Recognition and Treatment of Exertional Collapse Associated with Sickle Cell Trait (ECAST)

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Course Objectives

1. Differentiate between signs and symptoms of ECAST and other non-traumatic causes of on-field collapse.
2. Identify risk factors and prevention strategies for individuals who carry the sickle cell trait.
3. Incorporate appropriate treatment and return to activity considerations following and ECAST event.
Solve the Case*...

• A 19 y/o African American football player in Georgia collapsed during an outdoor summer conditioning session. He is a sophomore, and this is his first official “summer season”. His medical history includes seasonal allergies and possible asthma before the age of 13. He has no history of heat illness and does not use alcohol, tobacco, or drugs. He does not know if has SCT. When he collapsed, it was 86°F on a partly cloudy day with 85% humidity.

• What would be included in your differential diagnosis?

*Case study adapted from Casa DJ, Stearns RL. Emergency Management for Sport and Physical Activity. 2015.
Sickle Cell Trait

• One hemoglobin gene (A) is shaped normally and one hemoglobin gene (S) is abnormally shaped

• Abnormal shape decreases the ability of carry oxygen through the blood

• **NOT** to be confused with sickle cell disease – must have two abnormal gene
Sickle Cell Trait
Background

• Impacts 1-3 million people in the US with SCT and 100 million people worldwide

• Ethnicities traced to Africa, South/Central America, Mediterranean and South Asian countries, Middle Eastern, Hispanic and/or the Caribbean

• Exertional Rhabdomyolysis link

• New research on genetic modifiers
Causes and Predisposing Factors

• Abnormal hemoglobin changes from round to “sickle” during exertion
• Sickled RBC build up and block blood flow
  • Epinephrine rush

• Environment
  • Heat, humidity, altitude
• Hydration
• Asthma
Consider the workout prior to the athlete’s collapse: a 5-minute dynamic warm-up followed by 10 100-meter sprints with 45 seconds of rest between each sprint and 2 minutes after the 3\textsuperscript{rd} and 6\textsuperscript{th} sprints. The athlete was visibly struggling but was able to complete each sprint.

Has your differential diagnosis changed?
Signs and Symptoms of ECAST

Muscle
- Pain, cramping, weakness

Shortness of breath

Fatigue

Difficulty recovering

Inability to keep going – slump to the ground
Diagnostic Criteria

**SCT**
- Screening at birth
- NCAA guidelines - 2010
  - [https://www.ncaa.org/sites/default/files/SCT%20testing%20brief%202014.pdf](https://www.ncaa.org/sites/default/files/SCT%20testing%20brief%202014.pdf)
- ASH position - 2012

**ECAST**
- Presentation of signs and symptoms
- Timing of presentation including exertional effort
# Telltale Features Among Common Non-Trauma Causes of On-Field Collapse

<table>
<thead>
<tr>
<th>Sickling</th>
<th>Cardiac</th>
<th>Heat Stroke</th>
<th>Asthma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weakness &gt; pain</td>
<td>No cramping</td>
<td>Fuzzy thinking</td>
<td>Usually known asthma</td>
</tr>
<tr>
<td>Slumps to ground</td>
<td>Falls suddenly</td>
<td>Bizarre behavior</td>
<td>Prior episodes, poor control</td>
</tr>
<tr>
<td>Can talk at first</td>
<td>Unconscious</td>
<td>Incoherent</td>
<td>Breathless, may wheeze or not</td>
</tr>
<tr>
<td>Muscles “normal”</td>
<td>Limp or seizing</td>
<td>Can be in a coma</td>
<td>Gasping, panicky, on hands/knees</td>
</tr>
<tr>
<td>Temp &lt; 103° F</td>
<td>Temperature irrelevant</td>
<td>Temp often &gt; 106° F</td>
<td>Auscultate: moving little air</td>
</tr>
<tr>
<td>Can occur early</td>
<td>No warning</td>
<td>Usually occurs late</td>
<td>Usually occurs after sprinting</td>
</tr>
</tbody>
</table>

Let’s Revisit the Case....

• When the AT begins an on-field exam, the athlete complains of shortness of breath and lower extremity discomfort. As the exam continues, he becomes lethargic and his legs become too weak to support him. At this point the AT calls emergency medical services.

• Now what is the diagnosis?

• What else would you want to evaluate?
Treatment

- Activate EAP
- High flow oxygen – 10-15mL with non-rebreather
- IV fluids
- How do we include local EMS and ED?
Return to Activity

- No current evidence-based guidelines
- Athlete should be asymptomatic and have normal organ function tests
- Graded manner with light exercise → increased levels of intensity
- Education regarding physical activity, intensity levels, and role of hydration, heat, and humidity
Prevention of ECAST

**Environment**
- Heat
- Humidity
- Altitude

**Activity**
- Work to rest ratio
- Exclusion from timed performance

**Athlete and AT**
- Proper nutrition and hydration
- Education on signs and symptoms
- Emergency action plan related to ECAST
Final Case Report Thoughts...

What are the primary objectives of care at this point?

What are the main actions you can take to prevent ECAST?

What are the factors that determine survival after ECAST?
Clinical Bottom Line

• In order to prevent ECAST, preventative measures related to heat acclimation, appropriate work to rest ratios, and thorough hydration should be implemented, especially for athletes with SCT.

• Swift recognition and management of ECAST is imperative to prevent catastrophic outcomes. Immediate activation of the emergency action plan, fluid replacement via IV saline fluids, and administration of high flow oxygen has been shown to decrease morbidity rates.

• Athletic trainers who can recognize, differentially diagnose ECAST and establish an emergency treatment plan may be able to limit the associated metabolic complications and possible cardiac arrhythmia which are often the cause of mortality.

• Athletic trainers should be aware of the prevention strategies for ECAST and have specific policies in the Emergency Action Plan for a plan of care.
Questions???
References


