CARDIAC SYNCOPE

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Disclosures: None
SCOPE OF THE PROBLEM

• 1% of all hospital admissions
• 3% of all ER visits
• 6% incidence in institutionalized elderly
• Prevalence: 7 - 47% in young, healthy subjects; unknown in elderly
• Up to 30% of patients may have no diagnosis established at hospital discharge
• 6% annual mortality if no cause established
• 12 - 25% recurrence
Kapoor Medicine 69:1990  N = 433  Sudden death: 37%

Mortality %

Cardiac
Noncardiac
Unknown

Yr. of FU: 0 1 2 3 4 5
No. at risk: 433 380 349 295 179 44
SURVIVAL IN SYNCOPEAL PATIENTS

**Follow-up (yr)**

<table>
<thead>
<tr>
<th>No syncope</th>
<th>Vasovagal &amp; other causes (OH, med Rx)</th>
<th>Unknown cause</th>
<th>Neurologic cause</th>
<th>Cardiac cause</th>
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<tbody>
<tr>
<td>0.8</td>
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</table>

Soteriades et al. NEJM 2002;347:878 (Framingham) N = 822/7814
PREVALENCE OF SYNCOPE BY AGE

Ganzeboom et al    AJC 4.15.03
**YOUNGER ADULTS**

- OH, situational, seizures, drugs: 30%
- 1° arrhythmia: 15%
- Vasovagal: 40%
- Undetermined: 15%

**ELDERLY**

- OH, CSS, situational, seizures, drugs: 30%
- 1° arrhythmia, LV obstruction: 25%
- Cardiogenic: 30%
- Other causes: 15%
# Etiology of First Syncope in Patients > 65 Years

<table>
<thead>
<tr>
<th>Etiology</th>
<th>%</th>
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<tr>
<td>Reflex-mediated (VVS, CSS, situational)</td>
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<tr>
<td>Orthostatic</td>
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<tr>
<td>Cardiac</td>
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</tr>
<tr>
<td>Arrhythmic</td>
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</tr>
<tr>
<td>Nonarrhythmic</td>
<td>3</td>
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<tr>
<td>Drug-induced</td>
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<tr>
<td>CNS</td>
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<tr>
<td>Unexplained</td>
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</table>

Roussanov et al, Am J Geriatric Cardiol 2007;16:249 N=304 (VA patients)
FEATURES OF UNEXPLAINED SYNCOPE IN OLDER PATIENTS

• High incidence of comorbid conditions
• 24% recurrence rate
• Only 9% had an etiology established during follow-up
• Lower diagnostic yield of history and tests compared in younger patients
PROGNOSIS IN UNEXPLAINED SYNCOPE IN PATIENTS > 65

Roussanov et al. Am J Geriatric Cardiol 2007; 16:249 N = 304 VA pts
EVALUATION OF SYNCOPE: PERTINENT HISTORY

• Precipitating factors
  - Posture changes (orthostatic hypotension)
  - Cough, swallowing, micturition, defecation ("situational" syncope)
  - Exercise (consider aortic stenosis, HOCM, VT)
  - Head turning, Valsalva (suggests carotid sinus syndrome)

• Prodromal symptoms

• Speed of onset and recovery (prolonged recovery suggests vasovagal syncope)

• Aura (suggests seizure)
NATURAL HISTORY OF AORTIC STENOSIS

Onset of Sx With AVR

Without AVR

Asx stage

% Survival

CHF

Syncope

Angina

Years

With AVR

Without AVR

100

75

50

25

0

10

20

30
EVALUATION OF SYNCOPE: PERTINENT HISTORY

• Drugs
  - Diuretics (→ hypokalemia, hypomagnesemia)
  - Digitalis (AVB, VT-classically bidirectional)
  - Antihypertensives
  - Antiarrhythmic agents (→ proarrhythmia)
  - Ophthalmic β-blockers
  - Antianginal medications (preload and afterload reduction)
  - QT prolonging drugs (www.torsades.org)
  - OTC drugs
  - Herbs
  - Illicit drugs, alcohol
• Family history of sudden death (congenital long QT syndrome, hypertrophic obstructive cardiomyopathy)
• Known rhythm abnormality (e.g., WPW)
Exercise-induced RVOT VT
Deglutition bradycardia

