A Rare Cause of Altered Mental Status and Fever in a Young Military Recruit in Puerto Rico

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Heat stroke (HS) is a medical emergency characterized by increased core body temperature with associated systemic inflammatory response leading to a syndrome of multi-organ damage in which encephalopathy predominates. We describe a case of a 29 year old male recruit presenting with altered mental status during military training in Puerto Rico. Associated symptoms included high grade fever, dizziness, nausea, vomiting, blurred vision and profuse sweating followed by loss of consciousness. Upon arrival to medical evaluation the patient was found with dry skin and depressed Glasgow Coma Score. Initial laboratories, clinical evolution of symptoms and imaging studies were consistent with the diagnosis of HS. Patient was managed with mechanical ventilatory support, intravenous fluids and external cooling measures. He was later discharged home without any neurological sequelae. To our knowledge this is the first documented case of HS in Puerto Rico. [*P R Health Sci J 2014;33:200-202*]

Key words: Heat Stroke, Altered Mental Status, Puerto Rico

Heat stroke (HS) is a medical emergency characterized by increased core body temperature with associated systemic inflammatory response leading to a syndrome of multiorgan damage in which encephalopathy predominates. (1,2). It can be exercise or non-exercise induced, and occurs in humans when heat gain exceeds heat loss from the skin by radiation, convection, or evaporation (3). It is usually seen in patients with extreme ages who are exposed to high environmental temperatures and is rarely documented in tropical areas. The level of heat stress to which the subjects were exposed to is high and typical of tropical countries during most days of the year. Frequent exposure to a hot and humid environment induces an increase in the amount of sweat produced per gland, and an increase in the ability of sweat glands to resist the inhibition that occurs during prolonged exercise in hot environmental conditions and to sustain a high sweat rate throughout a prolonged period (4). This may induce thermoregulation problems on humans that can be fatal. Heat acclimatization and drinking an adequate amount of fluid may play an important role in the reduction of physiological strain and improvement of exercise tolerance in hot and humid conditions (4). We report a rare case of HS in a young healthy male during his military training in Puerto Rico.

Case Report

A 29 year-old male with past medical history of childhood asthma was brought to Emergency Room (ER) due to altered mental status. Patient was taking part of military training under humid conditions when he suddenly started with dizziness, nausea, vomiting, blurred vision and profuse sweating followed by a loss of consciousness. The patient works as a commercial auditor. He did not have any prodromal symptom, previous episodes of this problem, recent travel, exposure to pets or sick contacts. No history of caffeine or energy drinks consumption before episode of HS. Physical examination was remarkable for high grade fever, incoherent speech, confusion, dry skin, no cardiac murmurs, clear lung fields, no meningeal signs, and Glasgow Coma Score of 8. He was given intravenous fluids, broad spectrum antibiotics and placed on mechanical ventilatory support for airway protection. Sedation with lorazepam was started.

Initial laboratory work up revealed mild leukocytosis, hypotonic hyponatremia, increased hepatic enzymes and creatine phosphokinase with myoglobinuria (Table 1). Head CT Scan was done and diffuse brain swelling was noted without acute ischemic changes, cerebral hemorrhage or temporal enhancement (Figure 1). Toxicology panel only with benzodiazepines positive but lorazepam was administered before laboratory was optained. Lumbar puncture was performed and the patient was found with increased opening pressure and normal CSF cell count, no xantochromia, negative bacterial or viral cultures (Table 1). Diagnostic impression was of HS for which he was managed with sedation, cooling and anti-edema measures. Immersion cooling method by using cooling blankets in conjunction with ice packs placed on the

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Table 1. Lactate

Hb	Ht	MCV	Plat	WBC	Neutr	Lymph	Mono
12.7	34.9	78.8	292	20.7	89.1	3.9	6.5

Na	K	Cl	CO2	BUN	Creat	Gluc	Alb	Ca	Mg	Phos
134	3.8	91	20	9.6	0.83	118	4.7	9.4	2.4	3.0

Lactate	CPK	U/A	INR	Toxicology
1.6	5,906	Blood: Large	1.21	BNDZ 188

pH	pCO2	pO2	HCO3	O2Sat	FiO2
7.46	30.9	567.1	21.8	100	1.0

CSF Cell Count	CSF RBC	CSF Glucose	CSF TP	CSF GS	CSF India Ink
5	3-fresh	74	29.5	Negative	Negative

axilla, groin, neck, and head was use. Defervescence was noted after 8 hours. Both his neurological status and CNS swelling improved, last one noted in imaging studies (Figure 2, 3) in approximately 24 hours for which he was successfully extubated and discharged home a few days later without evidence of any neurologic dysfunction.

