Applying the new STEMI guidelines: 2. Disturbances of cardiac rhythm after ST-segment elevation myocardial infarction

Case 1
A 52-year-old man with hypertension and hyperlipidemia experiences chest pain and summons medical help. Thirty minutes later, in the presence of paramedics, he collapses with ventricular fibrillation (VF). He is promptly defibrillated. His admission electrocardiogram (ECG) reveals anterior ST-segment elevation. He receives intravenous fibrinolysis.

Question: Is this patient likely to have further episodes of VF?

Comment: Whereas VF in the first hour after myocardial infarction (MI) is relatively common, the risk of subsequent VF is similar to that in patients with an MI of equivalent size but without early VF. No specific antiarrhythmic therapy is needed for such patients.

Question: Later that day the patient experiences recurrent chest discomfort along with new ECG changes indicating ischemia. Angiography reveals a 90% proximal lesion in the left anterior descending coronary artery, which is treated with angioplasty and stenting. The angiogram reveals only mild disease in the patient’s other coronary arteries. Apart from transient mild heart failure, the patient has no further complications. However, 48 hours after admission, while reading, he has an episode of presyncope. ECG telemetry shows a 30-second episode of polymorphic ventricular tachycardia (VT), the first beat having a short coupling interval to the last sinus beat (Fig. 1). The VT stops spontaneously.

What is the clinical significance of this arrhythmia? How should this patient be treated?

Comment: Self-terminating polymorphic VT, particularly in an “ischemic milieu,” often occurs during activity or sinus tachycardia, and usually starts with a premature ventricular beat that is “closely coupled” (often for 300 milliseconds or less) to the last normal beat. This is the ECG signature of an ischemia- or infarction-related arrhythmia and is less likely than monomorphic VT to imply a “fixed arrhythmogenic substrate” (myocardial scar tissue from a previous infarct). The appropriate treatment is vigorous anti-ischemic therapy.

Question: Should this patient receive an implantable cardioverter defibrillator (ICD)?

Comment: Patients with this arrhythmia generally do not require an ICD, because the risk of recurrent sustained VT or VF is much lower than it is after monomorphic VT.

Question: The patient’s metoprolol dose is increased from 50 to 100 mg twice daily, and his other medications, including an angiotensin-converting enzyme inhibitor, ASA, clopidogrel and a statin, are continued. Echocardiography shows moderately severe segmental left ventricular dysfunction, with akinesis in the anterior and inferior septum and apex and an estimated left ventricular ejection fraction of 30%. On day 6, an exercise test with perfusion imaging shows no inducible arrhythmias and no reversible ischemia.

Given the low ejection fraction, is this patient at increased risk of subsequent arrhythmias? Should he receive an ICD before discharge?

Comment: Left ventricular function often improves after revascularization. Decisions regarding the need for ICD insertion should be deferred until at least 40 days after the acute event unless a sustained ventricular arrhythmia occurs beyond the initial 48 hours. If, on reassessment, the left ventricular function is found to be only moderately impaired (ejection fraction > 40%), further in-

Fig. 1: Polymorphic ventricular tachycardia (VT), arising from sinus tachycardia at 110 beats/min. Note the relatively short QT interval of 280 milliseconds and the short coupling interval from the last sinus beat to the first beat of VT of 300 milliseconds. These features suggest ischemia-related VT.
Is this patient at high risk of recurrence of this arrhythmia?

Comment: Sustained monomorphic VT in the presence of a ventricular scar, regardless of how quickly it degenerates to VF, strongly suggests the likelihood of recurrent cardiac arrest and requires insertion of an implantable cardioverter defibrillator (ICD). In contrast to polymorphic VT or VF at the outset of arrhythmia, monomorphic VT is a consequence of the ventricular scar from the MI and cannot be prevented by revascularization or anti-ischemic therapy.

Question: Subsequent cardiac catheterization shows moderate left ventricular dysfunction (ejection fraction 40%), inferior akinesis and an occluded right coronary artery with noncritical disease (< 50% stenosis) of the left anterior descending coronary artery. Should this patient receive an ICD?

Comment: Substantial clinical trial evidence indicates that insertion of an ICD is the best therapy in such cases. Anti-arrhythmic therapy, for example with amiodarone, is substantially inferior in both the short and long term for the prevention of sudden cardiac arrest and death.1,3
**Outcome:** The patient underwent implantation of an ICD 3 days later.

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**Competing interests:** Dr. Armstrong has received research funding from Hoffman-LaRoche, Aventis, Boehringer Ingelheim, and educational and consultant funding from Hoffman-LaRoche and Aventis. Dr. Dorian received speaker fees from Guidant Corp., Medtronic Inc., and St. Jude Medical Inc.

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