Continuous strips
CLUES TO ETIOLOGY OF SYMOMOPSE FROM PHYSICAL EXAMINATION

- Left ventricular impulse abnormalities suggesting past myocardial infarction
- Ventricular hypertrophy (need for AV synchrony)
- Ventricular gallops
- Murmurs (aortic stenosis, hypertrophic obstructive cardiomyopathy)
- Pulmonary hypertension
- Mitral valve prolapse (PSVT, VT, autonomic dysfunction)
- Carotid sinus massage
CLUES TO ETIOLOGY OF SYNCOPE FROM 12-LEAD ECG

- Long QT interval
- Prior MI (substrate for VT)
- Epsilon wave, anterior ($V_{1-3}$) T inversion, QRS duration $V_{1-3} / V_{4-6} > 1.2$, suggesting RV dysplasia
- Brugada pattern
- Ectopy
- Bradycardia
- AV conduction delay / block
- Bifascicular block
- Ventricular hypertrophy (need for AV synchrony)
Epsilon wave of RV dysplasia

V₁

V₂

V₃

Marcus, Fontaine  PACE 6.95
RV DYSPLASIA

- Young pt
- Can present as syncope or aborted sudden death
- Anterior T inversion
- Prominent anterior forces
- RIVCD
- MRI is diagnostic (fat replacement)
RV dysplasia
Brugada syndrome
OUTCOME IN PTS WITH BRUGADA ECG

- Asymptomatic pts (57%)
- Syncope pts (22%)
- Sudden death pts (21%)

Free of events (SD, VF)

\[ p = 0.00001 \]

N = 334, all EPS 63% of syncopal pts had VT induced
PROGNOSIS OF SYNCOPE IN BRUGADA SYNDROME

Free of Appropriate ICD Rx

Follow-up (mos)

Antzelevitch et al
Circulation 2005; 111:659 N=258 (Registry)
ROLE OF ECHOCARDIOGRAPHY IN SYNCOPE

- Aortic stenosis
- Hypertrophic cardiomyopathy (especially obstructive)
- Regional wall-motion disorders (substrate for VT)
- Right ventricular dysplasia
- Calcified mitral / aortic annulus (↑ AV block incidence)
- Intracardiac tumor
- Mitral valve prolapse
- Repaired congenital heart disease
NONARRHYTHMIC CARDIAC SYNCOPE: OBSTRUCTION TO FLOW

• Aortic stenosis
  - LV baroceptor stimulation with reflex peripheral vasodilation
  - Ventricular arrhythmias
  - Transmural ischemic injury with LV dysfunction
• Hypertrophic obstructive cardiomyopathy
• Tumor
• Primary pulmonary hypertension, pulmonic stenosis
• Pulmonary embolism
Syncope in aortic stenosis

Recorded during syncopal spell. BP unobtainable.
Syncope in aortic stenosis

Lead III: During syncopal spell

ST ELEVATION
SYNCOPE IN HYPERTROPHIC CARDIOMYOPATHY - 1

• Causes
  - SVT (especially AF)
  - VT
  - LV outflow tract gradient
  - Abnormal baroreceptor reflexes
  - Ischemia

• EP studies unreliable
• $\beta$-blockers, disopyramide and Ca$^{++}$ channel blockers do not reduce incidence of SD
SYNCOPE IN HYPERTROPHIC CARDIOMYOPATHY - 2

- ICD indicated for high risk patients
  - Family hx syncope/sudden death
  - LVH > 3 cm
  - Aborted sudden death
  - Nonsustained VT on Holter
SYNCOPE IN PULMONARY HYPERTENSION

• Usually exertional or immediately post-exercise
• “Fixed” right sided obstruction due to high pulmonary vascular resistance
• Inability to increase CO in response to ↓ SVR
• Decreased cerebral perfusion
NONARRHYTHMIC CARDIAC SYNCOPE: IMPAIRMENT IN VENTRICULAR FUNCTION

- Dilated cardiomyopathy
- Myocardial infarction (acute ↓ in contractility)
- Tako-tsubo syndrome
- Cardiac tamponade (impaired filling)
**VASOVAGAL vs ARRHYTHMIC* SYNCOPE**

