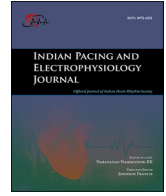




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Aborted sudden cardiac death in a patient with implantable loop recorder



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ABSTRACT

We discuss a 46-year-old man with history of hypertension and inferior wall myocardial infarction and mild left ventricular dysfunction who presented with aborted sudden cardiac death due to episodes of ventricular tachyarrhythmia detected by a Reveal-LINQ which had been implanted one year prior to presentation.

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1. Case presentation

A 46-year-old man was referred to us for further evaluation after aborted sudden cardiac death. He collapsed suddenly whilst playing hockey. Cardiopulmonary resuscitation (CPR) was performed, the patient regained consciousness a few seconds after defibrillation and then was transported to the hospital.

He had a history of inferior wall myocardial infarction two years prior due to spontaneous dissection of right coronary artery, and controlled hypertension. His medications at the time of his presentation were aspirin, atenolol and ramipril.

The 12-lead electrocardiography (ECG) showed normal sinus rhythm with small Q waves in leads of II, III and aVF as well as normal QRS, PR and QTc intervals which were similar to previous ECGs. In transthoracic echocardiographic study, normal left ventricular (LV) size and mildly impaired LV function [Left Ventricular Ejection Fraction (LVEF) = 45%] due to akinesia of basal inferior wall and hypokinesia of mid inferior wall were demonstrated; there was no new wall motion abnormality in comparison to previous echocardiographic evaluations. Moreover, serum electrolytes levels were normal and serum troponin-c level was only mildly elevated.

Selective coronary angiography revealed a healed extensive dissection of right coronary artery (from proximal part to crux) with TIMI flow of 3; the other coronary arteries were normal (similar to the previous coronary angiogram).

One year ago, he had two episodes of palpitation lasted 20–30 seconds accompanied with some vague symptoms including right-sided facial numbness, staring and transient aphasia. He reported no chest pain or syncope at that time. Given his cardiac and neurologic assessments (including Holter monitoring and one-week event recorder) did not reveal any abnormalities; it was decided to implant a loop recorder (Reveal LINQ) for detection of the possible arrhythmia (AF or ventricular arrhythmia).

The Interrogation of the loop recorder after CPR showed three episodes of ventricular tachyarrhythmia diagnosed by the device. The first episode followed a period of sinus tachycardia related to exercise (Figs. 1 and 2). The second and third episodes were ventricular tachyarrhythmias with a cycle length of approximately 200 milliseconds, which were terminated after delivering DC shocks (Fig. 3 and 4).

Since the probability of a new acute coronary syndrome was low, we decided to implant a dual chamber ICD for secondary prevention and remove the loop recorder.

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Tachy Episode #1167

Device: REVEAL LINQ LNQ11 Serial Number: Date of Visit: 05-Jul-2016 11:00:40
 Patient: ID: Physician:

ID#	Type	Date	Time hh:mm	Duration hh:mm:ss	Max V. Rate	Median V. Rate
1167	Tachy	04-Jul-2016	20:07	:02:27	375 bpm (160 ms)	333 bpm (180 ms)

