

CARDIAC ARREST IN SPECIAL CIRCUMSTANCES 1

Objectives

To understand how resuscitation techniques should be modified in the special circumstances of:

- Hypothermia
- Immersion and submersion
- Poisoning

- Pregnancy
- Electrocutation
- Anaphylaxis
- Acute severe asthma
- Trauma

Special Circumstances

- Common cause of cardiopulmonary arrest in younger age group
- Cardiac arrest often preventable
- Suitable patients may require a prolonged period of resuscitation

Hypothermia

Definition: Core temp $< 35\text{ }^{\circ}\text{C}$
(low reading thermometer)

- Mild $32 - 35\text{ }^{\circ}\text{C}$
- Moderate $30 - 32\text{ }^{\circ}\text{C}$
- Severe $< 30\text{ }^{\circ}\text{C}$

Hypothermia

Special problems of:

- Immersion
- Elderly
- Very young
- Injury/illness
- Drugs/alcohol

Clinical Features of Hypothermia

- Pulse: slow, irregular, small volume
- BP: ↓ or unrecordable
- Pupils: dilated
- CNS: depressed conscious level,
coma

Primary versus secondary hypothermia?

Caution

- The clinical features of hypothermia can mimic death
- Cerebral protective effect
- ‘Not Dead until Warm and Dead’ , except:
 - obvious lethal injuries
 - body so frozen - resuscitation impossible
 - in-hospital - clinical judgement

Airway and breathing

- Warm (40-46 °C), humidified, high concentration oxygen
- Tracheal intubation as indicated on ALS algorithm with care
- Ventilation to make chest rise visibly

Circulation

- Beware extreme bradycardia
- Consider use of Doppler probe
- Oesophageal temperature
- ↑ Chest wall stiffness
- Central or large proximal veins

Arrhythmias associated with hypothermia

Sinus bradycardia
Atrial fibrillation
Ventricular fibrillation
Asystole



Temp

Circulation

- Defibrillation may not be successful until core temp $>30^{\circ}\text{C}$
- Other arrhythmias spontaneously improve with warming alone
- Reduced efficacy of drugs $< 30^{\circ}\text{C}$
- Bradycardia may be physiological in severe hypothermia

Rewarming

- Remove from cold environment
- Movement may precipitate arrhythmias
- Prevent further heat loss
- Rapid transfer to hospital
- Remove cold/wet clothing

Active Rewarming

External

- Forced air warming blankets

Internal (core)

- Cardiopulmonary bypass
- Ventilation with warm humidified O_2
- Warm i.v. fluids (40 °C)
- Gastric, peritoneal, pleural, bladder lavage
- Continuous veno-venous haemofiltration

Monitoring and investigations

- Continuous haemodynamic monitoring
- Repeated arterial blood gas analysis
 - do not use temperature correction
- Electrolytes
 - hyperkalaemia during rewarming
- Thyroid function (elderly)

Immersion and Submersion

- Immersion - head above water
 - hypothermia
 - cardiovascular instability
- Submersion - head below water
 - asphyxiation
 - hypoxia - secondary cardiac arrest
- Drowning - death within 24 hours of submersion event

Decision to resuscitate

- Full recovery possible even after prolonged immersion
- High risk of hypothermia if water temperature $< 25^{\circ}\text{C}$
- Submersion related to epilepsy or alcohol?

Rescue from water

- Minimise risks to rescuers
- Consider spinal injury
- Keep patient horizontal
- Do not attempt resuscitation in water unless trained

Airway and breathing

- Caution: possible spinal injury
- Give 100% oxygen
- Do not attempt to ‘drain lungs’
- Vomiting is common
- Early intubation if unconscious
- High risk of ARDS

Circulation

- Beware extreme bradycardia
- Hypovolaemia from squeeze effect
- Intravenous fluids
- Nasogastric tube
- Salt/fresh water unimportant

Investigations

- Arterial blood gas analysis
- Electrolytes
- Glucose
- ECG
- CXR

Further management

If not had cardiac arrest consider discharge after 6 hours observation in hospital ONLY if:

- No clinical symptoms or abnormal clinical signs
- Normal PaO₂ breathing room air
- Normal CXR
- No other worrying symptoms

There is a small risk of late pulmonary oedema

Poisoning and drug intoxication

- A leading cause of death < 40 years
- Most commonly self-poisoning with therapeutic or recreational drugs
- Industrial accidents or warfare:
 - chemical contamination
 - radiation

Resuscitation: Airway

- Decreased conscious level common:
 - airway obstruction
 - respiratory arrest
- Avoid mouth-to-mouth ventilation if:
 - cyanide
 - hydrogen sulphide
 - corrosives
 - organophosphates

Breathing

- High concentration of O_2 (except paraquat)
- Intubate unconscious patients
- Arterial blood gas analysis
- Rapid sequence induction with cricoid pressure (*expert help required*)

Circulation

- Drug-induced hypotension is common
- Fluid therapy +/- inotropes
- Correct acid-base status
- Cardioversion for life-threatening arrhythmias

Specific therapeutic measures

- Limiting absorption of ingested poisons
 - < 1 hour - gastric lavage & charcoal
- Enhance elimination
 - haemodialysis
 - haemoperfusion
- Specific antidotes

Poisons Information

- National Poisons Information Service
- TOXBASE[®]
 - Edinburgh NPIS

Specific antidotes

- Paracetamol
 - N-acetylcysteine
- Organophosphates
 - Atropine
- Cyanides
 - Sodium nitrite
 - Sodium thiosulphate
 - Dicobalt edetate
- Digoxin
 - Fab antibodies
- Opioids
 - Naloxone

Further Management

- Prolonged coma - rhabdomyolysis
- Electrolytes (K^+) and glucose
- Arterial blood gases
- Temperature

Any Questions?