

A case of persistent and recurrent ventricular fibrillation with successful resuscitation and good neurological outcome

一個成功復甦而神經復原良好的持續及反覆重現心室纖維性顫動個案

CH Chung 鍾展鴻

A 49-year-old man suffering from chest pain collapsed on arrival at an emergency department. Ventricular fibrillation was confirmed and he survived neurologically normal after 22 defibrillation shocks. This case attests that persistent and recurrent ventricular fibrillation is still compatible with good neurological outcome. Energetic and persistent efforts should be continued in such cases. Amiodarone should be considered early in the course of refractory ventricular fibrillation. (*Hong Kong j.emerg.med.* 2005;12:28-31)

一名患上胸痛的 49 歲男子當抵達急症室時虛脫倒下，心動停止，證實為心室纖維性顫動，經過 22 次去顫電擊後生還，並神經狀況正常。這個案證明持續及反覆重現的心室纖維性顫動仍可有良好的神經復原。故此這類個案應積極及堅持地繼續努力搶救。處理頑強的心室纖維性顫動時，應及早考慮採用胺碘酮。

Keywords: Cardiac arrest, defibrillation, number of shocks

關鍵詞：心動停止、去顫術、電擊次數

Introduction

The probabilities of both successful resuscitation and survival among patients in cardiac arrest with ventricular fibrillation (VF) are related inversely to the total number of defibrillation shocks required for cardioversion.¹ Survival rates drop markedly if 5 or more shocks are required for either persistent or recurrent episodes of VF.¹ This is a report on a patient who survived neurologically intact after 22 defibrillation shocks.

Case report

A 49-year-old man with good past health was sent to the emergency department by ambulance in April 2003 because of central retrosternal pain for two hours. He had no history of diabetes, hypertension or ischaemic heart disease. He did not smoke and took alcohol only during social occasions. He collapsed suddenly and was found unconscious just on arrival at the emergency department. Cardiac arrest was confirmed and cardiopulmonary resuscitation (CPR) was started immediately in the ambulance. He was promptly sent into the resuscitation room of the emergency department, where VF was shown on the cardiac monitor. Defibrillation was attempted, starting from 200 Joules (J), then 300J, and subsequently 360J. Resuscitation continued according to the Advanced Cardiac Life Support guidelines. He was intubated

Correspondence to:

Chung Chin Hung, FRCS(Glasg), FHKAM(Surgery), FHKAM(Emergency Medicine)

North District Hospital, Accident & Emergency Department,
9 Po Kin Road, Sheung Shui, N.T., Hong Kong

Email: chunch@ha.org.hk

and intravenous access secured. After 9 additional electric shocks, three doses of 1 mg adrenaline and two doses of 75 mg lignocaine intravenous boluses, spontaneous circulation returned 13 minutes after arrival at the emergency department. The blood pressure was 178/39 mmHg and the pulse rate 100 beats/min. However, he lapsed into pulseless ventricular tachycardia (VT) after five minutes, which was 'defibrillated' again after 5 more shocks at 360J. A lignocaine infusion at 4 mg/min was started. However, VF recurred again. Successful defibrillation was achieved with 3 more shocks. The blood pressure was 142/70 mmHg and the pulse rate 123 beats/min. Amiodarone 300 mg was added intravenously. A central line was established and the first reading was 28 cm H₂O. However, VF recurred again. This time defibrillation was successful after only 1 shock. The total duration from the 1st to the 21st shock was 44 minutes. The blood pressure was then 69/40 mmHg and the pulse rate 94 beats/min. A dobutamine infusion at 10 microgram/kg/min was started and the lignocaine infusion continued. A Foley catheter was inserted. Electrocardiogram showed sinus tachycardia with ST elevation in leads V1-V5 (Figure 1). He was admitted into the Intensive Care Unit. At the time of transfer, his blood pressure was 121/88 mmHg, pulse rate 125 beats/min, SpO₂ 99% and central venous pressure 25 cm H₂O. Glasgow coma scale score was E4V1(T)M6.

After admission, streptokinase 1.5 MU was given intravenously. An amiodarone infusion at 0.6 mg/min was started to replace the lignocaine infusion. Echocardiogram showed extensive anterior infarction and an ejection fraction of 40%. He developed another episode of VF in the Intensive Care Unit a few hours later. Sinus rhythm returned after a single 200J defibrillation shock. An additional dose of amiodarone 150 mg in 100 ml D5 was infused in 30 minutes. The creatine kinase was up to 15,762 U/L (normal range 62-297). Blood cholesterol and triglycerides were normal. He was extubated later on the same day. On his discharge 10 days later, he was fully oriented and neurologically normal. At a follow up visit six months later, he was symptom-free and without chest pain even after running for 200 metres.