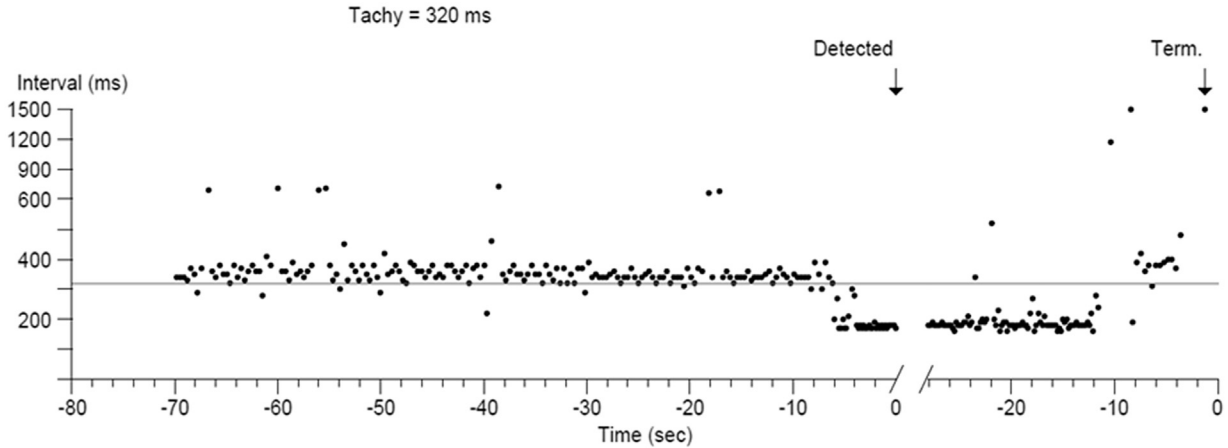


Fig. 1. A tachycardia with cycle length changing between 320 and 400 milliseconds most compatible with sinus tachycardia happened during exercise that suddenly changed to a more regular arrhythmia with cycle length of 180 milliseconds.

Tachy Episode #1167

Device: REVEAL LINQ LNQ11 Serial Number: Date of Visit: 05-Jul-2016 11:00:40
 Patient: ID: Episode #1167 Chart speed: 25.0 mm/sec

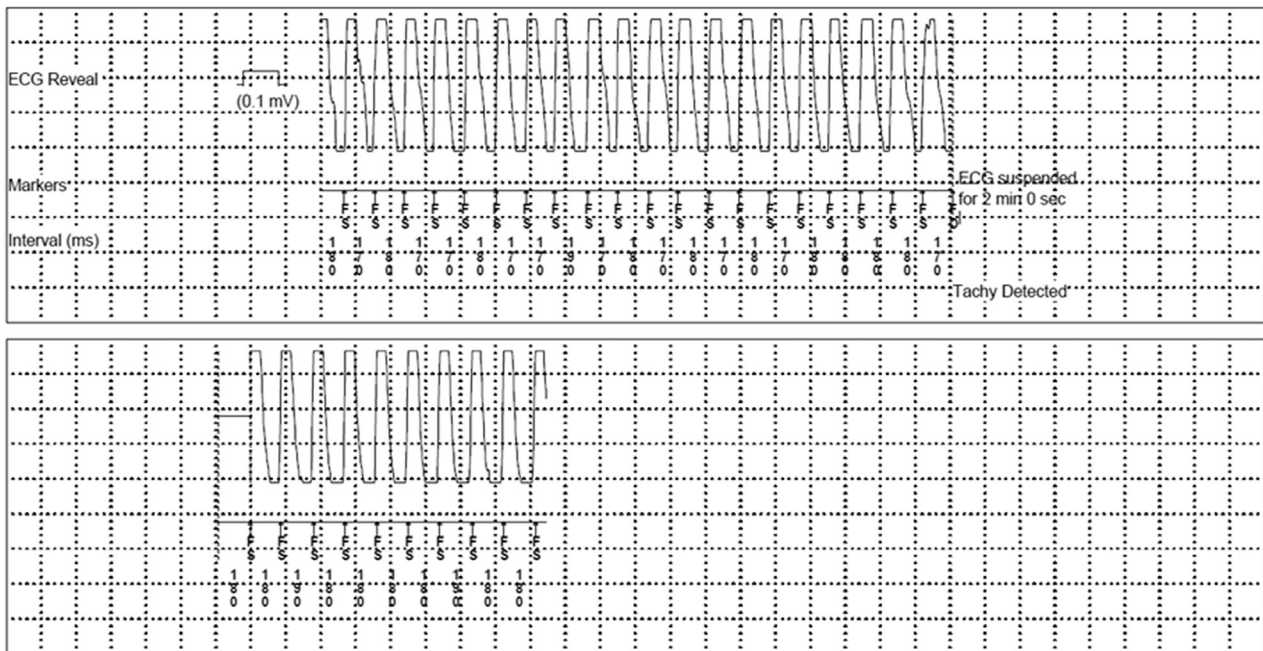


Fig. 2. The morphology of the ventricular tachyarrhythmia detected by loop recorder.