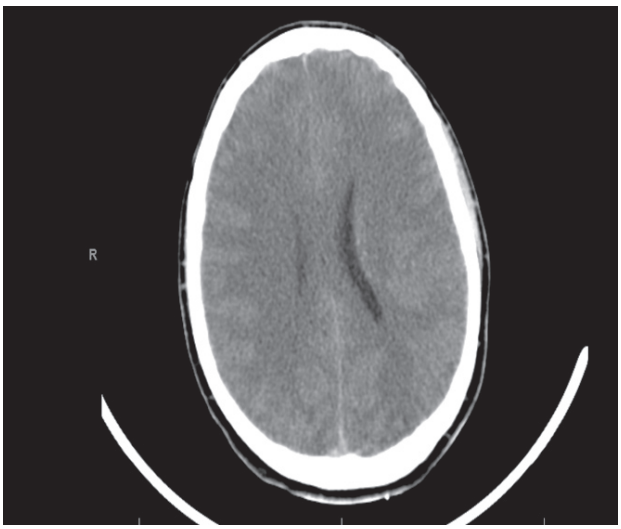

Figure 1. Head CT Scan: Diffuse effacement of cortical sulci

Discussion

HS is a life-threatening disease requiring immediate ICU admission (5). Why a mild illness develops in response to heat (as in heat exhaustion) in some people, whereas in others the condition progresses to heat stroke, who will survive and which are predictors of outcome remain unclear (6,7). Genetic factors may play a role that could result in thermoregulatory failure, exaggeration of the acute- phase response, and alteration in the expression of heat-shock proteins (2).

HS is a preventable illness, and knowledge of the disorder can help to reduce associated mortality and morbidity. Classic HS is predominant in very young or elderly persons and in those who have no access to air conditioning, those receiving medications that interfere with salt and water balance and sedatives that impair sweating (2,8). Exertional heat stroke may be seen in manual laborers, military personnel, football players and long-distance runners when exposed to high environmental temperatures and poor hydration (2).

The most serious complications of heat stroke are those falling within the category of multiorgan dysfunction syndrome. They include encephalopathy, rhabdomyolysis, acute renal failure, acute respiratory distress syndrome, myocardial injury, hepatocellular injury, intestinal ischemia or infarction, pancreatic injury, coagulopathy and thrombocytopenia (9).

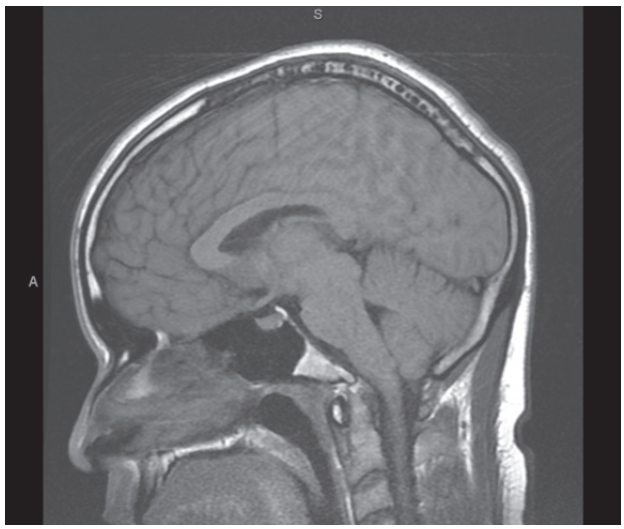

Figure 2. Brain MRI: Normal brain anatomy of midline structures.

The primary therapeutic goal must be to lower the core body temperature and provide supportive therapy to maintain organ function. Different therapeutic cooling techniques are therefore aimed at accelerating the transfer of heat from the skin to the environment without compromising skin blood flow (10,11). Pharmacotherapy has no role in accelerating or preventing this illness (10). The patient was managed with external cooling measures, anti-pyretic, intravenous fluids and anti-edema measures and was discharged home without any evidence of neurologic or renal dysfunction.