Discussion

Over the past decades there have been great advances in both the standard and process of resuscitation, culminating in improved outcomes in the prehospital setting. In contrast, the process of in-hospital resuscitation has remained relatively unchanged, and survival from in-hospital cardiac arrest has remained stagnant for almost 40 years.² Higher vigilance on patient deterioration and more energetic resuscitation in-hospital might be the solutions for improvement.

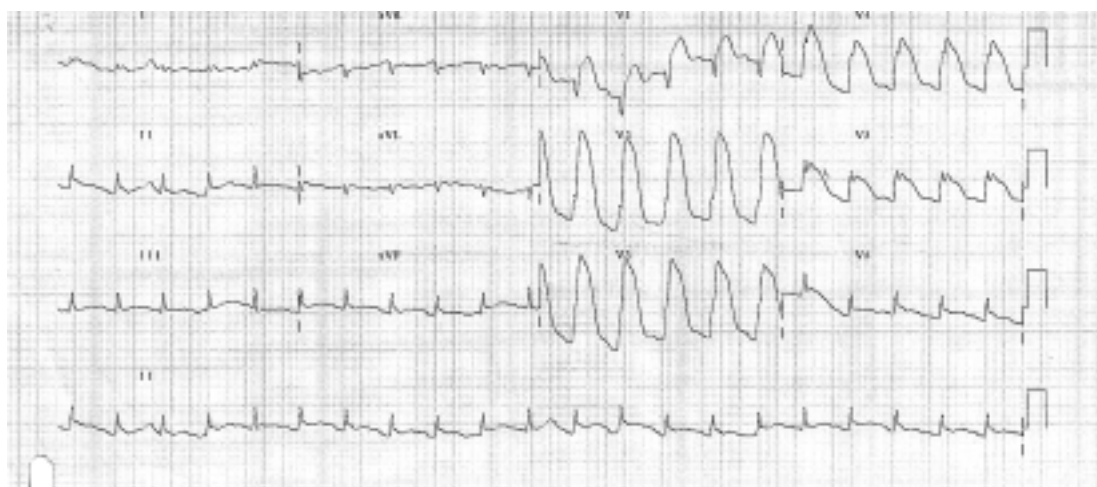


Figure 1. Post-resuscitation electrocardiogram showing ST elevation in V1-V5.

Most adults with sudden witnessed nontraumatic cardiac arrest are found to be in VF. For these victims, the time from collapse to first defibrillation is the most important determinant of survival.^{3,4} The probabilities of both successful resuscitation and survival are also related inversely to the total number of shocks required. Survival rates dropped markedly if 5 or more shocks are required for either recurrent or persistent episodes of ventricular fibrillation. In one series, of the patients who required 10 or more shocks for episodes of refrillation, only one, who received 18 shocks, survived.¹ Refibrillation is a major problem. This may occur in two-thirds of the patients with an organised rhythm after the first shock. Amiodarone has been shown to improve survival to hospital admission in patients with out-of-hospital cardiac arrest due to shock-refractory VF or pulseless VT.^{5,6} In shock-refractory VF, magnesium, lignocaine and bretylium are not recommended and intravenous amiodarone is the treatment of choice.^{7,8} Defibrillation using biphasic as opposed to monophasic waveforms has been claimed to be more effective for shock-refractory VF.⁸ Early administration of amiodarone in the course of a complicated cardiac arrest has been claimed to be more beneficial.⁶ Multiple regression analysis identified VF with an amplitude ≥ 0.5 mV, age ≤ 70 years, and arrest that needed ≤ 2 shocks for defibrillation, in rank order as independent predictors of survival to discharge.⁹

On the other hand, the survival rate was lowest in patients who converted to asystole after the first or second shock. The rate of survival was highest among patients in whom an organised pulse-generating rhythm was promptly converted and maintained. Survival is still high in patients with even a transient supraventricular rhythm or with persistent VF, after the first shocks. The appearance of asystole at any time indicated a poor prognosis.^{1,4}

Complete neurologic recovery after prolonged refractory cardiac arrest has been reported after 30 minutes of closed cardiac massage and 48 minutes of open cardiac massage in a 70-year-old woman,¹⁰ and for about 70 minutes of CPR, defibrillation and

pharmacotherapy in a 45-year-old man.¹¹ The longest successfully treated cardiac arrest reported in literature was a 60-year-old man in whom, at the end of five hours, CPR had been given 85% of the time and a total of 40-45 defibrillation shocks were required.¹²

This case illustrates all the favourable factors in the chain of survival – early access, early CPR, early defibrillation and early advanced care.³ This case was a witnessed cardiac arrest. Early CPR was performed. The rhythm was VF or pulseless VT. Early defibrillation and advanced medical care were immediately available. Moreover, the patient was young and with good past health. He certainly deserved the maximal efforts in resuscitation.

This case attests that prognosis during cardiopulmonary resuscitation may not be reliable, and that refractory ventricular fibrillation is compatible with neurologically intact survival. Energetic and persistent efforts should be continued in such cases.

Amiodarone should be considered early in the course of refractory ventricular fibrillation.

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