HARVARD MEDICAL SCHOOL
TEACHING HOSPITAL

Impact of Methamphetamine on the Heart

Leon Ptaszek, MD, PhD, FACC, FHRS

Cardiac Arrhythmia Service, Massachusetts General Hospital
Assistant Professor of Medicine, Harvard Medical School

21 October 2024

Disclosures: Research grant from Anumana; Consultant for Abbott, Bristol-Myers Squibb, NeuTrace, WorldCare Clinical, Medtronic, Moderna, Pfizer

MASSACHUSETTS GENERAL HOSPITAL
CORRIGAN MINEHAN HEART CENTER

Objectives

- Describe the impact of stimulant use on the heart.
- Describe the most common types of cardiovascular disease associated with chronic stimulant use.
- Summarize a strategy for managing patients with stimulant-related heart disease.

Question #1

Which of the following statements regarding the number of current methamphetamine users in the United States is correct?

A. There are approximately 300,000 current methamphetamine users.

B. There are approximately 500,000 current methamphetamine users.

C. There are approximately 700,000 current methamphetamine users.

D. There are approximately 900,000 current methamphetamine users.

Question #1

Which of the following statements regarding the number of current methamphetamine users in the United States is correct?

A. There are approximately 300,000 current methamphetamine users.

B. There are approximately 500,000 current methamphetamine users.

C. There are approximately 700,000 current methamphetamine users.

D. There are approximately 900,000 current methamphetamine users.

Common Stimulants

- Cocaine and methamphetamine are the most common non-prescribed stimulants
- In the US, an estimated 2% of the population has tried a non-prescribed stimulant at some point
- Among people who have used stimulants in a non-prescribed manner, 5% become dependent

Clinical Case

HPI:

47-year-old woman with presents with progressive dyspnea and fevers. Patient is a vague historian who is unable to give any further details:

PMH:

Polysubstance abuse, including IV drug use

Minimal contact with medical establishment

Clinical Case

Exam:

BP 88/60 HR 130 RR 18 O2 sat 96% RA

Obtunded

Poor skin turgor, dental caries

Skin stigmata of IV drug use

Labs:

Cr: 5.2

WBC: 12.1

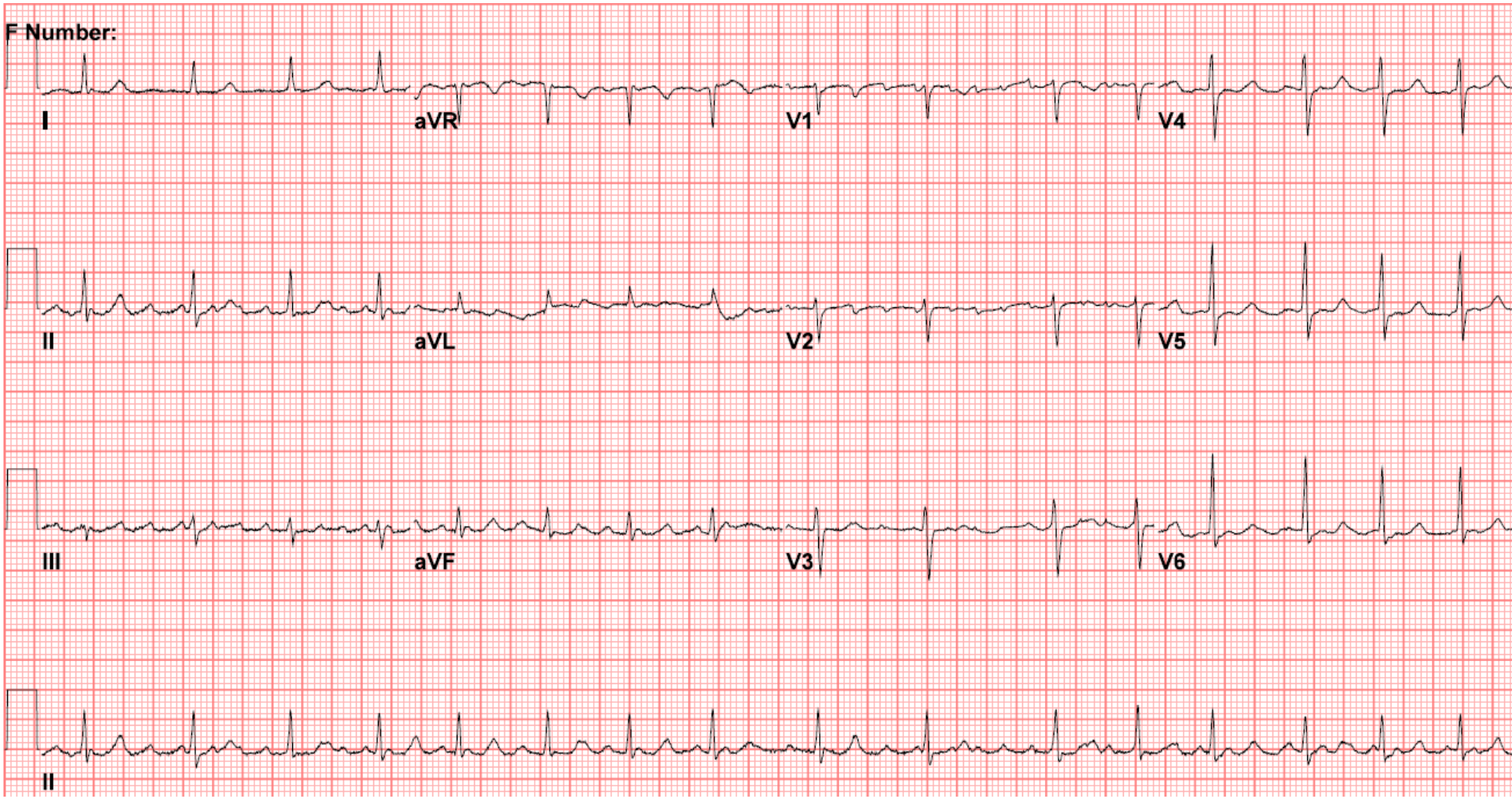
Tox: methamphetamine (+)

Clinical Case

Trans-Thoracic Echocardiogram:

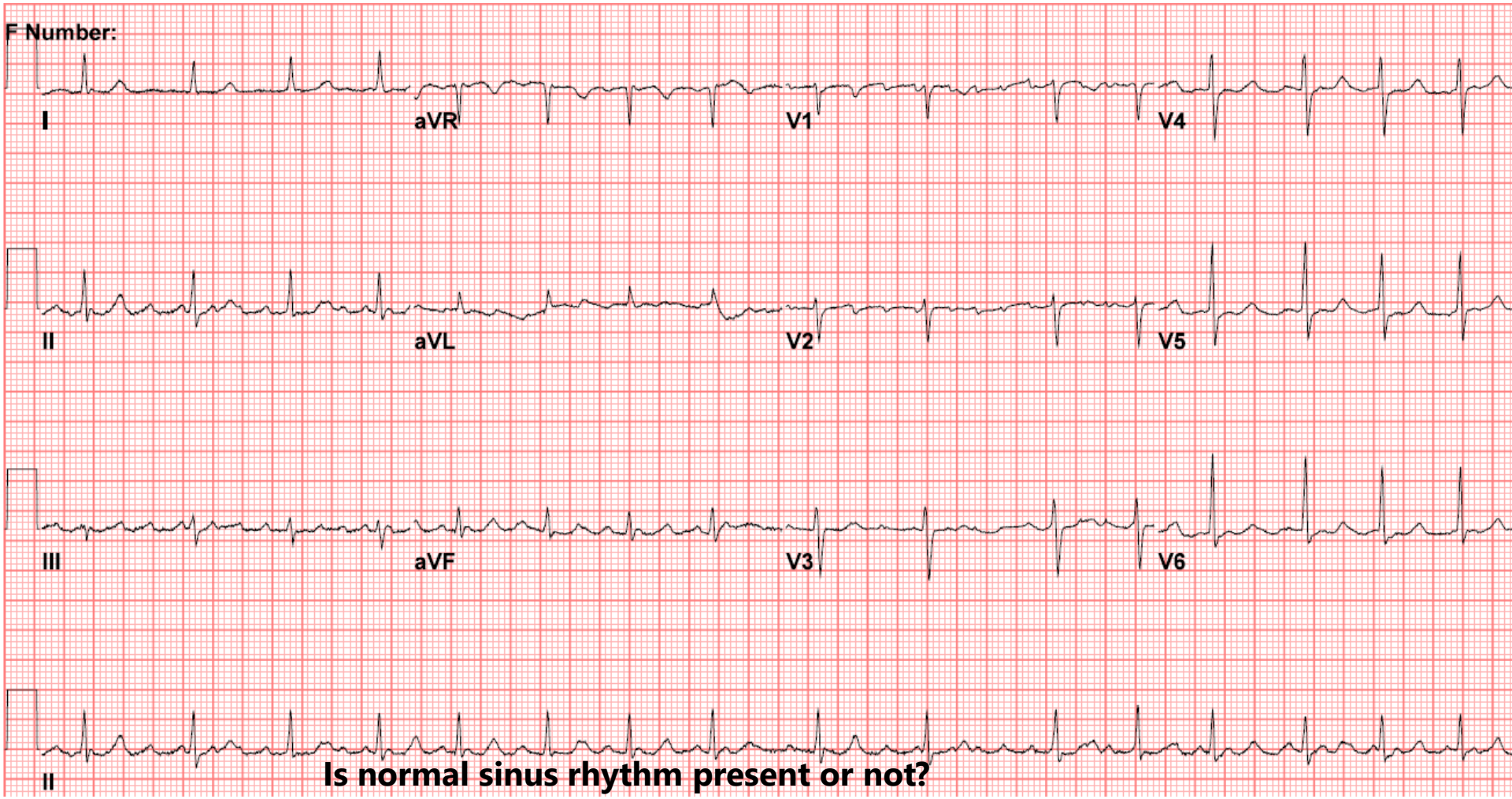
- Dilated LV with impaired systolic function (LVEF 26%); no LV thrombus
- Normal RV size with low-normal systolic function
- Moderate functional MR
- Mild TR with estimated RVSP 39 mmHg
- No valvular vegetations, no pericardial effusion

Clinical Case: ECG



MASSACHUSETTS GENERAL HOSPITAL
CORRIGAN MINEHAN HEART CENTER

Clinical Case: ECG



Is normal sinus rhythm present or not?