2. Discussion

Compared to a normal population, the mortality rate in patients with ischaemic heart disease is higher. Despite the introduction of

several non-invasive methods for sudden cardiac death risk assessment, none of them is perfect. For example using tests like T wave alternans, heart rate variability and signal averaged ECG often is not useful because despite the fact they have a high negative

Tachy Episode #1168

Device: REVEAL LINQ LNQ11 Serial Number: Date of Visit: 05-Jul-2016 11:00:40
 Patient: ID: Physician:

ID#	Type	Date	Time hh:mm	Duration hh:mm:ss	Max V. Rate	Median V. Rate
1168	Tachy	04-Jul-2016	20:10	:07:04	353 bpm (170 ms)	300 bpm (200 ms)

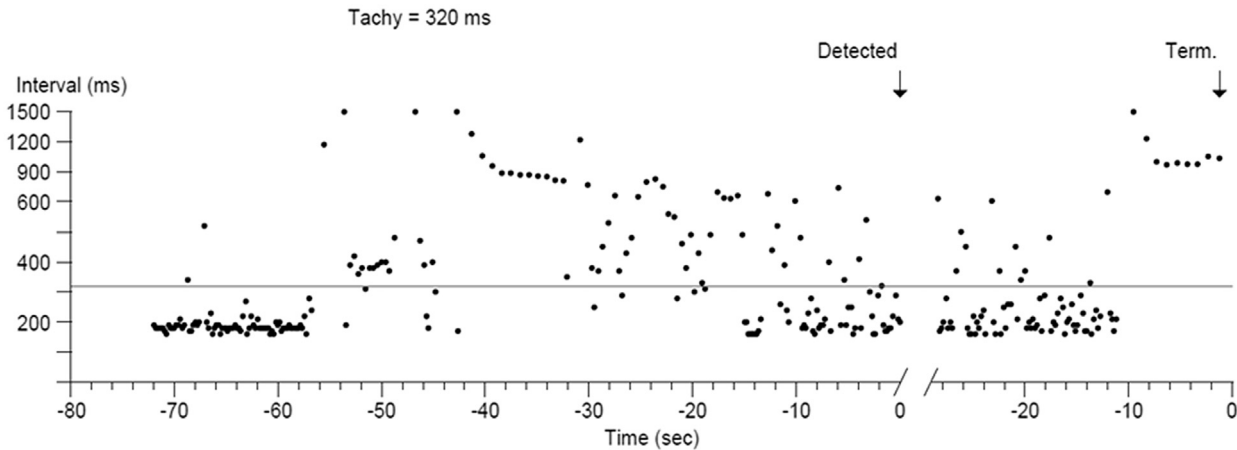


Fig. 3. A relatively regular arrhythmia with cycle length of 200 milliseconds that changed to an irregular fast ventricular tachyarrhythmia (ventricular fibrillation) and terminated with DC shock.

Tachy Episode #1169

Device: REVEAL LINQ LNQ11 Serial Number: Date of Visit: 05-Jul-2016 11:00:40
 Patient: ID: Physician:

ID#	Type	Date	Time hh:mm	Duration hh:mm:ss	Max V. Rate	Median V. Rate
1169	Tachy	04-Jul-2016	20:18	:01:11	353 bpm (170 ms)	333 bpm (180 ms)

