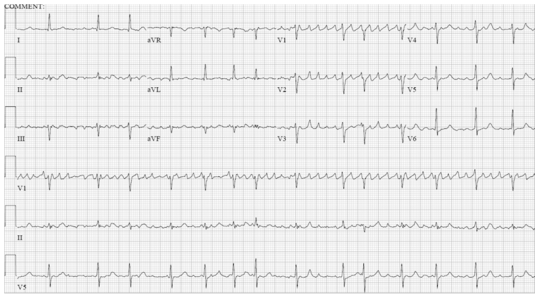
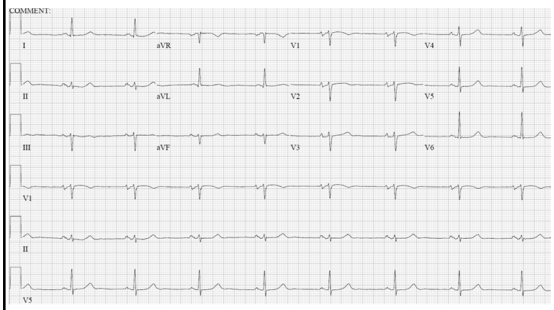
Case 1

- 80 yo Caucasian female presents for follow-up for atrial fibrillation with rapid ventricular rates, incidentally noted while presenting to an ED for diarrhea. She was started on diltiazem and apixaban. She is feeling well except for some dizziness which has improved with decreased diltiazem.
- PMH: Hypothyroidism (well-controlled), ascending aortic aneurysm (4.5 cm)
- Meds: started on aspirin 325 mg daily, diltiazem 120 mg daily
- PE: well-appearing, 118/78, HR 72, irregular; otherwise unremarkable

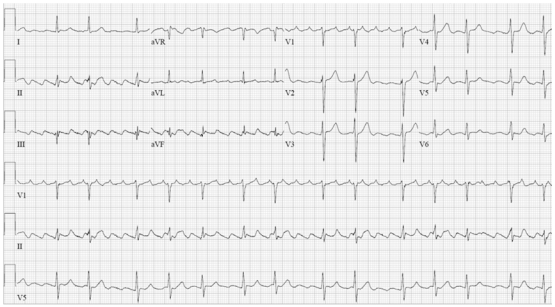
ECG upon discharge from ED



ECG in Clinic



Atrial Flutter - *very* regular flutter waves



Next steps

1. **Thromboembolic risk reduction**
   1. Calculate CHA2DS2-VASc score
   2. Consider anticoagulation
2. **Rate control**
   1. Continue diltiazem
3. **Rhythm control**
   1. Watch and wait
   2. Anti-arrhythmic medication
   3. Catheter ablation

New Guidelines: CHA_2DS_2-VASc

Risk Factor	Score
CHF/LV dysfunction*	1
Hypertension	1
Age > 75	2
Diabetes	1
Stroke/TIA	2
Vascular disease	1
Age 65-74	1
Female sex	1
Maximum Score	9

*Mod-Sev Reduced LVEF
--or-- recent decomp HFrEF/HFpEF

Score	Stroke Rate (%/Year)
0	0
1	1.3%
2	2.2%
3	3.2%
4	4.0%
5	6.7%
6	9.8%
7	9.6%
8	6.7%
9	15.2%

January C et al; JACC 64 (21) 2014

New Guidelines: CHA_2DS_2-VASc Less emphasis on aspirin

Table 2 Comparison of guideline recommendations for antithrombotic therapy based on $CHADS_2$ or CHA_2DS_2-VASc score [12, 48, 49]

