

Cardiology For Finals

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Plan

- Palpitations and Tachyarrhythmia
- Chest pain and Myocardial Infarction
- Breathlessness and Heart Failure
- Syncope and Bradyarrhythmia
- Death
- Angina and...
- Valvular disease
- Cardiovascular “risk factors”

- Questions

Cardinal Cardiac Symptoms

- Chest pain
 - “Typical”
- Breathlessness
 - Paroxysmal Nocturnal Dyspnoea
 - Orthopnoea
- Palpitations
- Syncope/LoC
 - Collateral
- Sudden Death (attempted)

Modifiers:

Exertional symptoms

Risk factors



Case 1

58♂

Palpitations

Case 1

History

- Sudden onset and offset
 - Lasts up to a few hours
 - Fast and feels irregular
 - Came to A&E
-
- No loss of consciousness/chest pain

Case 1

PMHx

- nil

DHx

- nil

SHx

- Non-smoker
- Bottle of wine a week

FHx

- No sudden cardiac death

Case 1

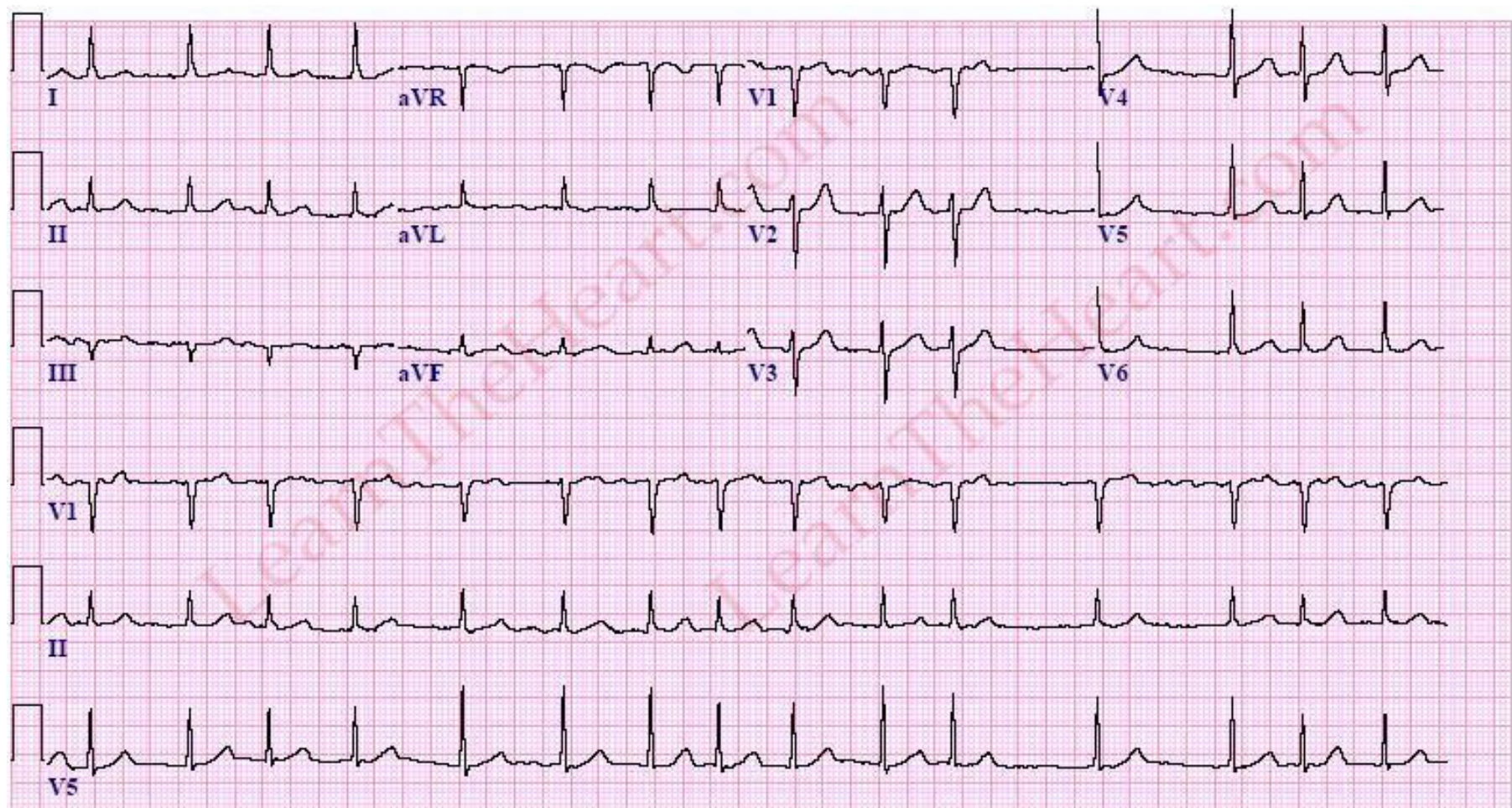
Examination

- BP 120/60, HR 130, RR 16, sats 95%
RA
- Irregularly irregular pulse
- No murmurs

