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CASE REPORT

Walking in Hot Summer may be Dangerous for the Elderly

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Abstract

This report details a case of exertional heat stroke in a 78-years-old male who collapsed after his regular evening walk in high-temperature conditions (ambient temperature 42.5°C, humidity 25%). After 30 minutes of walking, he lost consciousness and experienced a tonic-clonic seizure. Upon arrival at the emergency department, he was drowsy (Glasgow Coma Scale score of 12) and had recurrent seizures. The patient was intubated and mechanically ventilated. Treatment included cold sponging, intravenous fluids, intravenous lorazepam, and levetiracetam leading to cessation of seizures and improved consciousness. He was extubated after 25 hours and discharged after seven days. This case underscores the heightened risk of exertional heat stroke in elderly people during exercise in hot weather.

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Introduction

Heat stroke is a critical condition characterized by dangerously high core body temperatures over 40.5°C, leading to severe neurological dysfunction such as delirium, convulsions, or coma. In June 2024, an unprecedented heat wave affected India, particularly in the North, breaking previous records of past seven decades. Heat waves cause more fatalities than any other extreme weather condition. Regular walking is a highly recommended exercise for the elderly. The dose of exercise is determined by its duration, frequency, and intensity.[1] For optimal effects, exercise should be performed to near maximum capacity.[2] An elderly man who had been walking daily for an hour for the past 20 years developed severe, life-threatening heat stroke after his usual walk in the evening. We report this case to emphasize the caution needed regarding exercise for the elderly during hot summers.

Case Presentation

A 78-year-old man had been walking daily for one hour in the evening for the past 20 years. During his usual evening walk at 5 pm (ambient temperature 42.5°C and humidity of 25%, after walking for half an hour, he suddenly drooped down on the road, he was unconscious and was having convulsions. He was rushed to the emergency where he was found to be confused (Glasgow Coma Scale score of 12),

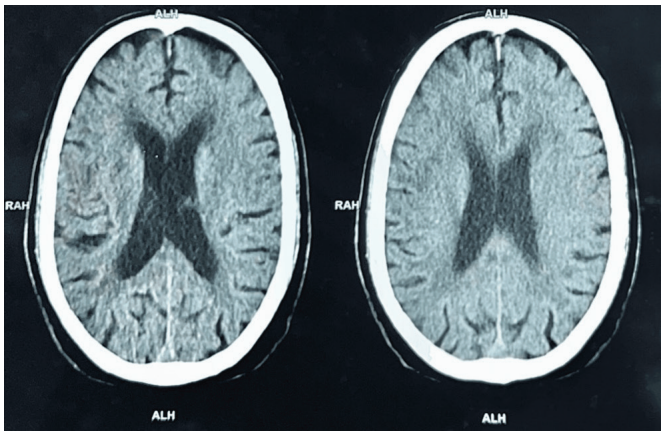

Figure 1: Cranial CT scan Axial sections showing chronic ischemic lesions in a patient with exertional heat stroke

had pulse of 140/min, blood pressure 160/92 mm Hg, and body temperature of 41.6°C. His blood glucose was 162 mg/dL, and oxygen saturation was 88% on room air. Despite treatment with IV Lorazepam (4 mg) and leveteracetam 1-gm IV seizure stopped but his consciousness did not improve he had laboured breathing and hypoxia therefore he was intubated and mechanically ventilated. He did not reveal focal neurological deficits or asymmetry. Biceps, triceps, knee, and ankle reflex were normal. ECG showed ST depression in V1 to V6 leads, and Troponin I was 23.2 ng/L. His leukocyte count was 15,000/mm^3 with 86% polymorphs, platelet

