EXERCISE ASSOCIATED COLLAPSE

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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
DDX 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
POTS

- Fatigue, dizziness and exercise intolerance when upright
- Young women predominantly

**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**
- Hydration!
- Vasoconstrictors and low-dose beta blockers if needed
Metabolic

- Hypoglycemia
- Hypoxemia
- Hyponatremia
- Hyperthermia
Psychiatric, Neurologic and Others

- Anxiety
- Panic attacks
- Hyperventilation

- Eating disorders
  - Dehydration
  - Electrolyte disarray

- Exercise associated anaphylaxis with collapse

- Substance abuse
  - Inhalants
  - Cocaine

- 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 CM
  - 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 or marked signs of dehydration
- Oral rehydration if able to tolerate po
- Obtain rectal temp
- 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)
- Cardiac murmurs at rest and during valsala or rise from squatting position
Evaluation - ECG

- QTc
- Pre-excititation
- 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 (eg. 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 is
Evaluation Algorithm

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.