Investigations

- Bloods + thyroid
- ECG

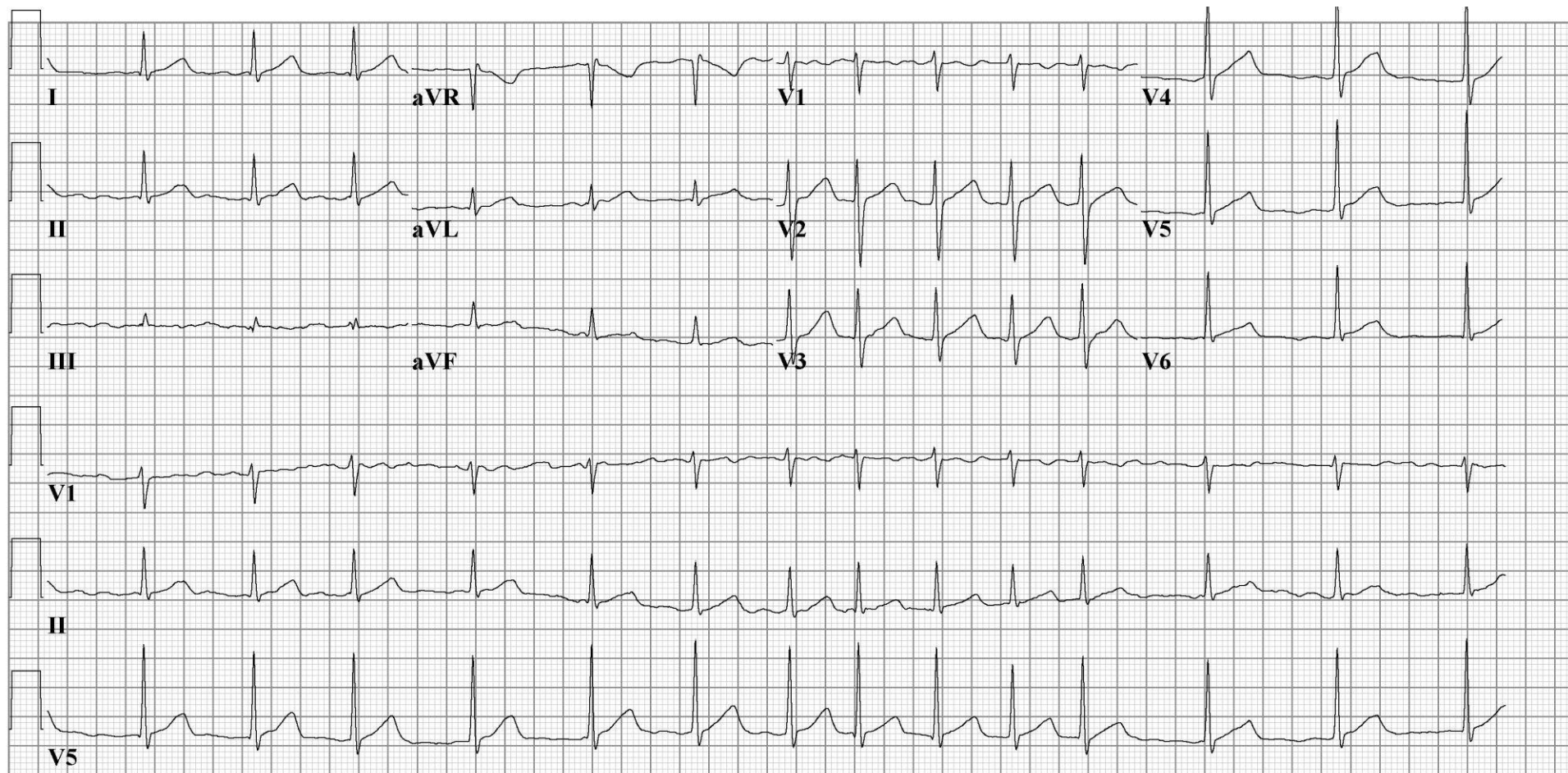
Case 1



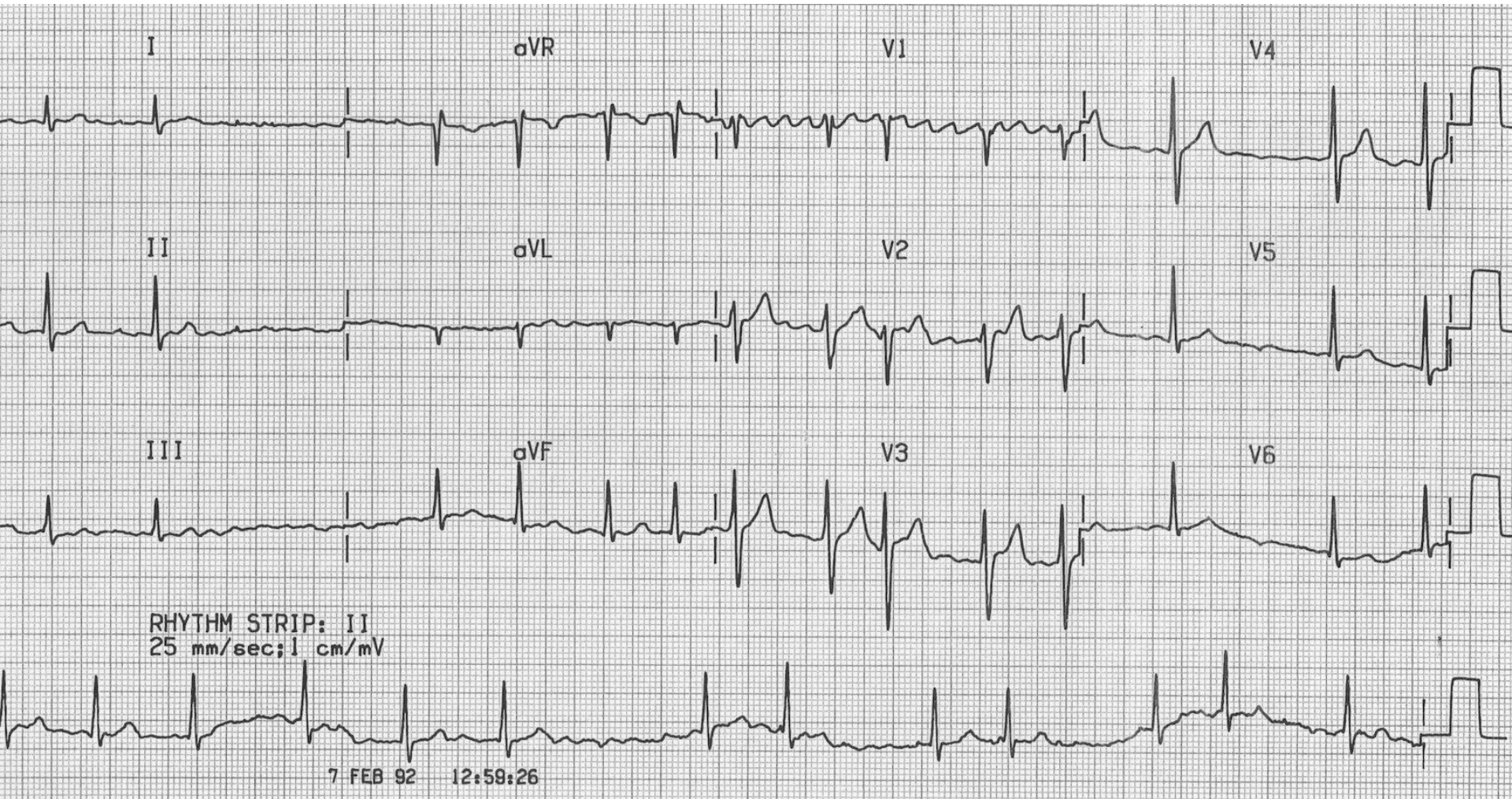
25mm/s 10mm/mV 40Hz 005C 12SL 254 CID: 27

EID:608 EDT: 15:33 25-OCT-2003 ORDER:

Case 1



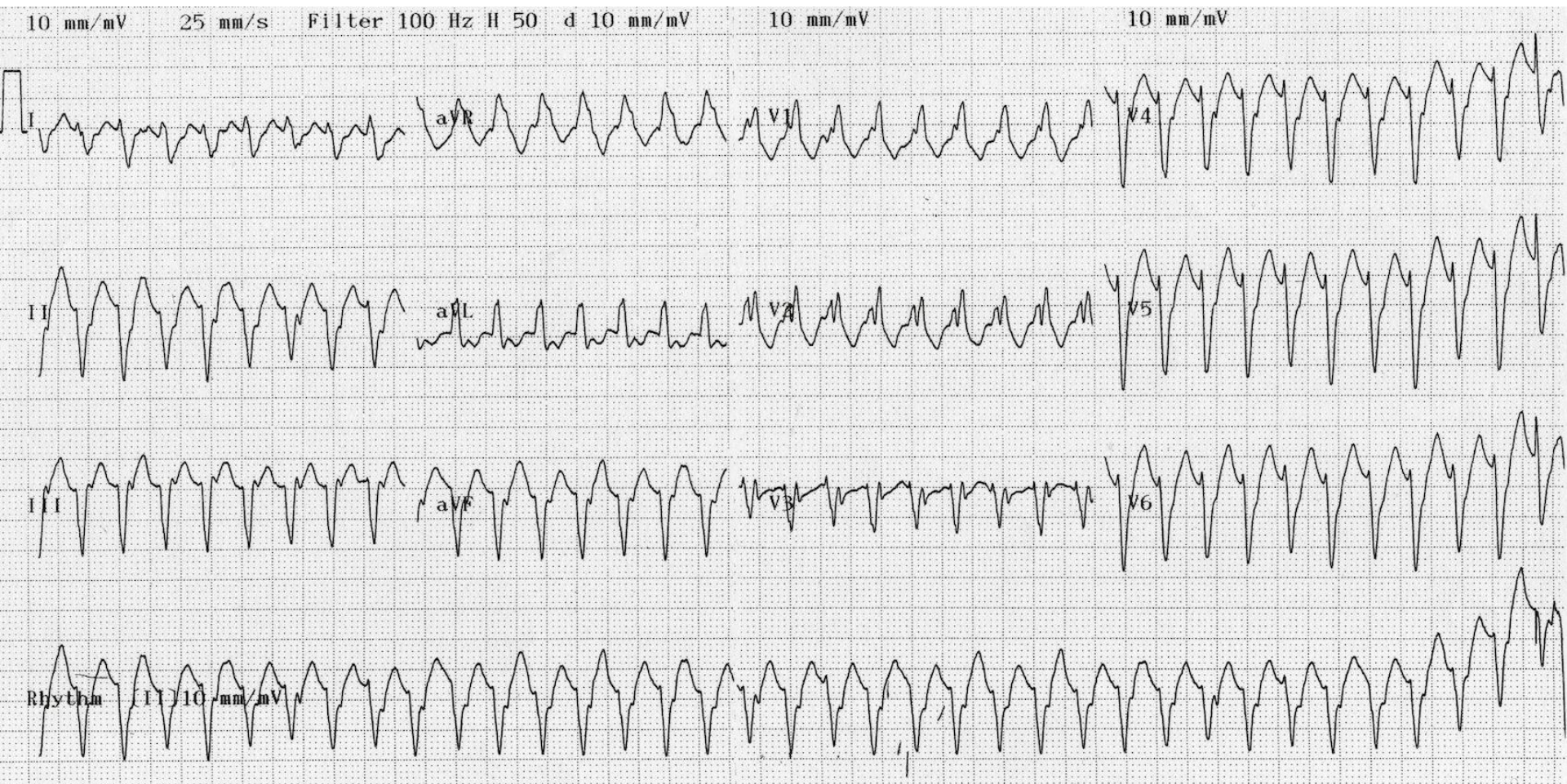
Case 1



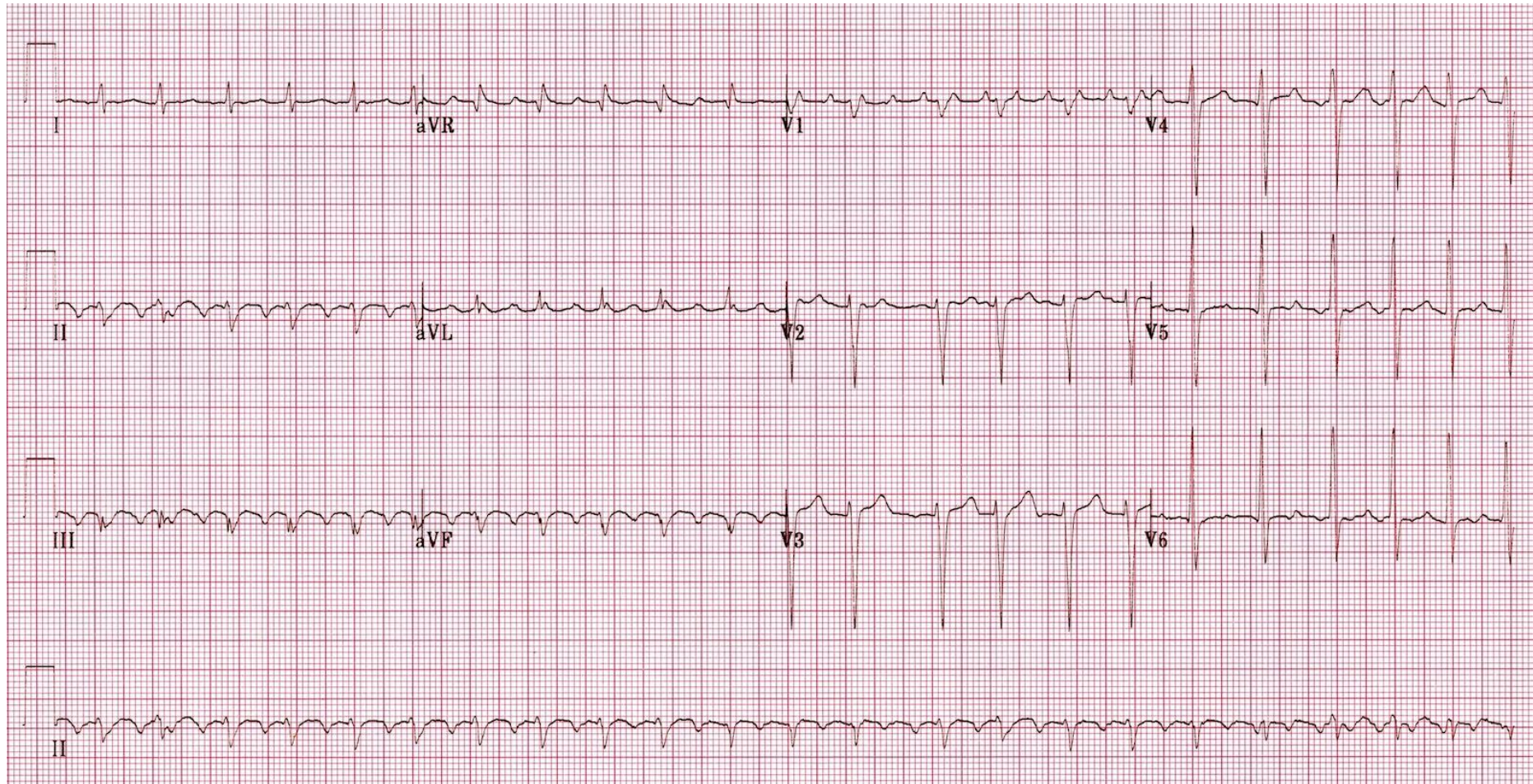
Case 1



Case 1



Case 1



Atrial Fibrillation

Classification

Type	Definition
Paroxysmal	<24 hrs
Persistent	>24hrs Needs treatment to cardiovert
Permanent	Can't cardiovert

Atrial fibrillation

STROKE RISK!!

- Most important thing
- More important than rhythm vs. rate management
- Really, really important.

