THE NORTHERN HOSPITAL

HEAT EXHAUSTION

"Helping Private Johnson to the Dressing Station", Photographer Damian Parrer, New Guinea 1943, (Australian War Memorial)

One day in late August we stood on a spur of the Owen Stanleys and looked down the deep valley which leads to Kokoda, five thousand feet below. All we could see was a blanket of dark green treetops broken only here and there by the white waters of the turbulent creeks at the bottom. The valley was almost as deep as it was wide and its sides swept up from the creekbed steeply and in some places precipitously. Somewhere under those treetops wound the track which leads from Kokoda up the valley and over the range to Port Moresby. And two miles away somewhere under those treetops in the dark damp forest Australian and Japanese troops were fighting desperately for the possession of this

track. It didn't look much to fight for. It was just a series of footholds in the mountainside…so slippery that you had to sling your rifle and leave your hands free to grab the nearest vine or branch as your feet slid from under you…so steep that in some places you could scale the mountain face only by using both hands and both feet…so muddy that at times you sloshed through a quagmire more than ankle deep and felt the cloying mud suck your feet back at every step. That was the track they were fighting for down there…

Chester Wilmot, ABC War Correspondent, September 1942

Many battles were fought under horrific conditions during the Second World War - Stalingrad, Okinawa, Iwo Jima, but none were fought in such hellish conditions as New Guinea. Desperate and brutal fighting took place between Australian and Japanese troops in steaming impenetrable jungles, amidst the mud, heat, humidity, rain, starvation and every manner of tropical disease. No quarter was given nor expected by either side. For the first time in the war the seemingly invincible advance of the imperial Japanese forces across the Pacific and South East Asia was bought to a halt by Australian troops at Kokoda.

The conditions under which the Australian "Thermopylae" was fought was first brought to the attention of the world at large by the war correspondent Chester Wilmot. As he wrote his report it was all he could do not to weep after what he had seen of the fighting. Hundreds on both sides would be slaughtered at each engagement, often without either side ever even catching sight of the other, through the impenetrable jungle, even though on occasions they could be only meters away. Death came from unseen assailants – sudden – and without waning. Wounding would mean a slow agonizing death, unless the New Guinea "Angles" could evacuate them back to Port Moresby. As graphic as the written reports were of the fighting however, it was Damian Parer, who electrified the world with his images of the conditions and ferocity of the war in New Guinea.

Damian Parer was Australia's greatest wartime photographer. He shot a number of documentary films amid some of the fiercest battles in the pacific region during the Second World War and in New Guinea in particular. In 1942, he won Australia's first Academy Award for Best Documentary film, "Kokoda Front Line". It told the story to the world of the battles at Kokoda where the Japanese clashed with Australian Forces and suffered the first check to their explosive expansion across the Asia-Pacific region. The following year Parer took probably his most poignant and famous footage "Helping Private Johnson to the Dressing Station", one of the iconic images for Australians of the Second World War. Many of Parer's images captured the theme of Australian mateship during extreme adversity, as well as the heroic efforts of the indigenous Islanders in defying the Japanese with their assistance to the Australians. In 1944 Parer was killed whilst filming American troops as they were advancing from the beaches of Peleliu in the Caroline Islands.

As if the horrors of the slaughter, disease and starvation of the war in New Guinea were not enough, there was also the misery of the heat and humidity of the jungle. Heat exhaustion was ever present.

HEAT EXHAUSTION

Introduction

Heat Exhaustion is an illness caused by an excessive exposure to environmental heat.

It may also be precipitated by strenuous exercise

It has features of heatstroke, however it stops short of this severe syndrome in that:

- Thermoregulation is maintained
- Body core temperature may be normal or elevated, however does not exceed 40 degrees
- There are no neurological symptoms, (cognitive status remains intact).
- There is no, or only minor rhabdomyolysis

Heat exhaustion predominantly manifests as **vascular collapse** due to **volume loss**.

It is a clinical diagnosis, of exclusion, and usually responds well to cooling and intravenous fluids.

While Heat Exhaustion has a benign outcome it is nonetheless vitally important to recognize and promptly treat, as it may be a precursor to the potentially fatal condition of Heat Stroke.

See also separate document on Heat Stroke (in Environmental folder).

Pathophysiology

Heat exhaustion is predominantly a volume loss syndrome. Water and sodium are lost due to sweating and poor oral intake whilst exposed to excessive environmental heat.