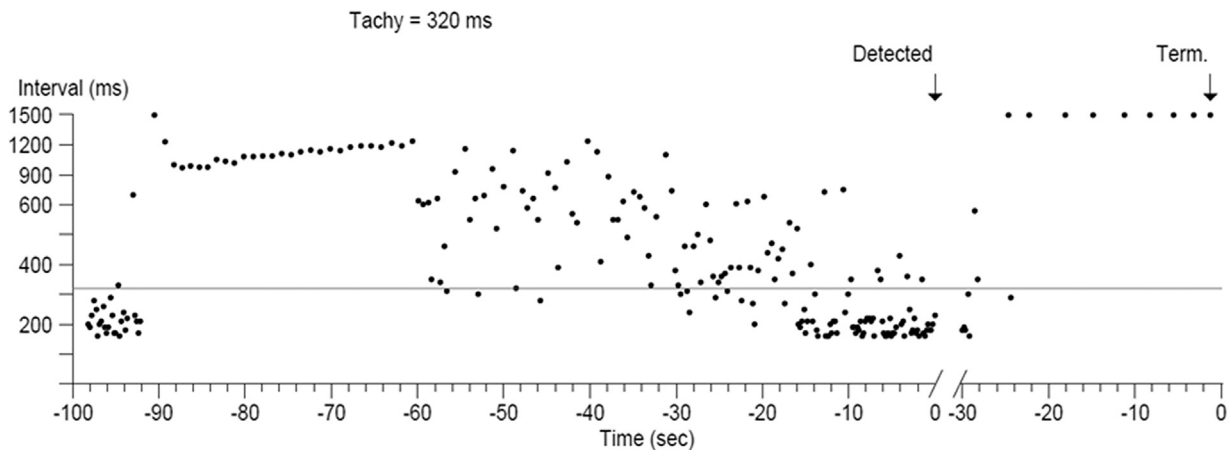


Fig. 4. A regular rhythm (probably sinus rhythm after DC shock) changed to an irregular rhythm with cycle lengths varying between 320 and 1000 milliseconds (probably AF or sinus rhythm with multiple premature beats) changed to a very rapid irregular tachyarrhythmia (probably VF) and terminated to sinus rhythm with DC shock.

predictive value, it is not clear what we should do for patients with abnormal results [1]. In fact, the only predictor that is usually used in clinical practice is LVEF because it has been demonstrated that severe LV systolic dysfunction is the most powerful predictor of sudden cardiac death in this group. However, although those with preserved LVEF have a decreased risk of cardiac death overall, a higher proportion of the total burden of cardiac death in patients

with preserved LV function is attributed to sudden cardiac death. If a patient with previous MI and relatively normal LV function succumbs to a cardiac death, the probability that it would be sudden death is higher [2].

According to current guidelines, ICD implantation is recommended only in patients with history of cardiac arrest or syncope with documented ventricular arrhythmia as secondary prevention

or in patients with severe left ventricular dysfunction as primary prevention [3]. Therefore, until there is a reliable way of identifying asymptomatic patients with relatively normal LVEF and high risk of sudden cardiac death, prescription of aspirin, beta blocker and angiotensin converting enzyme inhibitor or angiotensin II receptor antagonist alongside regular and close follow up are the only methods of decreasing the mortality rate. During each follow up visit, presence of symptoms like syncope, presyncope and palpitations should be noted, and if one of them is present, the possibility of malignant tachyarrhythmias must be considered. Such symptoms warrant a complete evaluation including prolonged ECG monitoring. If the symptom occurs occasionally, for example less than once a fortnight, the preferred monitoring method is using an implantable loop recorder [4]. The implantable loop recorder is a device with the ability to monitor the heart rhythm for a prolonged period of time (up to 3 years) and, it can record rhythm information during arrhythmic episodes. The new models are small and often injected into subcutaneous tissue of the pectoral area. They can either activate automatically when the heart rate goes above or below a programmed rate, or be activated manually by the patient when symptoms happen. When activated, the device will record and store the rhythm before, during, and after the event, and arrhythmias may be classified as tachyarrhythmia, bradyarrhythmia, pause, atrial tachycardia (AT), or AF based on rate and the regularity of the rhythm. Although there are reports of oversensing or undersensing of the R wave and oversensing of T or P waves (especially in older models), the development of improved technology and software (for example MRI-conditional devices) has improved their accuracy in detection of arrhythmias [5,6].

Current guidelines recommend using implantable loop recorders when symptoms are sporadic and considered to be related to arrhythmias and conventional diagnostic modalities were not helpful. However, some studies have showed superiority of implantable loop recorder as an initial approach in the evaluation of patients with syncope [7]. Moreover, the benefits of implantable loop recorder in patient with cryptogenic stroke or non-syncopal transient loss of consciousness, and the follow up of patients with AF have been proven [6,8]. However, its relatively high percentage of false positive results for arrhythmia detection is a big limitation for using it especially in assessing arrhythmia burden after AF ablation [9].

The European Heart Rhythm Association Survey revealed that there was a discrepancy between the current guidelines and clinical practice regarding the use of loop recorders in patients with unexplained syncope, palpitation and AF; the postulated explanation for underusing these devices was the cost and the need for implanting the device [4].

Because the patient has an ICD, he was advised to avoid physical activities with the risk of human-human or human-object impact like hockey. On the other hand, although there are insufficient data

to provide definitive recommendations in patients with history of spontaneous coronary artery dissection, it is reasonable to restrict their physical activities to participation in sports with low to moderate dynamic and low to moderate static demands [10].

In conclusion, our case report shows the importance of close follow-up and reviewing symptoms closely in patients with ischaemic heart disease. It also indicates the need to conduct more studies on sudden cardiac death risk stratification in patients with previous myocardial infarction and relatively normal LV systolic function.

Acknowledgement

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