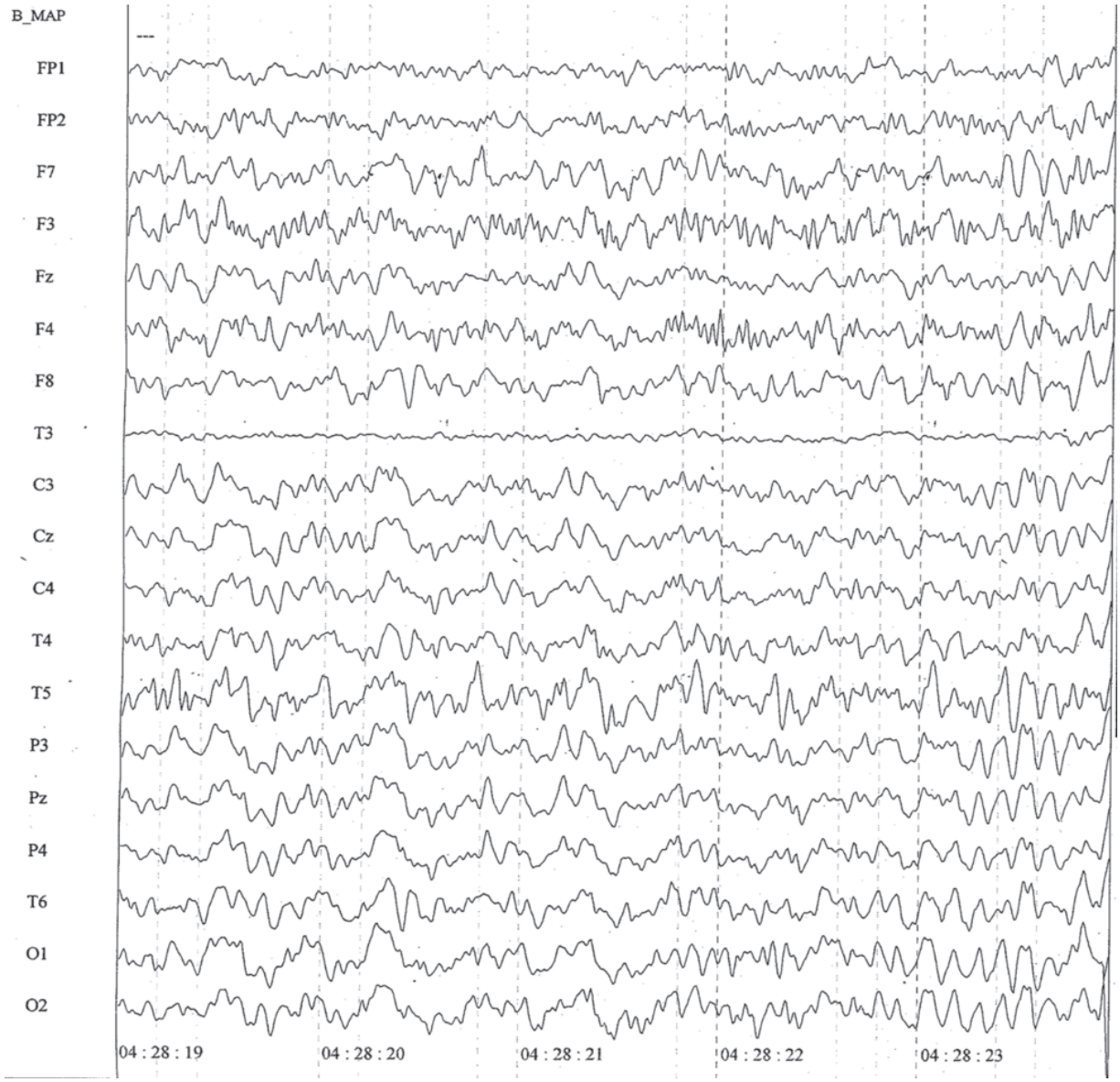

Figure 2: Electroencephalogram (EEG) of the patient with exertional heat stroke showing slowing of theta range with superimposed beta activity without any epileptiform activity. Reference montage, Filter 70-1 Hz, Gain 7.5 µV/mm, Sweep 30 mm/Sec

count 160,000/mm^3, blood urea 56 mg/dL, serum creatinine 2.37 mg/dL, creatine phosphokinase 2543 U/L, bilirubin of 0.19 mg/dL, and alanine amino transferase 92 U/L. Serum, sodium was 131 mEq/L and serum potassium at 3.9 mEq/L. Chest radiograph revealed infiltrates in the left upper zone, and echocardiography showed regional wall motion abnormality of left anterior descending artery territory with an ejection fraction of 50%. Cranial CT scan indicated chronic ischemic changes (Figure 1) and electroencephalogram demonstrated theta slowing without epileptiform activity (Figure 2).

Based on clinical and laboratory findings, the patient was diagnosed exertional heat stroke. Treatment included administration of 2 litres of IV normal saline, cold sponging and intravenous ceftriaxone (2 g twice daily) and Levetiracetam 500 mg twice daily. His fever subsided the following morning, consciousness improved, and he was seizure-free. He was successfully extubated on second day, on the third day his Trop I was 1.37 ng/L, serum creatinine 0.96 mg/dL, blood urea 33mg/dL, 32 U/L. He was discharged on day seven when his Pulse 86/minute, Blood pressure 118/74 mmHg, and was asymptomatic. His ECHO cardiography at 3 months follow-up was normal without any wall motion abnormality and ejection fraction was 65%. The laboratory tests on admission and on the fourth day of heat stroke are presented in Table 1.

