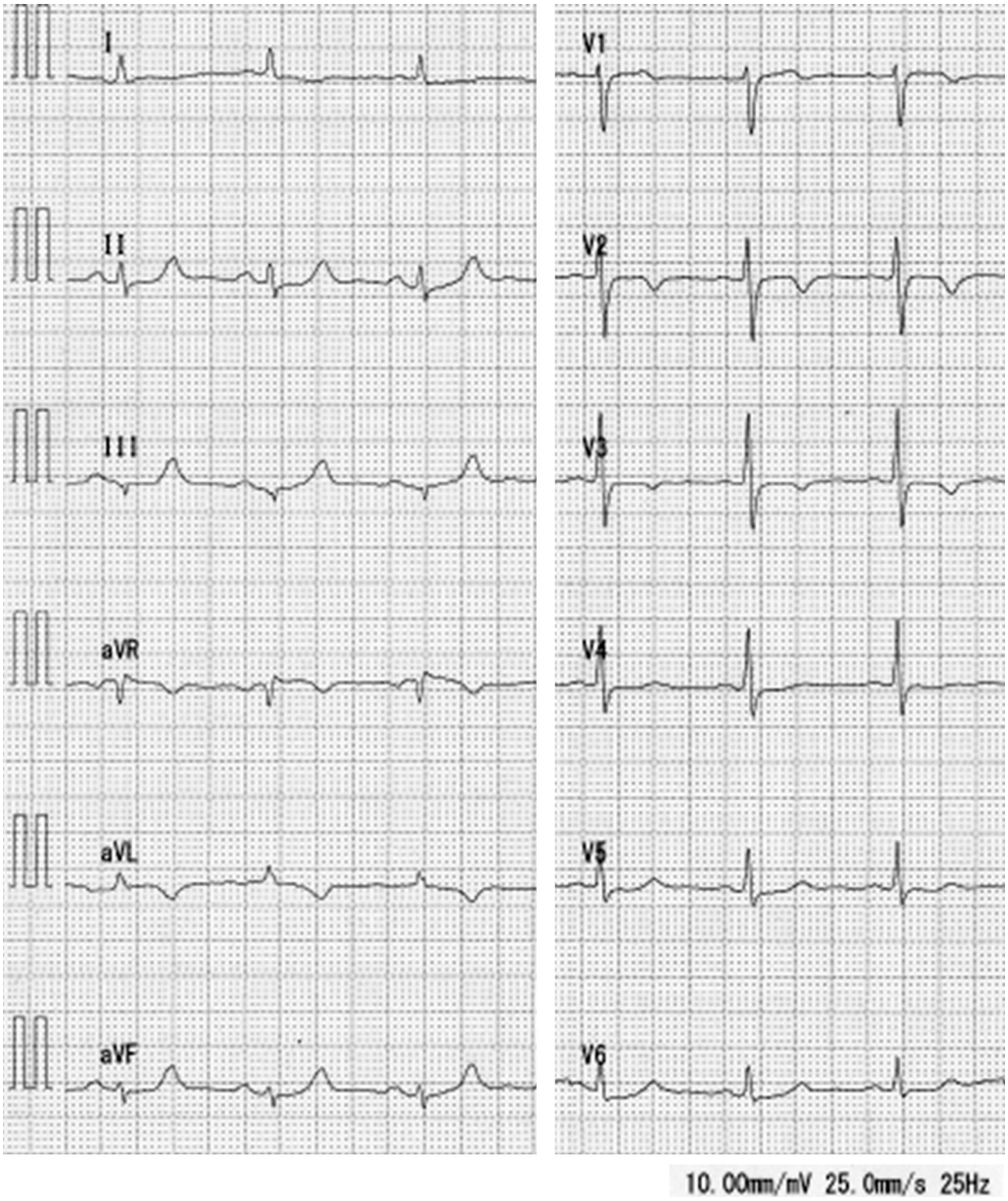

Fig. 1. A 12-lead electrocardiogram at rest. The 12-lead electrocardiogram showed no specific abnormal findings.

Two months later, she experienced a recurrent syncopal episode that occurred without any preceding symptoms while she was preparing dinner. The ECG during the syncope recorded by the ILR revealed a self-terminating VF episode lasting almost 3 min. First, the VF episode was initiated, which then became an organized ventricular rhythm with a cycle length of 220 ms for the last 14 s before terminating spontaneously (Fig. 2). Since VF was the cause of this syncopal episode, the mechanism of the patient's previous syncopal episodes could also have been self-terminating VF. Accordingly, an implantable cardioverter-defibrillator was implanted to prevent sudden cardiac death.

Discussion

Syncope is defined as a transient loss of consciousness and postural tone due to transient global cerebral hypoperfusion. Unexplained syncope often requires a variety of investigations to elucidate the cause. The ILR was developed as a means of long-term monitoring to capture the cardiac rhythm during an episode of syncope. In this case, considering her current cardiac function after the medical therapy (LVEF 54%) and the noninducibility of ventricular tachyarrhythmias in the electrophysiological study, initially an ILR was implanted instead of an ICD. Consequently, the sequential arrhythmic events could be confirmed during a syncopal episode in which long-lasting VF converted to an organized ventricular rhythm and finally self-terminated. Ventricular tachyarrhythmias are one of the causes of syncope and are observed in 1–3% of syncopal patients when detected by an ILR [1,2]; however, long-lasting VF as a cause of syncope is rare in clinical practice. One of the reasons why the long-lasting VF in this case could terminate spontaneously was the ability to organize from VF, before returning to sinus rhythm. Spontaneous reversion to sinus rhythm typically occurs when the localized chaotic activity is confined to a small area of the heart and gradually