- Male: $< .001$
- Age > 54: $< .001$
- Supine: NS
- Upright: NS
- Precipitant: $< .001$
- No presyncope: NS
- Warning: NS
- Diaphoresis: $< .001$

*VT + AVB

Calkins et al
AJM 98:1995
VASOVAGAL vs ARRHYTHMIC* SYNCOPE

Fatigue Post: < .001
Confusion: NS
Palpitations: NS
Incontinence: .02
Injury: NS
Major Injury: NS
Recovery > 0": < .001

*VT + AVB
Calkins et al
AJM 98:1995
ARRHYTHMIC SYNCOPE WORKUP

- ECG
- Holter (overall yield 2%)
- Event Monitor (patient cannot be syncopal)
- Head-up tilt table testing
- Electrophysiologic study (predictive value variable)
- Implantable loop recorder
PATIENT PRESENTING WITH SYNCOPE AND SEIZURE

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<th>Event Type</th>
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</table>
EP Testing in Patients with Syncope

Class I  Patients with syncope of unknown cause with impaired LV function or structural heart disease  (*Level of Evidence: B*)

Class IIa  Can be useful in patients with syncope when brady- or tachyarrhythmias are suspected, and in whom noninvasive diagnostic studies are not conclusive.  (*Level of Evidence: B*)
Class I

1. Cardiac arrest due to VF or VT not due to a transient or reversible cause.

2. Spontaneous sustained VT in association with structural heart disease.

3. Syncope of undetermined origin with clinically relevant, hemodynamically significant sustained VT or VF induced at EPS when drug Rx is ineffective, not tolerated, or not preferred.

4. Nonsustained VT in patients with CAD, prior MI, LV dysfunction, and inducible VF or sustained VT not suppressible by a Class I antiarrhythmic drug.

5. Spontaneous sustained VT without structural heart disease not amenable to other Rx.
ACC/AHA/NASPE 2002
RECOMMENDATIONS FOR ICD THERAPY

Class IIb

1. Cardiac arrest presumed to be due to VF when EPS is precluded by other medical conditions.

2. Severe Sx (e.g., syncope) attributable to ventricular tachyarrhythmias in patients awaiting cardiac transplantation.

3. Familial or inherited conditions with high risk for life-threatening ventricular tachyarrhythmias (e.g., LQTS, HCM).

4. Nonsustained VT with CAD, prior MI, and LV dysfunction, and inducible sustained VF.

5. Recurrent syncope of undetermined origin in the presence of ventricular dysfunction and inducible ventricular arrhythmias when other causes of syncope have been excluded.

6. Syncope of unexplained origin or family hx of unexplained sudden cardiac death in association with Brugada ECG.

7. Syncope in patients with advanced structural heart disease in whom investigation has failed to define a cause.
ACC/AHA/NASPE 2002
RECOMMENDATIONS FOR ICD THERAPY

Class III 1. Syncope of undetermined cause in a patient without inducible ventricular tachyarrhythmias and without structural heart disease.

2. Incessant VT or VF.

3. VF or VT resulting from arrhythmias amenable to surgical or catheter ablation

4. Ventricular tachyarrhythmias due to a transient or reversible disorder when correction of the disorder is feasible and likely to reduce the risk of recurrent arrhythmia.
INDICATIONS TO REFER SYNCOPAL PT TO ELECTROPHYSIOLOGIST

• Neurocardiogenic syncope, especially if refractory to avoidance of triggers and drug Rx, or associated with prolonged pauses in cardiac rhythm

• Arrhythmia identified during evaluation:
  - VT due to any cause
  - Bradyarrhythmia caused by Rx that cannot be withheld or changed
  - Supraventricular tachycardia, esp. with WPW conduction
INDICATIONS TO REFERSYNCOPAL PT TO ELECTROPHYSIOLOGIST

- Congenital long QT syndrome
- Brugada syndrome
- Structural heart disease
- Syncope in athletes
- Syncope during exercise
- Origin of syncope remains unknown and prolonged arrhythmia monitoring by implantable loop recorder is being considered