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Syncope and Atypical Chest Pain in an Intercollegiate Wrestler: A Case Report

Joseph B. Myers, MA, ATC; Kevin M. Guskiewicz, PhD, ATC; Bryan L. Riemann, MA, ATC

University of North Carolina at Chapel Hill, Chapel Hill, NC

Objective: To present the case of a 20-year-old collegiate wrestler who suffered from atypical chest pains and syncope after rigorous exercise, dehydration, and ingestion of a metabolic stimulant.

Background: As a result of pressure to obtain a lower body weight for competition, wrestlers often pursue practices to lose a substantial amount of weight in a short period of time. These practices include rigorous exercise, starvation, dehydration, laxatives, diuretics, and over-the-counter stimulants. Our case involves an athlete who ingested a metabolic stimulant containing ma huang (ephedrine) and suffered from syncope and atypical chest pains during a bout of rigorous exercise and dehydration to lose weight for competition.

Differential Diagnosis: Hypertrophic cardiomyopathy, electrolyte imbalance, drug overdose, traumatic head injury, myocardial infarction, syncope.

Treatment: The emergency medical services transported the athlete to the emergency room, and he was hospitalized for 2 days. After discharge, the team physician counseled the athlete in the dangers of metabolic stimulants and excessive weight-loss techniques.

Uniqueness: This case is unique because it presents an athlete who ingested an over-the-counter stimulant to lose weight and suffered from syncope and atypical chest pains during a bout of rigorous exercise and dehydration.

Conclusions: Athletic trainers must understand not only the dangers of excessive weight loss, but also the dangers of using unregulated ephedrine-containing stimulants to aid in weight loss.

Key Words: wrestling, Chinese herbal stimulants, ephedrine, weight loss

For scholastic and collegiate wrestlers, the pressure to attain and maintain a certain weight class is substantial. Wrestlers often rely on extended bouts of rigorous exercise, in combination with starvation and dehydration, to attain a competitive weight.[1–3] Unfortunately, wrestlers will often go so far as to pursue practices designed for a substantial amount of weight loss over a short period of time, including the use of saunas, hot boxes, steam rooms, impermeable rubber or nylon suits, laxatives, and diuretics.[2,3] As in our patient's case, wrestlers occasionally use over-the-counter (OTC) metabolic stimulants, which are available at most nutritional stores. Nutrition stores market these supplements to increase the body's metabolism, leading to an increase in weight loss.[4] Because these stimulants are marketed as "natural" and are so readily available, users feel they are safe.[5–8] Even though these stimulants are believed by the public to be safe, they sometimes contain Chinese herbal extracts, like ma huang extract, which has known side effects. The purpose of our paper is to report the case of an intercollegiate wrestler who suffered from syncope and atypical chest pains during a rigorous bout of exercise and dehydration after ingestion of an OTC stimulant containing ephedrine (ma huang) and caffeine.

Address correspondence to Joseph B. Myers, MA, ATC, 104 Trees Hall, University of Pittsburgh, Pittsburgh, PA 15261. E-mail address: jbmst28+@pitt.edu

REPORT OF THE CASE

A 20-year-old African-American male intercollegiate wrestler weighing approximately 61.23 kg experienced severe substernal chest pain, tachycardia, hyperventilation, and loss of consciousness during wrestling practice. Before the incident, the athlete had no previous history of cardiac pain or dysfunction. The athletic trainer intervened by initiating the prepared emergency action plan for prompt arrival by the emergency medical services. Initially, the supine athlete experienced an altered state of consciousness in which he did not always respond to verbal cues. He eventually described his chest pain as "chest pressure"; however, he reported no abnormal sensations into the upper extremities. Although the athlete was conscious when the emergency medical services arrived, his heart rate was significantly elevated (160 beats per minute). Upon arrival at the emergency room, the athlete had a blood pressure of 120/80 mm Hg and a pulse of 90 beats per minute. He was coherent and oriented but continued to suffer from intermittent chest pain, and his breathing was quick and shallow for approximately 2 hours. The athlete was admitted to the hospital for further evaluation.

At the emergency room, the athlete revealed that he had ingested a metabolic stimulant known as Ripped Fuel (Twin Lab, Ronkonkoma, NY). Ripped Fuel is available at most stores specializing in nutritional supplements. The athlete admitted taking 4 tablets daily for 2 months, 2 tablets at

breakfast and 2 tablets at dinner. On the day of the incident, with no food or beverage consumption for that day, the athlete ingested 2 tablets just before practice. His rationale for taking the medication was to increase his basal metabolism to aid in weight loss.

