Syncope in Pediatrics

Definition

Syncope:
A transient loss of consciousness and postural tone with spontaneous recovery; it is symptom, not a diagnosis.
Types of Syncope

- Neurocardiogenic
- Cardiac
- Non cardiac

Neurocardiogenic Syncope

- AKA: Vasovagal Syncope or The Common Faint
- Accounts for 80% of syncope episodes
- Usually benign
- Occurs when part of the nervous system that regulates HR and BP malfunctions in response to certain triggers.
Typical Features

- **Triggers**
  - Warm / confined space; Being exposed to high temps
  - Prolonged standing
  - Hunger
  - Sudden onset of extreme emotion
  - Painful/Unpleasant stimulus
    - Trauma
    - Severe menstrual cramps
  - Sight of blood
  - Dehydration

- **Prodromal S/S**: lightheaded, dizziness, nauseous, tunnel vision, flushed, sweating

Diagram:
- Triggering Stimulus
  - Vasomotor Center of Brain is Initiated
    - Decrease HR & Dilates Blood Vessels in legs
      - Venous Pooling
        - Decrease BP/Loss of Blood flow to Brain
          - Faint/ Fall to Floor
            - Blood Flow to Brain Resorted
              - Regain Consciousness
**Recap Vasovagal Syncope**

* Most prevalent
* Usually benign
* In response to certain triggers
* Characteristic pre-syncope symptoms
* Quick spontaneous recovery

---

**Cardiac Syncope**

* Syncope which occurs due to a disorder within the cardiac system
* Account for 2-6% of syncope events
* Structural Abnormality
  * Hypertrophic Cardiomyopathy (HCM)
* Arrhythmia
  * Long QT Syndrome (Long QTS)

*other disorders
Normal Cardiac Structure

Hypertrophic Cardiomyopathy

Normal heart (cut section)  Hypertrophic cardiomyopathy
What is HCM?

**HCM:** A genetic disorder that is characterized by the abnormal growth of muscle fibers in the heart. The walls become thick and stiff, making it difficult for the heart to pump blood in and out of the heart effectively.

* Affects 500,000 people in the US with children under 12 yrs. accounting for <10% of all cases

* Occurs at a rate of 5 per 1 million children

Complications of HCM

- **↓** Ventricular Volume
- **↓** Cardiac Output
- **↑** Risk of obstruction
- **↑** Cardiac Fatigue
- **↓** Exercise Tolerance
- **↑** Risk for arrhythmia
HCM and Syncope

- Syncope & pre-syncope occur in 15-25% of patients with HCM.
- In young patients, h/o recurrent syncope is associated with an increased risk of sudden death.
- Syncope typically occurs in younger patients with smaller ventricles.
- Syncope is often provoked by exercise (during or after)
- Episodes can occur at rest

**Syncope occurs without warning and/or symptoms suggestive of the cause**

Arrhythmia

Long QT syndrome:
A genetic or acquired disorder characterized by a prolongation of the QT interval on an EKG. Disorder is susceptibility to ventricular tachy-arrhythmias. May lead to syncope, cardiac arrest, or even sudden death.

*LQTS may be expected to occur in 1 in 10,000 individuals.*
• P wave: atrial contraction
• QRS complex: ventricular contraction
• T wave: ventricular recovery
• QT interval: total activity in the ventricles

Long QT Interval

• Increases the duration of electrical reset
• Increases vulnerability
• Prone to ventricular tachyarrhythmias
Types of Long QTS

- Genetic
- Acquired

Genetic Long QTS

- Born with disease
- Associated with congenital deafness
- Types 1-12 Categorized by which gene is affected
  (Genes sensitive to different stimuli)
  (LQTS 1) swimming
  (LQTS 2) emotion
  (LQTS 3) sleep
Acquired Long QTS

- Electrolyte Imbalances
  - hypokalemia
  - hypomagnesemia

*Severe Eating disorders

- Drug induced

Drugs that prolong QT interval

- Alfuzosin
- Amantadine
- Amiodarone
- Amisulpride
- Amripiprazole
- Apomorphine
- Asparagine
- Asenapine
- Bedaquiline
- Bepridil
- Bortezomib
- Bosutinib
- Chloral hydrate
- Chloroquine
- Thorazine
- Chlorothiazide
- Quinidine
- Cisapride
- Clarithromycin
- Clemipramine
- Clozapine
- Cymbalta
- Crizotinib
- Dabrafenib
- Dapoxetine
- Doxepin
- Droxidopa
- Dronedarone
- Droperidol
- Enalapril
- Fluphenazine
- Flecainide
- Fluoxetine
- Fosarnet
- Galantamine
- Gatifloxacin
- Gemfibrozil
- Griseofulvin
- Haldol®
- Hydrochlorothiazide
- Hydroxychloroquine
- Ibuprofen
- Ivermectin
- Itraconazole
- Levomepromazine
- Levomepromazine
- Lidocaine
- Minocycline
- Mirtazapine
- Moexipril/HCTZ
- Moxifloxacin
- Nifedipine
- Nitroglycerin
- Nitrofurantoin
- Nortriptyline
- Ofloxacin
- Onapristone
- Pantoprazole
- Paclitaxel
- Pazopanib
- Phenytoin
- Pimozide
- Propranolol
- Propofol
- Quinapril
- Rilpivirine
- Rosuvastatin
- Zidovudine
- Ziprasidone

