Exercise Associated Collapse

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DISCLOSURES

I have no relevant conflicts of interest or business relationships in relation to the topic of this lecture.

Acknowledge Dr. Daina Heiman previous lecture on this topic as the basis for my talk today.
LEARNING OBJECTIVES

• Define *exercise associated collapse* (EAC) and *exercise-associated postural hypotension* (EAPH)

• Review pathophysiology of EAC and EAPH

• Review DDX of EAC and EAPH

• Review diagnostic evaluation of EAC and EAPH

• Discuss treatment options for EAC and EAPH
DEFINITIONS

• **EAC** - Collapse in conscious athletes who are unable to stand or walk unaided as a result of lightheadedness, faintness and dizziness or syncope that occurs after completion of an exertional event or stopping exercise.

• **Exercise-associated postural hypotension** - Postexercise decline in systolic blood pressure by at least 20 mm Hg below supine values on assuming the upright posture.
PATHOPHYSIOLOGY of EAC

• Blood flow redistribution to working muscles during exercise
• Increased cardiac output to meet the oxygen demands of exercising muscle
• Venous return during exercise dependent on muscle pumping blood back to the heart ("second heart")
• Veins are compressed by the muscle contractions and in the absence of muscle contraction, venous pooling occurs
• Syncope may occur due to vasodilation with venous pooling
DIFFERENTIAL DX of EAC

- Neurocardiogenic
- Cardiac – can lead to sudden cardiac death
- Electrical
- Mechanical
- Eating disorders
- Substance abuse
- POTS
- Metabolic factors
- Psychiatric disorders
NEUROCARDIOGENIC SYNCOPE

• The sudden inability of the body to maintain BP sufficient to maintain blood flow to the brain.
• Vasovagal syncope
• Vasodepressor syncope
• Carotid sinus syndrome
• Cardioinhibitory syncope
• Situational syncope (deglutition, micturition, defecation, cough)
CARDIAC SYNCOPE

ELECTRICAL
- Heart block
- WPW
- Long QT syndrome
- Brugada syndrome
- ARVC
- Polymorphic VTach
- (CAD)

ATHLETE’S HEART CHANGES
- increased vagal tone
- Sinus bradycardia
- Sinus arrhythmia
- Wandering atrial pacemaker
- 1º AVB
- Junctional rhythm
- Mobitz Type I AVB
POSTURAL ORTHOSTATIC TACHYCARDiac SYNDROME (POTS)

- Fatigue, dizziness and exercise intolerance when upright
- Young women predominantly
- If hypermobile, consider Ehlers-Danlos Syndrome

**DX**
- Increase in HR by 30 bpm
- Tachycardia > 120 bpm
- No drop in BP
- Autonomic dysregulation due to partial sympathetic denervation of the legs

**TX**
- Intravascular volume expansion: Hydration! Salt! +/- ddAVP
- Vasoconstrictors and low-dose beta blockers if needed
METABOLIC COLLAPSE

• Hypoglycemia
• Hypoxemia
• Hyponatremia
• Hyperthermia
PSYCHIATRIC, NEUROLOGIC, & OTHER

Psychiatric
• Anxiety
• Panic attacks
• Hyperventilation
• Eating disorders
• Dehydration
• Electrolyte disarray
• Exercise associated anaphylaxis

Substance abuse
• Inhalants
• Cocaine

Neurologic
• Seizures
• Vertebrobasilar insufficiency
• Subarachnoid hemorrhage
CARDIAC SYNCOPE

Mechanical/Structural
- HCM
- Congenital coronary artery anomalies
- Kinking or compression of the artery during exercise
- Valvular heart disease
- Dilated Cardiomyopathy
- Marfan syndrome
- Myocarditis
IMMEDIATE TREATMENT

- Lay patient down and raise legs
- ABC’s
- Vitals
- Determine hydration status
- Check glucose and ISTAT Na if available
- IV rehydration if MS changes
- Oral rehydration if able to tolerate PO
- Obtain RECTAL temp (NOT ORAL OR TYMPANIC)
- Consider ED transfer if MS not clearing or remains tachycardic, hypotensive, febrile
EAC TREATMENT ALGORITHM

EVALUATION

• Presenting in the office
• Thorough history
• Thorough physical exam
• ECG
• Echo
• Exercise stress test
• Cardiology consult
• Advanced cardiac imaging
EVALUATION HISTORY

• True Syncope vs. “collapse”
• Post event state: postictal, incontinence, rapid recovery vs. prolonged unconsciousness
• Vital signs at scene
• During vs. after exercise
• Prodromal events: palpitations, nausea, pruritus, wheezing, chest pain
• Body position and precipitating events
• Occurrence at other times vs. only exercise
• Family history of sudden death
• Medications
• High risk Behaviors

• MOST IMPORTANT!
EVALUATION - PHYSICAL EXAM

- Vital signs supine and upright (at least 5 minutes standing)
- BP in arms/legs
- Body habitus (*Marfanoid*)
- Scara/ Hypermobility (*Ehlers-Danlos*)
- Cardiac murmurs at rest and during valsalva or rise from squatting position
EVALUATION - EKG

- QTc
- Pre-excitation
- ST-T wave abnormalities
- Ischemic changes
- T wave inversion v1 - v3
- Ectopy, in particular with LBBB
EVALUATION - ADVANCED TESTING

- Echo
- LV and RV size and function
- Valve structure
- Left main coronary ostial position
- Aortic annulus size
- Pulmonary systolic pressure
- Exercise Stress Test
- Designed to reproduce conditions which provoked the event (e.g., start-stop, prolonged high intensity)
- Appropriate QT shortening
- Cardiac MRI or CT for detailed anatomy
EVALUATION – CARDIOLOGY CONSULT

- Syncope during exertion
- Palpitations preceding syncope
- Syncope in the supine position
- Patient with known underlying cardiovascular disease (particularly known reduced ejection fraction)
- Family history of sudden cardiac death (HCM, RVC, LQTS)
- Syncope induced by loud noises, or diving into a swimming pool
- Older age, or other risk factors for ischemic heart disease
- You just don’t know what the etiology
EVALUATION ALGORITHM

Exercise-related syncope in a young athlete

- History, physical examination, ECG and selected laboratory tests
  - Diagnostic or suggestive
    - Potentially life-threatening abnormalities
      - Restriction
    - Non-life-threatening abnormalities
      - Treat or evaluate as indicated
  - Unexplained
    - Restriction
    - ECHO/GXT
      - Yes
        - Diagnostic
      - No
        - Reassuring clinical features:
          - Postexertional
          - Nonrecurrent
          - Normal family history
          - Normal cardiac examination
          - Normal ECG, ECHO, GXT
            - Yes
              - Reassurance

BOTTOM LINE

• EAC that occurs **AFTER** activity is typically *benign* and related to altered hemodynamics.
• EAC that occurs **DURING** activity is potentially *life threatening* and demands restriction from activity until full investigation is performed.
References