The athlete underwent a battery of tests during his hospitalization. An electrocardiogram revealed normal cardiac intervals and normal sinus rhythm. A Holter cardiac monitor of cardiac activity over a 24-hour period revealed no cardiac arrhythmia. An echocardiogram revealed no hypertrophic cardiomyopathy, and an arterial blood gas test ruled out the possibility of a pulmonary embolus. Urinalysis revealed an increased level of creatinine in his urine secondary to dehydration (the athlete reported no history of creatine supplement usage) and the presence of ephedrine. One day after the incident, the athlete performed a cardiovascular exercise tolerance test. He had minor chest pain lasting about 15 seconds during minute 16 of exercise, with normal cardiac rate, rhythm, and blood pressure and no signs of ischemia. Because the athlete lost consciousness and experienced hyperventilation, tachycardia, increased creatinine level, and atypical chest pain, the team physician diagnosed the athlete as suffering from syncope and atypical chest pains resulting from a combination of dehydration, physical stress, and use of the metabolic stimulant.

The athlete followed up with the team physician 4 days after the incident and was counseled about the dangers of nutritional supplements in combination with excessive weight loss. He was advised not to take medications containing ephedrine and pseudoephedrine without consulting a physician and to screen all medications with the team physician and athletic trainer. The team physician examined and cleared the athlete 4 days after the incident. The athlete has had no recurrence of signs and symptoms and has not used metabolic stimulants.

DISCUSSION

This athlete attempted to lose approximately 4.54 to 6.80 kg (10 to 15 lb) to compete in the 57.15-kg (126-lb) weight class. To aid in his weight loss, he ingested Ripped Fuel to theoretically increase his metabolism, thereby decreasing his weight. Ripped Fuel contains caffeine and a derivative of ephedrine called ma huang. Ma huang is extracted from the *Ephedra* species and has been used in Far Eastern societies for thousands of years.[6] In Western society, ma huang is marketed as a diet or energy pill.[4] Because ma huang is considered a nutritional supplement, it is not subject to the controls and vigorous testing of the Food and Drug Administration (FDA).[4,8–13] Even though ma huang is not strictly regulated, the FDA, through the MEDwatch program, is well aware of the dangers involved with its use. The MEDwatch program asks health professionals, as well as federal, state, and local health agencies, to voluntarily report adverse effects resulting from dietary supplement use.[9,14] On April 10, 1996, the FDA issued a warning to consumers to avoid nutritional supplements containing ephedrine.[15] In addition, the FDA proposed, and is currently deliberating over, the use of warning labels addressing the adverse effects of ephedrine and the banning of products containing more than 8 mg per serving and those containing ephedrine in combination with caffeine (like Ripped Fuel), as well as limiting product use to 7 days.[16–18] No clinical studies have proved the safety or claimed benefits of ma huang products.[4]

Over the past decade, over 500 reported adverse effects, including more than 15 deaths, have resulted from the use of ephedrine products like ma huang.[17,19,20] Theoharides[18] reported the death of a healthy 23-year-old male who regularly consumed 1 or 2 Ripped Fuel drinks daily over a 6-month period. The autopsy revealed myocardial necrosis associated with ephedrine toxicity. The Centers for Disease Control and Prevention[19] reported on a 38-year-old male who suffered from seizures and syncope after ingestion of an ephedrine-containing product. A 35-year-old woman used ephedrine to aid in weight loss,[19] and, although she used the recommended dose for 30 days, she experienced anterior chest pain and shortness of breath.[19] Wiener et al[21] reported crushing chest pains suffered by a 28-year-old healthy male after ingestion of an ephedrine alkaloid (pseudoephedrine). A case report by Derreza et al[22] revealed substernal chest pain, shortness of breath, and diaphoresis after pseudoephedrine ingestion. Cockings and Brown[23] reported diffuse myocardial injury in a 25-year-old male after intravenous injection of ephedrine as a substitute for an illicit street drug. Finally, Weesner et al[24] reported a 14-year-old female who suffered from chest pain, dizziness, tachycardia, and blurred vision after ingestion of an OTC stimulant containing ephedrine and caffeine. Possible adverse effects experienced with ma huang use are presented in the Table. The athlete in this case suffered from substernal sharp chest pains, syncope, tachycardia, and hyperventilation, all of which are reported in the literature as possible adverse effects from ephedrine use. Since the athlete admittedly consumed the Ripped Fuel before practice, it is feasible that his signs and symptoms resulted from the ephedrine-containing product.

