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ACC Latin America Conference 2017

Special
Syncope Guidelines: What's New?

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Saturday, June 24, 2017

10:25 to 11:10 a.m.

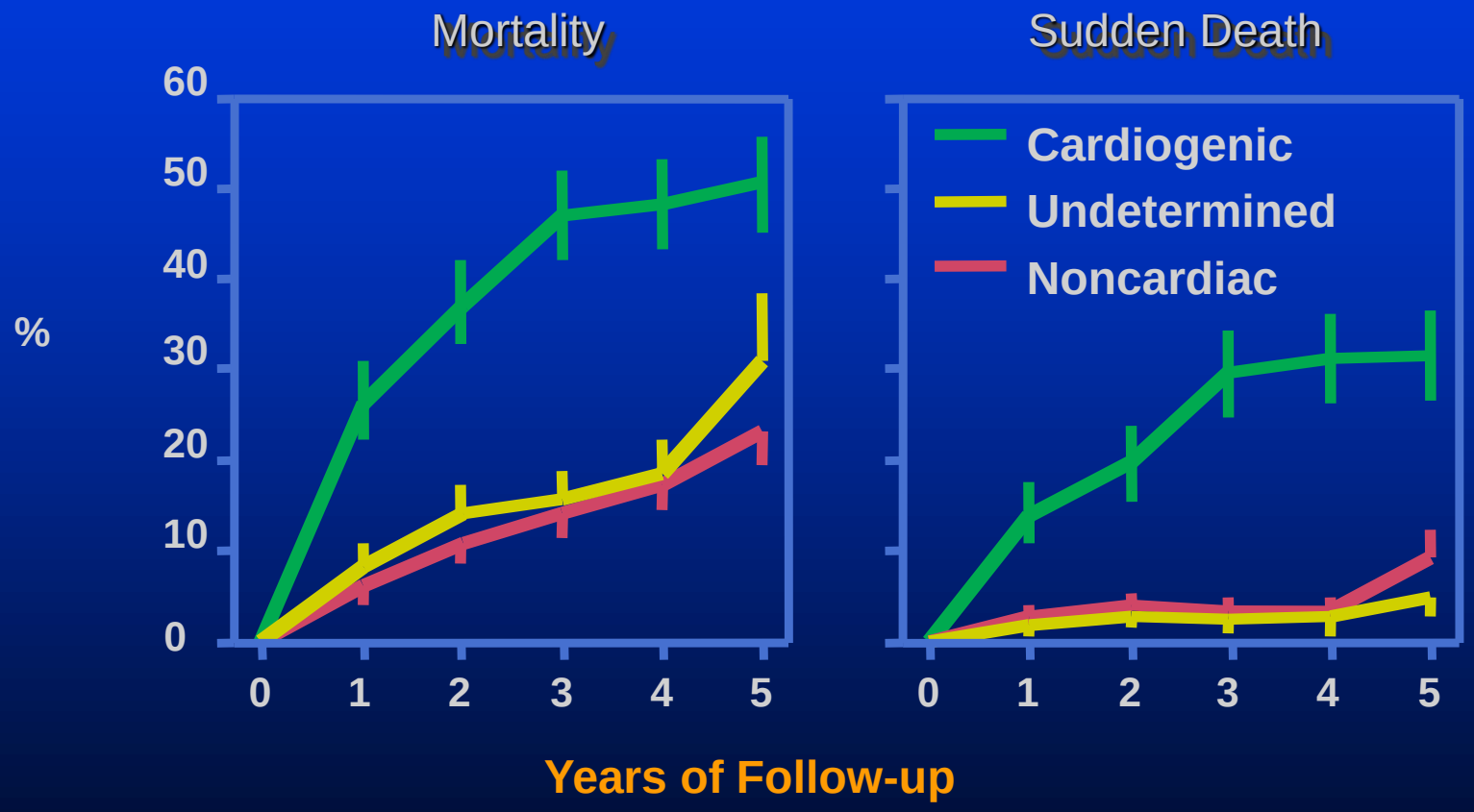
Conclusions

- **Risk stratification is critical**
  - History, physical examination and simple screening tests for structural heart disease
- **Medical therapy for vasovagal syncope is largely empiric**
  - Beta antagonists, alpha agonists, volume expansion
  - Role of pacing unclear
- **Tilt-testing is useful if it reproduces clinical symptoms**
  - Premature use of tilt test in syncope algorithm is misleading
- **Neurological testing is of little value unless suggested by history and examination**

Syncope at Mayo Clinic

- 600-1,000 ER patients/year
- 2,000-2,500 outpatient clinic evaluation/year
- 400 hospital admissions/year
- 30% of electrophysiology practice
  - 500 arrhythmia consults/year
  - 250 EP studies/year
  - 300 tilt table testing/year