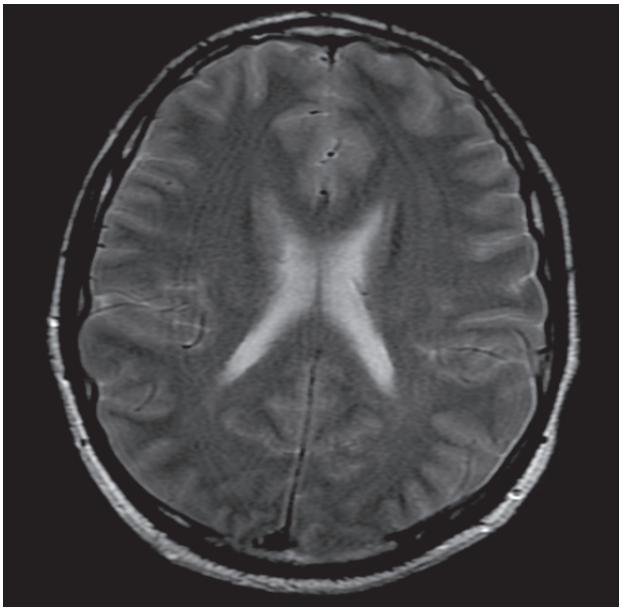

Figure 3. Brain MRI, The ventricular system is normal in size. Cortical sulci are well visualized. No abnormal signal intensity through brain parenchyma.

Data on the incidence of HS anywhere is imprecise because this illness is often unrecognized and misdiagnosed (2). Exertional HS rarely occurs in patients who are healthy, well hydrated and without exposure to high environmental temperature. To our knowledge this is the only documented case of HS in Puerto Rico. Although it is extremely rare in our island, HS needs to be considered in the differential diagnosis of patients with high grade fever and altered mental status who seek help in our clinical settings.

Resumen

La insolación o golpe de calor es una enfermedad caracterizada por un aumento en la temperatura corporal a través de una respuesta inflamatoria sistémica que conduce a un síndrome de daño a múltiples órganos en el cual predomina la encefalopatía. Nosotros describimos un caso de un recluta militar de 29 años que se presenta con alteración en el estado mental durante su entrenamiento militar en Puerto Rico. Los síntomas asociados fueron fiebre alta, mareos, nausea, vómitos, visión borrosa y sudoración excesiva seguido de un episodio de pérdida de conocimiento. En la evaluación médica inicial el paciente fue encontrado con piel seca y una disminución en la Escala de Coma de Glasgow. Los laboratorios iniciales, evolución clínica de los síntomas y estudios de imágenes eran consistentes con el diagnóstico de golpe de calor. El paciente fue manejado con ventilación mecánica, fluidos intravenosos y medidas externas de enfriamiento. El paciente fue dado de alta sin evidencia de disfunción neurológica. Para nuestro conocimiento, este es el primer caso documentado de golpe de calor en Puerto Rico.

References

1. Knochel JP. Environmental heat illness. Arch Intern Med 1974;133: 841-64.
2. Bouchama A, Knochel JP. Heat Stroke. N Engl J Med 2002;346: 1978-1988.
3. Shibolet S, Lancaster MC, Danon Y. Heat stroke: a review. Aviat Space Environ Med 1976;47:280-301.
4. Grogan H, Hopkins PM. Heat stroke: implications for critical care and anaesthesia. Br J Anaesth. 2002;88:700–707. doi: 10.1093/bja/88.5.700
5. Hemon D, Jougla E. The heat wave in France in August 2003. Rev Epidemiol Sante Publique 2004;52:3-5.
6. Bouchama A. Heatstroke: Facing the threat. Crit Care Med 2006;34: 1272-1273.
7. Levine BD, Thompson PD. Marathon Maladies. N Engl J Med 2005;352:1516-1518.
8. Jilma B, Derhaschnig U. Disseminated intravascular coagulation in heat stroke: A hot topic. Crit Care Med 2012;40;1370-1372.
9. Seder D, Van T. Methods of cooling: Practical aspects of therapeutic temperature management. Crit Care Med 2009;37:211-221.
10. Polderman K. Herold I. Therapeutic hypothermia and controlled normothermia in the intensive care unit: Practical considerations, side effects, and cooling methods. Crit Care Med 2009;37;1101-1120.
11. Rivera-Brown AM, Rowland TW, Ramirez-Marrero FA, Santacana G, Vann A. Exercise Tolerance in a Hot and Humid Climate in Heat-Acclimatized Girls and Women. Int J Sports Med 2006;27:943-950.