

# Cardiac arrest post surgery – the importance of immediate recognition and treatment

## Abstract

A 76-year old male patient with a history of ischaemic heart disease underwent an elective right hemicolectomy for malignancy. The operation was uneventful and he was transferred to the intensive care unit (ICU) postoperatively. Within one hour of admission to ICU he became suddenly unresponsive and went into VF cardiac arrest which was immediately recognised. He was successfully resuscitated according to the advanced life support (ALS) guidelines and return of spontaneous circulation (ROSC) restored. A post-operative acute myocardial infarction was identified and treated. He subsequently had a long ICU stay with difficulty in weaning from the ventilator but eventually made a full recovery.

Volume 5 Issue 6 - 2016

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## Case presentation

A 76-year old male patient was scheduled for an elective right hemicolectomy for cancer. His past medical history included ischaemic heart disease with a previous myocardial infarction six years ago, hypertension and hypercholesterolemia. He had a good exercise tolerance and was able to climb two flights of stairs. His medication history included atenolol, ramipril, simvastatin and he had no allergies. His social history concluded that he was fully independent, drank no alcohol and was a non-smoker. At pre-operative assessment his cardiac risk was assessed and due to a good functional capacity with no high risk active cardiac conditions he was not deemed high risk. But due to his history of ischaemic heart disease and the type of surgery which involved a laparotomy he was considered intermediate risk. Further investigations including full blood count, electrolytes and coagulation profiles were all normal. A chest-xray showed clear lung fields with no signs of cardiac failure. An electrocardiogram showed normal sinus rhythm with a ventricular rate of 65bpm and no signs of ischaemia. An echocardiogram showed good ventricular function with no valvular abnormalities. Pre-operatively large bore iv access was secured, thoracic epidural sited and anaesthesia induced with invasive monitoring. The operation was uneventful and the patient was successfully extubated, comfortable and transferred to recovery. In recovery he was hypotensive with a systolic blood pressure of 80mmHg so a fluid bolus was administered and the patient was transferred to ICU. On arrival to ICU an arterial blood gas was performed showing hypokalaemia with a potassium of 3mmol/L so potassium supplementation started. Suddenly a pathological rhythm was identified on the monitor and cardiac arrest confirmed and immediate resuscitation commenced according to the ALS guidelines. After CPR commenced the rhythm was identified as ventricular fibrillation (VF) and treated with cardioversion and circulation restored. Post resuscitation the patient was kept intubated and ventilated and the cause of the cardiac arrest was later confirmed as a myocardial infarction and treated by the cardiologists.

## Outcome and follow up

He subsequently spent six weeks in ICU and was difficult to wean from the ventilator needing a tracheostomy. He also had severe ventricular impairment with heart block needing a temporary pacemaker. Eventually his condition improved and he was later successfully discharged from ICU followed by an additional three

weeks in rehabilitation and subsequently made a full recovery with no neurological impairment.

## Discussion

Every year millions of people worldwide have surgery requiring an inpatient stay and in developed countries, the rate of disability or death from such procedures is between 0.4 and 0.8% but within this lies a subgroup of high risk patients which account for the majority of perioperative deaths.<sup>1</sup> It is recommended that all patients presenting for surgery should have adequate pre-operative evaluation as recommended by European guidelines with particular focus on ischaemic heart disease as it is the leading cause of death in the world.<sup>2</sup> Coronary heart disease is responsible for 60% of sudden cardiac arrests with the overall incidence of adult in-hospital cardiac arrest as 1.6 per 1000 hospital admissions. The presenting rhythm was shockable in 16.9% and non-shockable in 72.3% and rates of survival to hospital discharge associated with these rhythms were 49.0% and 10.5% respectively, but varied substantially across hospitals.<sup>3,4</sup> Cardiac complications after non-cardiac surgery depend on patient-related risk factors and surgical factors.<sup>5</sup> During pre-operative assessment the aim should be to identify cardiac conditions, serious comorbidities and a determination of functional capacity. In addition, medication history, allergies, exercise habits and smoking history should be inquired. Determining functional capacity is paramount to pre-operative cardiac risk assessment and this is measured in metabolic equivalents (METs). One MET equals the metabolic demand at rest, climbing two flights of stairs demands 4 METs and strenuous activity requires >10 METs. A functional capacity of <4 METs indicates poor functional capacity and is associated with an increased incidence of post-operative cardiac events. The presence of  $\geq 1$  of the following active cardiac conditions are considered high risk; unstable coronary syndromes, decompensated heart failure, significant arrhythmias and severe valvular disease. Risk stratification according to the type of non-cardiac surgery is classified according to high, intermediate or low risk. Patients at intermediate or high risk can undergo additional testing with investigations including; a resting 12-lead ECG, left ventricular function evaluation using echocardiography or nuclear testing, stress testing, coronary angiography and brain natriuretic peptide (BNP). BNP appears to be predictive for major adverse cardiac events following elective vascular surgery.<sup>6</sup> To calculate operative risk a surgical calculator has been developed by the American College of Surgeons National

Surgical Quality Improvement Program (ACS NSQIP) which utilises 21 preoperative factors and offers surgeons the ability to quickly and easily estimate important post-operative risks and present the information in a patient-friendly format.<sup>7</sup> Perioperative risk reduction strategies can include; preoperative revascularisation with coronary artery bypass grafting (CABG) or percutaneous coronary intervention (PCI), beta-blockers, statins, nitrates, ace inhibitors, calcium channel blockers, diuretics and alpha-2 agonists.<sup>8</sup>

In our case presentation there can be many reasons for the initial cardiac arrest; post-operative hypotension, electrolyte abnormalities or surgical stress response. But the correct use of post-operative ICU bed utilisation and continuous monitoring allowed prompt identification, diagnosis and successful treatment of a potentially fatal scenario.

### Learning points

- a. Patients with cardiac disease undergoing non-cardiac surgery need careful assessment.
- b. Electrolyte abnormalities need to be treated quickly.
- c. The benefit of a monitored bed allows rapid detection of abnormalities.
- d. The benefit of immediate advanced life support with good quality chest compressions must be highlighted.

### Acknowledgments

None.

### Conflicts of interest

The authors declare there is no conflict of interests.

### Funding

None.

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