Syncope and Mortality

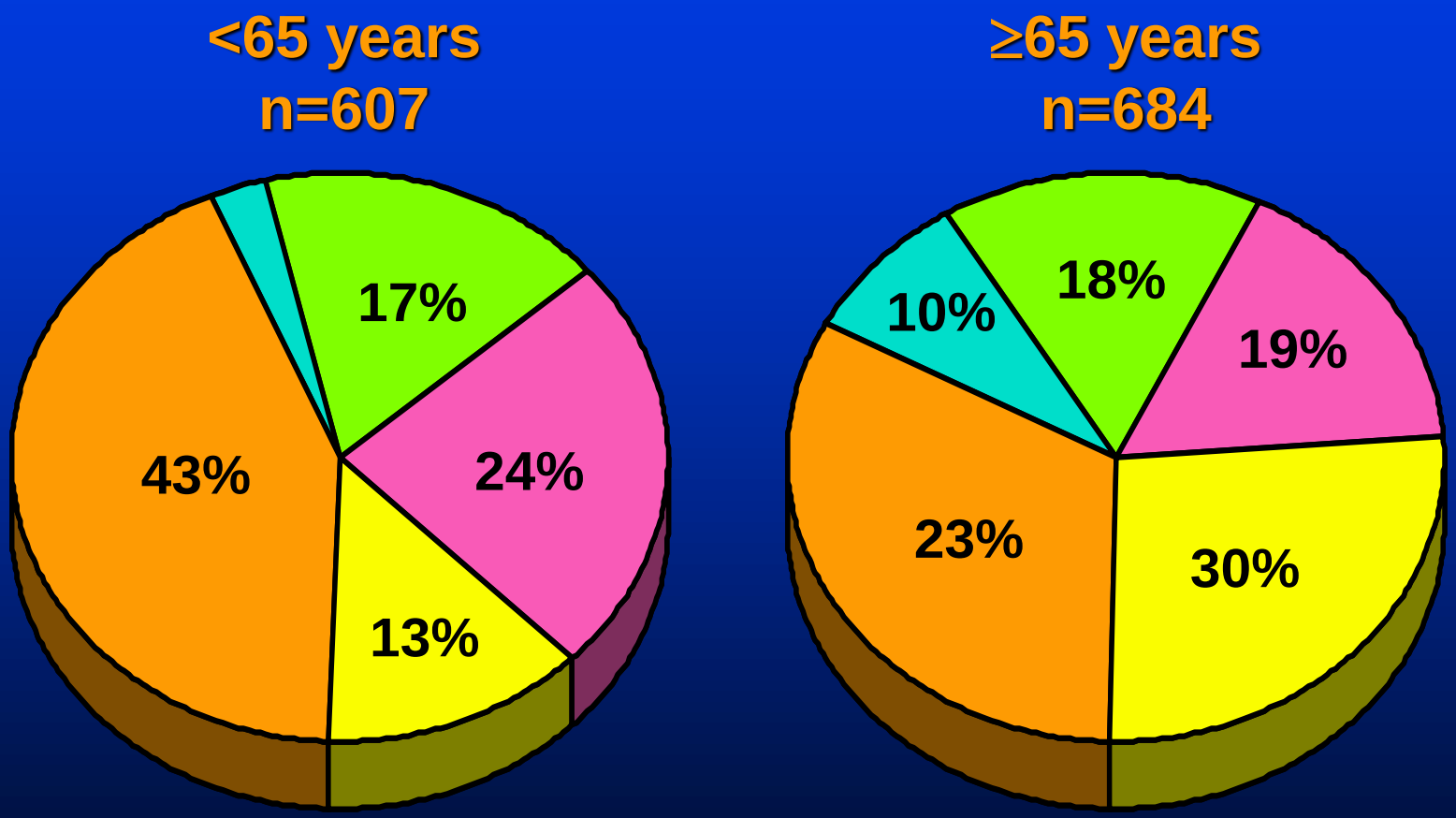


Kapoor: Medicine, 1990

Causes of Syncope

- Reflex-mediated
- Orthostatic hypotension
- Psychiatric
- Neurologic
- Cardiac
- Humorally mediated

Causes of Syncope
Mayo Clinic: 1996-1998 (n=1,291)



Value of the History and Physical Examination

Study	N	Dx by Hx & PE (%)	Dx by ECG (%)
Kapoor 1990	433	32	7
Ben-Chetrit 1995	101	33	11
Martin 1984	170	53	1
Eagle 1983	100	52	
Silverstein 1982	108	38	
Day 1982	198	74	2
All studies	1100	45	5

Key Features of History

- **Prodromal symptoms**

  Nausea, diaphoresis, claustrophobia, palpitations

- **Abruptness of onset, offset**

  Spaghetti vs. celery syncope

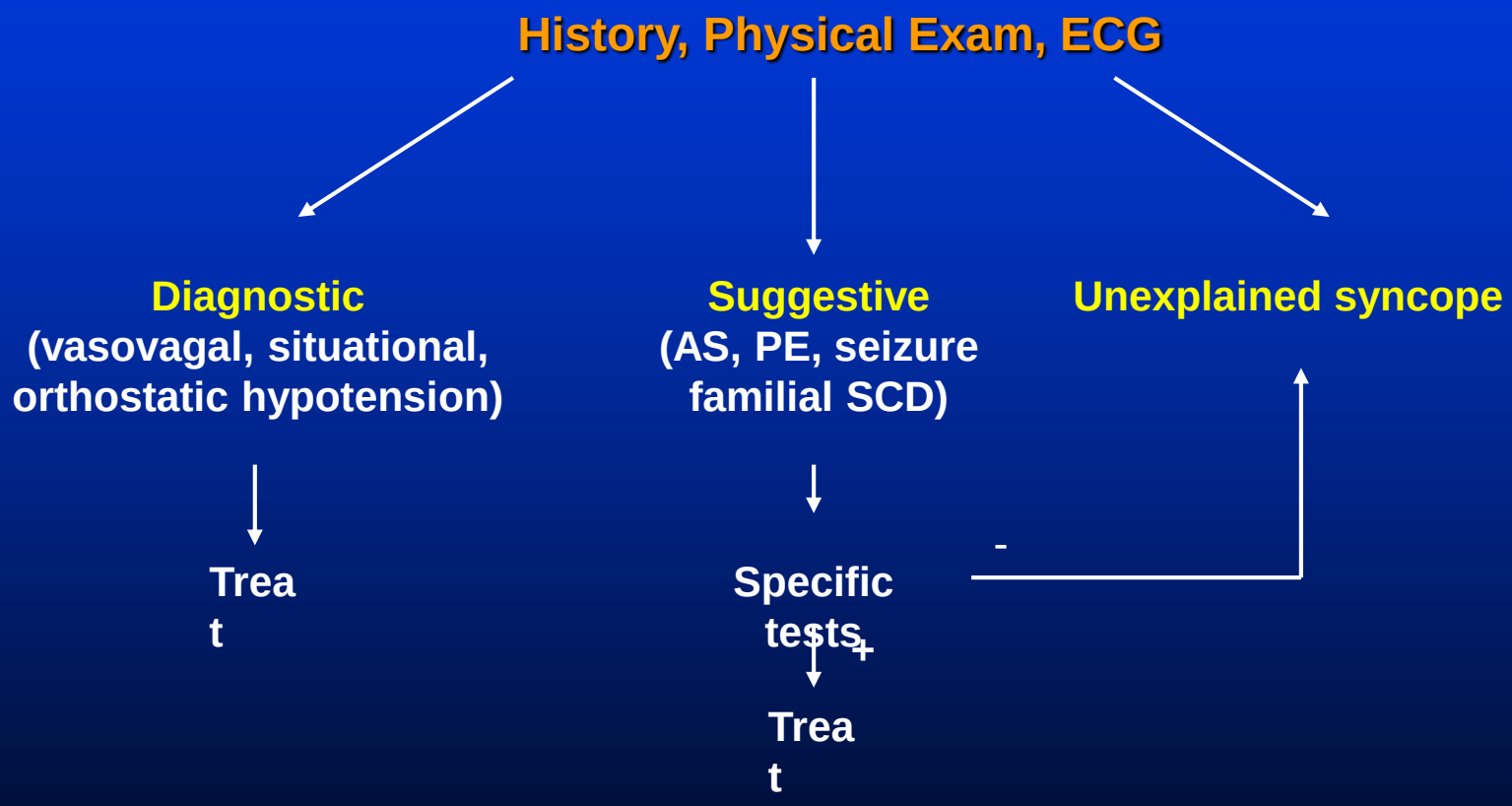
- **Associated incontinence, seizure activity**