Stroke risk

CHA₂DS₂VASc score

C – Congestive cardiac failure +1

H – Hypertension +1

A – Age >75yrs +2

D – Diabetes +1

S – Stroke/TIA +2

V – Vascular disease (MI, PVD) +1

A – Age >65yrs +1

Sc – Sex class, female +1

Stroke risk: CHADS-VASC

Score	Risk %/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

Stroke Risk - Management

- 0: Nothing
- 1: ~~Aspirin~~/Warfarin/OAC/(Nothing)
- >2: Warfarin/OAC

Rate vs. Rhythm in AF

- Which is better:
 - Sinus rhythm or AF but normal heart rate?
- We don't know...
- Often patient-directed.
- Evidence and preference for sinus rhythm is increasing

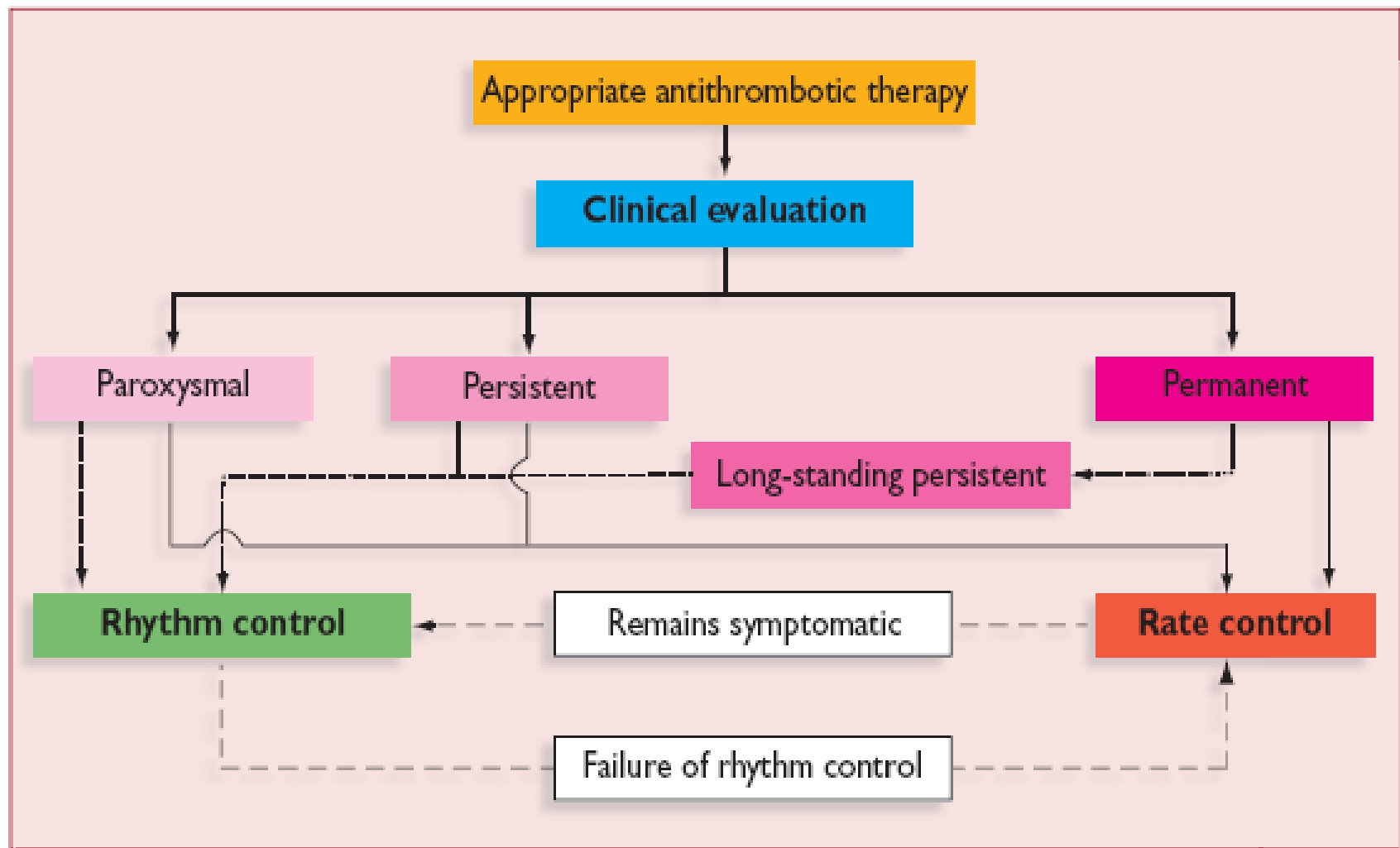
“COMPROMISED” AF

When AF causes haemodynamic compromise

- Hypotensive
- Chest pain
- Signs of heart failure
- Affecting level of consciousness (GCS)
- Other markers of insufficiency (metabolic acidosis)

DC CARDIOVERSION

Rhythm vs. Rate in AF



Rate vs. Rhythm

- Why Rhythm Control?
 - Paroxysmal AF/New onset Persistent
 - Very symptomatic
 - Uncontrolled rate
 - Younger patients
 - Mitral stenosis
 - Congenital Heart Disease

Rate vs. Rhythm

- Why Rate Control?
 - Asymptomatic
 - Acceptable rate
 - Not likely to succeed
 - Long history of AF

Rhythm strategies

MUST be in AF <48hrs

OR on warfarin/NOAC for 3 weeks BEFORE/4 AFTER

OR TOE guided DCCV

- Electricity: DC Cardioversion
- Drugs
 - Flecainide (normal heart)
 - Sotalol
 - Amiodarone (last resort/short term)
- AF Ablation (not acutely)

When to do nothing?

- No symptoms
- Not “compromised” (normal obs)
- No signs of end-organ dysfunction
 - Kidneys fine, lactate fine, GCS fine
- Reversible acute illness probably the cause
 - Thyroid
 - Infection
 - Post-surgery

Rate Control Strategies

- β -blockers (bisoprolol, metoprolol)
 - Avoid in asthma
- CCA (diltiazem, verapamil)
 - Avoid in heart failure
- Digoxin
 - Careful in renal failure (K^+)
- All have side-effects/toxicity states.

Case 1

- 53 yo man with palpitations
- Persistent AF (>24hrs)
- BP 120/60, HR 130, RR 16, sats 95% RA
- Irregularly irregular pulse
- Rhythm control:
 - i.v. flecainide
 - DCCV
 - Long term: β -blocker, flecainide

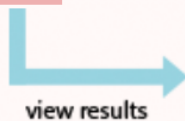
Case 1

- 93 yo with no symptoms
- BP 120/60, HR 70, RR 16, sats 95% RA
- Irregularly irregular pulse noted by GP
- Rate control:
 - Warfarin (unless bleeding risk)
 - β -blocker

Case 1

HASBLED clinical characteristic [click on present risk factors]

CLINICAL CHARACTERISTIC	POINTS AWARDED
Hypertension	1
Abnormal liver function	1
Abnormal renal function	1
Stroke	1
Bleeding	1
Labile INRs	1
Elderly (Age >65)	1
Drugs	1
Alcohol	1
Your score	1



HASBLED clinical risk estimation. Adapted from Pisters et al.

HAS BLED SCORE	NUMBER OF PATIENTS	NUMBER OF BLEEDING	BLEEDS PER 100 PATIENT YEARS
0	798	9	1,13
1	1286	13	1,02
2	744	14	1,88
3	187	7	3,74
4	46	4	8,70
5	8	1	12,50
6	2	0	0
7	---	---	---
8	---	---	---
9	---	---	---
Total	2084	22	2.15

Case 1

- 67 yo with chest pain, background of HTN.
- BP 80/30, HR 170, RR 30, sats 95% RA
- Irregularly irregular pulse
- Rhythm control:
 - **Emergency** DCCV
 - Warfarin

OSCE tips

- Assess the pulse → detect irregularity
 - Assess again at the carotids
 - Listen/look carefully for MITRAL signs
- “This lady has an irregularly irregular pulse, the diagnosis is most likely atrial fibrillation, but may be sinus with frequent ectopic beats.”

Case 2

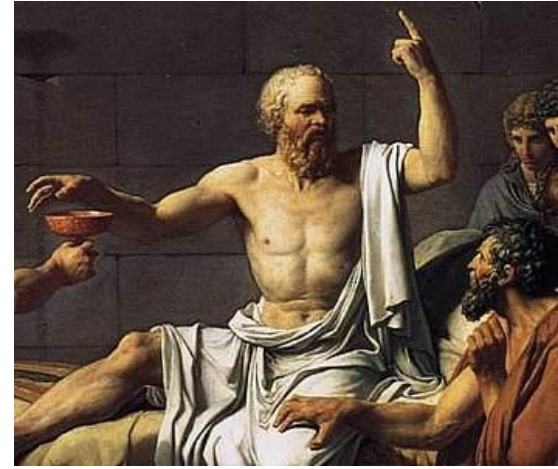
63 ♂

Chest pain

Chest pain

History

- S – central/sided
- O – sudden/very sudden/gradual
- C – pressure/stabbing/tearing
- R – left arm/jaw/shoulder blades
- A – nausea/vomiting/sweating/fear
- T – lasts longer than 30mins
- E – exertion/position GTN/morphine
- S – out of 10



Case 2

- History
 - Sudden onset, 2 hours ago
 - Central
 - Crushing
 - Nausea and sweatiness
 - Worse with walking
 - Got better with GTN spray
 - Feels like he's about to die
- Sometimes gets a similar pain on climbing stairs

Case 2

Medical History

- Cholesterol
- Hypertension
- Smoking (20 pack years)
- Diabetes (Type II)
- Family history

- Doesn't like tablets.

