

# An Unusual Cause for Ventricular Fibrillation Following Cardiac Surgery

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Life-threatening ventricular tachyarrhythmias can occur following cardiac surgery; the etiology for this complication is variable. We present the case of a middle-aged man with an unusual cause of ventricular fibrillation following cardiac surgery.

## PATIENT DESCRIPTION

A 54 year old man was admitted to the cardiac surgery department in our institute to undergo coronary artery bypass graft surgery. The patient suffered from ischemic heart disease and had a chronic total occlusion of the ostial right coronary artery that caused severe anginal pain (Canadian Class 3–4). An off-pump CABG was performed with implantation of a single venous graft to the right posterior descending artery. As part of the routine management, a temporary epicardial lead was attached to allow backup pacing. A few hours after the operation the patient was successfully extubated and a day later was transferred to the intermediate care unit.

On the second day after surgery the patient experienced three episodes of ventricular fibrillation necessitating electrical defibrillation for termination. The episodes were not preceded by any symptoms or signs. After the third episode, the patient was started on intravenous amiodarone and no further arrhythmias occurred.

CABG = coronary artery bypass graft

## COMMENT

Ventricular tachyarrhythmias can occur after CABG surgery. Following such events, several possible triggers should be ruled out immediately, mainly electrolyte abnormalities and cardiac ischemia.

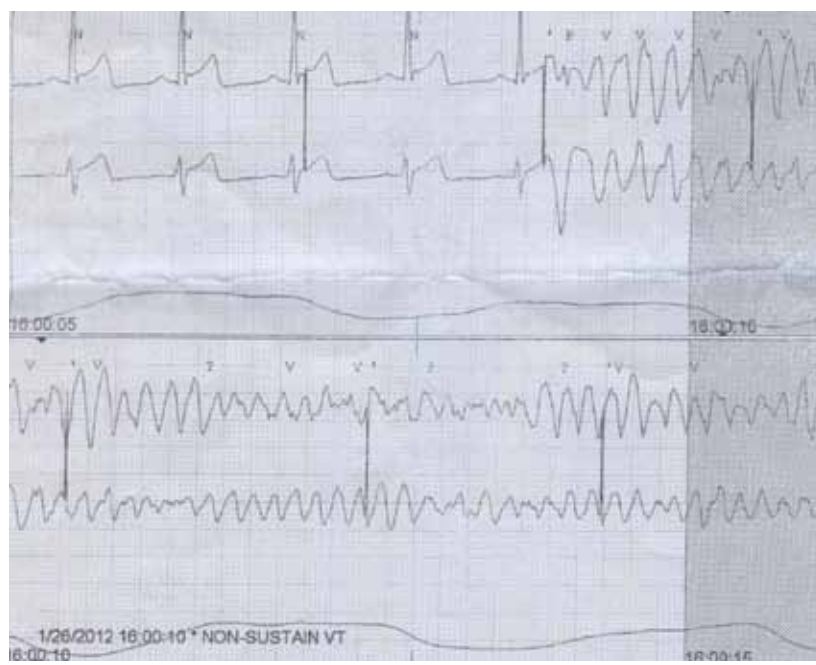
In our patient, laboratory analysis after the first episode of VF demonstrated normal levels of potassium, magnesium and calcium. With regard to ischemia, there were no clinical, electrocardiographic or laboratory findings to

support such a possibility. Moreover, a bedside echocardiographic examination revealed a mildly dilated left ventricle with mildly reduced systolic function and hypokinesis of the inferior-posterior walls of the left ventricle. These findings did not differ from those of a previous examination. Nevertheless, urgent coronary angiography was performed, which demonstrated a patent vein graft to the right posterior descending artery.

On the following day, detailed analysis of the patients' telemetry demonstrated inappropriate pacing by the temporary epicardial pacemaker [Figure]. Intriguingly,

VF = ventricular fibrillation

This tracing shows undersensing of the temporary epicardial lead. The first stimulus was delivered shortly after the R wave during the absolute refractory period and did not cause ventricular excitation. The second stimulus was delivered on the T wave resulting in short-coupling of ventricular excitation followed by VF



ingly, each of the three VF episodes was preceded by a stimulation artifact occurring during the ventricular repolarization period, resulting in short coupling of ventricular excitation followed by VF. The inappropriate stimuli were caused by undersensing of the intrinsic electrical activity of the heart. By chance, some of these stimuli reached the myocardium during the vulnerable ventricular repolarization period, causing R-on-T pacing that deteriorated to VF.

Although well-described, this phenomenon appears in only a few case reports of pacemaker-induced ventricular tachycardias resulting from R-on-T pacing [1-3]. We believe that this case constitutes a very elegant example of this phenomenon. It also highlights the importance of performing daily checks of the external pacemaker system in order to identify malfunctions, that sometimes may be dangerous, and to prevent unnecessary procedures.

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**Capsule**

**Towards germline gene therapy of inherited mitochondrial diseases**

Mutations in mitochondrial DNA (mtDNA) are associated with severe human diseases and are maternally inherited through the egg's cytoplasm. Tachibana et al. investigated the feasibility of mtDNA replacement in human oocytes by spindle transfer (ST, also called spindle-chromosomal complex transfer). Of 106 human oocytes donated for research, 65 were subjected to reciprocal ST and 33 served as controls. Fertilization rate in ST oocytes (73%) was similar to controls (75%); however, a significant portion of ST zygotes (52%) showed abnormal fertilization as determined by an irregular number of pronuclei. Among normally fertilized

ST zygotes, blastocyst development (62%) and embryonic stem cell isolation (38%) rates were comparable to controls. All embryonic stem cell lines derived from ST zygotes had normal euploid karyotypes and contained exclusively donor mtDNA. The mtDNA can be efficiently replaced in human oocytes. Although some ST oocytes displayed abnormal fertilization, remaining embryos were capable of developing to blastocysts and producing embryonic stem cells similar to controls.

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Eitan Israeli

**Capsule**

**Nocturnal glucose control with an artificial pancreas at a diabetes camp**

Recent studies have shown that an artificial pancreas system can improve glucose control and reduce nocturnal hypoglycemia. However, it is not known whether such results can be replicated in settings outside the hospital. In this multicenter multinational randomized crossover trial, Phillip et al. assessed the short-term safety and efficacy of an artificial pancreas system for control of nocturnal glucose levels in patients (age 10 to 18 years) with type 1 diabetes at a diabetes camp. In two consecutive overnight sessions, the authors randomly assigned 56 patients to receive treatment with an artificial pancreas on the first night and a sensor-augmented insulin pump (control) on the second night, or to the reverse order of therapies on the first and second nights. Thus, all the patients received each treatment in a randomly assigned order. The primary end-points were the number of hypoglycemic events (defined as a sensor glucose

value of < 63 mg/dl for at least 10 consecutive minutes), the time spent with glucose levels below 60 mg/dl, and the mean overnight glucose level for individual patients. When comparing nights when the artificial pancreas was used with nights when the sensor-augmented insulin pump was used, there were significantly fewer episodes of night-time glucose levels below 63 mg/dl (7 vs. 22) and significantly shorter periods when glucose levels were below 60 mg/dl ( $P = 0.003$  and  $P = 0.02$ , respectively, after adjustment for multiplicity). Median values for the individual mean overnight glucose levels were 126.4 mg/dl (interquartile range 115.7–139.1) with the artificial pancreas and 140.4 mg/dl (interquartile range 105.7–167.4) with the sensor-augmented pump. No serious adverse events were reported.

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**“Life is an adventure in forgiveness”**

Norman Cousins (1915-1990), American political journalist, author, professor, and world peace advocate