  Post-ictal confusion, prostration

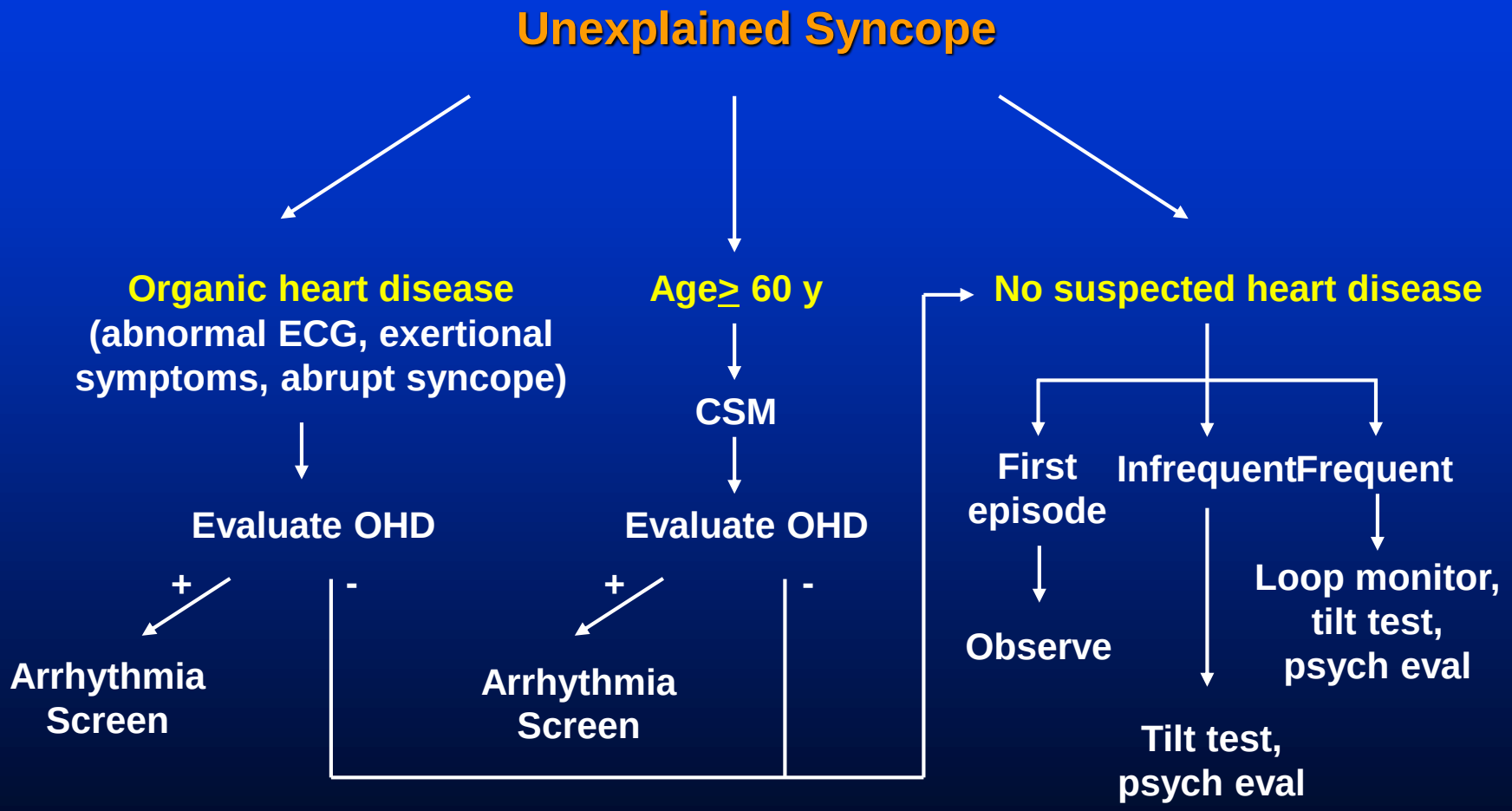
Key Features of Examination

- **Arterial pressure**
  - Supine, seated, upright, upright after 1-2 mins
  - Right and left arms
- **Precordium**
  - LV aneurysm
  - RV lift, palpable P2
- **Cardiac murmur**
  - Effects of valsalva maneuver, standing, squatting
  - Left decubitus position

Algorithm for Evaluation of Syncope



Algorithm for Evaluation of Syncope



Screening for Arrhythmias

- Ambulatory ECG
- Loop recorder
  - Continuous (King of Hearts)
  - Heart Card
  - Implantable recorder
- Electrophysiologic testing

24 Hour Ambulatory ECG Yield

1,512 patients

Syncope/presyncope during monitoring (17%)

Documented arrhythmia (2.1%)

Arrhythmia without symptoms (15%)

Gibson: AJC 53, 1984

External Loop Recorder Yield

526 patients

Palpitations/syncope/presyncope

Transmission (49%)

No transmission (51%)