Case 2

Drugs

- GTN spray
- Simvastatin 20mg
- Amlodipine 5mg
- Brufen 200mg prn

Social

- Father of 2
- Taxi driver
- 20 pack years smoker
- 6 pints a week (12 units)

Family

- Dad had a heart attack aged 55, now has heart failure

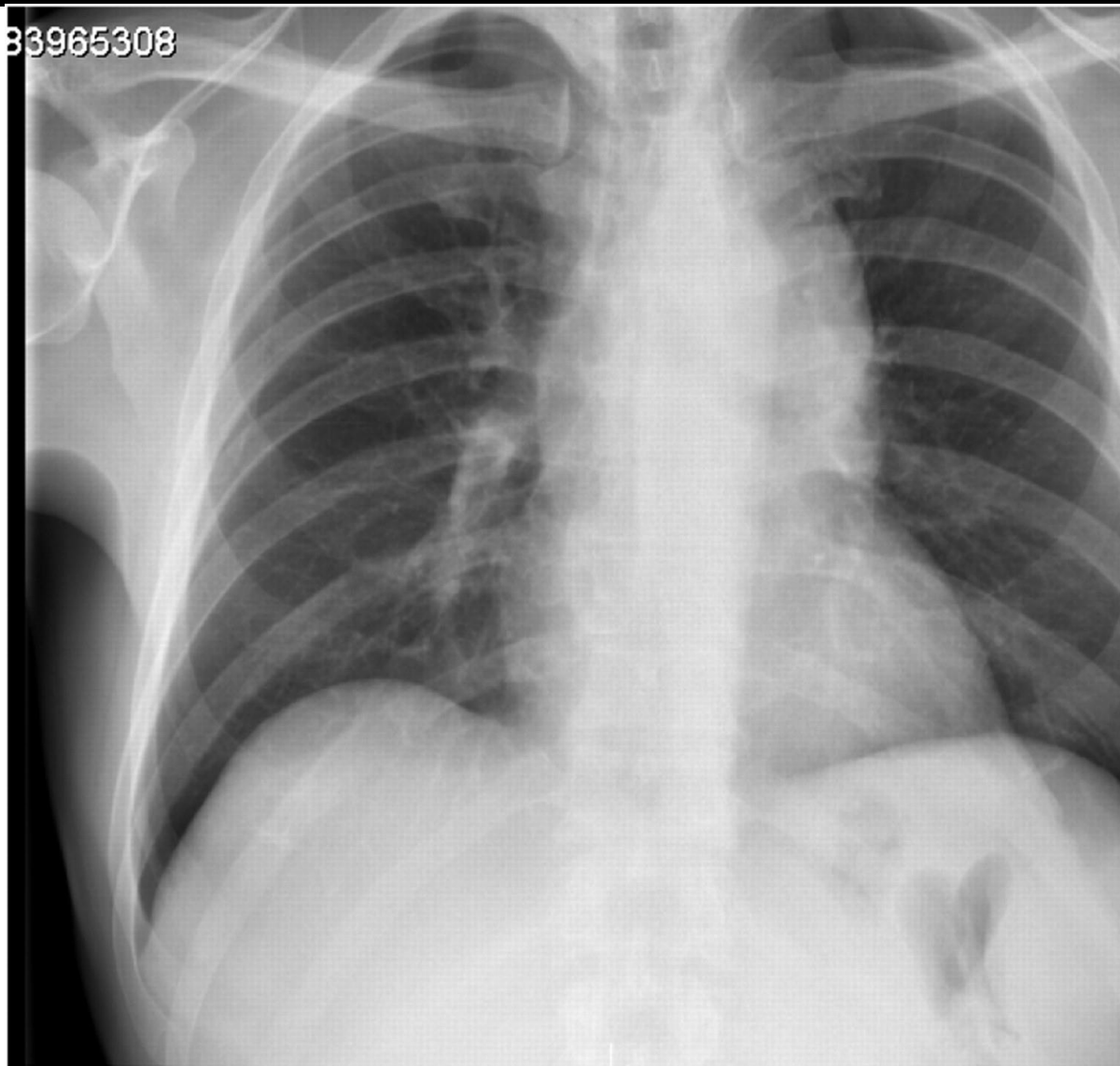
Case 2

Examination

- Looks ill, sweaty, clammy.
- BP 160/80, HR 100, sats 95% on 2L
- All pulses present
- No murmurs
- Clear chest

Investigations

- Chest X-ray
- ECG
- Bloods (routine)
- Troponin



Bonus slide: Aortic Dissection

- Tearing chest pain
- Interscapular
- Missing pulses
- CT/echo
- BP <100 systolic
- Surgeons

ECGs: ACUTE MI

- Where's the clot?
- Is it a STEMI?

AMI ECG, ANATOMY AND PATHOLOGY

LCX LESIONS ±

POSTERIOR MI

STE: V7-9
STD: V1-2 (reciprocal STE)
R:S ≥ 1: V1-2
Tall T: V1-2
RCA and LCX occlusion

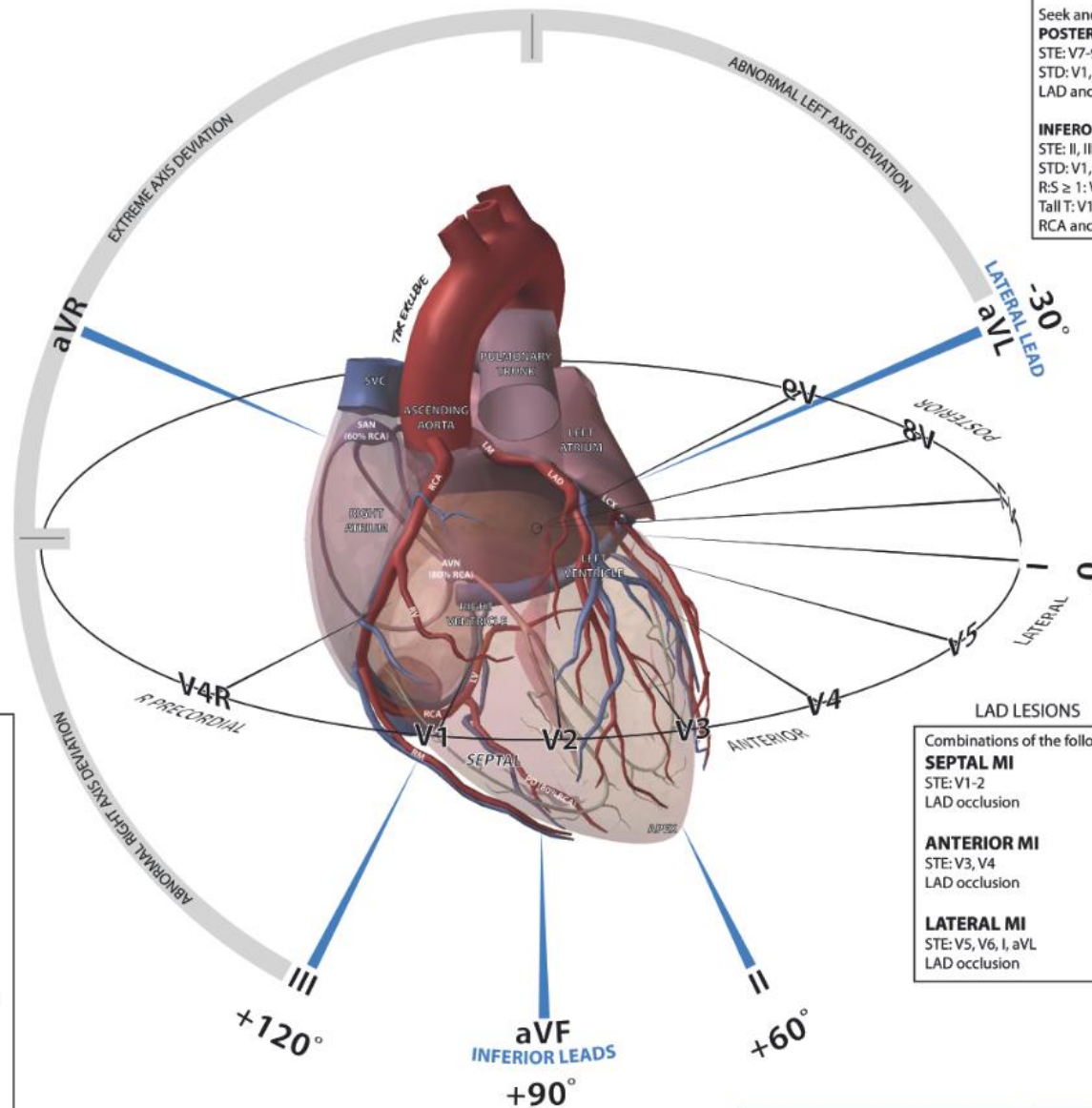
Seek and exclude

POSTEROLATERAL MI

STE: V7-9 and I, aVL, V5-6
STD: V1, V2
LAD and LCX occlusion

INFEROPOSTERIOR MI

STE: II, III, AVF and V7-9
STD: V1, V2 (reciprocal STE)
R:S ≥ 1: V1-2
Tall T: V1-2
RCA and LCX occlusion



RCA 'TYPE' LESIONS ±

INFERIOR MI

STE: II, III, aVF
STD: aVL (reciprocal STE)
RCA occlusion distal to RV
58% of MI

Seek and exclude

INFERIOR AND RV MI

STE: II, III, aVF and V1, V4R
RCA occlusion proximal to RV
40% of Inferior MI
Increased mortality risk

INFEROLATERAL MI

STE: II, III, AVF and I, aVL, V5, V6
± V4R
LAD and LCX occlusion
in a L dominant system

INFEROPOSTERIOR MI

STE: II, III, AVF and V7-9
STD: V1, V2 (reciprocal STE)
R:S ≥ 1: V1-2
Tall T: V1-2
RCA and LCX occlusion

LAD LESIONS

Combinations of the following

SEPTAL MI

STE: V1-2
LAD occlusion

ANTERIOR MI

STE: V3, V4
LAD occlusion

LATERAL MI

STE: V5, V6, I, aVL
LAD occlusion

STEMI or NSTEMI?

Or UA?

