

Unique Obstacle Race Injuries at an Extreme Sports Event: A Case Series

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Obstacle course endurance events are becoming more common. Appropriate preparedness for the volume and unique types of injury patterns, as well as the effect on public health these events may cause, has yet to be reported in emergency literature. We describe 5 patients who presented with diverse injuries to illustrate the variety of injuries sustained in this competitive event. In particular, 4 of the patients had a history of contact with electrical discharge, an obstacle distinctive to the Tough Mudder experience. [Ann Emerg Med. 2014;63:361-366.]

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INTRODUCTION

The Tough Mudder is a 10- to 12-mile course in a class of endurance obstacle courses known as MOB (mud, obstacles, beer) runs.¹ Since its inception by an entrepreneur and the first event in 2010, it has expanded from 3 to 35 locations and has had 700,000 participants worldwide.² Unlike competitive timed races focused on individual performance, an obstacle course may be more likely to challenge stamina and build camaraderie through the teamwork required to successfully proceed through the obstacles and complete the course. There are 20 to 25 obstacles that participants may jog between in the course; the sequence and exact selection are kept secret until the event day. A list of possible obstacles and recommended training³ are listed in Table 1. Popular obstacles include “electroshock therapy” (Figure), in which participants must run through mud and water while dodging electrical wires delivering “10,000 volts of electric shock,” and “walk the plank,” “a 15+ foot high jump into freezing water,”³ the obstacle cited in the media recently after the accidental death of a participant in West Virginia.⁴

The 2-day event took place the weekend of June 1, 2013, during which a single Pennsylvania hospital had 38 emergency department (ED) visits. This series received expedited approval by our hospital’s institutional review board. We describe 5 patients who presented with diverse injuries; 4 were associated with electrical obstacles, a unique risk to this type of endurance event.

Case 1

An 18-year-old man with a negative past medical history arrived by emergency medical services (EMS) for chest discomfort. He self-reported that it began immediately after he received 13 electrical shocks during the last obstacle in a Tough Mudder race. On protocol, EMS gave him aspirin (324 mg) and nitroglycerin. The patient was a nonsmoker, and family history was negative for heart disease. His vital signs were blood pressure 138/88 mm Hg, pulse rate 89 beats/min, respiratory rate 19

breaths/min, temperature 99.4°F (37.4°C), and oxygen saturation 100%. The CBC count and chemistry panel results were unremarkable, and the creatine phosphokinase level was 1,099 u/L (normal 30 to 170 u/L). The first troponin I level was 0.47 ng/mL (normal <0.04 ng/mL), his second had increased to 5.17 ng/mL, and the third was 23.62 ng/mL. ECG showed normal sinus rhythm with rightward axis and ST elevation related to early repolarization. The patient was admitted to the hospital.

Cardiology was consulted and noted on their examination that the patient had multiple burn marks consistent with electrical injury on his upper back and posterior right arm. A 2-dimensional echocardiogram showed normal structure and function. Cardiac magnetic resonance imaging (MRI) showed mild left-sided atrial enlargement and inferior and lateral akinesis with subendocardial late gadolinium enhancement, suggesting infarction or possibly an atypical presentation of myocarditis.

His troponin level trended downward and he was discharged on day 2. His final diagnosis was myocarditis caused by electrical shock.

Case 2

A 28-year-old man arrived by EMS for severe headache and altered mental status. He sustained multiple electrical shocks to the head while running through the water in an obstacle and experienced syncope and altered mental status thereafter. He was not submerged or underwater. He had a past medical history of hypertension (while being treated with lisinopril). His vital signs were blood pressure 180/110 mm Hg, pulse rate 88 beats/min, respiratory rate 16 breaths/min, temperature 98.0°F (37.2°C), and oxygen saturation 99%. On examination, he was slow to respond but awake and oriented to person, place, and time. His speech was normal and he had no gross cranial nerve deficit or facial weakness. He had no abnormal cerebellar findings; no abnormal finger-to-nose test; no weaknesses, motor, or sensory deficits; and no pronator drift. His rhythm strip was normal sinus rhythm, but his ECG had diffuse ST elevation (early repolarization versus

Table 1. Tough Mudder obstacle list and recommended training.

