

Sudden Cardiac Death in Acute Coronary Syndromes

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KEYWORDS

• Acute coronary syndrome • Sudden cardiac death • Ventricular fibrillation

KEY POINTS

- Sudden cardiac death due to ventricular tachyarrhythmias is a major threat in patients with acute coronary syndromes despite a decline in the incidence as a result of contemporary management.
- Acute treatment of life-threatening ventricular tachyarrhythmias consists of electrical defibrillation and coronary revascularization.
- Apart from beta-blockers and amiodarone, the role of other antiarrhythmic drugs is marginal. Catheter ablation may be very effective in selected patients.

INTRODUCTION

Sudden cardiac death is a major cause of mortality in acute coronary syndromes, mostly caused by complex ventricular arrhythmias, in particular, ventricular fibrillation (VF). This article focuses on sudden cardiac death and complex ventricular arrhythmias occurring in the acute phase of coronary syndromes and not in the long-term phase after such an episode. For the latter, abundant literature exists.¹⁻⁴

SUDDEN CARDIAC ARREST AS INITIAL MANIFESTATION OF AN ACUTE CORONARY SYNDROME

Complex ventricular arrhythmias and VF are frequent in the setting of acute myocardial ischemia. In contrast to the chronic phase of coronary artery disease, in which monomorphic ventricular tachycardia (VT) occurs based on myocardial substrate, acute ischemia predominantly leads to VF and not monomorphic tachycardia. In a substantial number

of cases, sudden cardiac arrest caused by VF may represent the initial manifestation of the acute coronary syndrome. Thus, in a recent study with a large number of subjects admitted to the hospital for ST-segment elevation myocardial infarction (STEMI), 7.0% had out-of-hospital cardiac arrest; that is, a sudden cardiac arrest as an initial manifestation of the acute ischemic episode.⁵

IN-HOSPITAL COMPLEX VENTRICULAR ARRHYTHMIAS

Following admission, the risk of VF and sudden cardiac death in patients with acute coronary syndromes is highest in the early phase. The incidence of in-hospital VF has been reported in numerous studies. As a result of advances in the management of patients with episodes of acute myocardial ischemia, the incidence of VF in this setting seems to be declining and is currently mostly reported in the range of 2% to 7%. Thus, in the Global Use of Strategies To Open coronary arteries (GUSTO) V trial, 4.4% of the subjects

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with STEMI developed early VT or VF (VT/VF) occurring within 48 hours after admission.⁶ This rate was lower in the Acute Coronary Syndrome Israeli Survey in a large population including both subjects with STEMI and subjects with non-STEMI (NSTEMI). Ventricular tachyarrhythmias occurred in 3.8% of subjects with 2.1% occurring within the first 48 hours and 1.7% after the first 48 hours.⁷ Similarly, more recent investigations, such as the Early Glycoprotein IIb/IIIa Inhibition in Non-ST Segment Elevation Acute Coronary Syndrome (EARLY ACS) reported a considerably lower rate of VT/VF of 1.5% in subjects with NSTEMI with a similar distribution between the early and late phase (before and after the first 48 hours).⁸ In contrast, a considerably higher incidence of VT/VF was reported in other populations with NSTEMI. In a report of NSTEMI subjects undergoing cardiac catheterization within 48 hours, the rate of VT/VF was 7.6% with 60% of the life-threatening ventricular tachyarrhythmic episodes occurring in the first 48 hours after admission.⁹

PROGNOSTIC SIGNIFICANCE OF IN-HOSPITAL COMPLEX VENTRICULAR ARRHYTHMIAS

Thus, VF/VT is still relatively common in the setting of an acute episode of myocardial ischemia (particularly in the first 48 hours), and represents a major threat to the patient's life. Obviously, a successful acute management of these arrhythmic episodes is mandatory, but the short-term and long-term prognostic significance is still debated.

For episodes occurring after the early phase, which is mostly defined as the first 48 hours after the beginning of symptoms, there is general agreement that they are associated with impaired prognosis.⁷ This is different for episodes occurring in the early phase of an acute ischemic episode; that is, within the first 48 hours. Although some investigators have reported a considerably worse prognosis of subjects with acute coronary syndromes suffering episodes of VF in the early phase of the syndrome, others did not confirm this association. Thus, in a large series of patients with STEMI and NSTEMI, VTs in both the early (within 48 hours) and in the late (later than 48 hours) phase were significantly associated with in-hospital death; however, only episodes in the late phase were associated with increased 30-day mortality.⁷ In an older study of subjects with acute myocardial infarction, in-hospital mortality during the initial hospitalization was higher for subjects in whom VT/VF occurred (27% vs 7%, $P < .001$); however, long-term mortality of hospital survivors showed no difference.¹⁰ Similarly, in a more recent series of STEMI subjects, a large cohort of subjects

with VF episodes in the first 48 hours had a higher in-hospital mortality. The long-term prognosis of those discharged was similar in subjects who did not experience VF during the acute episode.¹¹ Recently, in a large series of STEMI subjects treated predominantly by fibrinolysis, VF occurring before admission to the intensive care unit was an independent predictor of in-hospital mortality. This was not the case for subjects treated with primary angioplasty.¹² In contrast, in the GUSTO V study, VT/VF occurring in the first 48 hours of myocardial infarction was associated with a significant and marked increase of 30-day mortality (22% vs 5%, $P < .001$).⁶

Overall, the occurrence of VT/VF within the first 48 hours is associated with a significantly increased in-hospital mortality. Doubt remains whether the increased risk also applies to long-term mortality, provided, of course, that the tachyarrhythmia episode is successfully acutely treated. Conversely, VT/VF occurring in the late phase of the syndrome; that is, 48 hours from the start of the ischemic episode, is associated with an impairment of both short-term and long-term prognosis.

ACUTE TREATMENT OF VENTRICULAR TACHYARRHYTHMIAS IN THE SETTING OF ACUTE CORONARY SYNDROMES

VF/VT occurring in the setting of an acute coronary syndrome must be immediately terminated in the same way as episodes occurring outside of this setting.¹³ Electrical defibrillation is obviously the cornerstone of management and should be performed without any delay. Rapid detection of the episode is of major importance and, in this particular setting, has been greatly facilitated by the introduction of coronary care units in which subjects are continuously monitored. Indeed, coronary care units have revolutionized the management of patients with acute coronary syndromes and have significantly contributed to the considerable reduction of mortality observed in the last decade.¹⁴

In contrast, the role of antiarrhythmic drugs is much less clear. Beta-blockers are an established treatment in acute coronary syndromes and have a beneficial effect for relief of ischemia. Recent evidence suggests that early application of beta-blockers may also reduce the incidence of in-hospital ventricular tachyarrhythmic episodes in patients with acute coronary syndromes.¹⁵ This was confirmed by Global Registry of Acute Coronary Events (GRACE), in which oral beta-blockers were associated with a decrease in the risk of ventricular arrhythmias.¹⁶ However,

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