It is most commonly precipitated by excessive activity, where it is sometimes also referred to as "**exercise-associated collapse**".

Risk factors for heat exhaustion are similar to those of the more severe syndrome of heatstroke.

There are 2 important factors here:

- High ambient temperatures
- High ambient humidity.

The **wet bulb globe** thermometer reading takes into account not only the ambient temperature, but also the ambient humidity. Over 90 % of heat syndrome cases are associated with wet bulb globe thermometer readings of 30 ^{0} C or more.

Further predisposing factors include:

1. Age extremes, infants and elderly.

2. Occupation including athletes, laborers and the military.

3. Concurrent drug factors, especially anti-cholinergic agents, (which inhibit sweating)

4. Psychological factors, (belief of "invulnerability" of the young)

5. Rarely pathological conditions of the sweat glands, including:

    - Cystic fibrosis.
    - Quadriplegia
    - Congenital anhidrosis.

Clinical Assessment

Heat exhaustion is a clinical diagnosis as well as one of exclusion

Other causes of fever and /or volume loss always need to be considered and excluded if there is sufficient clinical suspicion.

The commonest history will be one of a person undergoing strenuous and / or prolonged activity, in a hot environment, often with little or no fluid intake, suddenly becoming unwell and collapsing.

Features of clinical assessment include:

1. Vital signs:

    - Tachycardia
    - Tachypnoea
    - Temperature may be normal or elevated **up to 40 degrees**, (but not to 41 degrees or above, which suggests the more severe syndrome of heat stroke).
    - Blood pressure, may be normal or low

2. Nausea and vomiting are common.

3. Mental status:

    - Whilst the patient may be significantly distressed, their mental or cognitive state will be **normal.** If it is not, then heatstroke needs to be considered

4. Check the BSL

5. Check for evidence of volume loss

    - Orthostatic hypotension may be present indicated by symptoms or a postural drop in blood pressure

6. Sweating is preserved, (this may be absent in the more severe syndrome of heat stroke)

7. Signs of dehydration in general:

    - Dry mucous membranes

    - Reduced tissue turgor

Investigations

Investigations will not usually be necessary; unless alternative diagnoses need to be ruled out or secondary complications are suspected

The following may be considered:

1. FBE:

    - A degree of hemoconcentration is often seen

2. U&Es/ glucose:

    Generally these will be within normal limits, however the following may be seen:

    - Hypernatremia may be seen in those who have had no fluid intake, while those who have had some fluid intake will more likely show isotonic dehydration and the sodium levels will be normal

    - Hypokalemia, if excessive vomiting

    - Mild elevations in urea, creatinine secondary to dehydration

    - Check for hypoglycemia

3. CK/ myoglobin.

Other tests are done as indicated to rule out **heatstroke**, alternative diagnoses, (such as sepsis) or to look for other secondary complications

Management

While Heat Exhaustion has a benign outcome it is nonetheless vitally important to recognize and promptly treat, as it may be a precursor to the potentially fatal condition of Heat Stroke.

Simple cooling measures and fluid resuscitation will usually be adequate to reverse heat exhaustion

1. Lie the patient flat
2. Remove the patient from the heat environment:
    - Bring indoors or to shade
    - Remove excessive clothing
3. Cool the patient:
    - Electric fans
    - Tepid sponging
3. Correct any hypoglycemia
4. Rehydration:
    - **Oral rehydration** may be sufficient, especially "in the field".
    - **IV fluid resuscitation** will be required in more severe cases

      Two to three liters of fluid will generally make the patient feel much better, as well as restoring their volume loss.

Disposition

Most patients will recover well enough to be discharged from the ED

A short admission for ongoing rehydration and further observation may be required in some patients, especially the elderly, very young, those with significant co-morbidities, or those slow to fully recover.

Dawn breaks over the Bomana War Cemetery, Port Moresby, Papua New Guinea, Anzac Day, 25 April, 2008.

"The Australians who served here in Papua New Guinea fought and died, not for defence of the Old World, but the New World. Their world.

They died in defence of Australia and the civilization and values which had grown up there. That is why it might be said that, for Australians, the battles in Papua New Guinea were the most important ever fought"

Paul Keating, Bomana War Cemetery,
Port Moresby, Anzac Day, 1992.

References

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Further reading:

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