

A Successful Outcome of Cardiac Arrest Transported by a Doctor-Helicopter

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Abstract

Case Report

A 40-year-old military man experienced a severe coughing fit after running 3000 meters and collapsed at the base. His colleagues used an automated external defibrillator (AED) and called a general ambulance, and a fire department requested the dispatch of a doctor helicopter (DH). When a doctor-helicopter (DH) staff checked him, he was in a restless unconscious state and his systolic blood pressure was 80 mmHg. A venous route was secured, drugs were administered and tracheal intubation was performed. Twelve-lead electrocardiography showed precordial ST elevation. After arrival at hospital, a coronary arteriogram showed complete occlusion at segment No 6 and coronary angioplasty resulted in recanalization. Sequentially, he underwent normothermic therapy in a coronary care unit. On the 2nd day, he could obey orders, and his circulation and respiration function were stable; thus, extubation was performed. He was discharged without cardiac or cerebral sequelae after rehabilitation. A seamless chain of survival including the application of the AED, early medical intervention and transportation provided by the DH, early radical treatment, and neuroprotective intensive care was the key to obtaining social rehabilitation in the present case.

Keywords: acute myocardial infarction; doctor helicopter; cardiac arrest.

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INTRODUCTION

Minimizing the total ischemic time in the initial treatment of ST-elevation acute myocardial infarction (STEMI) is of utmost importance [1]. A recent analysis of 146,940 patients registered in the National Cardiovascular Data Registry suggests that shorter patient-specific door-to-balloon times (from onset to radical treatment) were closely associated with better in-hospital outcomes and 6-month outcomes [2]. In Eastern Shizuoka, a physician-staffed helicopter, called a doctor-helicopter (DH) in Japan, is dispatched for patients with cardiac arrest (CA) or suspected acute myocardial infarction to provide early medical intervention [3, 4]. There are few clinical reports on cases in which a successful outcome was obtained after helicopter transportation in cases of out-of-hospital cardiac arrest induced by acute myocardial infarction [5]. We herein report the successful outcome of a case of out-of-hospital cardiac arrest-induced acute myocardial infarction under a chain of survival that included transportation by a doctor helicopter.

CASE REPORT

A 40-year-old military man experienced a fit of severe coughing after running 3000 meters at full-

speed for a physical fitness test at a military base. When putting away the physical fitness test tools in a warehouse he fell down, and was observed to be blowing bubbles from the corner of his mouth. His past and family histories were not remarkable. His colleagues retrieved an automated external defibrillator (AED) from the base and used it to shock the patient three times. They called a general ambulance at 10:46. After receiving the first call, the fire department requested the dispatch of a DH in Eastern Shizuoka prefecture, ordered the dispatch of a ground ambulance and obtained permission for the landing of the DH from the military base at 10:57. The DH took off at 11:01. When emergency medical technicians (EMTs) checked him, he was found to have obtained a return of spontaneous circulation. He was in a coma state with weak radial pulse and a percutaneous oxygen saturation of 80%. He was transported to the rendezvous zone in the military base with an oxygen mask by the ground ambulance and the DH landed the military base at 11:12. When the DH staff checked him, he was in a restless unconscious state and his systolic blood pressure was 80 mmHg. A venous route was secured, and then tracheal intubation was performed under use of sedation and muscle relaxant. A twelve-lead electrocardiogram showed precordial ST elevation. The

DH staff ordered an emergency physician and cardiologist to standby at an emergency room. The patient was transferred from the ground ambulance to the DH, and the DH took off from the military base at 11:35 and landed at our hospital (a DH base in Eastern Shizuoka) at 11:51. Usually a ground ambulance will take 70 minutes to reach our hospital from the scene where an emergency catheter could be performed in the nearest. On arrival, his Glasgow Coma Scale was E2VTM4, and his vital signs were as follows: blood pressure, 142/78 mmHg; heart rate, 80 beats/min; and SpO₂, 100% with mechanical ventilation. A physical examination revealed no specific findings. An arterial gas analysis revealed the following: pH, 7.36; PCO₂, 35 mmHg; PO₂, 210 mmHg; HCO₃⁻, 20 mmol/L and base excess, -4 mmol/L. A twelve-lead electrocardiogram still showed precordial ST elevation (Figure 1). Cardiac echo depicted akinesis of the septal wall. Troponin T was positively detected. Emergency chest

roentgenography did not show significant changes but whole body computed tomography suggested aspiration. He was then transported to a catheter room after denying subarachnoid hemorrhage at 12:25. A coronary arteriogram showed complete occlusion at segment No 6 (Figure 2). Coronary angioplasty resulted in recanalization. The main results of a blood biochemical analysis on arrival were as follows: white blood cell COUNT, 18,200/ μ l; aspartate aminotransferase, 141 IU/L; alanine aminotransferase, 137 IU/L; creatine phosphokinase, 334 IU/L and fibrin degradation product, 46 μ g/ml. He underwent normothermic therapy in a coronary care unit. On the 2nd day, he could obey orders, and his circulation and respiration function were stable; thus, extubation was performed. He was discharged without cardiac or cerebral sequelae after rehabilitation on the 12th hospital day.

