

INTRODUCTION

Minor heat-related problems include:

- ankle swelling
- calf cramps
- heat rash (prickly heat).

Major problems are heat exhaustion and heat stroke. These tend to occur in three circumstances:

1. **classic heat stroke** is due to very high external temperatures. It tends to be more common in older patients in very hot climates
2. **exertional heat stroke** is due to excess heat production. This tends to occur in:
 - athletes
 - manual workers
 - firefighters
 - military recruits
3. A variety of drugs may predispose to heat illness as above. In addition, people who take drugs of abuse (e.g. cocaine, ecstasy, amphetamines) and then do a lot of dancing, e.g. at a “rave,” may also get heat illness.

ASSESSMENT

It is important to suspect heat exhaustion/heat stroke from the history, circumstances and abnormalities on physical examination as above. However it may be dangerous to assume that collapse in an athlete is due to heat. Check for other potential causes e.g. diabetes or cardiac problems (*refer to relevant guidelines*).

In heat exhaustion the patient may have flu-like symptoms, such as:

- headache
- nausea
- dizziness
- vomiting
- cramps.

On examination the temperature may or may not be elevated (usually less than 41°C) but they will have a raised heart rate, a lowered blood pressure and will be sweating.

The difference between heat stroke and heat exhaustion is that in heat stroke the patient will have neurological symptoms such as:

- decreased level of consciousness

- ataxia
- convulsions.

In addition the temperature will always be elevated, typically more than 41°C. Sweating may be absent.

Heat stroke is potentially fatal and the patient needs to be cooled as an emergency.

MANAGEMENT¹⁻⁴

Start correcting:

- **AIRWAY**
- **BREATHING**
- **CIRCULATION**
- **DISABILITY** (mini neurological examination)
- administer high concentration oxygen (O₂) (*refer to oxygen guideline*) via a non-re-breathing mask, using the stoma in laryngectomee and other neck breathing patients, to ensure an oxygen saturation (SpO₂) of >95%, except in patients with chronic obstructive pulmonary disease (COPD) (*refer to COPD guideline*)
- apply pulse oximetry
- measure blood glucose.

If major ABC problems:

- correct A and B on site then
- commence transfer to nearest suitable receiving hospital
- provide a hospital alert message / information call
- continue treatment en route to hospital.

Specifically assess:

Circulation:

- if the patient is fully conscious with no central nervous system disturbance (i.e. heat exhaustion), they can be treated with oral fluid replacement.⁵ If possible use a dextrose and saline re-hydration fluid.
- In more severe illness:
 - ECG monitoring
 - obtain IV access

In fit individuals with heat exhaustion, initial fluid replacement should be undertaken before vital signs become abnormal. If the patient has symptoms suggestive of heat exhaustion then give a fluid bolus of 250mls saline. However high volumes should be avoided as they may induce cerebral oedema.

Heat Exhaustion and Heat Stroke

If either central or peripheral pulses are absent then 250mls boluses of saline are required up to one litre total. Early transfer to hospital is required.

- Re-assess vital signs after each bolus.
- **DO NOT** delay at scene for fluid replacement; wherever possible cannulate and give fluid **EN-ROUTE TO HOSPITAL**.

Disability:

- check Glasgow Coma Score⁸

Exposure / environment:

- remove the patient from the hot environment or remove cause if possible
- remove to an air conditioned vehicle if available
- measure the patient's temperature (and if possible the ambient temperature)
- remove outer clothing
- commence cooling with fanning, tepid sponging, water mist or a wet sheet loosely over the patient's body (**NOT** cold water as this may cause vasoconstriction and reduce heat loss).
- Transfer the patient with air conditioning turned on or with windows open.

Key Points – Heat Exhaustion and Heat Stroke

- Heat exhaustion/heat stroke occurs in high external temperatures, as a result of excess heat production and with certain drugs. The higher the level of activity the lower the temperature required to produce heat stroke.
- Do not assume that collapse in an athlete is due to heat – check for other causes.
- In heat exhaustion the patient may suffer flu-like symptoms, such as headache, nausea, dizziness, vomiting, and cramps, but the temperature may not be elevated.
- In heat exhaustion (heat stroke) the patient will have neurological symptoms such as decreased level of consciousness, ataxia, and convulsions and the temperature will be elevated, typically >41°C.
- Remove the patient from the hot environment or remove cause, if possible, remove outer clothing and cool.

REFERENCES

- ¹ Eichner ER. Treatment of suspected heat illness. *International Journal of Sports Medicine* 1998;19(Suppl 2):S150-3.
- ² Yaqub B, Al-Deeb S. Heat stroke: aetiopathogenesis, neurological characteristics, treatment and outcome. *Journal of Neurological Science* 1998;156(2):144-51.
- ³ Waters TA. Heat illness: tips for recognition and treatment. *Cleveland Clinic Journal of Medicine* 2001;68(8):685-7.
- ⁴ Barrow MW, Clark KA. Heat-related illnesses. *American Family Physician* 1998;58(3):149-59.
- ⁵ Maresh CM, Herrera-Soto JA, Armstrong LE. Perceptual responses in the heat after brief intravenous versus oral rehydration. *Medicine and Science in Sports and Exercise* 2001;33(6):1039-45.
- ⁶ Turner J, Nicholl J, Webber L, Cox H, Dixon S, Yates D. A randomised controlled trial of pre-hospital intravenous fluid replacement therapy in serious trauma: The NHS Health Technology Assessment Programme 4(31), 2000.
- ⁷ Revell M, Porter K, Greaves I. Fluid Resuscitation in Prehospital trauma care: a consensus view. *Emergency Medical Journal* 2002;19(494-98).
- ⁸ Teasdale G, Jennett B. Assessment of Coma and Impaired Consciousness: A Practical Scale. *The Lancet* 1974;304(7872):81-84.

METHODOLOGY

Refer to methodology section.