CASE REPORT

Pre-hospital cardiopulmonary resuscitation and pneumoperitoneum

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SUMMARY

A case is reported of pneumoperitoneum after prolonged ventilation of a smoke inhalation victim at the scene by a fireman using intermittent positive pressure ventilation. The clinical presentation, treatment and aetiology, when associated with cardiopulmonary resuscitation, are discussed. The need for adequate training in the use of resuscitation equipment is emphasized, especially for non-medical staff.

Key words: cardiopulmonary resuscitation, pneumoperitoneum

INTRODUCTION

Advanced life support is increasingly being delivered in the pre-hospital setting by ambulance staff with extended training.1 In addition, some advanced life support skills are being taught to non-medical staff — for example, in the fire service and voluntary aid societies. It is essential that adequate training in the appropriate use of equipment and on potential complications is given.

CASE REPORT

A 60-year-old man was brought to the accident and emergency (A&E) department by ambulance. The unconscious victim had been rescued from a house fire after smoke inhalation. A fireman had administered intermittent positive pressure ventilation by facemask using a Pneupak ventilator. After an unsuccessful intubation attempt by a paramedic the patient was brought to hospital. On arrival at the A&E department there was cardiopulmonary arrest and gross abdominal distension was noted. The patient was intubated and cardiopulmonary resuscitation (CPR) started.

Ventilation was extremely difficult. Further examination showed a grossly distended tympanitic, rigid abdomen, which was rock-hard on palpation (Fig. 1). Gastric decompression was not seen after the placement of an orogastic tube.

His carboxyhaemoglobin level was 73.1%. An echocardiogram revealed asystole and the patient was pronounced dead without further resuscitation. Chest and abdominal radiographs obtained after death showed massive pneumoperitoneum and gaseous distension of the small bowel (Figs 2 and 3). A necropsy was not performed.

DISCUSSION

Pneumoperitoneum in association with CPR is uncommon.2 A number of mechanisms have been proposed which involve high inflation pressures causing gastrointestinal and thoracic trauma, resulting in gastric rupture, pneumomediastinum and pneumothorax. Often, however, no anatomical abnormality is found at laparotomy or at necropsy.3

High gastrointestinal pressures result from ventilation against resistance either from a closed glottis in association with incorrect head positioning leading to a subluxed tongue, laryngospasm, laryngo-oedema or foreign bodies. Airway obstruction also causes the redistribution of air down the oesophagus and secondary barotrauma. Excessively high ventilatory pressures alone, a combination of extended compression and ventilation or incorrect hand positioning, especially over the sternum or upper abdomen, have been postulated as further contributing factors. Gastric rupture may then occur, most typically at the lesser curve, leading to pneumoperitoneum. Pneumomediastinum, from pneumothorax, a pleural tear or oesophageal rupture, may be a pathway for the leakage of air through the diaphragm (possibly the Foramen of Winslow)2 and subsequent pneumoperitoneum.

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Fig. 1. Rigid, distended abdomen on arrival in the A&E department.

Fig. 2. Chest radiograph showing considerable amounts of air under both hemi-diaphragms.

Fig. 3. Abdominal radiography showing intraperitoneal gas. Note the well-defined small bowel wall resulting from both intra- and extra-luminal air.

In this instance CPR was started using a Pneupak ventilator. The equipment is capable of high ventilatory pressures and any of these possibilities could account for the pneumoperitoneum. However, no oedema — a possible cause of airway obstruction after thermal injury — was noted at intubation in the A&E department. The use of Pneupak ventilator by inexperienced staff in difficult circumstances probably resulted in significant barotrauma and the subsequent pneumoperitoneum. Although published work supports gastric rupture as the most likely cause of pneumoperitoneum, the cause of death in this instance was probably carbon monoxide poisoning. Paracentesis was not used as the diagnosis of pneumoperitoneum was made after death.

Ineffective ventilation occurs in extreme cases of pneumoperitoneum and this diagnosis should be considered in the presence of an expanding, increasingly rigid abdomen. Decompression by emergency laparotomy in cardiac arrest has not been reported. Where the prognosis is optimistic, an assessment of basic life support procedures...
should be made, followed by attempts to decompress the abdomen using an orogastric tube or abdominal paracentesis.\

In Scotland, both the fire and ambulance service currently carry Pneupak ventilators. Firemen are authorized to use their equipment, but only paramedics and medical staff are allowed to use the equipment available in ambulances. Training and retraining is essential as medical and non-medical staff use more sophisticated equipment for resuscitation, otherwise the equipment should not be used except in experienced hands.

REFERENCES

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