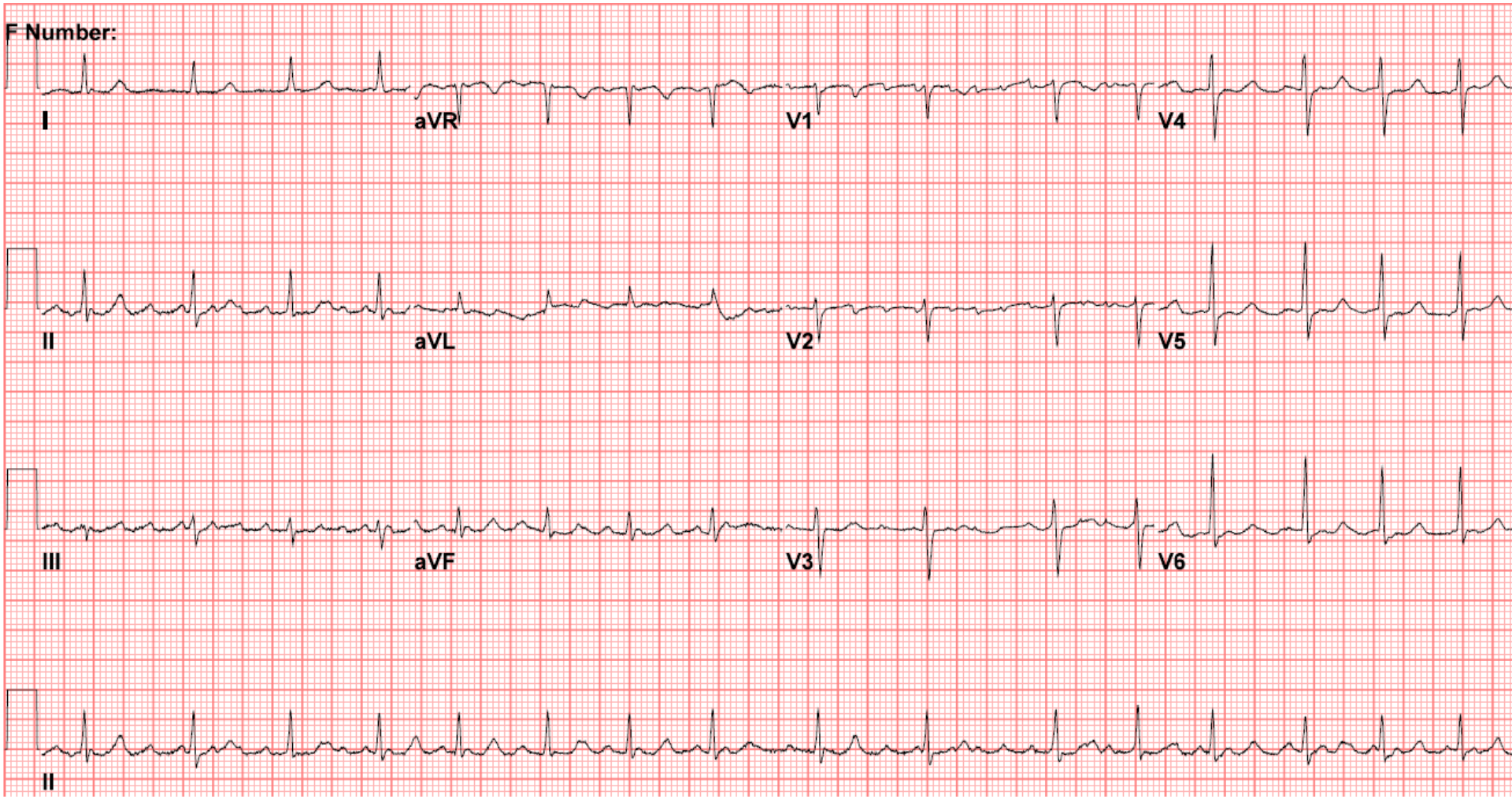
Do you see a P wave?

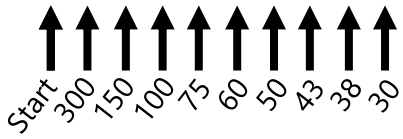
Does every P have a QRS and does every QRS have a P?

Is the axis of the P wave normal (upright in I and II)?

