Syncope: To Refer or Not?

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Definition: Syncope
Sudden and transient loss of consciousness and postural tone with spontaneous recovery.
As many as 15% of children experience at least one syncopal event prior to the end of adolescence.

Causes of syncope

Syncope in pediatric patients in an ER (n=226)

- Neurocardiogenic 80%
- Neurologic 9%
- Cardiac 2%
- Psychogenic 3.5%
- Breath holding 2%
- Intoxication 2%
- Obstructive respiratory disease 0.4%
- Hypoglycemia 0.4%
- Aplastic crisis during parvovirus infection 0.4%

Reminder: patients I will be referring to are otherwise normal and specifically without a history of congenital heart disease.

If it is the cardiac-related, what is the problem?

- Simple Faint
- SUDDEN DEATH

Neurocardiogenic syncope (simple fainting)

- Cardioinhibitory - predominant bradycardia or asystole
- Vasodepressor - predominantly hypotension
- Mixed - components of both

News Release
A Death in the Family
By Glenn Nelson
HoopGurlz PublisherPosted: Apr 13, 2007
Just before the start of the Deep South Classic in Raleigh-Durham, N.C., a rising young star loses her life, and the teammates she left behind honor her by playing - and winning.
Neurally Mediated Syncope

- Standing
- Blood Pooling
- Decreased venous return
- Decreased stroke volume

Mechanoreceptors (PA, Ao, Carotid sinus, atria, ventricles)

Brainstem

- Increased sympathetic tone
- Increased HR
- Increased DBP
- Stable or decreased SBP

Increased vagal tone

- Decreased HR
- Decreased BP

SYNCOPE

Associations with neurocardiogenic syncope

- Prolonged standing
- Hair grooming
- Pain/fear (venipuncture)
- Hot temperatures (outside, in shower)
- Not eating/drinking

***prodrome prior to syncope***

Treatment

- Increase salt and water in the diet
- Avoid caffeine
- Be aware of symptoms

If symptoms persist and interfere with everyday life, then:

- Florinef
- Midodrine
- Beta-blocker
- Pacemaker for cardioinhibitory syncope

Cardiac causes of syncope

Cardiac disease accounts for 30-80% of sudden death in the pediatric population

In these patients, history of prior syncope is a fairly common finding, particularly exercise-related syncope.

Cardiac causes of syncope

Cardiomyopathy
- restrictive
- hypertrophic
- dilated

Structural
- Post-operative congenital heart disease
- Aortic stenosis
- Arrhythmogenic right ventricular dysplasia
- Anomalous coronary artery

Primary pulmonary Hypertension
WPW with Atrial Fibrillation

Torsades de point

Hypertrophic cardiomyopathy

Anomalous takeoff of LCA

How to distinguish

- Family history
  - Premature death
  - Drowning death
  - Unexplained death

How to distinguish

- Story of event
  - Appropriate for age?
  - Syncope with exercise or stress
  - Syncope in a swimming pool
  - Syncope without a prodrome
  - Syncope followed by seizure
  - CPR instituted
  - Syncope preceded by palpitations
  - Syncope resulting in significant injury
  - Seizure - refer to neurologist and cardiologist
How to distinguish

- Physical examination
  - Deafness
  - New murmur
  - Signs of congestive heart failure
  - Irregular rhythm
  - Neurologic signs
  - Any suggestions of neurocutaneous or neuromuscular disorders (kearns-Sayre, friedreich ataxia)

Evaluation of patients with syncope:

***Red flags***
- Syncope with exercise
- Syncope without a prodrome
- Family history of syncope, sudden death
- Injury with syncope
- Other cardiac symptoms

Syncope secondary to noncardiac vs cardiac causes

<table>
<thead>
<tr>
<th>Positive Variable</th>
<th>Noncardiac (n=458)</th>
<th>Cardiac (n=22)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
<td>143</td>
<td>10</td>
<td>0.19</td>
</tr>
<tr>
<td>Family Hx</td>
<td>153</td>
<td>9</td>
<td>0.50</td>
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<tr>
<td>Exam</td>
<td>38</td>
<td>2</td>
<td>0.09</td>
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<tr>
<td>EKG</td>
<td>52</td>
<td>16</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Ritter Pediatrics 2000

Case 1: don’t refer

13 year old girl presents to the emergency room with a single episode of syncope. She was cheerleading at a football game - outside on a hot day. She had not eaten anything all day. She was standing around after a dance routine. She felt hot, tired, lightheaded. She saw spots and then had tunnel vision. The next thing she remembers is waking up with her fellow cheerleaders looking down at her.

History: consistent with vasovagal syncope

Case 2-4: Refer

6 year old boy passed out while wrestling with his brother on 2 occasions. (died from anomalous coronary)

13 year old girl passed out in mid-stride while running down a basketball court. (diagnosed with HCM)

12 year old girl passed out in the swimming pool. (diagnosed with long QTc)

Case 5: Refer

10 year old boy has had multiple episodes of passing out, generally after he fell and hurt himself (while skateboarding). Each time, after passing out, he has a brief stiffening and likely seizure activity.

(diagnosed with cardioinhibitory syncope and was treated with a pacemaker)
**Cardiac Evaluation**

- EKG
- Holter
- Event monitors/Implantable loop recorder
- Echocardiogram
- Cardiac MRI
- Exercise stress test
- Tilt table test
- Invasive electrophysiology study
- Drug challenge (epinephrine for Long QT, procainamide for Brugada)
- Genetic testing (Long QT)

**EKG**

- Wolff-Parkinson-White syndrome
- Long Qtc
- Ventricular ectopy
- Atrioventricular block
- Ventricular hypertrophy
- Brugada syndrome
- Ischemia

- EKG low diagnostic yield
  - (Steinberg 2005; Gordon 1987; Lerman-Sagie 1994)
- EKG: Highly sensitive test for heart disease
  - Ritter 2000: of 480 patients, abnormal history, PE and EKG identified 21/22 patients with cardiac cause of syncope

**Echocardiogram**

- Hypertrophic cardiomyopathy
- Dilated cardiomyopathy
- Restrictive cardiomyopathy
- Anomalous coronary artery

- Echocardiogram:
  - Ritter 2000: of 480 patients with syncope
  - Echocardiograms performed in 322 (67%)
  - 2 cardiomyopathies detected as possible cause of syncope
  - 35 other non-significant findings on echocardiogram - not cause of syncope
  - Sensitivity of echocardiography for detecting a cardiac cause of syncope = 18%
  - *This study shows little benefit of screening echocardiography*

**Tilt table testing**

- In children:
  - Sensitivity 45%-57%
  - Specificity 83%-100%
- In young adults:
  - Sensitivity 75%
  - Specificity 35%-55%

**New Technology for Evaluation:**

**Medtronic Reveal™ implantable loop recorder**

**Cost of Evaluation**

Review of 169 pediatric patients with new syncope:

- A total of 663 tests performed at a cost/patient of $1055
- Only 26 tests (4%) were diagnostic in 24 patients (14%)
  - Steinberg J
  - Pediatr 2005
Who requires further cardiac evaluation:

- Anyone who worries you
- Positive family history
- All syncope with injury
- All syncope with exercise
- Abnormal cardiac exam
- Abnormal ECG