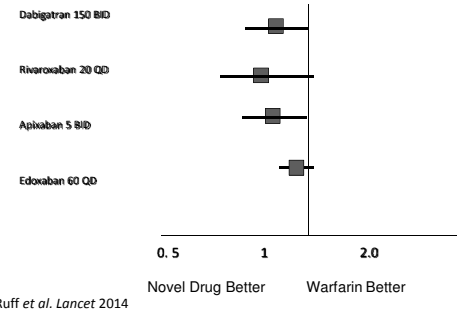
2012 CHEST guidelines on antithrombotic therapy for atrial fibrillation	2012 Focused update of the ESC guidelines for atrial fibrillation	2014 AHA/ACC/HRS atrial fibrillation guidelines
$CHADS_2$ score of 0: no antithrombotic therapy (IIB[a])	CHA_2DS_2-VASc score of 0: no antithrombotic therapy (IB)	CHA_2DS_2-VASc score of 0: no antithrombotic therapy (IIa, B)
$CHADS_2$ score of 1: oral anticoagulation rather than no therapy (IB) and rather than aspirin or combination therapy with aspirin and clopidogrel (IIB)	CHA_2DS_2-VASc score of 1: oral anticoagulation with adjusted-dose VKA, direct thrombin inhibitor (dabigatran), or oral factor Xa inhibitor (e.g., rivaroxaban, apixaban) should be considered based on risk of bleeding and patient preferences (IIa, A)	CHA_2DS_2-VASc score of 1: no antithrombotic therapy or treatment with oral anticoagulant or aspirin may be considered (IIb, C)
$CHADS_2$ score of ≥2: oral anticoagulation rather than no therapy (IA) with dabigatran suggested rather than adjusted-dose VKA (IIB)	CHA_2DS_2-VASc score of ≥2: oral anticoagulation with adjusted-dose VKA, direct thrombin inhibitor (dabigatran), or oral factor Xa inhibitor (e.g., rivaroxaban, apixaban) is recommended (IA)	CHA_2DS_2-VASc score of ≥2: oral anticoagulation (options include warfarin [IA], dabigatran [IB], rivaroxaban [IB], or apixaban [IB])

Kalabalik *et al. Drugs* 2015

New Anticoagulants FDA Approved

	Dabigatran	Rivaroxaban	Apixaban	Edoxaban
Trial Name	RELY	ROCKET-AF	ARISTOTLE	ENGAGE-AF
Population	CHADS2 ≥ 1	CHADS2 ≥ 2-3	CHADS 2 ≥ 1	CHADS2 ≥ 2
Sample size	18000	14000	18000	21105
Comparator	Warfarin	Warfarin	Warfarin	Warfarin
Dosing	110/150 BID	20 QD	5 BID	30/60 QD
Blinding	Partial	Blinded	Blinded	Blinded
Endpoint	Stroke/SE	Stroke/SE	Stroke/SE	Stroke/SE

NOAC vs. Warfarin Mortality



Ruff *et al. Lancet* 2014

NOAC vs. Warfarin

	RRR	P Value
Stroke or SE	0.81	P<0.0001
Hemorrhagic stroke	0.49	P<0.0001
All cause mortality	0.90	P=0.0003
Intracranial hemorrhage	0.48	P<0.0001
GI bleeding	1.25	P=0.04

Ruff *et al. Lancet* 2014

Next steps

- Diagnostic Testing
  - Echocardiogram
  - Holter monitor

- The echocardiogram was largely normal.

Diagnosis and Therapeutic Options

- **Diagnosis**
  - Tachy-brady syndrome
- **Therapeutic options**
  - Anti-arrhythmic medication
  - Catheter ablation
  - Pacemaker

A Word on Bradyarrhythmia

- Definition:
  - A heart rhythm with a ventricular rate < 60 (50) beats per minute
    - Sinus node dysfunction
    - AV block

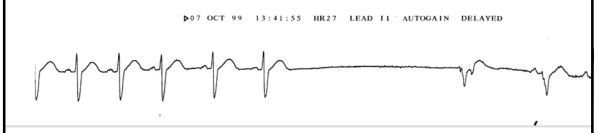
Bradyarrhythmia

Symptoms:

- Syncope
  - Sudden loss of consciousness with loss of postural tone
- Presyncope/dizziness
- Poor exercise tolerance/fatigue
- Congestive heart failure

- *No Symptoms*

Sinus Pause/Arrest



Prognosis

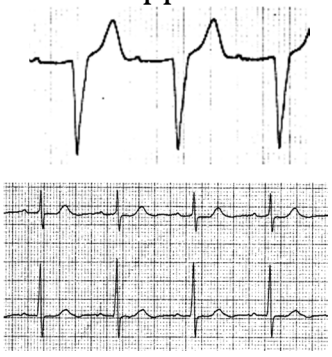
- Sinus node dysfunction – generally benign, though risk of syncope and injury
  - Sinus bradycardia, symptomatic
  - Sinus arrest
  - Tachy-brady syndrome