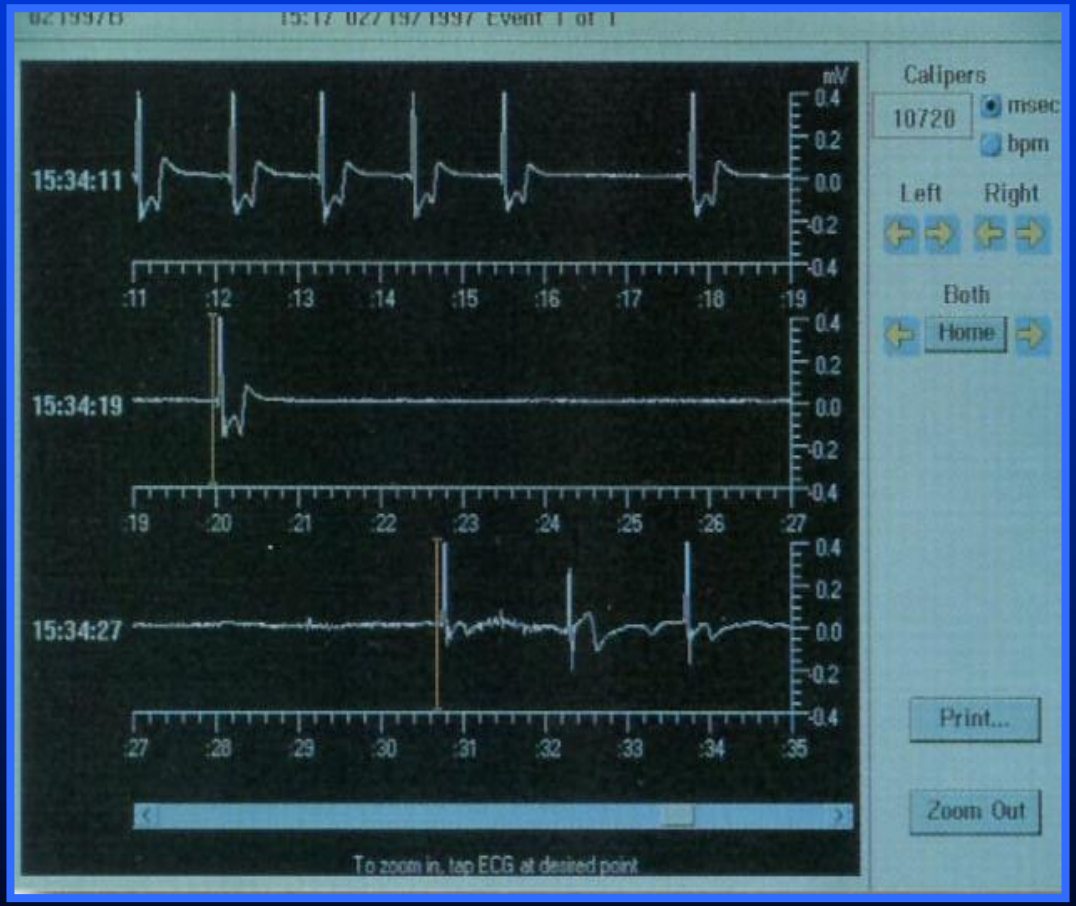
Arrhythmias (35%)

No arrhythmias (14%)

