

Successful defibrillation in the prone position

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Early defibrillation provides the greatest chance of survival after ventricular fibrillation. Conventional cardiopulmonary resuscitation and defibrillation requires the patient to be in the supine position. Electrical treatment of arrhythmias such as atrial fibrillation by means of a defibrillator back paddle in patients receiving prone ventilation in intensive care has been described. We report a case in which electrical defibrillation was successfully performed in the prone position in a patient undergoing complex spinal surgery. We suggest that, if defibrillation were required in ventilated patients positioned prone, defibrillation should be attempted in the prone position, as turning the patient supine would consume valuable minutes and reduce the chances of successful defibrillation.

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We describe a case of successful treatment of ventricular fibrillation by electrical defibrillation in a patient undergoing complex spinal surgery in the prone position.

Case report

A 39-yr-old female presented for palliative debulking of metastatic tumour of the third thoracic vertebral body and internal fixation of the thoracic spine to prevent spinal cord compression. The primary tumour was a squamous cell carcinoma of the lung, which had been treated with chemotherapy and radiotherapy. The patient was otherwise in good health and on the following medication: dexamethasone, low molecular weight heparin, lansoprazole, naproxen, fentanyl patches and hydromorphone. Preoperative haematological and biochemical investigations revealed no abnormalities (the serum potassium concentration measured 36 h preoperatively was 4.8 mmol litre⁻¹).

Prior to induction of anaesthesia, a few isolated unifocal ventricular ectopic beats were noted on the ECG monitor; the blood pressure was not affected. General anaesthesia was induced with midazolam, fentanyl and propofol. Tracheal intubation was facilitated by vecuronium and anaesthesia was maintained with oxygen/nitrous oxide and infusions of remifentanyl and propofol. After induction of

anaesthesia, runs of unifocal ventricular ectopic beats were noted, lasting for 2–3 s and occurring every 2–3 min; these had no effect on the arterial blood pressure trace.

In the operating theatre, the patient was turned prone onto a Montreal mattress and the head fixed in position on a Mayfield head-holder (Ohio Medical Instruments, Cincinnati, USA) with pins inserted into the skull. After commencement of surgery the runs of ventricular tachycardia continued to occur, but were well tolerated. The serum potassium concentration was measured and found to be 3.6 mmol litre⁻¹. An infusion of potassium chloride 20 mmol was commenced *via* the femoral venous line. Twenty minutes after the potassium infusion was started, the arterial blood pressure trace was suddenly lost and the ECG monitor showed ventricular fibrillation. This persisted despite the administration of a sharp thump to the back of the chest, and compressions were commenced on the back of the chest. At this stage there was a large open surgical wound in the upper back although no metalwork had as yet been inserted. The infusion of potassium chloride was stopped (10 mmol had been given), anaesthetic agents were discontinued and the lungs ventilated with 100% oxygen. A defibrillator (Lifepack 6, PhysioControl, Redmond, USA) was brought to the scene, and two standard electrode gel pads (3M) placed on the back of the chest on either side of the surgical wound, one low down on the left side just posterior to the

mid-axillary line, and the other just inferior to the right scapula. A single shock of 200 J was administered and was followed by the return of sinus rhythm. As the patient remained haemodynamically stable after this, it was decided to continue with the surgery. The serum potassium concentration was measured and found to be 7.2 mmol litre⁻¹. A second blood sample was taken 7 min later to ensure that the elevated serum potassium measurement was not due to an artefact from haemolysis or inappropriate blood sampling and was found to be 6.1 mmol litre⁻¹. The ampoules of potassium chloride were checked to ensure that no errors in the dosage of potassium chloride administered had occurred. Five millimoles of calcium gluconate and an infusion of amiodarone were started. After 30 min the serum potassium concentration was 4.1 mmol litre⁻¹. The operation was completed uneventfully, with no further arrhythmias occurring. At the conclusion of surgery, the trachea was extubated and the patient was observed for the next 24 h in the intensive care unit (ICU). She remained stable although occasional ventricular ectopic beats continued to occur.

A 12-lead electrocardiogram revealed no abnormalities. However, on direct questioning the patient admitted to a 10-year history of palpitations, without accompanying symptoms, which had never been investigated or treated. She was reviewed by a cardiologist who recommended that amiodarone should be continued, and she was discharged from hospital a week later after an uneventful postoperative course.

Discussion

Electrical treatment is the only effective treatment for ventricular fibrillation, and early defibrillation provides the greatest chance of survival.¹

The European Resuscitation Council recommends that defibrillator paddle position is important as it influences flow of current through the myocardium.² The paddle positions recommended are: one electrode positioned below the outer half of the right clavicle and the other electrode positioned in the 5th intercostal space in the anterior axillary line. If repeated defibrillation is unsuccessful in this position, an alternative approach is to position one electrode to the left of the lower sternal border and the other posteriorly, just inferior to the scapula.³ The latter position is also recommended in patients with implanted defibrillators or pacemakers. The polarity of the paddles does not matter as they are interchangeable.

In the case described, the patient was prone with pins screwed into the skull, covered with surgical drapes, and had an open surgical wound on the back of the chest. In addition, numerous intravascular lines and breathing circuitry connected her to the anaesthetic machine and monitors. Turning her into the supine position to carry out defibrillation and cardiopulmonary resuscitation would have taken several minutes. Movement of the now unstable column during this manoeuvre would almost certainly have resulted in spinal cord damage.

In neurosurgery, the prone position is commonly used for operations on the spine and occasionally for operations on the posterior fossa. In ICU, prone positioning is increasingly used to improve oxygenation in patients with acute respiratory distress syndrome. If such patients were to require defibrillation, the process of turning them supine to perform defibrillation would consume valuable minutes, which reduces the chances of successful defibrillation.

Cattell *et al.* describe the use of electrical countershock in the prone position for the treatment of arrhythmias such as atrial fibrillation in ICU patients receiving prone ventilation.⁴ They suggest that defibrillation should be carried out in the prone position as the first choice, if it is required in patients being nursed in the prone position. The case described demonstrates that defibrillation can be successful when performed in the prone position, and we believe it should be attempted if a defibrillator is at hand, and if turning the patient cannot be performed quickly.

The decision to continue with anaesthesia and surgery after the occurrence of runs of ventricular ectopics in the anaesthetic room was made on the basis that they did not have any haemodynamic ill effects, and that the surgery was palliative. However, with hindsight, it is probable that the early use of amiodarone could potentially have prevented the whole scenario.

References

- 1 Bossaert L, Callanan V, Cummins RO. Early defibrillation. An advisory statement by the Advanced Life Support Working Committee of the International Liaison Committee on Resuscitation. *Resuscitation* 1997; **34**: 113–14
- 2 Bossaert LL. Fibrillation and defibrillation of the heart. *Br J Anaesth* 1997; **79**: 203–13
- 3 *Advanced Life Support Course Provider Manual*, 3rd Edn. Resuscitation Council UK, 1998; 39–40
- 4 Cattell E, Saravanan P, Chay S, Lawler PG. The defibrillator back paddle: use for treatment of arrhythmias during prone position ventilation. *Anaesthesia* 2000; **55**: 491