The goal of excessive weight loss in wrestling is to qualify at a lower weight class, where the wrestler believes he will be bigger, stronger, and faster and possess greater leverage over his opponent.[3] Excessive weight loss to make a lower weight

Possible Adverse Effects of Ma Huang Use[4,5,19,24–30]

Nervousness	Acute hepatitis
Diaphoresis	Renal failure
Blurred vision	Seizures
Insomnia	Arrhythmia
Headaches	Chest pain
Dizziness	Tachycardia
Paranoia	Palpitations
Psychosis	Hypertension
Tremors	Coronary spasm
Convulsions	Myocardial infarction
Syncope	Mortality

class may occur 15 to 30 times over a 4-month period.[3] As a result of dehydration, wrestlers often shed as much as 4% to 5% of their body weights on the day of competition.[3] Brownell et al[1] reported that most athletes who participate in sports with specific weight categories like wrestling compete at levels 5% to 10% lower than their normal body weights. Being dehydrated has many adverse effects on both athletic performance and overall health. Dehydration decreases muscle strength, decreases work performance, and lowers blood volume and liver glycogen, as well as affecting thermoregulation.[1,3,31–33] Elite wrestlers who lost 8% of their body weight exhibited decreased speed with uphill sprinting and isometric endurance.[33] Both of these deficits are important indicators of athletic performance. A study of 9 intercollegiate wrestlers involved testing their peak work capacity before and after excessive weight loss over a 4-day period and revealed decreased work capacity.[31] The mean weight loss for the 9-wrestler subject pool was 4.8% of body weight. After rehydration to simulate prematch activities, the group's body weight was still 2.2% lower than the pretest values, and peak work capacity was still decreased. Even though wrestlers have the opportunity to rehydrate after weigh in, performance is still affected.[31] Dehydration has also been shown to affect the thermal regulation of the body. Body weight loss of 5% significantly increases the risk of a wrestler's experiencing some type of heat-related illness.[3] As an athlete continues to exercise in a dehydrated state, the body is unable to fully cool itself, which may lead to decreased renal blood flow and eventually kidney failure, decreased cardiac output, and even death.[3]

The medical records for our patient revealed a diagnosis of syncope and atypical chest pains due to a combination of an OTC stimulant (Ripped Fuel), dehydration, and vigorous exercise. Burke et al[34] defined syncope as a brief and sudden loss of consciousness and muscle tone secondary to some contributory factor. Contributory factors to syncope can include hyperventilation, dehydration, hypoglycemia, electrolyte imbalances, increased temperature and humidity, drug use, and cardiac conditions.[35] A number of factors could have contributed to the syncope experienced by this athlete. As stated previously, ephedrine use can cause syncope and unresponsiveness.[19] Heat illness and dehydration cause syncope.[20,35,36] The athlete in this report exhibited increased levels of creatinine in the urinalysis due to dehydration. The dehydration levels involved with "cutting weight" possibly contribute to syncope. Cardiac conditions can contribute to syncope.[35] While no cardiac conditions like hypertrophic cardiomyopathy, myocardial infarction, or myocardial necrosis were diagnosed, the athlete suffered from tachycardia and atypical chest pains for approximately 2 hours. Thus, the cardiac abnormalities may have contributed to the syncope. The athlete exhibited hyperventilation during the episode and 2 hours thereafter. Since hyperventilation can cause syncope, it may have been a contributing factor.[35] Because it is impossible to truly determine the exact cause of the syncopic episode and chest pains experienced by the athlete, we can only speculate as to the cause. We have noted several cases similar to this, in which ephedrine products were believed to have contributed to injury or illness.[17,19,24]

CONCLUSION

This case study is unique in that it involves a collegiate wrestler experiencing syncope and atypical chest pains while attempting to lose weight. Whether the syncope and atypical chest pains resulted from the combination of exercise, dehydration, and Ripped Fuel or from a single cause, athletic trainers and coaches must understand not only the dangers of "cutting weight" but also the dangers of using unregulated stimulants like Ripped Fuel to aid in weight loss. The recent deaths of 3 collegiate wrestlers over a 2-month period while attempting to lose a substantial amount of weight have increased awareness of the dangers involved with "cutting weight." Using a stimulant like Ripped Fuel may compound the risk of excessive weight loss.

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