MASSACHUSETTS GENERAL HOSPITAL
CORRIGAN MINEHAN HEART CENTER

Clinical Case: ECG



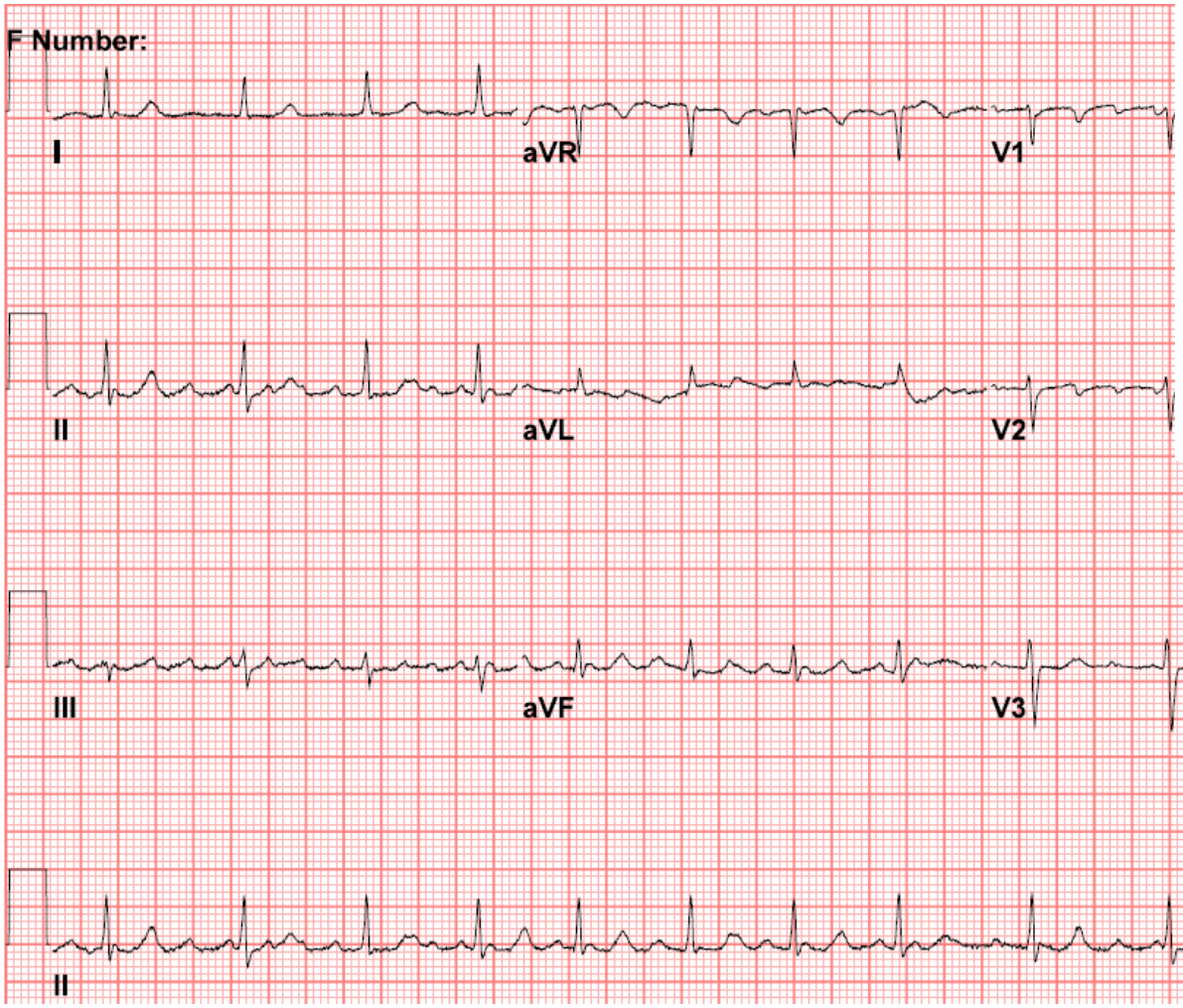


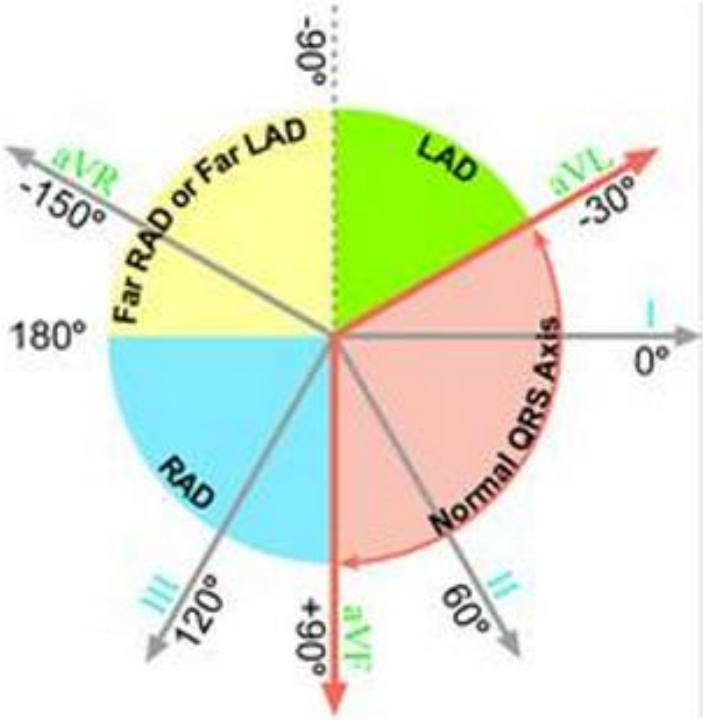
Rate in bpm = 300 / # large squares

Rate in msec = 60,000 / bpm

MASSACHUSETTS GENERAL HOSPITAL
CORRIGAN MINEHAN HEART CENTER

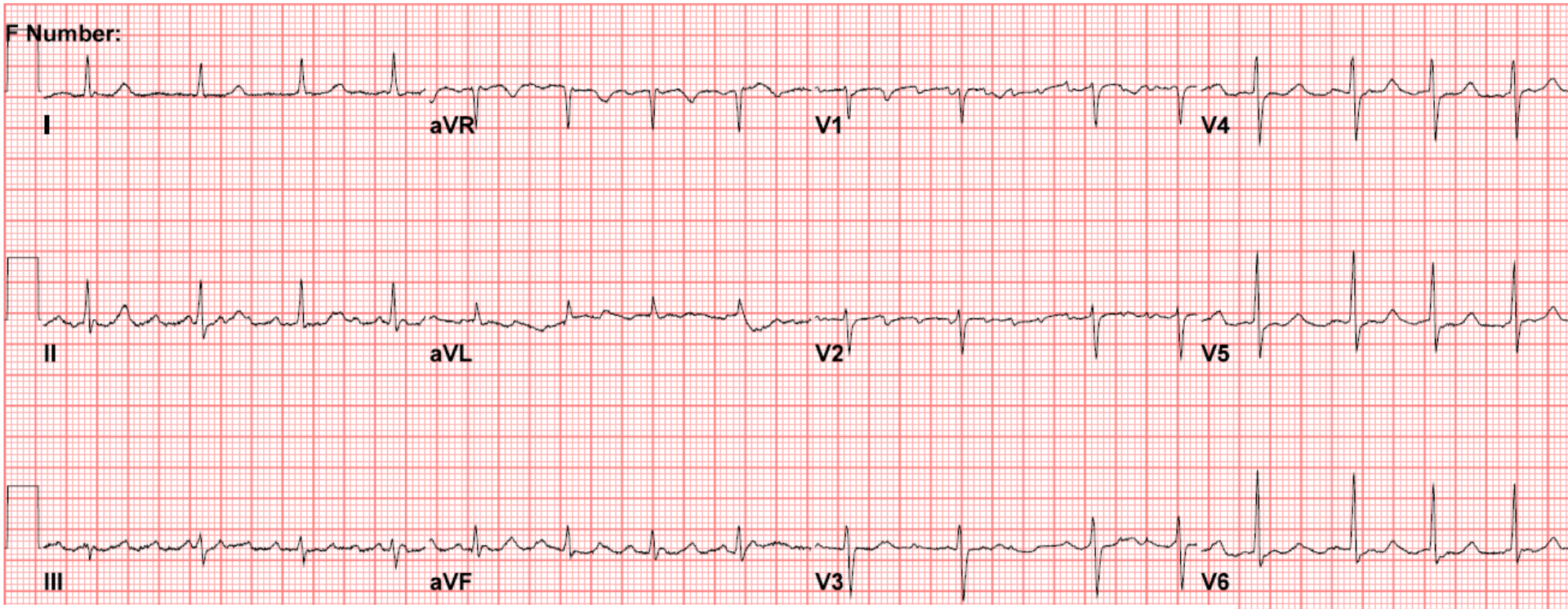
Clinical Case: ECG





MASSACHUSETTS GENERAL HOSPITAL
CORRIGAN MINEHAN HEART CENTER

Clinical Case: ECG



ESC/ACC/AHA/WHF Criteria:

ST Elevation: ≥ 0.1mV (1mm) in two adjoining leads, except V2, V3

In V2, V3: ≥ 1.5mm in women
≥ 2mm in men ≥ 40 years
≥ 2.5mm in men < 40 years

Clinical Case

HPI:

47-year-old woman with presents with progressive dyspnea and fevers. Patient is a vague historian who is unable to give any further details:

Next Steps:

- Blood cultures drawn
- Inotrope support and wide-spectrum antibiotics initiated

Clinical Case

Trans-esophageal echocardiogram:

- No endocarditis
- No wall motion abnormalities
- No evidence of left atrial thrombus

Blood/urine/respiratory cultures:

No growth

Clinical Case

Early Treatment Course:

- Amiodarone and heparin IV gtt given for AFL with RVR
- Heart rate reduction
- Persistent inotrope requirement
