

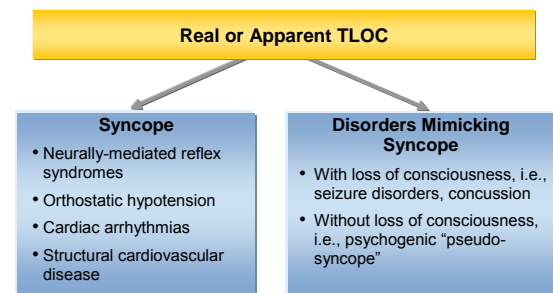
## Palpitations, Syncope, and Chest Pain

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[www.heartnp.com](http://www.heartnp.com)

## Palpitations

- Heart flip-flopping
- Heart fluttering
- Skipping beats
- Pounding esp. while lying on left-side
- Sensation of pulsation in neck

### Classification of Transient Loss of Consciousness (TLOC)



Brignole M, et al. *Europace*. 2004;6:467-537.

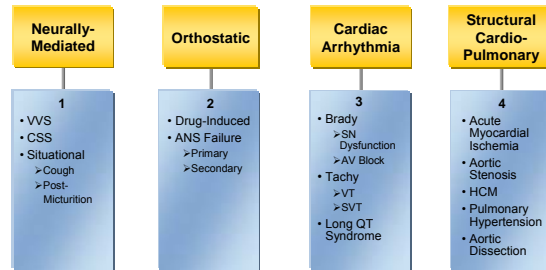
### Syncope – A Symptom, Not a Diagnosis

- Self-limited loss of consciousness and postural tone
- Relatively rapid onset
- Variable warning symptoms
- Spontaneous, complete, and usually prompt recovery without medical or surgical intervention

Underlying mechanism is transient global cerebral hypoperfusion.

Brignole M, et al. *Europace*. 2004;6:467-537.

### Causes of True Syncope



Unexplained Causes = Approximately 1/3

DG Benditt, MD, U of M Cardiac Arrhythmia Center

### Syncope Mimics

- Acute intoxication (e.g., alcohol)
- Seizures
- Sleep disorders
- Somatization disorder (psychogenic pseudo-syncope)
- Trauma/concussion
- Hypoglycemia
- Hyperventilation

Brignole M, et al. *Europace*. 2004;6:467-537.

## Challenges of Syncope

- **Diagnosis**
  - Complex
- **Quality of life implications**
  - Work
  - Mobility (automobiles)
  - Psychological
- **Cost**
  - Cost/year
  - Cost/diagnosis

## A Diagnostic Plan is Essential

- **Initial Examination**
  - Detailed patient history
  - Physical exam
  - ECG
  - Supine and upright blood pressure
- **Monitoring**
  - Holter
  - Event
  - Insertable Loop Recorder (ILR)
- **Cardiac Imaging**
- **Special Investigations**
  - Head-up tilt test



Brignole M, et al. *Europace*, 2004;6:467-537.

## Initial Exam: Detailed Patient History

- **Circumstances of recent event**
  - Eyewitness account of event
  - Symptoms at onset of event
  - Sequelae
  - Medications
- **Circumstances of more remote events**
- **Concomitant disease, especially cardiac**
- **Pertinent family history**
  - Cardiac disease
  - Sudden death
  - Metabolic disorders



Brignole M, et al. *Europace*, 2004;6:467-537.

## Initial Exam: Thorough Physical

- **Vital signs**
  - Heart rate
  - Orthostatic blood pressure change
- **Cardiovascular exam: Is heart disease present?**
  - ECG: Long QT, pre-excitation, conduction system disease
  - Echo: LV function, valve status, HCM
- **Neurological exam**
- **Carotid sinus massage**
  - Perform under clinically appropriate conditions preferably during head-up tilt test
  - Monitor both ECG and BP

Brignole M, et al. *Europace*, 2004;6:467-537.

## Carotid Sinus Massage (CSM)

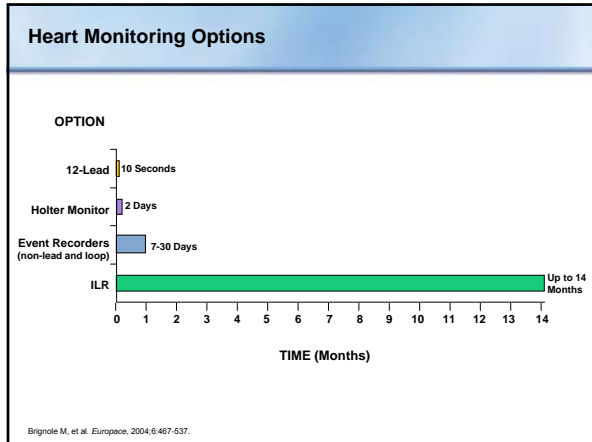
- **Method<sup>1</sup>**
  - Massage, 5-10 seconds
  - Don't occlude
  - Supine and upright posture (on tilt table)
- **Outcome**
  - 3 second asystole and/or 50 mmHg fall in systolic BP with reproduction of symptoms = Carotid Sinus Syndrome
- **Absolute contraindications<sup>2</sup>**
  - Carotid bruit, known significant carotid arterial disease, previous CVA, MI last 3 months
- **Complications**
  - Primarily neurological
  - Less than 0.2%<sup>3</sup>
  - Usually transient

