



Care of Patients Experiencing Cardiac Arrest

Complete recovery after out-of-hospital cardiac arrest with prolonged (59 min) mechanical cardiopulmonary resuscitation, mild therapeutic hypothermia and complex percutaneous coronary intervention for ST-elevation myocardial infarction

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ABSTRACT

We report on a 68 years old survivor of an out-of-hospital cardiac arrest with favorable neurological outcome following prolonged cardiopulmonary resuscitation (CPR 59 min) until return of spontaneous circulation (ROSC) due to ST-elevation myocardial infarction (STEMI). The case demonstrates the beneficial effect of an *optimal rescue chain* including basic life support performed by trained bystanders, short response time of the emergency medical service, uninterrupted CPR during transportation using a *mechanical* chest compression system (LUCAS[®]), in combination with optimal intensive care management of cardiogenic shock after ROSC including multivessel emergency percutaneous coronary intervention (PCI) and *intravascular* therapeutic hypothermia (Coolgard[®]-System).

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Case report

A 68 years old male without previous history of cardiovascular events, but known type 2 diabetes mellitus and arterial hypertension (under control with metformin and ramipril), stopped a bicycle tour because of sudden chest pain and collapsed on a bench, witnessed by two nurses who incidentally walked by and detected a cardiac arrest based on palpation of the carotid pulse. They immediately initiated manual continuous chest compression, simultaneously instructed the patient's son to perform mouth-to-nose ventilation, and asked another bystander to call the emergency medical service (EMS) by mobile phone and guide them to the location of the cardiac arrest.

Disclosures and conflicts of interest: This case report describes the use of commercial products. There is no conflict of interest or compensation for this study.

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Timing after emergency call

After 7 min, (data of the emergency dispatching center) the first ambulance – staffed with two trained paramedics – arrived on scene. Ventricular fibrillation (VF) was detected by an external automatic defibrillator (AED) but initial defibrillation was unsuccessful and chest compression as well as Ambu[™] bag ventilation was continued.

After 10 min, a simultaneously dispatched second emergency car arrived, staffed with a trained emergency physician. She found the patient deeply cyanotic under continuous cardiopulmonary resuscitation and in persistent VF. The second defibrillation after endotracheal intubation led to pulseless ventricular tachycardia (PVT) and chest compression as well as mechanical ventilation were continued. After repetitive application of epinephrine (3 × 1 mg i.v.) VF reoccurred, which converted into another episode of PVT after 300 mg amiodarone and repeated defibrillation.

After 36 min, all advanced life support measures failed to achieve ROSC and the patient was transported to our referral center under



Fig. 1. Mechanical chest compression–decompression system LUCAS[®]. Adapted with permission from Physio-Control Germany Sales GmbH.

continuous CPR – using a mechanical chest compression–decompression system (see Fig. 1: LUCAS[®]-System, Jolife company/Sweden, battery operated, compression rate 100/min, deepness of chest compression 4–5 cm). During transportation several episodes of VF were detected and terminated by defibrillation with the effect of persisting PVT.

After 52 min, the patient directly arrived at our intensive care unit (ICU) with an alternating rhythm between PVT and episodes of VF. He was severely acidotic (serum lactate 122 mg/dl, pH 6.9) with an excellent oxygenation under mechanical ventilation (pO₂ 122 mm Hg, pCO₂ 52 mm Hg). Blood glucose was 557 mg/dl. Both pupils were dilated but round. Mechanical chest compression was continued.

After 59 min, ROSC with palpable pulses was achieved for the first time – after infusion of 250 ml of sodium bicarbonate 8.4% and another 1 mg bolus of epinephrine. 12-lead ECG displayed sinus tachycardia (120 bpm) and significant ST-segment-elevations in leads I, aVL and V2–V6 as a sign of an acute and extensive anterior wall myocardial infarction (see Fig. 2). The patient was in cardiogenic shock requiring continuous infusion of epinephrine. Therapeutic hypothermia was initiated by rapid infusion of 1000 ml cold saline at 4 °C (body temperature 36.5 °C on admission). After i.v. application of 5000 IU unfractionated heparin and 500 mg aspirin, the patient was transferred to the catheterization laboratory. During the catheterization procedure another 1000 ml of cold saline were applied.