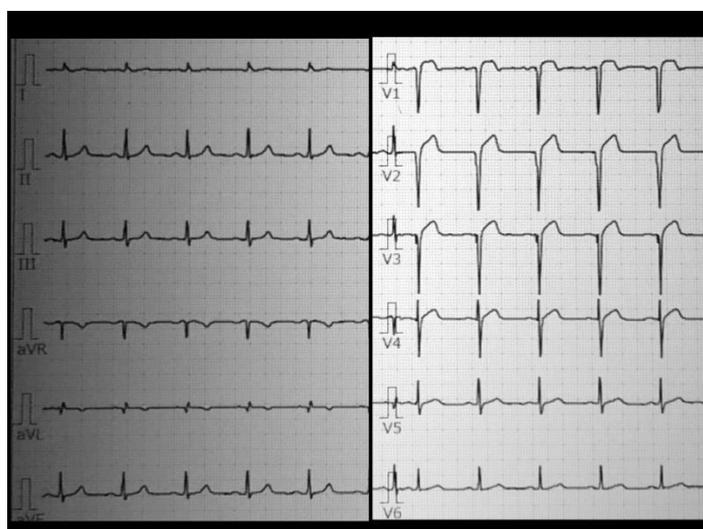


Fig-1: The twelve-lead electrocardiogram on arrival. The twelve-lead electrocardiogram shows precordial ST elevation

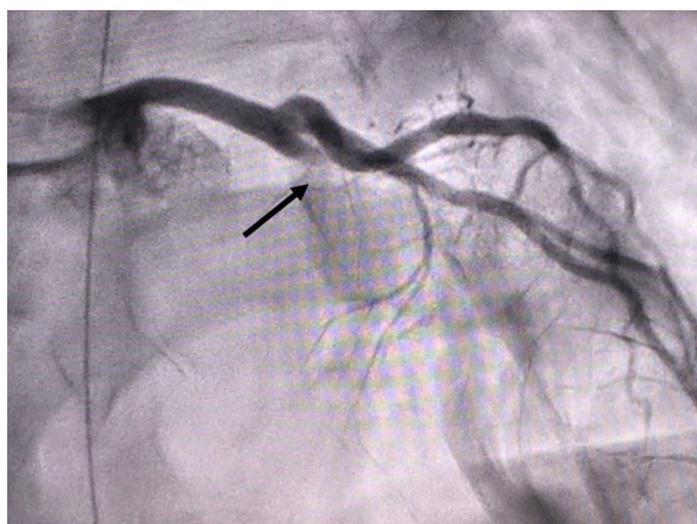


Fig-2: The coronary angiogram on arrival the coronary angiogram shows a normal right coronary artery and circumflex branch of the left coronary artery, with the complete obstruction of the branch of anterior descending artery (arrow)

DISCUSSION

There are several reasons why a favorable outcome was obtained in the present case. The first is that the AED was applied at the scene. The deployment of the AED by a bystander among is important for improving the prognosis of CA as it can minimize the damage from cerebral ischemia [6]. In other words, early defibrillation was associated with a good neurologic outcome after CA with ventricular fibrillation. In Japan, it takes approximately 8.5 min from the first call for EMTs to contact patients [6]. Eight minutes is too long to prevent whole cerebral ischemia due to CA. Since July 2004, it has been legal for any citizen in Japan to use an AED, and public-access AEDs have become increasingly available. The second reason is the early medical intervention provided by the DH staff. In Japan, EMTs cannot perform tracheal intubation or administer drug infusions to patients without CA. In contrast, the physician of the DH can secure a definitive airway by tracheal intubation, use drugs to stabilize circulation and respiration or treat acute coronary syndrome (*e.g.*, nitroglycerin, aspirin or opioid analgesics). Gunnarsson *et al.* also reported that patients who were transferred by a helicopter escorted by EMTs were at increased risk of serious in-hospital adverse events in comparison to patients who were transported by a DH [8]. These medical interventions and safe transportation might have resulted in the favorable outcome [3,9]. The third reason is early transportation by helicopter. In the present case, the patient arrived at our hospital approximately one hour earlier than he would have if he had been transported by ground ambulance. Minimizing the total ischemic time through the initial treatment is the key to obtaining a favorable outcome in patients with STEMI [1]. The last reason is the administration of neuroprotective therapy for anoxic encephalopathy. Body temperature control after CA is a key factor influencing the final outcome [10]. Accordingly, the seamless chain of survival in the present case resulted in successful social rehabilitation.

CONCLUSION

A seamless chain of survival, the including application of an AED, early medical intervention and transportation by DH, early radical treatment, and neuroprotective intensive care were the key to obtaining social rehabilitation in the present case.

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