Discussion

The present patient suffered from seizures, encephalopathy and cardiac dysfunction following exertional heat stroke, which responded to cooling and supportive treatment. Walking is commonly recommended for elderly individuals because of its safety, efficacy, and convenience, even in those with mild to moderate myasthenia gravis.[3] Over-motivation and peer pressure often drive people to exercise beyond their physiological capability, which is an important risk factor for exertional heat stroke.[4] The present patient was highly motivated and adhered to his walking routine for the past 20 years, disregarding the prevailing heat wave.

He presented with systemic inflammatory

Table 1: The sequential changes in the laboratory tests in the patient with heat stroke.

Test	18 June	21 June	Reference Range
Hb (g/dL)	11.6	9.40	13.5-17.5
TLC (cells/mm3)	15000	9180	4000-11000
Polymorph (%)	86%	79	40-75
Platelet (cells/mm3)	160000	120000	150000-450000
Serum Bilirubin (mg/dL)	0.19	0.12	0.1-1.2
SGPT (U/L)	92	32	29-33
Serum Creatinine (mg/dL)	2.37	0.96	0.7-1.3
Serum Na (mEq /L)	131	137	135-145
Serum K (mEq/L)	3.9	4.08	3.5-5.5
Trop I (ng/L)	23.2	1.37	0.012-0.02
Blood urea (mg/dL)	56	33	20-40

response syndrome (SIRS) (temperature 41.6°C, pulse 140/min, white cell counts 15,000/mm^3, respiratory rate 26/min). Heat stroke is considered a form of hyperthermia associated with SIRS, leading to multi-organ dysfunction where encephalopathy predominates.[5] In a study of hospitalized patients with exertional heat stroke, 84% met the criteria for SIRS.[6]

The brain is highly sensitive to hyperthermia, resulting in early encephalopathy characterized by behavioral changes, confusion, delirium, slurred speech, signs of raised intracranial pressure, and seizures. Consciousness is commonly affected in heat stroke but improves with cooling below the critical level of 40.5°C. Cerebellar involvement leading to atrophy is a well-recognized complication of heat stroke, a 75-year-old woman who developed heat stroke and coma for three days after walking at 42.2°C ambient temperature exhibited pan-cerebellar syndrome on follow-up. The present patient had a shorter period of encephalopathy, but more severe respiratory and cardiac dysfunction compared to the earlier report[7].

The present patient also had significant cardiac involvement evidenced by tachycardia, ST depression, wall motion abnormality and elevated troponin I level. Tachycardia is the most common cardiac abnormality in heat stroke, likely due to volume depletion and adrenergic response. Approximately 50% of heat stroke patients exhibit ST segment deviations, often associated with elevated cardiac enzymes and regional wall motion abnormalities.[8] In a study of Haj pilgrims with heat stroke, 18% showed wall motion abnormalities.[9] Elderly individuals are more vulnerable to heat stroke compared to younger ones due to reduced ability to increase cardiac output, impaired vasodilatory response, and other age-related factors.[10]

The diagnosis of heat stroke is clinical, considering the context and ruling out other conditions such as meningoencephalitis, seizures, neuroleptic malignant syndrome, and endocrine emergencies like thyroid storm and pheochromocytoma. Exertional heat stroke typically progresses through three phases: a hyperthermic-neurologic acute phase, a hematologic-enzymatic phase (peaking 24 to 48 hours post-event), and a late renal-hepatic phase (if symptoms persist longer than 96 hours).[11] For primary care practitioners, prompt recognition and treatment during the acute phase are crucial and potentially lifesaving. The present patient developed severe heat stroke despite his regular walking schedule because he exercised at high ambient temperature.

Conclusions

There has been an unusually hot summer during the recent heat wave, which could result in heat stroke. The present case highlights that the elderly are especially vulnerable to exertional heat stroke even if they are accustomed to specific exercise routines. Elderly should avoid exercising in hot weather. The diagnosis of heat stroke is clinical recognizing the context clinical picture and excluding other clinical conditions. The patient with heat stroke should be promptly managed with cooling and symptomatic treatment to avoid the involvement of other systems which may lead to poor outcomes.

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