CASE REPORT

Accidental hypothermia cardiac arrest treated successfully with invasive body cavity lavage

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Learning points for clinicians

Accidental hypothermia is a rare but significant presentation in the colder climates, which has significant morbidity and mortality. It is important that physicians understand the multitude of non-invasive and invasive rewarming techniques and when they should be employed. The use of invasive rewarming method should be based on the availability of local expertise, resources and characteristics of the patient. Without this knowledge, recoverable hypothermic-related injury may be unrecognized.

Case presentation

We describe a case of successful resuscitation in a young female from severe hypothermia using body-cavity lavage and had complete physical and neurologic recovery after cardiac resuscitation lasting over 2 h. A 33-year-old female with history of polysubstance abuse was found unresponsive outdoors with an estimated ambient temperature of 25°C at 0706. Upon emergency medical services arrival, her vital signs were a blood pressure of 143/100 mmHg, heart rate of 78 beats/min, respiratory rate of 12 breaths/min, an oxygen saturation of 98% on a 100% non-rebreathing mask, normal blood glucose and an unrecordable low body temperature. Patient remained minimally responsive to 0.4 mg intravenous naloxone.

Upon arrival in ED at 0741, an esophageal probe was inserted and recorded her core body temperature of 77.1°F. On primary survey, no spontaneous movements were noted. Secondary survey was unremarkable. Standard CPR was continued, along with external rewarming using a commercial forced air rewarming blanket as well as minimally invasive active rewarming using warmed IV fluid and bladder lavage. Serum electrolytes were unremarkable. After 30 min of resuscitation, her core body temperature had only minimally increased to 77.9°F. In addition, she continued to be in refractory VF, despite ongoing attempts at DCCV. More aggressive invasive methods of internal rewarming were undertaken including closed thoracic lavage and peritoneal lavage at 0830. After initiated her on body cavity lavage, her core body temperature improved to 81°F within an hour. Her rhythm spontaneously converted to sinus bradycardia with palpable distal pulses. Normal cardiac function was confirmed via trans-thoracic echocardiogram (TTE) and vital signs revealed a blood pressure of 81°F within an hour. Her rhythm spontaneously converted to sinus bradycardia with palpable distal pulses. Normal cardiac function was confirmed via trans-thoracic echocardiogram (TTE) and vital signs revealed a blood pressure of 131/99 mmHg and heart rate of 61 beats/min. At 0945, her core temperature was measured at 82.0°F and she began moving her extremities spontaneously. Body cavity lavage was discontinued 1 h later when her body temperature gradually increased prior to reaching 95.0°F.

She was transferred to the intensive care unit (ICU) requiring only low dose norepinephrine for vasoactive support and continued on external rewarming and warmed IV fluids. By Day 2 of ICU admission, her core body temperature had improved to 81°F within an hour. Her rhythm spontaneously converted to sinus bradycardia with palpable distal pulses. Normal cardiac function was confirmed via trans-thoracic echocardiogram (TTE) and vital signs revealed a blood pressure of 131/99 mmHg and heart rate of 61 beats/min. At 0945, her core temperature was measured at 82.0°F and she began moving her extremities spontaneously. Body cavity lavage was discontinued 1 h later when her body temperature gradually increased prior to reaching 95.0°F.

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Discussion

Hypothermia can be classified into four clinical stages on the basis of temperature, clinical symptoms and vital signs using the Swiss staging system (Table 1). Each of the stages requires different distinct approaches to management. Hence, the first step of managing patients with accidental hypothermia is to stage them appropriately. Patients with severe hypothermia have significant risk of arrhythmia and cardiac arrest, particularly once the core temperature drops to below 98.6°F.2,3 Hence, patient with hypothermic (HT) stage II and above should be moved minimally, to reduce irritation to the cardiac membrane, which may precipitate arrhythmia.3,4

Treatment of hypothermia is primarily aimed at maintaining cerebral circulation while initiating prompt rewarming. In patients with stable circulation, active external (warm environment, chemical, electrical or forced-air heating packs or blankets) and minimally invasive rewarming (warm parental fluids at 100–108°F) can be used to raise the core temperature. In those with cardiac instability, more aggressive invasive internal rewarming methods (body-cavity lavage, endovascular devices and extracorporeal heating systems) should be utilized.5,6 The use of invasive rewarming method should be based on the availability of local expertise, resources and characteristics of the patient.1

The literature identifies five main characteristics associated with a favorable outcome: youth; deep hypothermia (core temperature < 82°F); absence of asphyxia or anoxic brain injury; established infrastructure/experience of the rescue team; use of an effective rewarming technique.6 In our patient with stage IV hypothermia, each of these characteristics contributed to an excellent clinical outcome.

Conflict of interest: None declared.

References

Table 1. Swiss staging system and management of accidental hypothermia

<table>
<thead>
<tr>
<th>Stage</th>
<th>Core temperature</th>
<th>Clinical symptoms</th>
<th>Treatment</th>
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<tbody>
<tr>
<td>HT I</td>
<td>95–89.6°F</td>
<td>Conscious and shivering</td>
<td>Active rewarming (warm environment, clothing, warm drink and active movement if possible)</td>
</tr>
<tr>
<td>HT II</td>
<td>&lt;89.6–82.4°F</td>
<td>Impaired consciousness and no shivering</td>
<td>Cardiac monitoring, minimal movements to avoid arrhythmias, full-body insulation, active external (warm environment, forced-air heating packs or blankets) and minimally invasive rewarming (warm parental fluids)</td>
</tr>
<tr>
<td>HT III</td>
<td>&lt;82.4–75.2°F</td>
<td>Loss of consciousness, vital signs present and increase risk of cardiac arrest</td>
<td>HT II management plus airway management as needed; ECMO or CPB in case of cardiac instability that is refractory to medical treatment, if expertise and resources are available</td>
</tr>
<tr>
<td>HT IV</td>
<td>&lt;75.2°F</td>
<td>Absence of vital signs and possible VF</td>
<td>HT II and III management plus ACLS protocol for full cardiac resuscitation, with further guidance based on clinical response; active external and internal rewarming (body-cavity lavage) plus CPR or rewarming with ECMO or CPB if expertise and resources are available</td>
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HT, hypothermic; VF, ventricular fibrillation; ECMO, extracorporeal membrane oxygenation; CPB, cardiopulmonary bypass; ACLS, advanced cardiovascular life support; CPR, cardiopulmonary resuscitation.