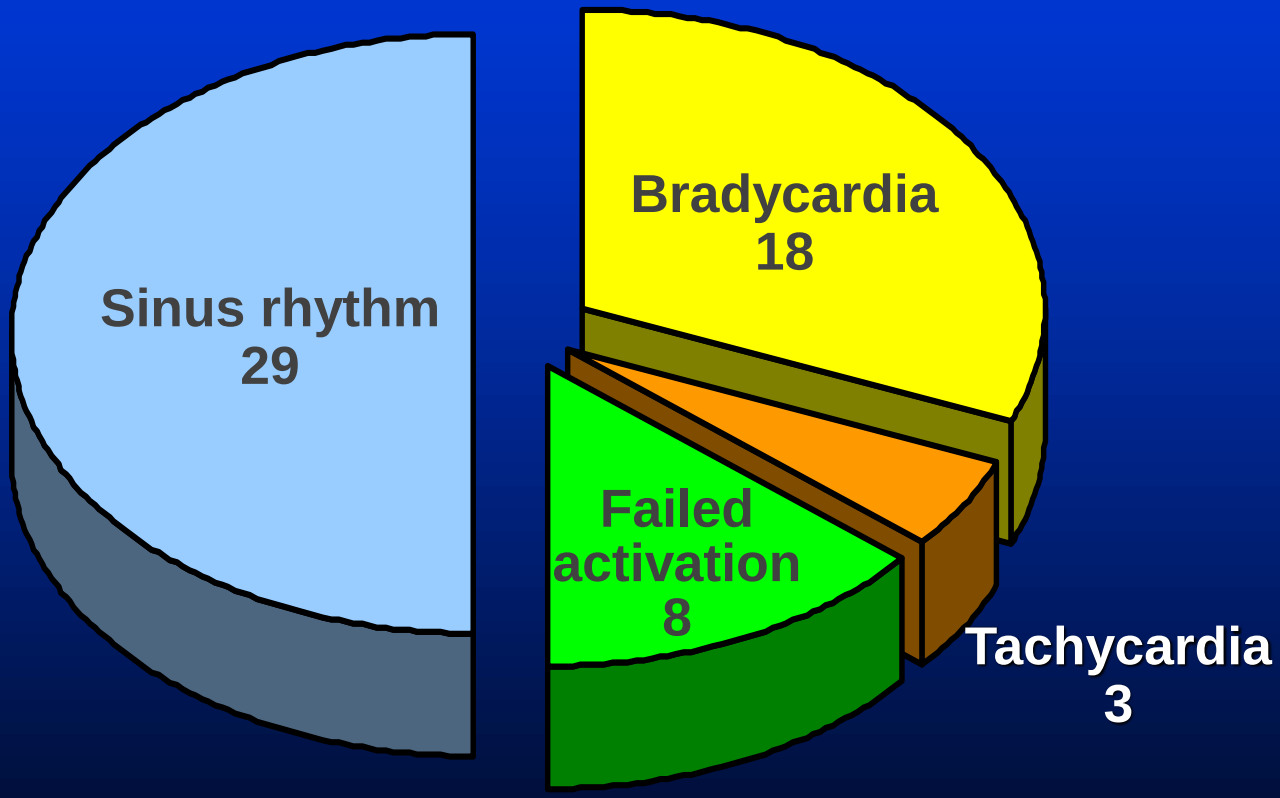
Shen: Mayo Clinic Proc, 1987

Implantable Loop Recorder

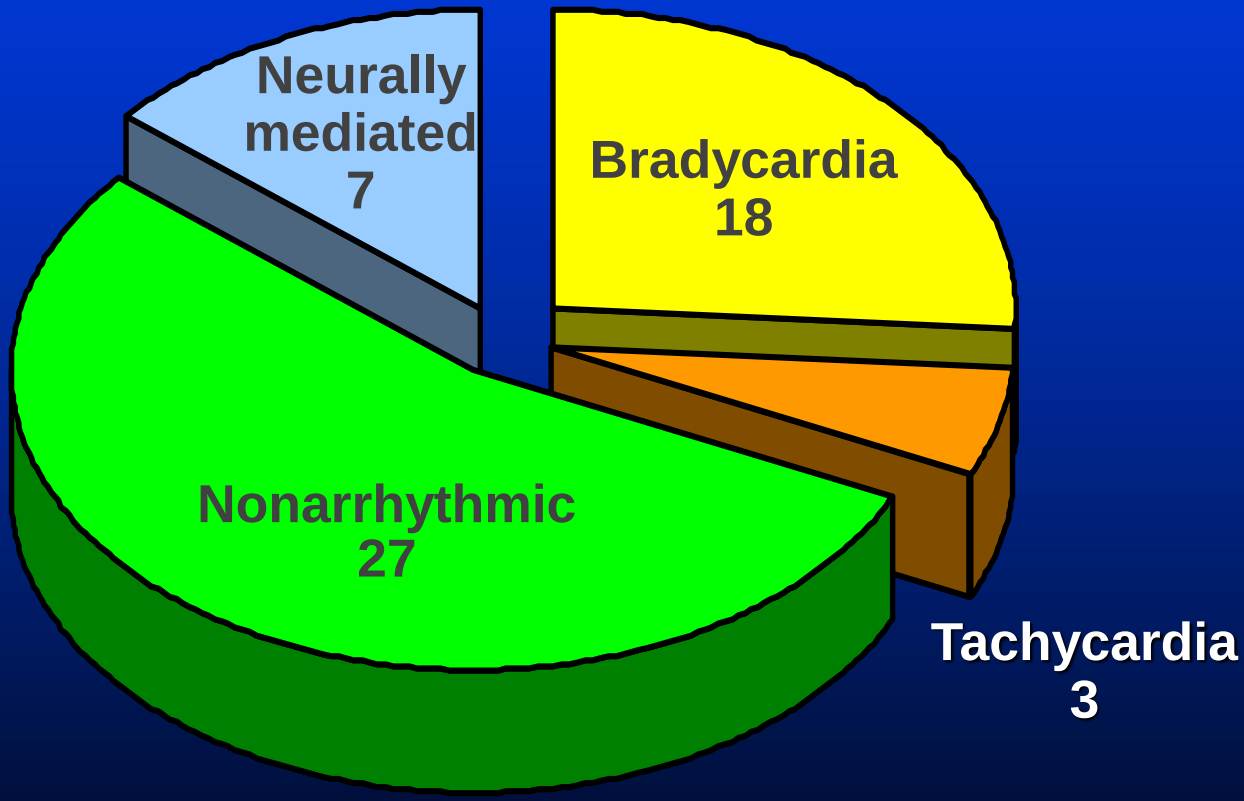
Implantable Loop Recorder



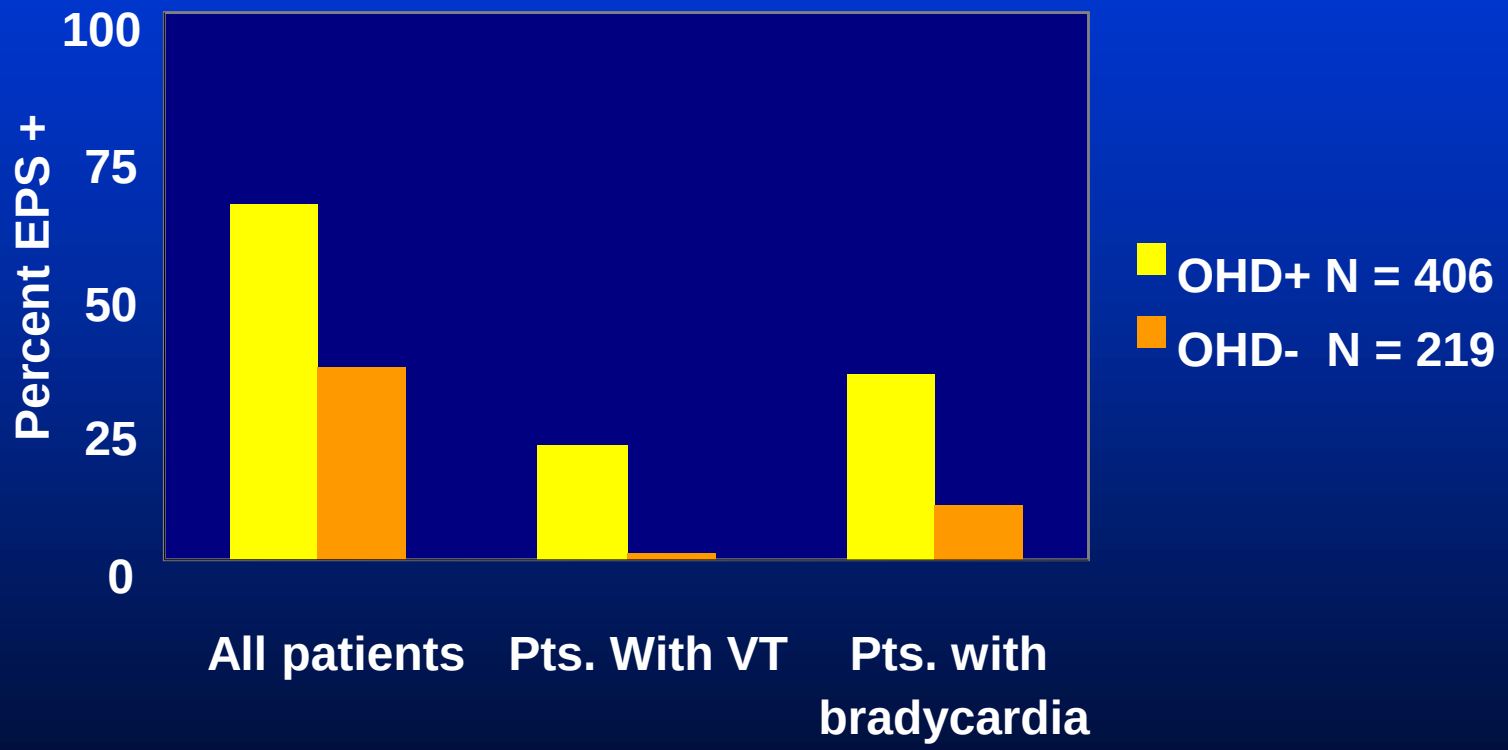
ILR: Rhythm at time of symptoms



ILR: Etiology of Syncope



Yield of EP study
8 studies, 625 patients with syncope



Yield of Neurologic Testing in Syncope

- In patients unselected by history or physical exam for evidence of neurologic disease, yield of EEG, cranial imaging, & neurovascular studies is < 2%
- Carotid disease causes syncope only with high grade stenosis and contralateral carotid occlusion
  Bruits usually present
- Associated diplopia, paresis, intractable nausea suggest vertebrobasilar insufficiency

Transient Loss of Consciousness & Cerebral Ischemic Events

Incidence of Syncope (%)

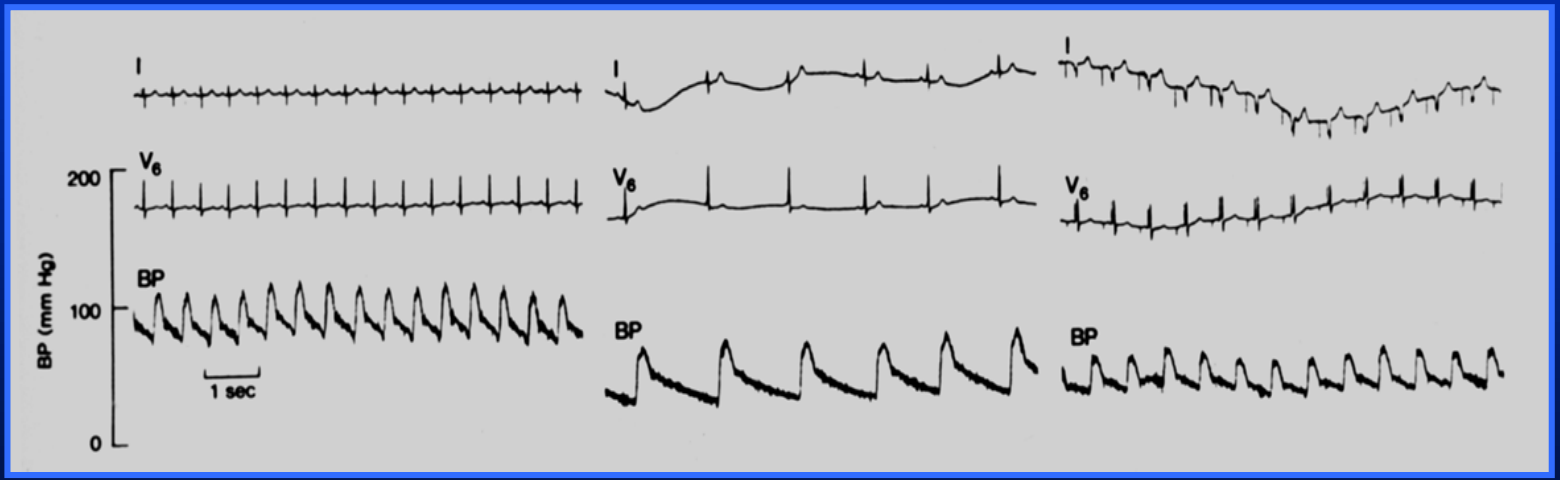
Stroke		TIA	
Ischemic	6.5	Basilar	1.5
Embolic	13.2	Carotid	0

Bousser: Ann Med Intern, 1981

Tilt Testing

Tilt Induced Vasovagal Response

Baseline BP 136/67 mmHg HR = 115 bpm	BP 54/30 mmHg HR = 39 bpm	BP 47/29 mmHg PCL = 700 msec
Baseline Tilt	Vasovagal response	A-V pacing CL = 700 ms



Tilt Testing in Syncope

Technical Issues

Tilt angle	60-80° acceptable 70° most common
Tilt duration	30-45 min Data support a 45 min protocol
Drug Provocation	Isoproterenol, NTG, edrophonium

ACC Expert Consensus Conference JACC 1996

Tilt Testing in Syncope