Chest pain:

ST elevation CRITERIA

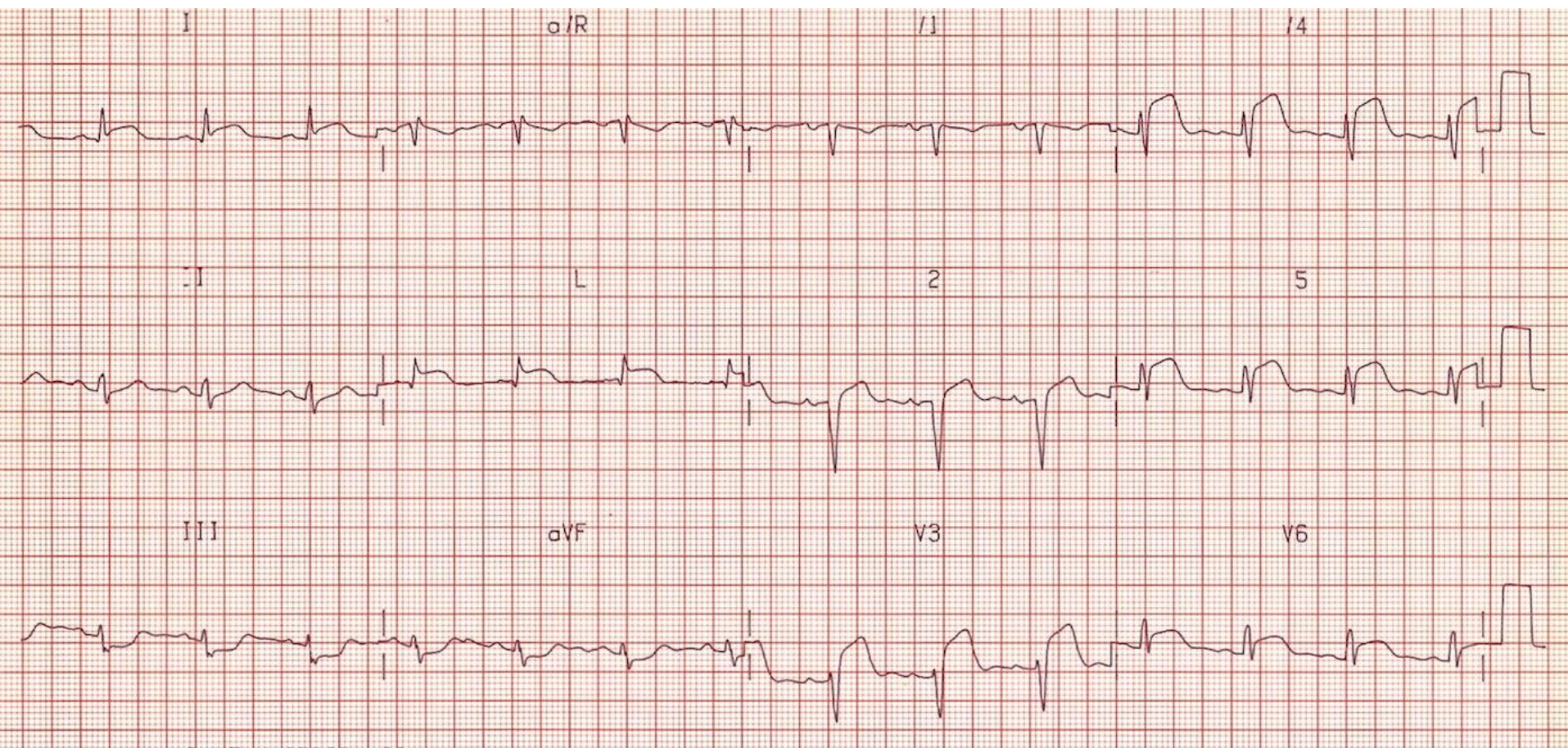
2 contiguous leads

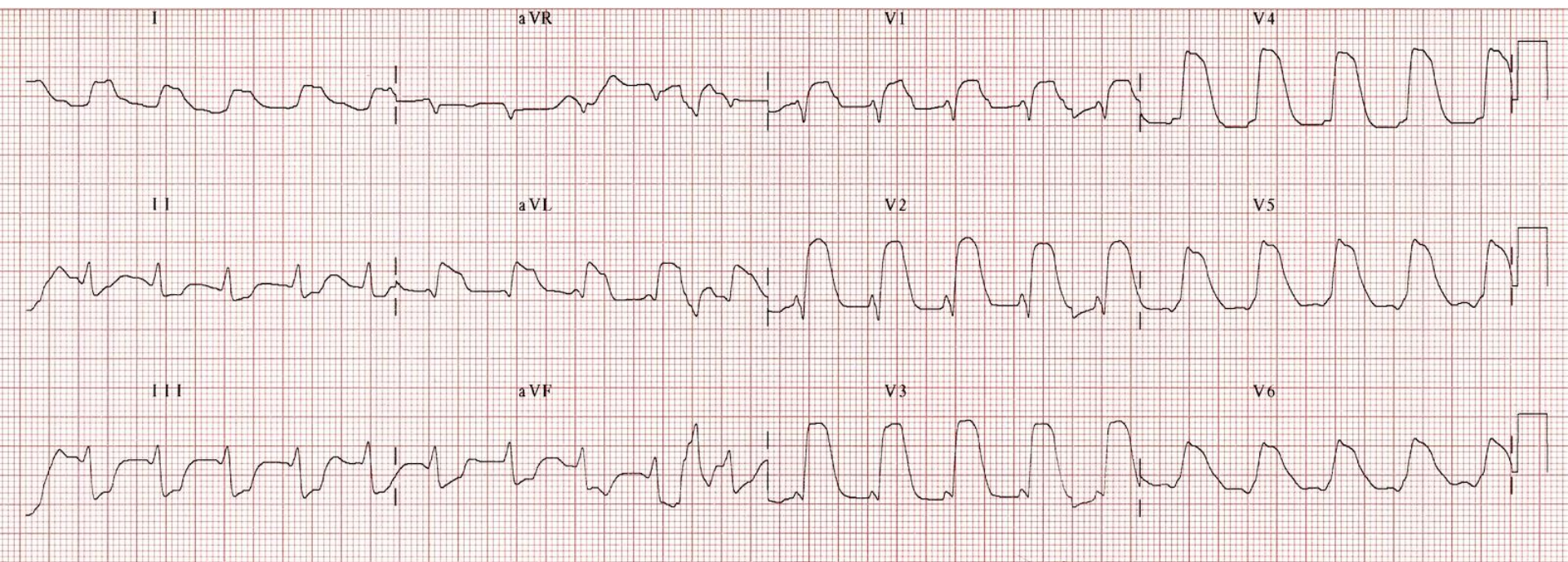
- >1mm limb leads
- >2mm V1-V6

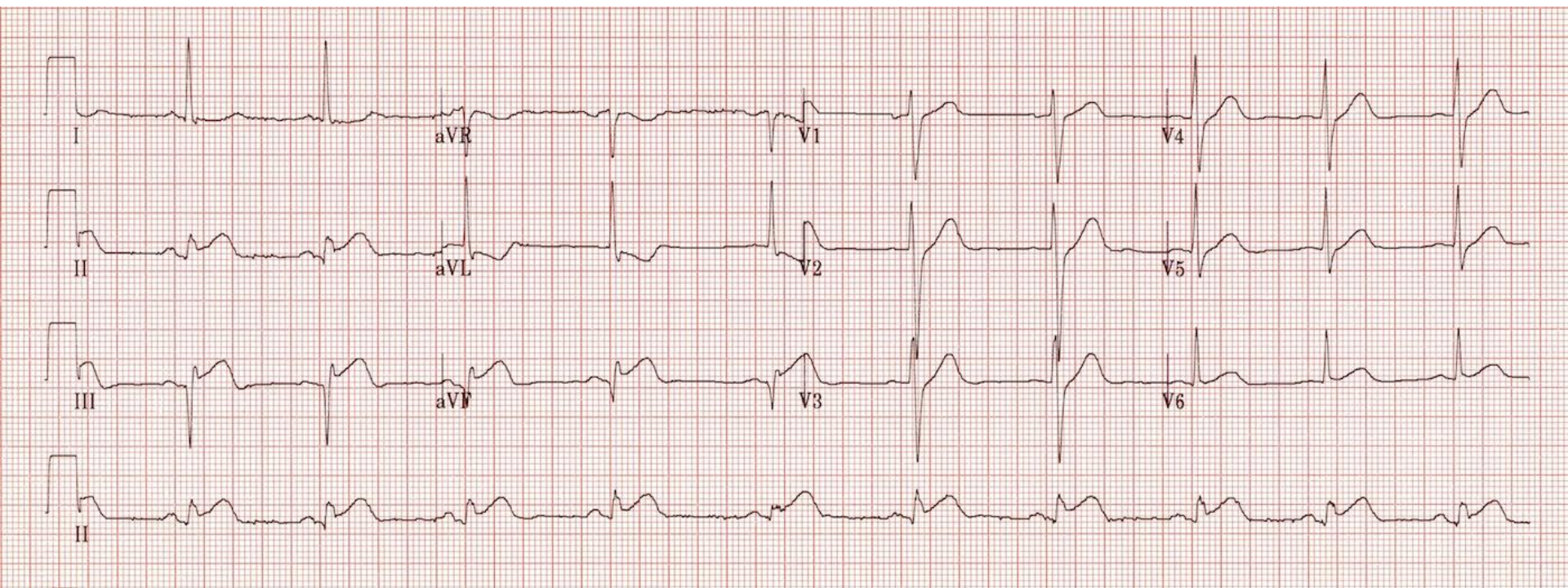
Chest pain:

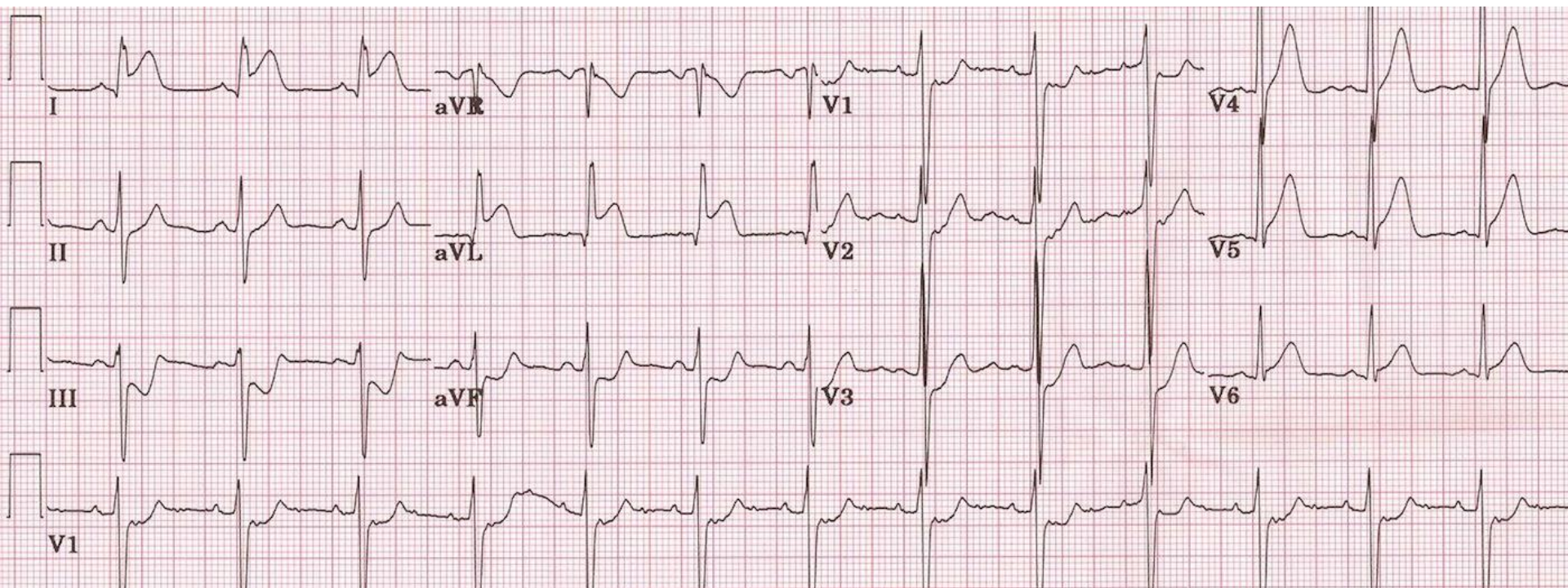
w/other changes:

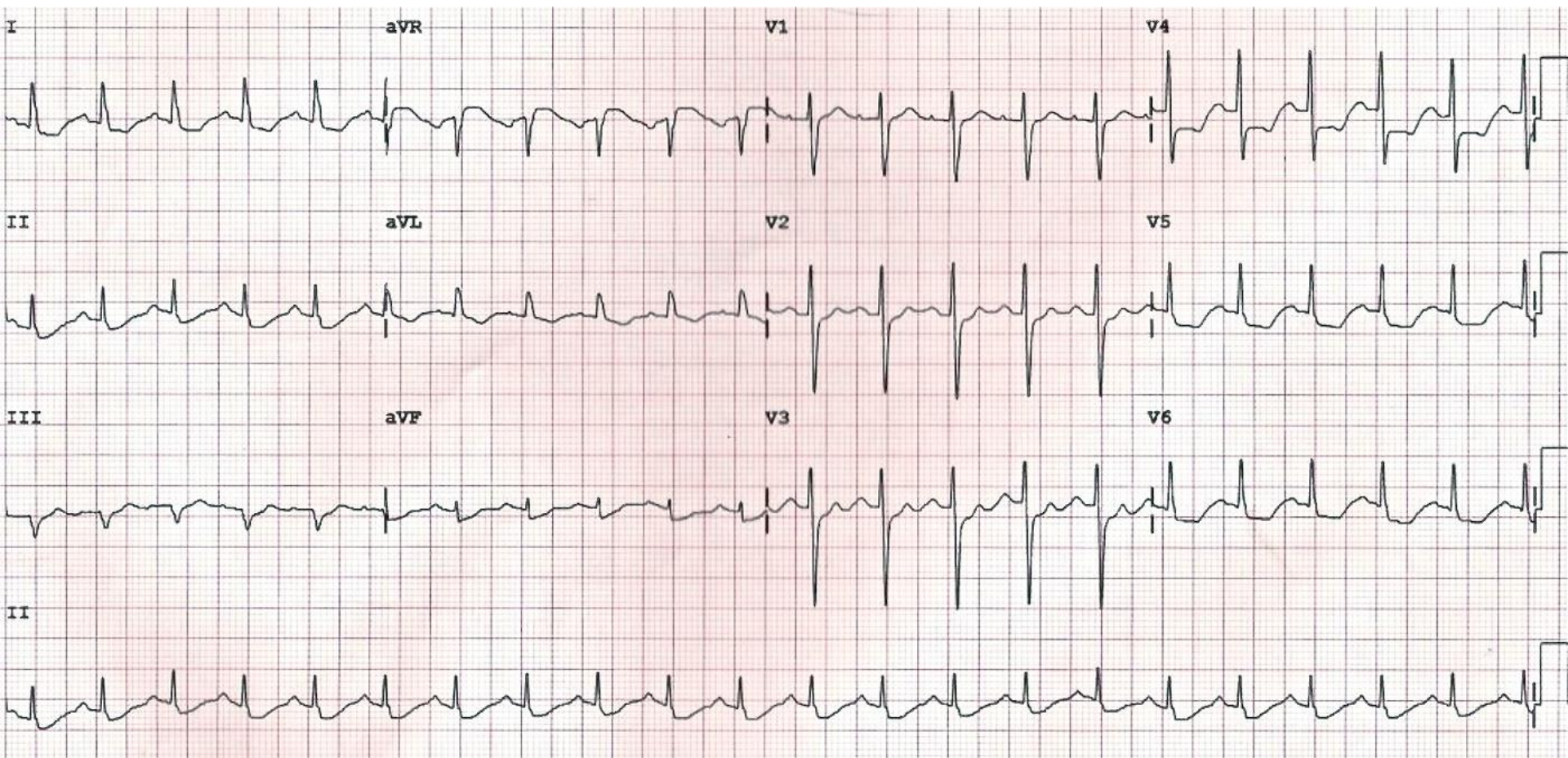
- ST depression
- T wave inversion
- Troponin!