<sup>1</sup>Kenny RA. *Heart*, 2000;83:554.  
<sup>2</sup>Lipson M. *Ann Intern Med*, 1997;126:989.  
<sup>3</sup>Munro N, et al. *J Am Geriatr Soc*, 1994;42:1248-1251.

## Other Diagnostic Tests

- **Ambulatory ECG**
  - Holter monitoring
  - Event recorder
    - Intermittent vs. Loop
    - Insertable Loop Recorder (ILR)
- **Head-Up Tilt (HUT)**
  - Includes drug provocation (NTG, isoproterenol)
  - Carotid Sinus Massage (CSM)
- **Adenosine Triphosphate Test (ATP)**
- **Electrophysiology Study (EPS)**

Brignole M, et al. *Europace*, 2004;6:467-537.



### Diagnostic Assessment: Yields (N=341<sup>1</sup> to 433<sup>2</sup>)

	Yield (%)
<b>Initial Evaluation</b>	
History, Physical Exam, ECG, Cardiac Massage	38-40
<b>Other Tests/Procedures</b>	
Head-Up Tilt	27
External Cardiac Monitoring	5-13
Insertable Loop Recorder (ILR)	43-88 <sup>3-5</sup>
EP Study	<2-5
Exercise Test	0.5
EEG	0.3-0.5
MRI	No data available <sup>6</sup>

References Available

### Neurological Tests: Rarely Diagnostic for Syncope

- EEG, Head CT, Head MRI
- May help diagnose seizure

Brignole M, et al. *Eurpace*. 2004;6:467-537.

### Head-Up Tilt Test (HUT)

- Protocols vary
- Useful as diagnostic adjunct in atypical syncope cases
- Useful in teaching patients to recognize prodromal symptoms
- Not useful in assessing treatment

Brignole M, et al. *Eurpace*. 2004;6:467-537.

### Insertable Loop Recorder (ILR)

Reveal<sup>®</sup> Plus ILR

Typical Location of the Reveal<sup>®</sup> Plus ILR

### Insertable Loop Recorder (ILR)

The ILR is an implantable patient – and automatically – activated monitoring system that records subcutaneous ECG and is indicated for:

- Patients with clinical syndromes or situations at increased risk of cardiac arrhythmias
- Patients who experience transient symptoms that may suggest a cardiac arrhythmia

## Specific Conditions

- Cardiac arrhythmia
  - Brady/Tachy
  - Long QT syndrome
  - Torsade de pointes
  - Brugada
  - Drug-induced
- Structural cardio-pulmonary
- Neurally-mediated
  - Vasovagal Syncope (VVS)
  - Carotid Sinus Syndrome (CSS)
- Orthostatic



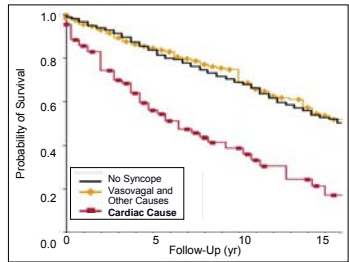
## Cardiac Syncope

- Includes cardiac arrhythmias and SHD
- Often life-threatening
- May be warning of critical CV disease
  - Tachy and brady arrhythmias
  - Myocardial ischemia, aortic stenosis, pulmonary hypertension, aortic dissection
- Assess culprit arrhythmia or structural abnormality aggressively
- Initiate treatment promptly

Brignole M, et al. *Eurpace*. 2004;6:467-537.

## "...cardiac syncope can be a harbinger of sudden death."

- Survival with and without syncope
- 6-month mortality rate of greater than 10%
- Cardiac syncope doubled the risk of death
- Includes cardiac arrhythmias and SHD



Soleriades ES, et al. *N Engl J Med*. 2002;347:878.