	Positive yield (pseudo sensitivity) (%)	Specificity controls (%)	Reproducibility (%)
Passive tilt	20-75	80-90	60-70
Isoproterenol	40-85	55-80	65-90

Tilt Testing in Syncope: Caveats

- Negative responses are more reproducible than positive
- Interpretation of positive response relies on similarity of spontaneous and provoked symptoms
- Serial testing for drug efficacy not useful
- Positive response should not halt further evaluation in patients with structural heart disease

Treatment of Vasovagal Syncope

- Mechanisms poorly understood
- Few randomized blinded drug trials

  Small trials with atenolol and paroxetine
- Spontaneous resolution makes many treatments
  appear effective
- Conflicting data regarding pacing

Efficacy of Beta-Blockade in VVS

	Repeat tilt		Continued tilt-proven drug		Discontinued tilt-proven drug		Received empiric Rx	
Oral drug	Pt (no.)	Efficacy (%)	Pt (no.)	Recur (%)	Pt (no.)	Recur (%)	Pt (no.)	Recur (%)
Atenolol	98	91	71	11	10	40	7	14
Propranolol	33	100	28	7	5	60	2	50
Metoprolol	22	100	16	0	4	25	3	33
Nadalol	4	100	3	67	0	0	1	0
Total	157	94	118	10	19	42	13	23

Cox: JACC, 1995

Efficacy of Atenolol in VVS

- Randomized, double-blinded, placebo-controlled study
- Inclusion:
  - 50 patients
  - At least 2 episodes VVS in past year
  - Tilt test followed by IV atenolol
- Placebo (N=24) or atenolol 50 mg / day(N=26)
- End-point: time to recurrence of syncope