- AV Block
  - First-Degree (AV Node*)
  - Second-Degree
    - Mobitz I (AV node*)
    - Mobitz II (His-Purkinje system*)
  - Third-Degree (His-Purkinje system*)

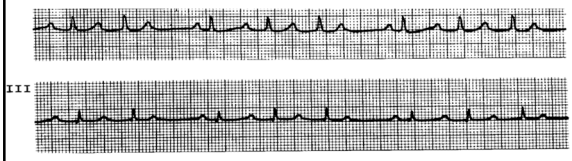
Benign prognosis

More malignant prognosis

1st Degree AV block
Delay – no dropped beats



2nd degree AV block Mobitz Type I (Wenckebach)
Progressive delay with dropped beats

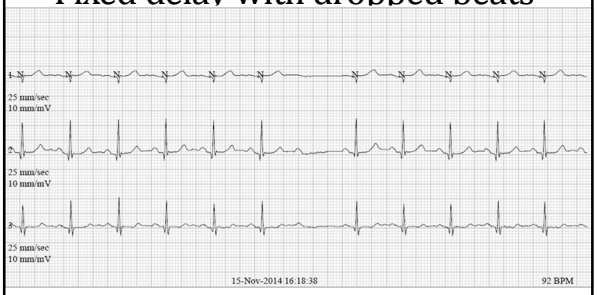


5476 76M

FIGURE 19–4. Type I second-degree AV block with typical Wenckebach phenomenon.

(Chou. Electrocardiography in Clinical Practice 3rd ed.)

2nd Degree AV block
Mobitz Type II
Fixed delay with dropped beats



3º AV block
Complete AV block – no conduction from A to V

Prognosis

- Sinus node dysfunction – generally benign, though risk of syncope and injury
  - Sinus bradycardia, symptomatic
  - Sinus arrest
  - Tachy-brady syndrome
- AV Block
  - First-Degree (AV Node*)
  - Second-Degree
    - Mobitz I (AV node*)
    - Mobitz II (His-Purkinje system*)
  - Third-Degree (His-Purkinje system*)

Benign prognosis

More malignant prognosis
--- *needs paceamker*

Case 1

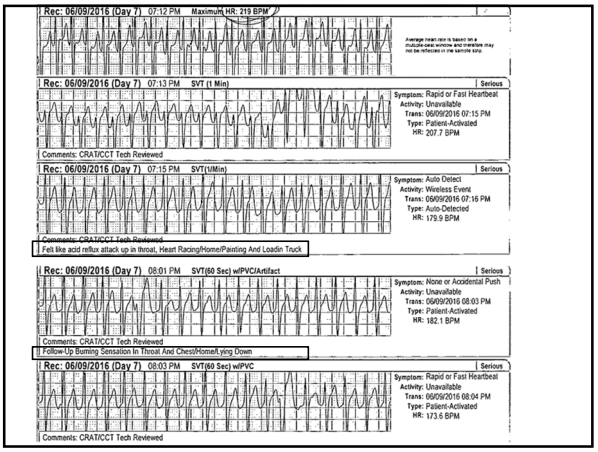
- The patient received a permanent pacemaker and up-titration of her diltiazem.
- She had recurrent AF with RVR and was started on dronedarone (Multaq) for rhythm control.
- In a younger patient, catheter ablation can also be considered for rhythm control.