- IV diuresis
- Continued IV antibiotics: fevers, persistent elevation of WBC, repeat blood cultures negative

Question 2

People with methamphetamine use disorder are at higher risk of which of the following with respect to the general population?

A. Overdose
B. Stroke
C. Renal failure
D. Myocardial infarction
E. All of the above

Question 2

People with methamphetamine use disorder are at higher risk of which of the following with respect to the general population?

A. Overdose
B. Stroke
C. Renal failure
D. Myocardial infarction
E. All of the above

Question 3

Which statement best describes the increase in risk of stroke for people who use methamphetamines:

A. Two-fold increase
B. Three-fold increase
C. Four-fold increase
D. Five-fold increase
E. Six-fold increase

Question 3

Which statement best describes the increase in risk of stroke for people who use methamphetamines:

A. Two-fold increase
B. Three-fold increase
C. Four-fold increase
D. Five-fold increase
E. Six-fold increase

Methamphetamine-Related Heart Disease

Methamphetamine has several physiologic effects:

- Increased catecholamine, dopamine levels*
- Increased oxidative stress, inflammation

Methamphetamine-related changes in physiology result in increased risk for:

- Myocardial infarction (including vasospasm) -> fibrosis
- Dilated cardiomyopathy
- Arrhythmias
- Stroke
- Renal failure

* Reddy PKV et al JAHA 2020;9:e016704

MASSACHUSETTS GENERAL HOSPITAL
CORRIGAN MINEHAN HEART CENTER

Question 4

Methamphetamine-related cardiomyopathy has been shown to be the result of which of the following:

A. Tachycardia
B. Vasospasm/myocardial ischemia
C. Tachycardia
D. Direct cellular toxicity/fibrosis
E. All of the above

Question 4

Methamphetamine-related cardiomyopathy has been shown to be the result of which of the following:

A. Tachycardia
B. Vasospasm/myocardial ischemia
C. Tachycardia
D. Direct cellular toxicity/fibrosis
E. All of the above

Objectives

Describe the impact of stimulant use on the heart.

- HTN/vasospasm/fibrosis -> cardiomyopathy

Describe the most common types of cardiovascular disease associated with chronic stimulant use.

- Cardioyopathy
- Stroke
- Vascular disease (aortic dissection, renal failure)

Summarize a strategy for managing patients with stimulant-related heart disease.

- Cessation of drug use
- Goal-directed medical therapy


Thank you
MGH
1811
MASSACHUSETTS
GENERAL HOSPITAL