Madrid: JACC, 2001

Efficacy of Atenolol in VVS

- Tilt test positive in 20 patients
  - IV atenolol prevented another positive tilt-test in 5
- One year follow-up:
  - Median # of syncopal spells 2 (atenolol), 0 (placebo)
  - Median time to recurrence 7 months w/ no difference between groups
- Conclusion:
  - Recurrence rate drops in both groups
  - No effect of atenolol proved

Madrid: JACC, 2001

North American Vasosvagal Pacing Study (VPS)

- Six or more lifetime episodes of syncope
- Tilt test induces syncope/presyncope
  Relative bradycardia
- Randomized to rate-drop pacemaker
- 54 patients enrolled
- Endpoint: time to first recurrence of syncope

JACC 1999;33:16-20

VPS: Results

- 27 patients randomized to pacer/27 to observation

  7% beta-blocker use in both groups
- Time from randomization to syncope

  No pacer - 54 days

  Pacer - 112 days
- No effect on presyncope

VPS: Problems

- Non paced group received little medical therapy
- Placebo effect of pacer implant not assessed
- No data regarding frequency of rate-drop pacing and correlation with abortive symptoms
- Possible type II statistical error due to small sample size

Conclusions

- **Risk stratification is critical**
  - History, physical examination and simple screening tests for structural heart disease
- **Medical therapy for vasovagal syncope is largely empiric**
  - Beta antagonists, alpha agonists, volume expansion
  - Role of pacing unclear
- **Tilt-testing is useful if it reproduces clinical symptoms**
  - Premature use of tilt test in syncope algorithm is misleading
- **Neurological testing is of little value unless suggested by history and examination**

Those who suffer from frequent and severe fainting often die suddenly.

Hippocrates 1000 BC

Syncope: Case Study # 1

- 25 year old female
- Flurry of syncopal spells ages 9 and 14
- Restricted from high school sports
- 4 episodes as a high school senior

Syncope: Case Study # 1

- **June 1996**
  - Witnessed syncope
  - Impaired consciousness X 5 minutes
  - No incontinence
  - Possible retrograde amnesia
- **July/ August 1998**
  - Syncope X4 at home
  - No premonitory symptoms/aura
  - Retrograde amnesia
  - No incontinence

Syncope: Case Study # 1

- **Past Medical History**
  - Asthma
  - Closed head injury age 3
- **Family history**
  - Premature CAD
  - No family history of SCD, syncope, seizures
- **Examination**
  - BP 100/78, pulse 64 seated
  - BP 100/54, pulse 72 standing
  - Exam otherwise normal

Syncope: Case Study # 1

- ECG entirely normal
- Echocardiogram entirely normal

Syncope: Case Study # 1

Next Diagnostic Step?

- 1) Head up tilt test
- 2) EP study
- 3) Neurological evaluation
- 4) Loop recorder

Syncope: Case Study # 1

Head up tilt test

- With isoproterenol, 70 degrees, presyncope at 3 min
- Provoked symptoms unlike spontaneous episodes

Syncope: Case Study # 1
Next Diagnostic/Therapeutic Step?

- 1) EP study
- 2) Neurological evaluation
- 3) Loop recorder
- 4) Treat for vasovagal syncope and observe

Syncope: Case Study # 1
Electrophysiologic Study

- Dual retrograde pathways without SVT

Syncope: Case Study # 1

Neurology evaluation

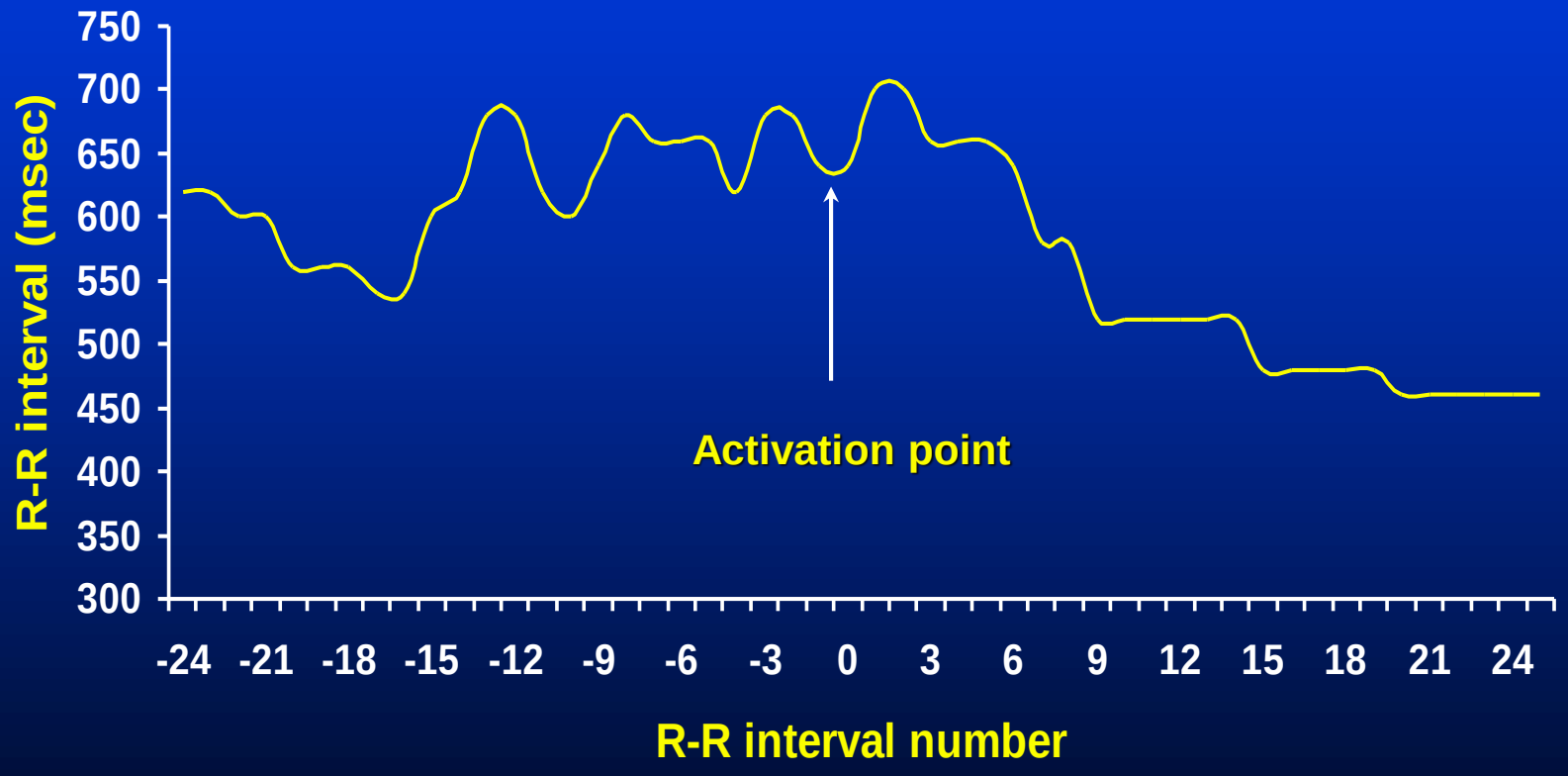
- Examination normal
- EEG sleep and awake-normal
- MRI normal
- Impression-seizure unlikely