## Syncope Due to Structural Cardiovascular Disease: Principle Mechanisms

- Acute MI/Ischemia
  - 2° neural reflex bradycardia – Vasodilatation, arrhythmias, low output (rare)
- Hypertrophic cardiomyopathy
  - Limited output during exertion (increased obstruction, greater demand), arrhythmias, neural reflex
- Acute aortic dissection
  - Neural reflex mechanism, pericardial tamponade
- Pulmonary embolus/pulmonary hypertension
  - Neural reflex, inadequate flow with exertion
- Valvular abnormalities
  - Aortic stenosis – Limited output, neural reflex dilation in periphery
  - Mitral stenosis, atrial myxoma – Obstruction to adequate flow

Brignole M, et al. *Eurpace*. 2004;6:467-537.

## Syncope Due to Cardiac Arrhythmias

- Bradyarrhythmias
  - Sinus arrest, exit block
  - High grade or acute complete AV block
  - Can be accompanied by vasodilatation (VVS, CSS)
- Tachyarrhythmias
  - Atrial fibrillation/flutter with rapid ventricular rate (eg, pre-excitation syndrome)
  - Paroxysmal SVT or VT
  - Torsade de pointes

Brignole M, et al. *Eurpace*. 2004;6:467-537.

## Treatment of Syncope Due to Tachyarrhythmia

- Atrial tachyarrhythmias
  - AVRT due to accessory pathway – Ablate pathway
  - AVNRT – Ablate AV nodal slow pathway
  - Atrial fib – Pacing, linear/focal ablation for paroxysmal AF
  - Atrial flutter – Ablate the IVC-TV isthmus of the re-entrant circuit for 'typical' flutter
- Ventricular tachyarrhythmias
  - Ventricular tachycardia – ICD or ablation where appropriate
  - Torsade de pointes – Withdraw offending drug or implant ICD (long QT/Brugada/short QT)
- Drug therapy may be an alternative in many cases

Brignole M, et al. *Eurpace*. 2004;6:467-537.

## Neurally-Mediated Reflex Syncope

- Vasovagal Syncope (VVS)
- Carotid Sinus Syndrome (CSS)
- Situational syncope
  - Post-micturition
  - Cough
  - Swallow
  - Defecation
  - Blood drawing, etc.

Brignole M, et al. *Europace*. 2004;6:467-537.

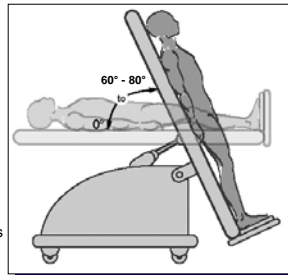
## VVS Incidence

- Most common form of syncope
  - 8% to 37% (mean 18%) of syncope cases
- Depends on population sampled
  - Young without SHD, ↑ incidence
  - Older with SHD, ↓ incidence

Linzer M, et al. *Ann Intern Med*. 1997;126:989.

## VVS Diagnosis

- History and physical exam, ECG and BP
- Head-Up Tilt (HUT) – Protocol:
  - Fast > 2 hours
  - ECG and continuous blood pressure, supine, and upright
  - Tilt to 70°, 20 minutes
  - Isoproterenol/Nitroglycerin if necessary
  - End point – Loss of consciousness



Benditt D, et al. *JACC*. 1996;28:263-275.  
Brignole M, et al. *Europace*. 2004;6:467-537.

## VVS General Treatment Measures

- Optimal treatment strategies for VVS are a source of debate
- Treatment goals
  - Acute intervention
    - Physical maneuvers, eg, crossing legs or tugging arms
    - Lowering head
    - Lying down
- Long-term prevention
  - Tilt training
  - Education
  - Diet, fluids, salt
  - Support hose
  - Drug therapy
  - Pacing

Brignole M, et al. *Europace*. 2004;6:467-537.

## VVS Pharmacologic Treatment

- Fludrocortisone
- Beta-adrenergic blockers
  - Preponderance of clinical evidence suggests minimal benefit<sup>1</sup>
- SSRI (Selective Serotonin Re-Uptake Inhibitor)
  - 1 small controlled trial<sup>2</sup>
- Vasoconstrictors
  - 1 negative controlled trial (etilefrine)<sup>3</sup>
  - 2 positive controlled trials (midodrine)<sup>4,5</sup>



<sup>1</sup>Brignole M, et al. *Europace*. 2004;6:467-537.  
<sup>2</sup>Di Girolamo E, et al. *JACC*. 1999;33:1227-1230.  
<sup>3</sup>Raviele A, et al. *Circ*. 1999;99:1452-1457.

<sup>4</sup>Ward C, et al. *Heart*. 1998;79:45-49.  
<sup>5</sup>Perez-Lugones A, et al. *J Cardiovasc Electrophysiol* 2001;12(8):935-938.

