CASE REPORT

Successful resuscitation from sea water drowning

P. F. MAHONEY, L. WILLIAMS & J. I. ANDREWS
District General Hospital, Kayll Road, Sunderland, SR4 7TP

SUMMARY

A case of a 24-year-old male who survived a near drowning despite suboptimal pre-hospital management is reported. The case illustrates the value of continuing resuscitative efforts even in the apparently dead drowning victim.

CASE HISTORY

In July 1990 a 24-year-old, fit lifeguard became submerged and apparently drowned during a rescue attempt of a distressed swimmer in the North Sea.

After a delay the entirely submerged lifeguard was located in a lifeless state headdown in the water with his clothing caught by an underwater object. He was brought to shore in a small crowded dinghy. No attempt was made to resuscitate him by his rescuers either in the water or in the boat until he was landed on the beach some 20 min after he had disappeared from view.

He was unresponsive, apnoeic and pulseless. His colleagues started Holger-Neilson resuscitation. An off-duty, non-paramedic ambulance woman organized conventional basic life support with other bystanders. Expired air resuscitation (EAR) and external cardiac massage (ECM) was continued and at 15 min a weak carotid pulse and gasping respiratory effort was noted. The patient vomited a large quantity of water but remained lifeless with fixed, dilated pupils. Further delay ensued as the attending ambulance became stuck in the sand and was carried to the casualty by the excited crowd.

During transfer to hospital life support was continued with bag and mask ventilation, supplementary oxygen and ECM. His physiological parameters on arrival in the A&E department’s resuscitation room are shown in Table 1.

Orotracheal intubation to secure his airway and give intermittent positive press-
Resuscitation from sea water drowning

Table 1. Casualty’s physiological parameters on arrival in the A&E department

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No spontaneous respiration.</td>
<td></td>
</tr>
<tr>
<td>Pulse rate*</td>
<td>68 beats min⁻¹</td>
</tr>
<tr>
<td>Blood pressure*</td>
<td>135/65 mmHg</td>
</tr>
<tr>
<td>Rectal temperature</td>
<td>31.9°C</td>
</tr>
<tr>
<td>Arterial blood gases†</td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>6.45</td>
</tr>
<tr>
<td>PaCO₂</td>
<td>11.6 kPa</td>
</tr>
<tr>
<td>PaO₂</td>
<td>13.4 kPa</td>
</tr>
<tr>
<td>Serum potassium</td>
<td>4.3 mmols l⁻¹</td>
</tr>
<tr>
<td>Glasgow Coma Score</td>
<td>3</td>
</tr>
</tbody>
</table>

(Pupils fixed and dilated)

* Prior to asystolic arrest.
† Corrected for temperature. Blood gases taken following CPR and bag and mask assisted ventilation in the ambulance, FiO₂ not stated.

Irrigation ventilation (IPPV) resulted in asystolic cardiac arrest. Manual bag ventilation with supplementary oxygen and ECM was continued, 1 mg of intravenous adrenaline, 2 mg of intravenous atropine and 200 μg of intravenous isoprenaline produced a nodal bradycardia of 20 beats min⁻¹. A further 2 mg of intravenous atropine and 200 μg of intravenous isoprenaline resulted in a sinus tachycardia of 90 beats min⁻¹ and a brachial blood pressure of 160/80 mmHg.

Other treatment in the resuscitation room included single intravenous doses of cefuroxime (for prophylaxis of chest infection due to aspiration), frusemide (to encourage diuresis) and dexamethasone. The patient remained cold, oliguric and unresponsive and was admitted to the Intensive Care Unit (ICU) for further resuscitation.

The patient’s lungs were ventilated with warmed, humidified gases and he was given warmed intravenous fluids. Further heat loss was minimized by covering him with a plasticized, aluminium thermal blanket and he became normothermic within 4 h.

The initial respiratory acidosis (Table 1) gave way to a metabolic acidosis related to poor perfusion. Small intravenous aliquots of sodium bicarbonate (50 ml of 4.2%) were given under blood gas control at 1 and 2 h post ICU admission producing blood pH values of 7.05 and 7.32 respectively.

To encourage diuresis 75 ml of 20% mannitol was given 2 h post ICU admission. Thirty-six hours following admission his serum creatinine had returned to normal levels.

Twenty-one hours after submerging he was weaned from the ventilator and extubated. His recovery was complicated only by a chest infection treated with cefuroxime and physiotherapy. He had clear recollection of the events leading to his near drowning. He was discharged home with no neurological deficit.
DISCUSSION

Resuscitation of a similarly submerged, trapped and apparently drowned casualty has previously been described in this journal (Redmond & Mallikarjun 1984).

The difficulty in locating our submerged patient coupled with his rescue in a crowded boat resulted in considerable delays in starting effective basic CPR. When landed on the beach obsolete and ineffective methods of resuscitation were tried. However this, followed by conventional CPR and EAR, maintained the cold casualty's circulation sufficiently to preserve higher cerebral function.

The lifeguards involved in this incident were ignorant of modern methods of resuscitation. Their supervision and training in North East England remains under local authority control with little or no formal training of instructors in Resuscitation Council (UK) Guidelines (G. H. Belshaw, Northumbria Ambulance Service NHS Trust, personal communication). Comprehensive reviews of the management of near-drowning victims appear in the medical literature (Pearn, 1985; Harries, 1990; Stuart Taylor, 1990).

Some authors give particular emphasis to 'field' resuscitation (Samuelson et al., 1982; Stewart, 1989; Bowman, 1990) yet these messages are not reaching 'front-line' rescuers. Should we tolerate this situation in the 1990s?

The use of steroids, diuretics and antibiotics in these patients remains controversial (Simcock & Morgan, 1990). While corticosteroids have been used to reduce swelling around brain tumours their use for reduction of intracranial pressure after ischaemic insult is not recommended by most clinicians (Stewart, 1989).

Drowning usually affects young people without previous cardio-respiratory disease. Even in July, North Sea temperatures rarely exceed 4°. It is clear that these patients can be resuscitated successfully even after prolonged immersion.

REFERENCES