Name of Obstacle	Description of Obstacle	Web Site Recommended Training
Arctic Enema	Participant jumps into and swims through frigid water, swims under a wooden plank, and pulls himself or herself out.	None listed
Bale Bonds	Participant hurls himself or herself over or through a bale of loose hay. A pitchfork is buried in the hay.	Strengthen core w/planks, side planks, and dips
Balls to the Wall	Climb and descend a 15-ft wall with a rope.	Alternate between pull-ups and chin-ups
Berlin Walls	Climb 3 12-ft walls with the help of teammates. Strategically placed at point at which athletes are weakest.	Teamwork
Boa Constrictor	Crawl through series of pipes downhill into freezing mud and then ascend through another set of pipes.	None listed
Cage Crawl	Participant pulls himself or herself 60 ft on his or her back through water, using a cage suspended 6 in. above the water level.	None listed
Cliffhanger	Climb a ≥ 40 -ft muddy cliff sloped at a 45-degree angle.	"Find the biggest hill near your house, measure it, then drive until you get to a hill twice as steep"
Devil's Beard	Run/crawl underneath a cargo net fastened to the ground. Sometimes located on a hill.	Teamwork
Dirty Ballerina	Run and jump over a 5-ft-wide muddy pit.	None listed
Dong Dangler	Use a suspended rope to climb over a pool of ice water.	None listed
Drag Queen	Pull a set of tires attached to a rope 100 yards; then turn around and come back.	Practice pulling tires
Electric Eel	Slide on stomach through frigid water or along layer of ice while shocks hang overhead.	None listed
Electroshock Therapy	Run through a field of live wires (up to 10,000 V). "Electrifying mud" surface. Always last obstacle.	None listed
Everest	Run/climb up quarter pipe covered in grease and mud.	Teamwork
Fire Walker	Run among pits of blazing firewood. Flames up to 4 ft tall. Finish by jumping over last pit of fire into a pit of ice-cold water.	"Don't even bother trying to train"
Funky Monkey	Monkey bars coated with mud and butter, suspended above a pool of ice water. Bars are 1.5 ft apart. First half of bars is ascending and second half is descending.	Keep arms at 90 degrees and bicycle kick for momentum
Glory Blades	Climb 8-ft wall that is sloped at < 90 degrees.	Teamwork
Greased Lightning	Slide down a slippery slope into frigid, muddy water.	None listed
Hangin' Tough	Series of hanging rings suspended above pool of ice-cold water. Rings are 4–6 ft apart.	None listed
Hold Your Wood	Carry a heavy log 0.5 mile or up a steep hill	None listed
Island Hopping	Jump from pad to pad floating in water. Pads sink the longer participant stands on it.	Speed and Agility
Just the Tip	Scale a wall using fingertips and toes. Footholds removed toward the end.	None listed
King of the Mountain	Climb 20-ft pyramid constructed of bales of hay.	None listed
Kiss of Mud	Crawl on stomach through mud with barbed wire suspended 8 in. above the ground.	Crawl through mud or alternate low and high planks.
Ladder to Hell	Climb up and down an oversized ladder 15–20 ft tall.	None listed
Log Jammin'	Jump over and crawl under stacks of logs at varying heights.	Burpees
Lumberjacked	Jump over set of 2 hurdles 6 ft off the ground.	Teamwork
Mud Mile	Run up to a mile in waist-deep sludge.	Balance and coordination
Pirate's Booty	Climb up and down cargo net ladder.	Teamwork
Smoke Chute	Slide down a black tunnel with smoke into a pit of murky, muddy water.	Go down highest, darkest water slide possible
Spider's Web	Climb up and over a cargo net suspended between 2 trees.	None listed
Trench Warfare	Crawl through narrow, dark, muddy trenches.	Teamwork
Twinkle Toes	Walk across a narrow, wooden beam above an ice-laden pond.	Balance and agility
Underwater Tunnel	Swim and bob underneath rows of floating barrels in ice-cold body of water.	Swim in cold water or take cold showers
Walk the Plank	≥ 15 -ft jump into freezing water.	None listed
Warrior Carry	Fireman-carry another participant 100 yards. Then switch with partner and go another 100 yards.	None listed

pericarditis) and an abnormality in V1, suggesting right ventricular conduction delay. His telemetry monitoring throughout his stay showed no arrhythmia. His CBC count showed a hemoglobin level of 11.6 g/dL (normal 13.5 to 18.0 g/dL) and WBC count of

16.9 thou/mm³ (normal 4.5 to 11 thou/mm³). His chemistry panel result was normal except for a sodium level of 127 mEq/L (normal 135 to 146 mEq/L) and potassium level of 3.1 mEq/L (normal 3.5 to 5.2 mEq/L). Creatine phosphokinase was initially

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