Syncope: Case Study # 1
Loop recorder

- Implantable loop recorder placed
- 3 episodes syncope/presyncope
- Device activated by relative after syncopal spell

Syncope: Case Study # 1

R-R Intervals at time of syncope



Syncope: Case Study # 1

Inpatient observation on epilepsy monitoring unit

- Syncope and presyncope observed
- EEG normal
- Hypotension without bradycardia documented
- Dismissed on fludrocortisone

Syncope: Case Study #2

- 78 year old male
- 4 episodes syncope in 4 years

  1992- Walking in AM, no bkfst, turned head brief LOC

  1993- Standing cooking, rushing in head, brief LOC

  1995- Kneeling in church, no bkfst, rushing in head, brief LOC

  1996-Standing in kitchen, rushing in head, brief LOC

Syncope: Case Study #2
Medical History

- **PMH**
  Borderline hypertension
  Possible Meniere's disease
- **Family history**
  No SCD/syncope or CAD
- **Medication**
  Nadolol 10 mg/d
  Meclizine 37.5 mg/d
- **Coronary Risk Factors**
  Gender, hypertension

Syncope: Case Study #2
Examination

- Weight 218 lbs
- BP 160/104 R & L, pulse 70 and regular
- Hear, lung vascular, neurological exams normal

Syncope: Case Study #2
Prior Evaluation

- Chest X ray- LV enlargement
- EKG - Voltage criteria for LVH; one PVC
- Chemistries, CBC, sTSH, UA - normal
- ENT evaluation - no evidence Meniere's
- Sleep study - suggestive of sleep apnea

Syncope: Case Study #2

Next Diagnostic Step ?

- 1) Head up tilt test
- 2) Loop recorder
- 3)Electrophysiologic study
- 4) Neurological evalaution

Syncope: Case Study #2
Head-up tilt test (outside)

- 80 degrees head-up isoproterenol 5 mcg/min
- BP 140 to 90 systolic
- No change in pulse
- Symptoms somewhat similar to spontaneous episodes

Syncope: Case Study #2
Head-up tilt test (Mayo)

- Normal response to CSM
- 70 degrees head-up, isoproterenol 3 mcg/min
- At 20 min BP fell to 70/40, sinus rate fell to 60 bpm
- Symptoms somewhat similar to spontaneous episodes

Syncope: Case Study #2

Next Diagnostic/Therapeutic Step ?

- 1) Electrophysiologic study
- 2) Neurological evaluation
- 3) Increase nadolol dose
- 4) Loop recorder

Syncope: Case Study #2
Loop recorder

- Dizzy and lightheaded, but no syncope/presyncope
- Single PVC detected on strip

Syncope: Case Study #2
Next Diagnostic/Therapeutic Step ?

- 1) Electrophysiologic study
- 2) Neurological evaluation
- 3) Psychiatric evaluation
- 4) Implantable loop recorder

Syncope: Case Study #2
Electrophysiologic study

- Transthoracic echo prior to EP study
  - Inferolateral hypokinesis
  - Ejection fraction 45 %
- Ventricular tachycardia reproducibly induced
  - 2 extrastimuli, drive cycle 400, RVA
  - RBBB NAX CL 230
- VT suppressed with sotalol

Syncope: Case Study #3

- 68 year old female
- 7 year history of spells
  - 30-60 min lightheadedness
  - Intermittent syncope
  - Nausea, vomiting, diarrhea, palpitations
- Well between episodes

Syncope: Case Study #3
Medical History

- Cholecystectomy, appendectomy, tonsillectomy
- Family History

  Mother - breast cancer

  Brother - myocardial infarction

  Sister - valvular heart disease
- Medication - estrogen, Ca suppl, ASA 325/d

Syncope: Case Study #3
Examination

- BP 110/60 R & L without orthostatic change
- ENT - nl
- CV - nl
- Skin - no rash
- Abd - nl

Syncope: Case Study #3
Laboratories

- ECG - ventricular paced rhythm
- CXR - normal pacer lead position
- Echocardiogram - normal chamber sizes

Syncope: Case Study #3
Prior Evaluation and Treatment

- 1990 - Coronary angiography normal
- 1993 - EP study and attempted ablation of atrial tachycardia focus “near sinus node”
- 1995 - AV node ablation and pacer implant
  recurrent spell in hospital after procedure
- Consultations

  Neurology - ? Seizures

  Gastroenterology - ? Eating epilepsy

  Cardiology - ? Postprandial hypotension

Syncope: Case Study #3
Next Diagnostic/Therapeutic Step ?

- 1) Psychiatry evaluation
- 2) Urinary metanephrines
- 3) Urinary 5 HIAA
- 4) Bone marrow biopsy

Syncope: Case Study #3

- Bone marrow biopsy - perivascular infiltrates of tryptase positive cells
- Serum tryptase 28 ng/ml
- Diagnosis: systemic mastocytosis
- Treatment: antihistamines and aspirin

Syncope: Case Study #3

- Lessons

  Wacky symptoms in non-wacky patient warrant exhaustive search

  If all the usual suspects are innocent, round up the unusual ones

  Zebras are mostly in other countries and zoos, but only mostly

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