ABSTRACTS OF CURRENT LITERATURE

RESUSCITATION

Survival After Avalanche-Induced Cardiac Arrest

Avalanche burials have a reported mortality rate of 52% and are responsible for approximately 150 deaths in North America and Europe per year. The primary causes of cardiac arrest after avalanche burial are asphyxia, trauma, and severe hypothermia. Current international guidelines recommend stopping cardiopulmonary resuscitation (CPR) in avalanche burial patients in the setting of asystole, signs of severe trauma, the airway is packed with snow, and burial time is greater than 35 minutes. The authors investigated whether cardiac arrest caused by isolated profound hypothermia resulted in a better survival or neurological outcome.

This retrospective analysis over 20 years (1994-2013) of avalanche burial and on-scene cardiac arrest patients was collected from the registry of the Northern French Alps Trauma System. Investigators collected information regarding the cardiac arrest, survival outcomes, and neurological outcomes 3 months after injury. A total of 48 avalanche patients with cardiac arrest on the scene (median CPR time of 90 minutes) were included in the study, CPR was terminated in 11 patients primarily due to a serum potassium greater than 10 mmol/L. Of the remaining 37 patients, 29 (60.4%) did not survive to hospital discharge due to brain death and multi-organ failure. Overall, 8 of the 48 patients survived in the study. Characteristics of the survivors included shorter CPR duration, higher arterial pH, and no coagulation abnormalities. Three of the 8 patients had a favorable neurological outcome 3 months following initial injury; additionally, these 3 patients had signs of life or an air pocket at the time of extraction.

While the mortality rate is extremely high following cardiac arrest from avalanche burial, the authors found that vital signs prior to cardiac arrest and the presence of an air pocket may indicate that the cardiac arrest was due to profound hypothermia, thus improving chance of survival. Limitations of the study include its retrospective nature, small number of survivors, and possible changes in treatment protocols over the 20-year period.


Prepared by Matthew Stewart, University of Utah Global Medicine Fellow, Salt Lake City, UT.

JOURNAL OF KOREAN MEDICAL SCIENCE

Prophylactic Effect of Erythropoietin Injection to Prevent Acute Mountain Sickness: An Open-Label Randomized Controlled Trial

Acute mountain sickness (AMS) occurs when individuals arrive at high altitudes (typically > 2400 m) and is characterized by headache plus one or more of following symptoms: gastrointestinal symptoms, weakness, dizziness, and difficulty sleeping. There are multiple drugs that can reduce the incidence of AMS, however there are no definitive studies evaluating the use of erythropoietin (EPO) and AMS. EPO increases arterial oxygen content by stimulating red blood cell production and decreasing overall plasma volume. Additionally, EPO has been shown to improve exercise performance and cognitive function.

The current study investigated the use of prophylactic EPO injections to reduce the incidence of AMS among individuals traveling from sea level to Annapurna base camp (4,130 m).

This randomized controlled study enrolled 39 participants living at sea level in Seoul, Korea. Exclusion criteria included a history cardiovascular disease, current smokers, and hemoglobin (Hb) ≥15.5 g/dL. The EPO group received EPO injections once per week for 4 consecutive weeks, beginning 5 weeks prior to trip departure. All subjects traveled to Pokhara (900 m) and hiked to the Annapurna base camp (4,130 m) over a 4-day period. Primary outcome measures were Lake Louise Score, AMS incidence, and the need for immediate descent as determined by the US Army Research Institute of Environmental Medicine criteria. Other outcome measures included Hb and hemodynamic parameters.

The EPO group had significantly higher Hb levels than the control group just prior to trip departure (respectively 15.4 and 14.2 g/dL, p=0.001). Among the control group, 74% developed AMS while only 30% of the EPO group developed AMS at the Annapurna base camp (p=0.01). Additionally, the EPO group had lower Lake Louise Scores compared to the control group at the Annapurna base camp. Finally, only 15% of the EPO group versus 53% of the control group met criteria for immediate descent. There were no significant hemodynamic differences between the two groups. The investigators conclude the EPO is a possible effective prophylactic treatment for AMS, but future studies are needed to directly compare other medications such as acetazolamide and dexamethasone.


Prepared by Matthew Stewart, University of Utah Global Medicine Fellow, Salt Lake City, UT.

RESUSCITATION

The Effectiveness of Avalanche Airbags

Given the increasingly common use of avalanche airbags in North American and Europe, questions have arisen regarding
mortality risk reduction and the efficacy of avalanche airbags in reducing the incidence of critical burial (defined as head under snow and breathing impairment). Avalanche airbags are intended to reduce the degree of burial and possibly reduce the mortality rate following avalanche burial. The current study evaluated the efficacy and absolute mortality risk reduction by conducting an analysis of avalanche incident reports involving use and non-use of avalanche airbags.