CredibleMeds®
Long QTS and Syncope

- Syncope is the most common sign of long QT syndrome
- Dx. after immediate family member had a cardiac arrest
- Syncope events are caused by the heart temporarily beating in an erratic way (ventricular tachy-arrhythmias)
- These fainting spells may happen when individuals are excited, angry, scared or during exercise. Drug induced? Electrolyte disturbances?
- Fainting can occur without warning/sign/symptom. ex: losing consciousness after being startled by a ringing telephone.

EKG Strips

- Normal Sinus Rhythm
- Torsades
- Ventricular Tachycardia
- Ventricular Fibrillation
Non-Cardiac Syncope

Events which occur that are not related to disorders of the heart and episode does not present like a vasovagal syncope.

- Seizure
- Hypoglycemia
- Migraine Syndrome
- Hysteria
- Hyperventilation
- Choking

Evaluation

History & Physical
Red Flag Warnings

- Scenario not typical for a simple faint
- Syncope associated with chest pain
- Syncope occurred during exercise
- Syncope associated with palpitations
- Prolonged loss of consciousness
- Abnormal physical examination
- Positive family history

Evaluation Continued

- Non-Invasive Testing
  - EKG
  - Echocardiogram
  - Holter Monitor
  - Event Monitor
  - Stress Test
  - Laboratory testing/Genetic testing

- Invasive Testing
  - Electrophysiology (EP) Testing
Holter Monitor

- 24-48 hr. continuous monitoring
- Wear home/school
- Data downloaded for interpretation
- Diary
- Normal activates
- PE class okay unless otherwise restricted
- Prevent direct wall trauma

Event Monitor

- 30 day continuous monitoring
- Okay to remove for brief periods
- Encourage routine activity
- Diary
- Urgent notifications
- Phone in transmissions
- Beeping?
- Hypoallergenic leads
Exercise Stress Test

- Treadmill
- Cardiac Monitor
- BP Checks Q 3 mins
- Strenuous/Strict Protocol
- Inducible Arrhythmia?
- Normal BP response?

Electrophysiology study

- Right atrium
- Leads
- Catheter
- Inferior vena cava
- Right ventricle
- Heart
- Abnormal electrical signals
**Treatment**

**Goal: Treat underlining cause of syncope**

- Vasovagal Syncope
  - Eliminate triggers as much as possible
  - Increase fluid intake
  - Increase salt intake (unless medically contraindicated)

- Cardiac Syncope
  - Surgery
  - Ablation
  - Medication
  - Pacemaker
  - Automated Implantable Cardioverter Defibrillator (AICD)

**Conclusion**

- Syncope is categorized into 3 different types: vasovagal, cardiac, and non cardiac.

- Most syncope is benign

- Can be a sign of a serious underlying cardiac disease.

- Red flag warnings prompt further investigation.

- Further tests can help rule out cardiac disease.

- Goal is to treat underlying cause of the syncope

- Prevent reoccurrence of syncope and/or sudden cardiac arrest and even sudden cardiac death.
Scenario 1

Ella is a 10 year old girl. She has no prior known medical history. It was raining out so everyone was in the cafeteria eating lunch. She was standing in line when she told her friends that she was not feeling well. Complained she was hot and sweaty. A few minutes later she was found on the floor, but regained consciousness fairly quickly.

Call 911?

Typical features
- Triggers: warm, confirmed environment. Standing in lunch line.
- Pre-syncope warning: “c/o not feeling well”

Evaluation
- H&P: consistent for vasovagal syncope. No baseline EKG abnormalities. No further work up completed.

Conclusion
- Dx w/ vasovagal syncope

Scenario 2

Josh is 11 year old boy. He was at school one day walking the hall. Without warning, he collapsed and fell to the floor. He had an LOC for about 1 minute. When he regained consciousness, he was not sure what happened to him.

Call 911?

Triggers?

Evaluation
- H&P: Concerning that there were no triggers or pre-syncope s/s
- EKG/Echo: consistent w/HCM

Conclusion
- Dx w/ HCM. Had an AICD placed to help minimize syncope events and/or prevent cardiac arrest
Scenario 3

Tammy is a 13 year old girl. She has no prior known medical history. She was running a track meet and was pushing herself to her limits. Towards the end of the race she had a syncope episode, coach claims he caught her on the way down. LOC for only a few seconds. She was able to recall all events. Claims this has occurred before.

Call 911?

Triggers?

Evaluation

H&P concerning because it event occurred during exercise. Required further testing: EKG, Echo, Stress, Holter  Normal

Conclusion

R/O cardiac etiology; dx w/ vasovagal syncope

References


Combined list of Drugs that prolong QT and/or cause Torsades de Pointe (TDP). June 2015. www.crediblemeds.org