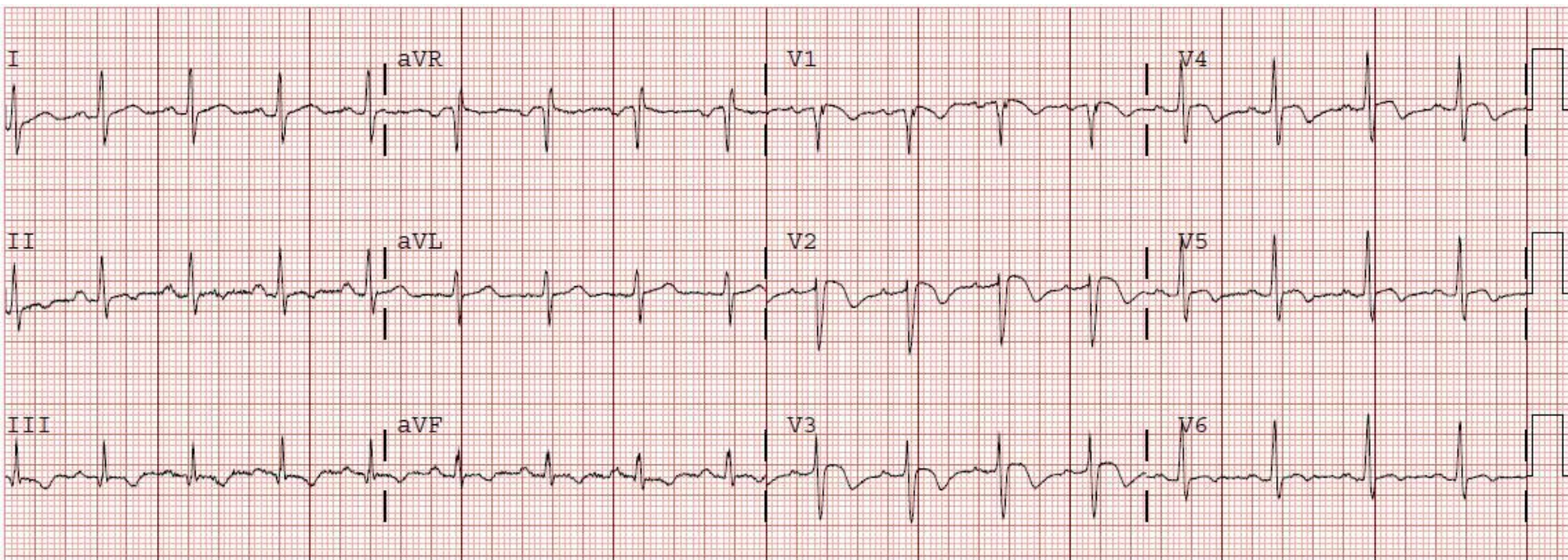




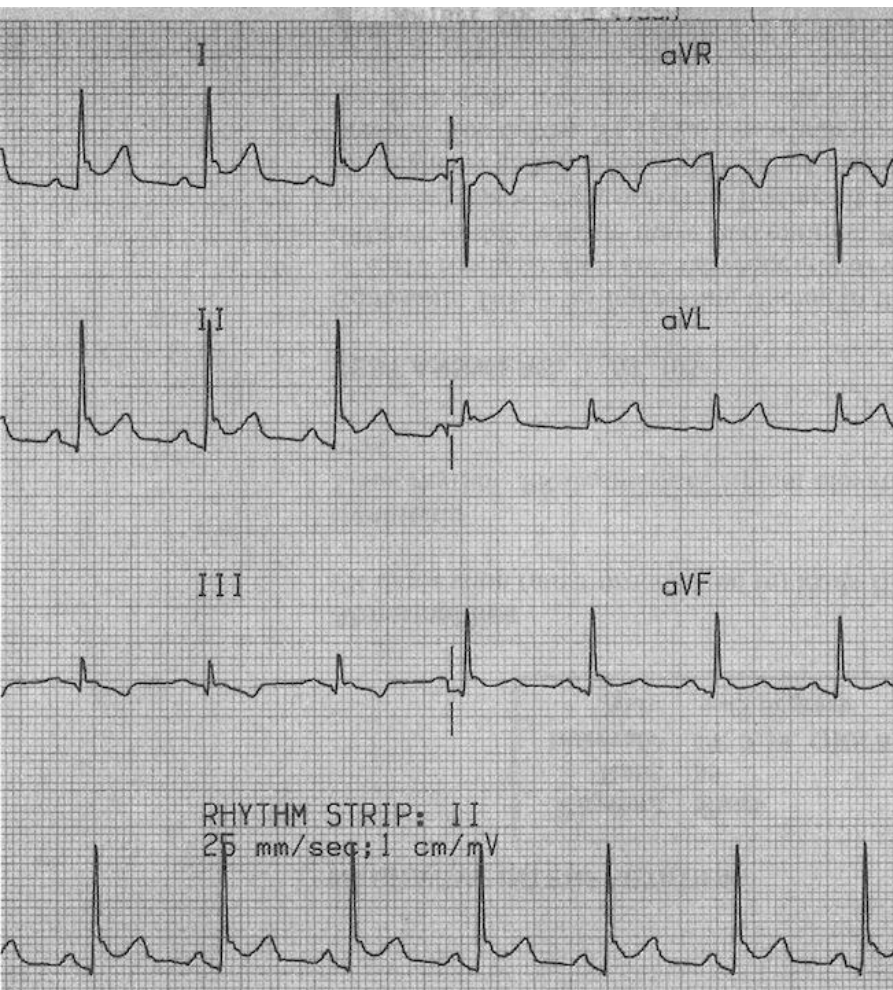












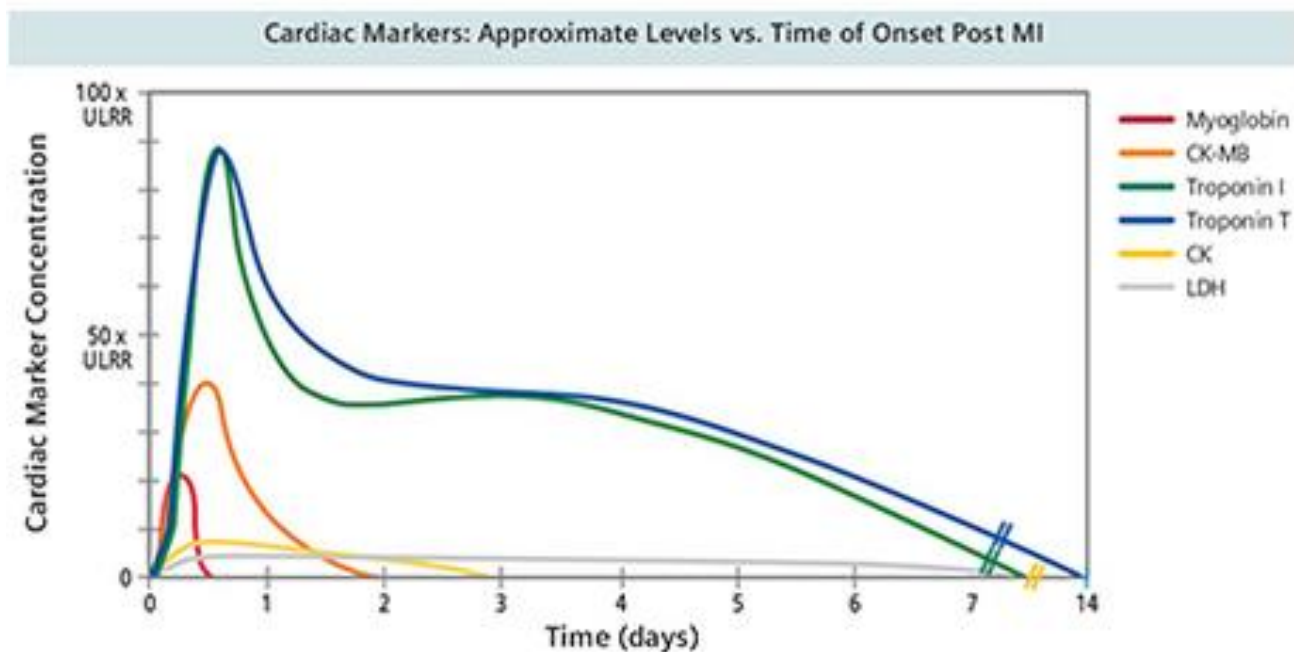
- Bonus slide!

Pericarditis

- Chest pain
- Positional
- Worse on inspiration
- Saddle shaped ST segments
- Treat with NSAIDs
- Can lead to myocarditis (trop rise)
- Heart failure

Troponin

DON'T WAIT FOR A TROPONIN IN STEMI!!



- Most sensitive at 12 hours
- But now <3 hours with high sensitivity TroponinT

Management of MI

Immediately:

- Treat pain
 - GTN
 - Morphine (co-prescribe anti-emetic)
- Give Aspirin 300mg
- P2Y₁₂ Inhibitor
 - Clopidogrel (300-600mg)
 - Prasugrel
 - Ticagrelor

Management of MI

STEMI

- Direct transfer for PCI
- Angiogram +/- stent
- IIb/IIIa-i (abciximab, tirofiban, eptifibatide)

NSTEMI

- “Cool off”
- Angiogram <72hrs
- Fondaparinux 2.5mg
- Risk stratify: GRACE score
- Emergency PCI if pain continues

Complications of MI

- Death
- Arrhythmia/heart block
- Ruptured aneurysm
- Thrombus (mural)
- Heart failure/cardiogenic shock
- VSD
- Another MI
- Dressler's syndrome
- Emboli
- Regurgitant valve



OSCE Station: Median Sternotomy



- Probably a bypass
 - Look for vein graft on the legs (or it might be a LIMA only)
- Could be a valve replacement
 - Listen for metallic clicks.

Traditional Incision



Endoscopic Incisions



Case 3

79 ♀

Breathlessness

Case 3

- At night
- Wheezy and short of breath
- “Sounded chesty”

Differential?

- Heart failure
- Pneumonia
- Asthma/COPD?
- Pulmonary embolus?!

- Orthopnoea
- Paroxysmal Nocturnal Dyspnoea (PND)
- Reducing ET (dyspnoea)

Case 3

PMHx

- MI 1999 → 2 stents
- MI 2004 → CABG
- Hypertension
- Type 2 Diabetes
- CKD 3

Case 3

DHx

- Aspirin 75mg
- Atorvastatin 40mg
- Bisoprolol 2.5mg
- Amlodipine 5mg

- New: Furosemide 40mg od from GP
 - “Swollen ankles”

Case 3

Social

- Lives alone
- Coping less well for 2/52
- No alcohol
- Ex-smoker (30py)

Family

- Parents lived to 80s
- 2 children
 - Australia
 - America

Case 3

Examination

Looks ill, cold, clammy.

BP 190/60, HR 110.

Sats 90% on RA. RR 30.

Case 3

Examination

- Raised JVP (7cm)
- Pan-systolic murmur
- Third heart sound
- Peripheral oedema to knee

Diagnosis?

- Crepitations to the midzone!