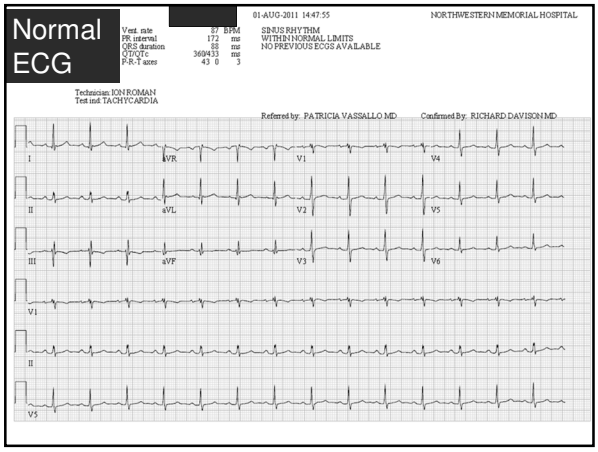
Overview

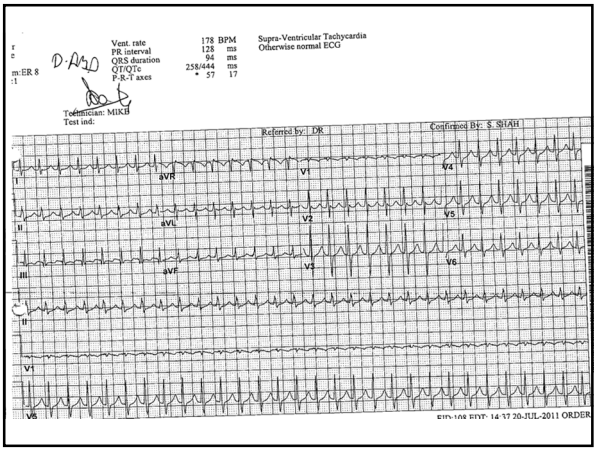
- Introduction
- Case 1
  - Atrial fibrillation
    - Thromboembolic risk reduction (NOAC vs. warfarin)
    - Rate control
    - Rhythm control
  - Brady-arrhythmias
    - Sinus node dysfunction (generally benign, though syncope/injury may occur)
    - AV block (Mobitz II, complete heart block can be life-threatening if no escape rhythm)
- Case

Case 2

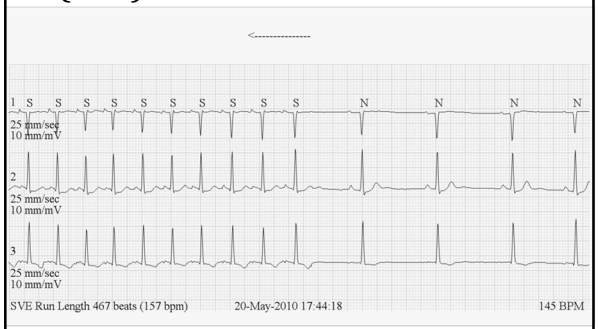
- 70M with DM II, HTN, CAD, s/p LAD stent 3 years prior presents with episodic “attacks” characterized by chest pressure, a choking sensation, and palpitations. These occur 1-2 times per month and last about 30 minutes.
- He underwent coronary angiography with stent placement and transoral incisionless fundoplication to treat angina and GERD, respectively, but his attacks persisted.
- He ultimately underwent 30-day event monitoring during which an “attack” occurred.





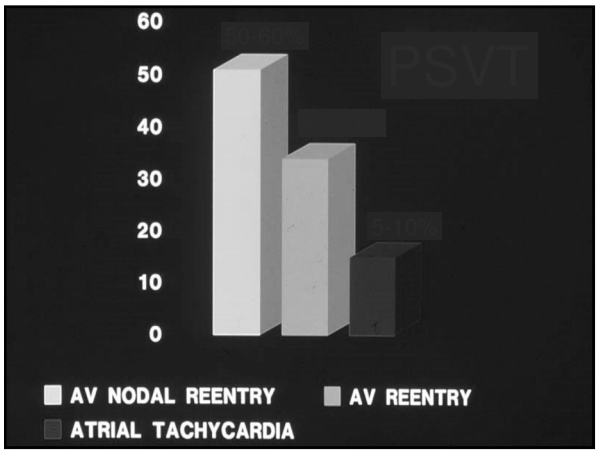


Supraventricular Tachycardia (SVT)



Paroxysmal Supraventricular Tachycardia (PSVT)

- REGULAR, NARROW-QRS TACHYCARDIA
  - AV nodal reentrant tachycardia (AVNRT)
  - Atrio-ventricular reentrant tachycardia (AVRT)
  - Ectopic atrial tachycardia (AT)

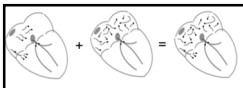


POSSIBLE SYMPTOMS

- None
- Heart Racing
- Chest discomfort
- Dyspnea
- Loss of Consciousness (syncope)
- Heart failure
  - Incessant tachycardia can cause a tachycardia mediated cardiomyopathy
- Aborted Sudden Death

