CASE REPORT

Failed resuscitation in acute severe asthma: a medical indication for emergency thoracotomy?

R. H. DIAMENT AND J. P. SLOAN

Accident and Emergency Department, The General Infirmary at Leeds, England

SUMMARY

A case is reported in which a 32-year-old man who had a cardiac arrest secondary to acute severe asthma was successfully resuscitated following an emergency thoracotomy when conventional external measures failed.

INTRODUCTION

Emergency thoracotomy is accepted as an option in the resuscitation of those who have been subject to life-threatening traumatic injury resulting in cardiac arrest (Champion *et al.*, 1986). Following the introduction and proven effectiveness of external cardiac massage (Kouwenhoven *et al.*, 1960), it is no longer advocated in the management of 'medical', non-traumatic cardiac arrest. This case report suggests that there may still be a place for emergency thoracotomy in the management of cardiac arrest in acute severe asthma.

CASE REPORT

A 32-year-old male, known to be asthmatic, was brought to the Accident and Emergency Department, The General Infirmary at Leeds, England, by ambulance after collapsing at home. The ambulance drivers found him unconscious, apnoeic and pulseless with dilated pupils. No history other than a past history of asthma was available. Cardiopulmonary resuscitation was instituted immediately and he was transported to the department.

Correspondence: Mr R. H. Diamant, Accident and Emergency Department, The General Infirmary at Leeds, Great George Street, Leeds LS1 3EX, Yorkshire, England.

He was unconscious on arrival in A&E. The patient was a well-built young man with a barrel-shaped chest, examination revealed central cyanosis, apnoea, dilated and unreactive pupils with no palpable pulse. An ECG monitor showed asystole. Resuscitation was continued with endotracheal intubation and external cardiac massage. Ventilation required very high inflation pressures and little air movement was heard within the chest despite the administration of Adrenaline 1 mg and Aminophylline 250 mg intravenously, and Adrenaline 1 mg via the endotracheal tube. This was followed by an intravenous infusion of 100 ml of 8.4% Sodium Bicarbonate solution. External cardiac massage failed to produce a palpable pulse in the carotid area. The chest was, therefore, opened through a Left anterolateral thoracotomy. The lungs appeared hyperinflated, bulky and tense and did not collapse when the pleural cavity was opened. The pericardium was opened and asystole confirmed, following eight to ten compressions of the heart some intrinsic activity commenced, ventilation also became much easier. The initial bradycardia without ejection was replaced by ventricular fibrillation. Left ventricular blood gas analysis at this time showed that there was still a profound acidosis ($\text{pH} = 6.82$, Base deficit = 19, $\text{pO}_2 = 35\text{KPa}$, $\text{pCO}_2 = 5.2\text{KPa}$) despite the bicarbonate already administered. With the administration of a further 100 ml of 8.4% sodium bicarbonate and internal cardioversion (25 joules), a sinus tachycardia was established which produced a palpable pulse and a blood pressure of 110/70. Blood gas analysis showed an appropriate improvement. Both pupils contracted and became briskly reactive to light. Mannito 1 (20 g) and Dexamethasone (10 mg) were given intravenously in an attempt to reduce post-arrest cerebral oedema.

Following formal closure of the thoracotomy in the operating theatre, the patient was transferred to the Intensive Care Unit where he was ventilated but required no other pharmacological support.

It subsequently transpired that the patient had already seen two doctors on the day of his collapse. In the morning, he had attended a Respiratory Clinic complaining of tiredness, weakness and increasing breathlessness and was 'reassured'. He consulted his general practitioner at lunchtime who felt anxiety greatly contributed to his condition and prescribed Nitrazepam (5 mg) one of which he took before collapsing at about 15.00 h. The exact time from collapse to the re-establishment of cardio-respiratory function is unknown but must be of the order of 25 min.

Following resuscitation, he remained haemodynamically stable but exhibited signs of a severe chest infection. Sputum culture grew *Haemophilus influenzae* which was probably responsible for his initial illness. He never regained consciousness and breathed spontaneously for only a short time on the day after resuscitation. He died when ventilatory support was withdrawn after 8 days.

DISCUSSION

The standardized death rate from asthma in the 5–34 year age group has remained constant in the last century despite improved pharmacological treatment (Tatham & Gellert, 1985). The conventional management of acute severe asthma comprises the administration of oxygen, bronchodilators by inhalation and injection, corticosteroids

and antibiotics. Recently, calcium antagonists have also been used. Paralysis and positive pressure ventilation may be necessary in severe cases.

Champion reviewed his experience of emergency thoracotomy in the management of trauma. He concluded that emergency thoracotomy could be the first step in the successful resuscitation of a specific patient population in extremis from acute injury especially those with non-ballistic penetrating chest injuries (Champion *et al.*, 1986).

Flynn came to the same conclusion, claiming a 66% survival rate following thoracotomy for penetrating chest injuries (Flynn *et al.*, 1982). Experiments in dogs have shown internal cardiac massage to be mechanically superior to external cardiac massage (Sanders *et al.*, 1984).

No similar data is available on the value of thoracotomy in the management of life-threatening, non-traumatic illness. The failure of external cardiac massage to produce a palpable cardiac output in this case is interesting. The authors suggest that the anatomical variance of a young asthmatic chest accompanied by the relative incompressibility of hyperinflated lungs due to severe bronchospasm precluded adequate cardiac compression and ejection.

Conventionally, a medical emergency is not considered to be an indication for emergency thoracotomy. The management of asthmatic cardiac arrest is not specifically well documented. The authors suggest that, in the young asthmatic who has a cardiac arrest, if external cardiac massage does not produce a palpable cardiac output, then consideration should be given to emergency thoracotomy.

REFERENCES

- Champion H. R., Danne P. D. & Finelli F. (1986) Emergency thoracotomy. *Archives of Emergency Medicine* 3, 95–9.
- Flynn T. C., Ward R. E. & Miller P. W. (1982) Emergency department thoracotomy. *Annals of Emergency Medicine* 11, 413–6.
- Kouwenhoven W. B., Jude J. R. & Knickerbocker G. G. (1960) Closed-chest cardiac massage. *Journal American Medical Society* 173, 1064–7.
- Sanders A. B., Kern K. B., Ewy G. A., Atlas M. & Bailey L. (1984) Improved resuscitation from cardiac arrest with open-chest massage. *Annals of Emergency Medicine* 13, 672–5.
- Tatham M. E. & Gellert A. R. (1985) The management of acute severe asthma. *Postgraduate Medical Journal* 61, 599–606.