Exercise Induced Collapse: Neurocardiogenic Syncope

Background

1. Vasovagal syncope-most common
2. Must rule out congenital heart defects

Pathophysiology

1. Mechanism-sudden reflex vasodilation/bradycardia
    - May be caused by:
        - Stimulation of mechanoreceptors
        - Elevated catecholamine
        - Dehydration
    - Maximum exercise = high cardiac output
        - Due to increased venous return and high heart rate
    - Sudden stop decreases venous return
    - Heart continues forceful contraction with low end diastolic volume
        - Stimulate vasovagal reflex in medulla to increase vagal tone
        - Increased vagal tone leads to bradycardia/vasodilation
            - Hypotension/syncope
2. Other possible mechanisms
    - Bradycardia
        - Increased parasympathetic output from vagus nerve
    - Vasodilation-due to:
        - Post exercise withdrawal of alpha-agonist activity
        - Increased Beta 2 agonist activity
    - Increased catecholamines/dehydration during prolonged exercise can stimulate ventricular contractions
        - Catecholamine directly stimulates ventricles
        - Dehydration increases heart rate/contractility

Diagnostics

1. Detailed history of syncopal event
    - Postural or exertional symptoms
    - Association with neurologic symptoms
    - History of cardiac disease
    - History of psychiatric illness
    - Family history of sudden death
2. Evaluate for structural heart disease
    - EKG
    - ECHO
        - Pathological causes of syncope
        - Positive findings may need:
            - Exercise stress testing
            - Cardiac catheterization
            - Coronary angiography
            - Myocardial biopsy
            - Electrophysiology study

- Ambulatory heart monitoring
  - Necessary if EKG/ECHO negative but continued syncopal episodes
    - Possible arrhythmia
  - Consider cardiology consult
  - Holter-24 hour monitoring
  - Event monitor-allows up to two week monitoring

3. Neurally mediated syncope
   - Carotid-sinus syncope
   - Psychiatric illnesses (panic, anxiety disorders, major depression)
   - Carotid sinus massage
     - Rubbing carotid sinus stimulates baroreceptors and glossopharyngeal nerve
       - Can cause decreased heart rate
       - May slow rapid heart rate
         - Atrial flutter or atrial tachycardia
       - Can provide diagnostic information
     - May be useful in older patients
       - Carotid-sinus syncope common in elderly
     - Avoid in patients with carotid bruit/known cerebrovascular disease
       - May dislodge thrombus/plaque
     - Diagnostic testing
       - Head up tilt table test
       - Increased sensitivity with provocation with isoproterenol or nitroglycerin

Therapeutics

1. Activity modification
2. Avoid sports that may cause syncopal episodes
3. Proper post exercise cool-down periods
4. Increase salt and water intake
5. Wear compression stockings
6. Reestablish cerebral perfusion
   - Place athlete in Trendelenburg position
   - Medications:
     - Beta-blockers, disopyramide, SSRIs, fludrocortisone, midodrine

Prevention

1. Proper hydration
2. Cool down periods
3. Avoid provocative environments
4. Be aware of warning signs
   - Lie down, cross legs, tighten leg muscles may help avoid fainting
5. Avoid alcohol
   - Causes vaso-arterial dilation
6. Reduce caffeine intake
7. Increase fluid intake

8. Medications:
    - B-blockers, disopyramide, SSRIs, fludrocortisone, midodrine
    - No protocol for athletes exist
    - Individual response vary
9. Pacemaker
    - Currently experimental use only for neurogenic syncope

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