After 107 min, the first coronary angiography scene was acquired (see Fig. 3) and confirmed a total thrombotic occlusion of the left anterior descending coronary artery (LAD). Furthermore, the proximal left circumflex artery (LCX) as well as the mid right coronary artery (RCA) showed severe stenosis.

After 117 min, the first balloon inflation was performed (Door-to-balloon time 65 min) and the LAD was successfully reperfused with a TIMI flow grade III after stent implantation (bare metal stent 3.0/30 mm). Subsequently, the LCX and the RCA were treated by PCI (bare metal stents) with a TIMI flow grade III. The patient received a loading dose of 600 mg clopidogrel via a nasogastric tube.

After 142 min, the patient was transferred back to the ICU and intravascular therapeutic hypothermia was started using an

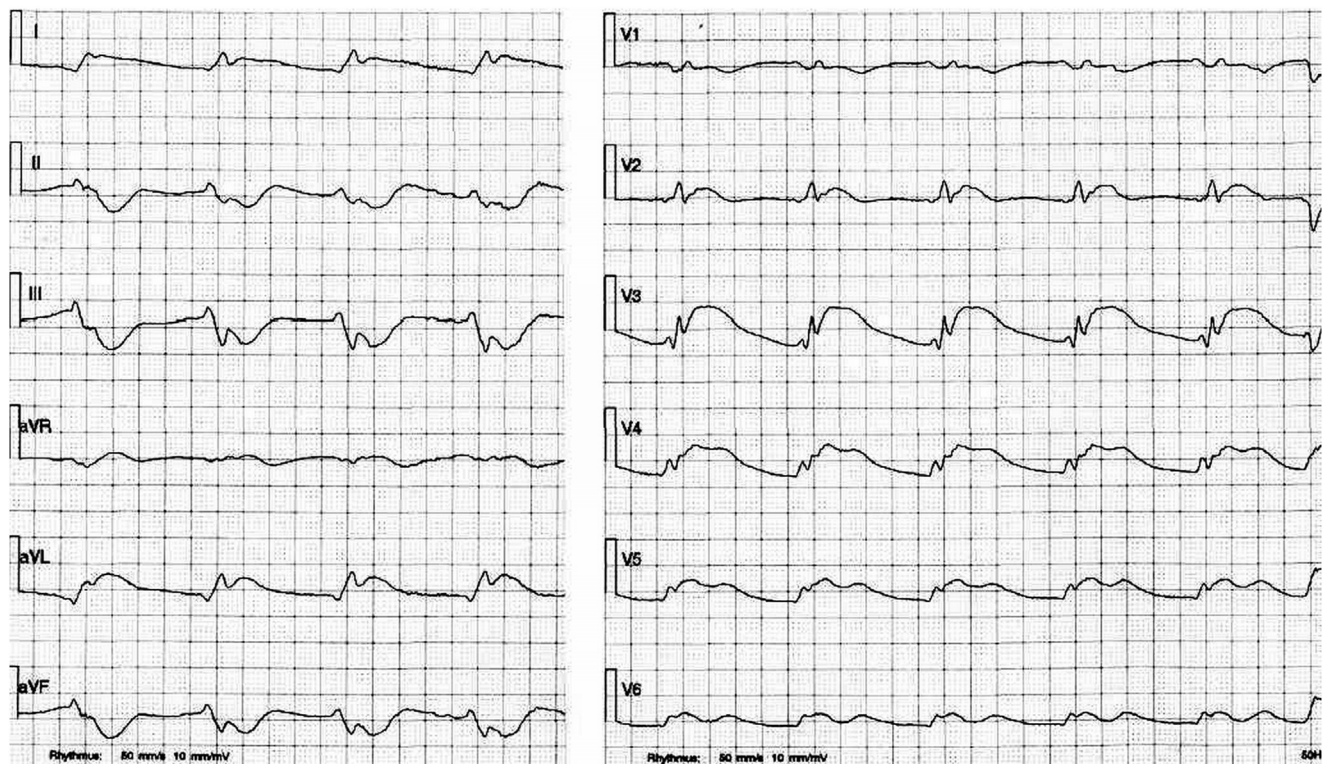


Fig. 2. ECG on admission. Signs of an acute and extensive anterior wall myocardial infarction.

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