## Role of Pacing as Therapy for Syncope: Summary

- Three earlier studies single blind – Bias?
- Pacemaker implantation may modulate reflex syncope and autonomic responses<sup>1</sup>
- Study results may differ based on pre-implant selection criteria and tilt-testing techniques
- Pacing therapy is effective in some but not all (cardioinhibition vs. vasodepression)
- In five pacing studies, syncope recurred in 33/156 (21%) of paced patients, 72/162 (44%) in non-paced patients (p<0.000)<sup>2</sup>

<sup>1</sup>Kapoor W. *JAMA*. 2003;289:2272-2275.  
<sup>2</sup>Brignole M, et al. *Europace*. 2004;6:467-537.

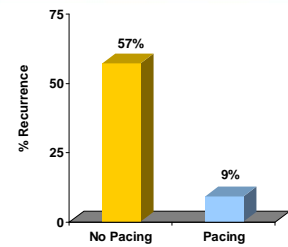
## CSS Carotid Sinus Syndrome

- Syncope clearly associated with carotid sinus stimulation is rare ( $\leq 1\%$  of syncope)
- CSS may be an important cause of unexplained syncope/falls in older individuals
- Prevalence higher than previously believed
- Carotid Sinus Hypersensitivity (CSH)
  - No symptoms
  - No treatment

Kenny RA, et al. *J Am Coll Cardiol* 2001;38:1491-1496.  
 Brignole M, et al. *Europace* 2004;6:467-537.  
 Sutton R, In: *Neurally Mediated Syncope: Pathophysiology, Investigation and Treatment*. Blanc JJ, et al. eds. Armonk, NY: Futura;1996:138.

## CSS Role of Pacing – Syncope Recurrence Rate

- Class I indication for pacing (AHA and BPEG)
- Limit pacing to CSS that is:
  - Cardioinhibitory
  - Mixed
- DDD/DDI superior to VVI
  - Mean follow-up = 6 months



Brignole M, et al. *Eur JCP* 1992;4:247-254.

## Orthostatic Hypotension

- Etiology
  - Drug-induced (very common)
    - Diuretics
    - Vasodilators
  - Primary autonomic failure
    - Multiple system atrophy
    - Parkinson's Disease
    - Postural Orthostatic Tachycardia Syndrome (POTS)
  - Secondary autonomic failure
    - Diabetes
    - Alcohol
    - Amyloid

Brignole M, et al. *Europace* 2004;6:467-537.

## Treatment Strategies for Orthostatic Intolerance

- Patient education, injury avoidance
- Hydration
  - Fluids, salt, diet
  - Minimize caffeine/alcohol
- Sleeping with head of bed elevated
- Tilt training, leg crossing, arm pull
- Support hose
- Drug therapies
  - Fludrocortisone, midodrine, erythropoietin
- Tachy-Pacing (probably not useful)

Brignole M, et al. *Europace* 2004;6:467-537.

## Syncope: Diagnostic Testing in Hospital Strongly Recommended

- Suspected/known 'significant' heart disease
- ECG abnormalities suggesting potential life-threatening arrhythmic cause
- Syncope during exercise
- Severe injury or accident
- Family history of premature sudden death

Brignole M, et al. *Europace* 2004;6:467-537.

## Conclusion

- Syncope is a common symptom with many causes
- Deserves thorough investigation and appropriate treatment
- A disciplined approach is essential
- ESC guidelines offer current best practices

Brignole M, et al. *Europace* 2004;6:467-537.

## Chest Pain evaluation

### Reference

*Quick Guide to Rule Out Chest Pain Emergencies*

Shannon E. Runion, NP-C & Elizabeth M. Lamb, NP-C  
The American Journal for Nurse Practitioners  
11(6) June 2007

### Risk Stratification

- Age: < 30 yrs, 30-40, 40-60, >60
- History of Pain
- Family History
- Social/Habits
- Associated Symptoms
- Physical Exam

### Assessment

- History
- Physical exam
- Diagnostic Tests: EKG, Echocardiogram, possible CT
- Differential signs & symptoms

### Physical Exam

- Vital Signs
- Inspect and auscultate heart & lung fields
- Auscultate and palpate peripheral pulses
- EKG
- Echocardiogram
- CT may be needed

### Emergent Causes of Chest Pain

- Acute Coronary Syndrome
- Aortic Dissection
- Esophageal Rupture
- Pneumothorax
- Pulmonary Embolism

### Causes of Chest pain

- Cardiovascular
- Pulmonary
- Gastrointestinal
- Musculoskeletal
- Neurologic
- Functional or psychiatric
- Misc: diaphragmatic spasms of flutter, mediastinitis or tumors