The investigators performed a retrospective analysis of avalanche incident databases from Canada, Slovakia, Norway, Switzerland, and the United States between 1994 and 2012. The final data analysis included 61 accidents and a total of 189 patients. The rate of airbag non-inflation was 20%, most commonly related to deployment failure by the user. The risk for critical burial with non-inflated airbags was 47%, while the risk with inflated airbags was 20%. The overall mortality rate was 44% for critically buried patients and 3% for non-critically buried patients. Overall, the absolute mortality reduction for the use of inflated airbags was 11% (22% to 11% mortality; 95% confidence interval).

The authors recognize that one well-known concern regarding avalanche airbag use is that recreationalists using airbags travel into higher-risk avalanche terrain. Therefore, safety benefits of airbag use may be quickly nullified if airbag users are caught in an avalanche of greater size. Additionally, investigators note that the 11% absolute mortality reduction in this study is less than the previously reported 16% mortality reduction when using avalanche airbags. Study limitations include the small sample size, incident reporting bias, and non-standardization of incident reporting between countries and incidents. The authors conclude that avalanche airbags are a valuable avalanche safety device and can reduce mortality, but recognize the need for a larger dataset in future studies.

Prepared by Heather Beasley, University of Utah School of Medicine medical student, Salt Lake City, UT.

CANADIAN JOURNAL OF SURGERY

The “Weekend Warrior”: Fact of Fiction for Major Trauma?

The colloquial term “weekend warrior” refers to individuals engaging in demanding recreational activities on weekends with very little physical training during the week. Prior data suggests that approximately 1-3% of adult Americans are “weekend warriors”, participating in irregular physical activity only 1-2 days per week for greater than 150 minutes. Due to inappropriate physical conditioning and possible inexperience with a chosen physical activity, the authors hypothesize that weekend warriors are at an increased risk of injury compared to individuals recreating more frequently during weekdays.

This retrospective cohort study utilized the Alberta Trauma Registry that collects data on trauma patients with an injury severity score (ISS) greater than 12. Patients were included if they were adults (≥ 16 years old), and presented from 1995 to 2009. Weekends were defined as recreational activity occurring from 5pm on Friday until 8am on Monday. The authors’ excluded the following recreational activities due to prior well-known trauma epidemiology: cycling, horseback riding, rodeo sports, and downhill skiing. A total of 351 patients were included that were injured on the weekdays (n=159) and the weekends (n=192), with an average ISS of 18. A significantly higher number of patients were injured on the weekends versus weekdays (54% vs. 45%, p=0.016). Both weekend and weekday injuries had multiple similarities relating to time of injury during the day, mode of transport to the hospital, length of hospital stay, and need for surgical intervention; however, motocross-related injuries were much more common among patients admitted on the weekends. For all patients, 93.4% survived to hospital discharge and the most common cause of death was traumatic brain injury in 6.6% of patients.

The authors conclude that recreationalists during the weekend had a higher rate of severe injury when compared to weekday recreationalists, identifying a potential area for community education. Limitations of the study include its retrospective design and possible confounding variables such as alcohol or drug use.

Prepared by Matthew Stewart, University of Utah Global Medicine Fellow, Salt Lake City, UT.

CASE REPORTS IN MEDICINE

Sustained Ventricular Tachycardia and Cardiogenic Shock due to Scorpion Envenomation

Scorpion envenomations are extremely common throughout the world and there were 51,457 reported scorpion stings in Brazil in 2010. While the majority of stings are not serious, they can cause acute pulmonary edema and cardiogenic shock. This case report from an emergency department in São Paulo, Brazil highlights potential complications following a scorpion envenomation. A 25 year-old female was presumably stung in the toe by a scorpion and presented to a primary care office with a blood pressure of 220/110 and an electrocardiogram confirming sustained ventricular tachycardia at 300 bpm. The patient was given amiodarone and transferred to an emergency department. On arrival, the patient’s oxygen saturation was 89% on room air and a chest x-ray confirmed pulmonary edema. The patient had sinus tachycardia at 110 bpm and labs were significant for a lactic acidosis, hypokalemia, hyperglycemia, and elevated troponin I. Due to the severity of the envenomation, the patient received scorpion antivenom 2.5 hours after initial sting and was admitted to the hospital. Shortly after admission, she developed profound hypotension and a dobutamine drip was started. An echocardiogram confirmed an ejection fraction of 30%, consistent with cardiogenic shock. With supportive care