Case 2

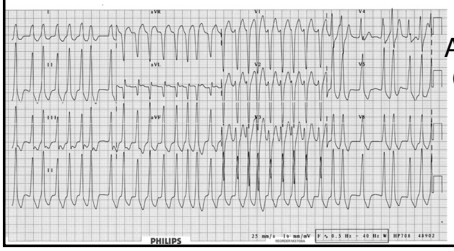
- Management options
  - Watchful waiting
  - Medication
    - AV-nodal blocking agents
    - Anti-arrhythmic medication
  - Catheter ablation
    - ~95% rate of cure for AVNRT, AVRT; 80-85% for AT
    - 2-3% risk of any complication
- Given the severity of his symptoms, I recommended that he undergo catheter ablation.
- He was found to have typical AVNRT during the EP study and he underwent successful slow pathway modification.



A Word on Sudden Death in WPW

AF + WPW = AF with very rapid ventricular rates

AF = atrial fibrillation



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AF with RVR Can lead to VF

VF = ventricular fibrillation

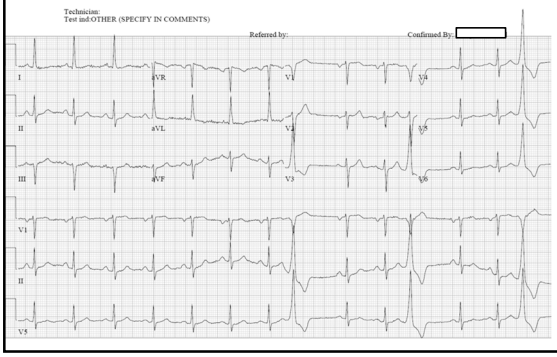
Overview

- Introduction
- Case 1 –Tachy-brady Syndrome
  - Atrial fibrillation
    - Thromboembolic risk reduction (NOAC vs. warfarin)
    - Rate control
    - Rhythm control
  - Brady-arrhythmias
    - Sinus node dysfunction (generally benign, though syncope/injury may occur)
    - AV block (Mobitz II, complete heart block can be life-threatening if no escape rhythm)
- Case 2 – SVT
  - SVT
    - AVNRT, AVRT, AT
    - Watchful waiting, medication, catheter ablation

Case 3

- 54 yo Caucasian F presents with daily abnormal heart beats along with exertional fatigue and shortness of breath. She was found to have a low left ventricular ejection fraction at 35-40% (normal 55-60%).
- PMH: no significant history
- 24-hour Holter monitor: 20,552 PVCs/94,339 total QRS complexes (~22% burden)

Presenting ECG



Case 3

- Management options:
  - Watchful waiting
  - Medication
  - Catheter ablation
- The patient was initially treated with metoprolol succinate, but had persistent symptoms and a persistently high burden of PVCs. **Given that a PVC burden of >15-20% can contribute to LV dysfunction**, she presented for catheter ablation.
- The PVCs were mapped to 8 o'clock on the mitral annulus in the left ventricle.
- Post-ablation, her PVC burden decreased to ~150 (vs. 20,000)

Overview

- Introduction
- Case 1 –Tachy-brady Syndrome
  - Atrial fibrillation
    - Thromboembolic risk reduction (NOAC vs. warfarin)
    - Rate control
    - Rhythm control
  - Brady-arrhythmias
    - Sinus node dysfunction (generally benign, though syncope/injury may occur)
    - AV block (Mobitz II, complete heart block can be life-threatening if no escape rhythm)
- Case 2 – SVT
  - SVT
    - AVNRT, AVRT, AT
    - Watchful waiting, medication, catheter ablation
- Case 3 – Frequent PVCs
  - >15-20% PVC burden associated with cardiomyopathy that improves with reduction in burden.

Clinical Pearls

- Atrial Fibrillation
  - Use CHADS-VASc scoring system for thromboembolic risk
  - Look for tachy-brady syndrome in AF with dizziness
  - Catheter ablation a viable rhythm-control option
- SVT
  - Can manifest unusually
  - Catheter ablation is relatively low risk, with potentially very high success rages
  - Pre-excited AF (AF with WPW pattern on ECG can be a pre-cursor to sudden death).
- PVCs
  - A very high burden of PVCS (~22%) can contribute to LV dysfunction, catheter ablation is a reasonable management strategy.