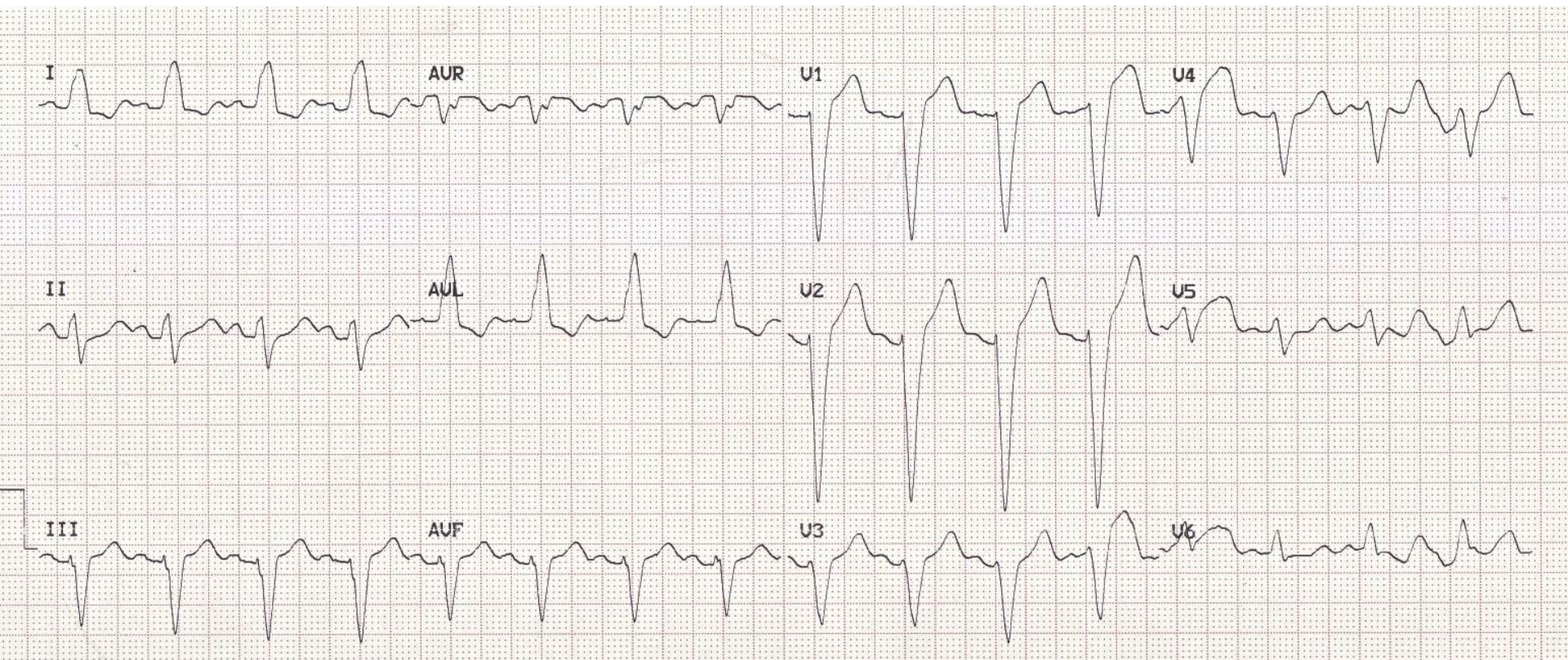
Case 3

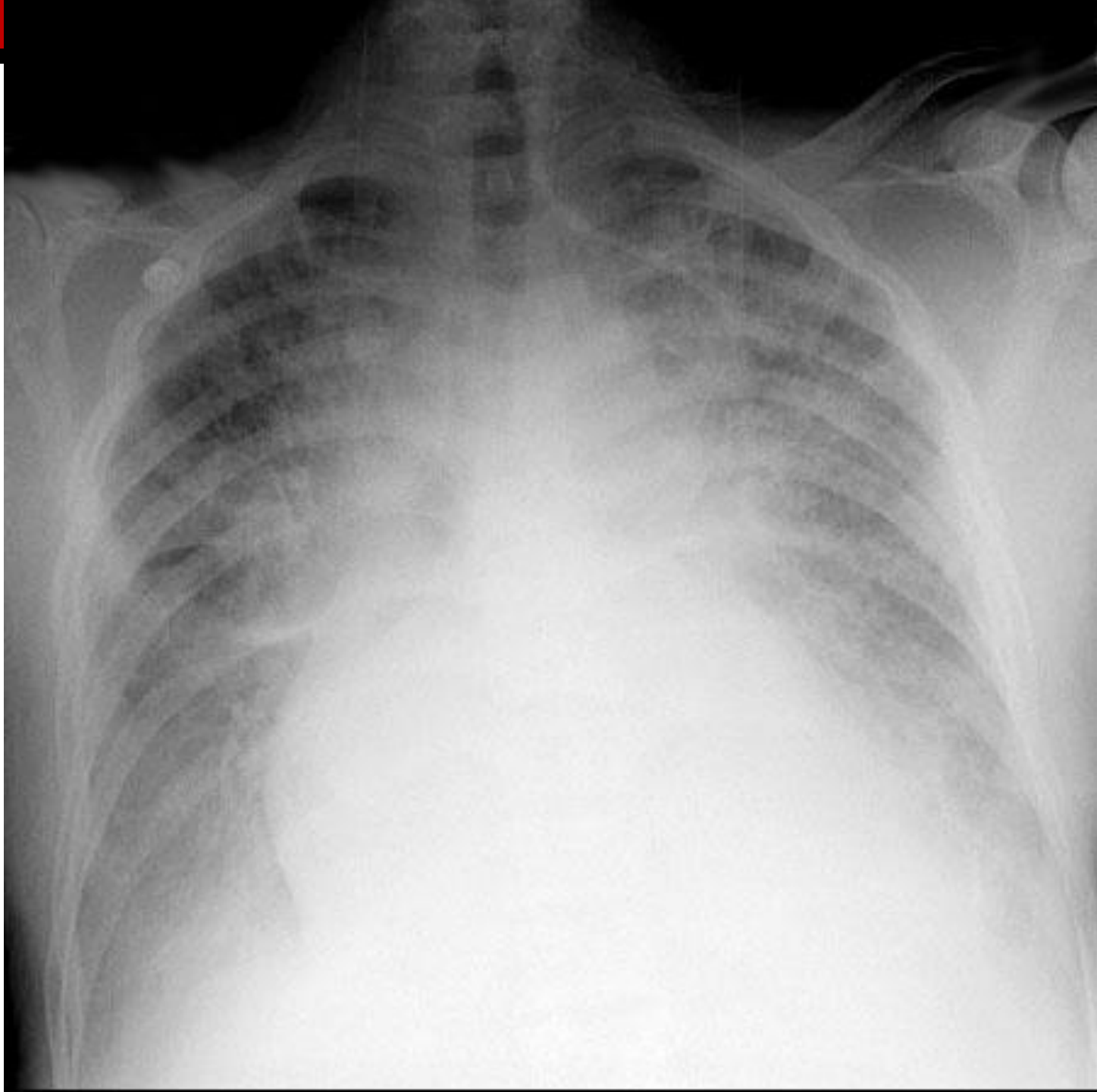
Investigations

- Bloods
- ECG
- Chest X-ray
- Echocardiogram

Na+	128
K+	4.0
Ur	13.5
Cr	270
WCC	7
Hb	10.5
Plts	327
NT-pro-BNP	3000
CRP	<5

Case 3





Heart Failure CXR ABCDE

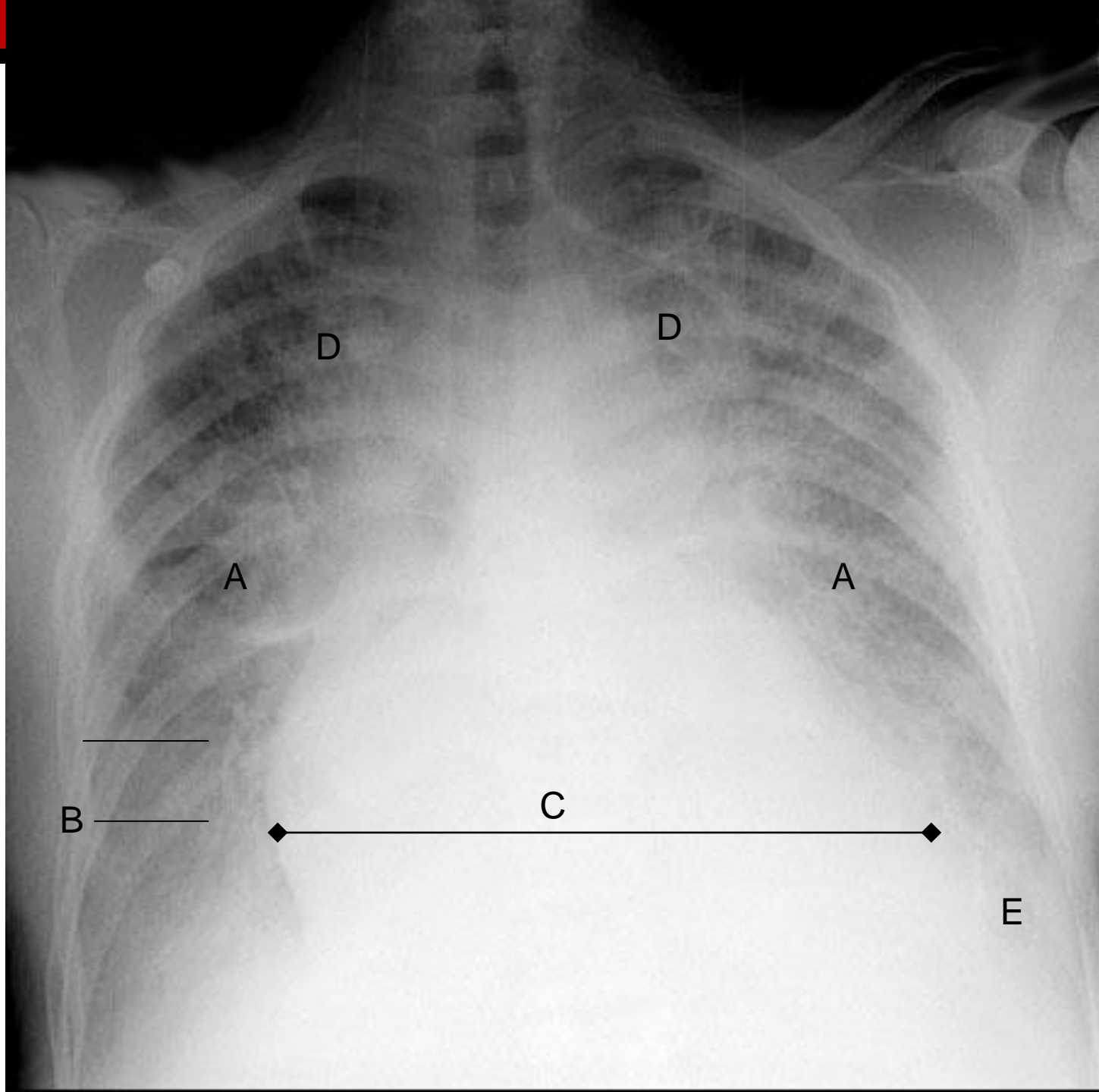
A - Alveolar shadowing

B – Kerley-B lines

C - Cardiomegaly

D - Upper lobe Diversion

E - Pleural Effusions



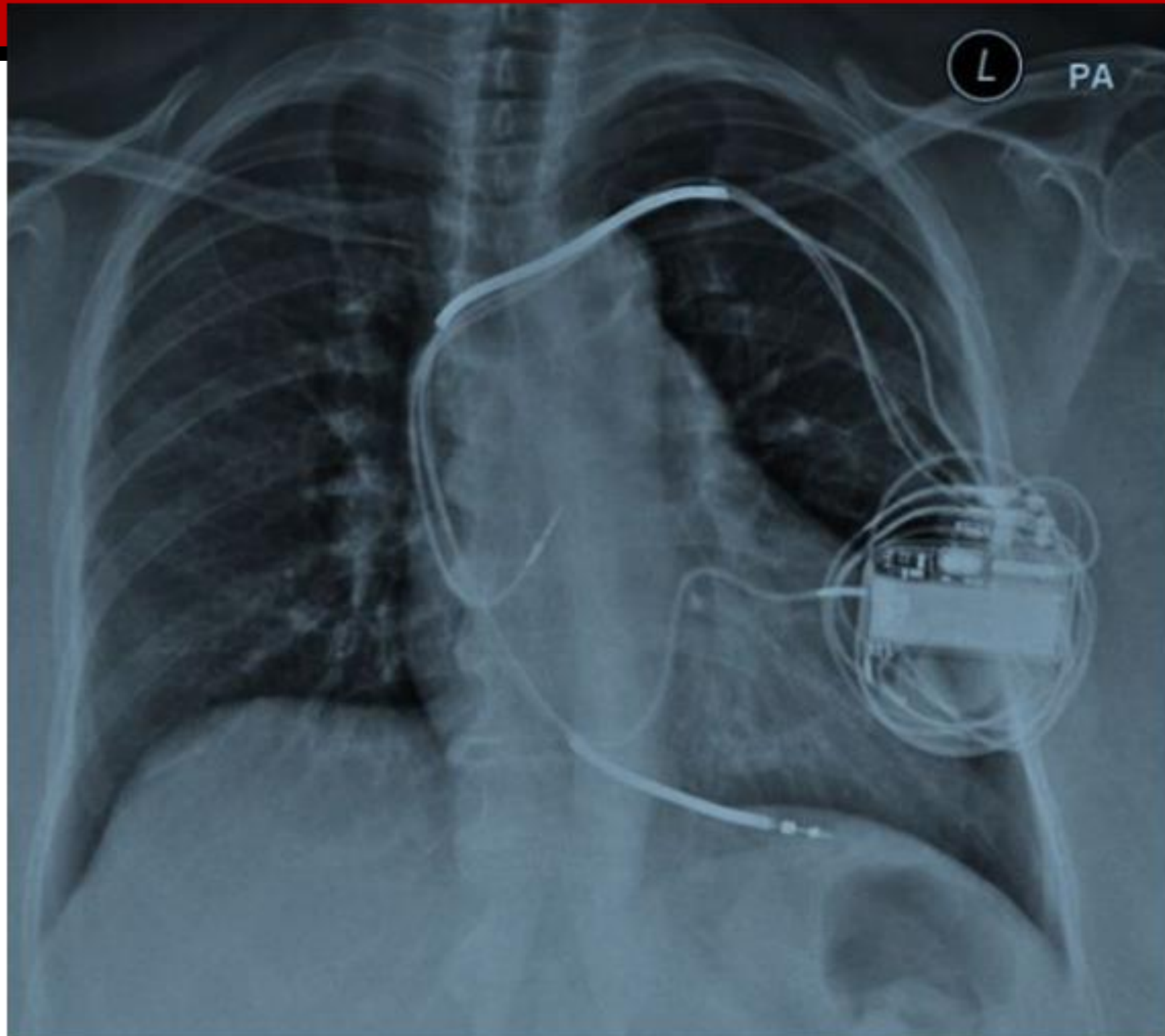
Heart Failure Management

Acute

- Oxygen
- Furosemide (i.v.)
 - Aiming for diuresis
- If fails → CPAP
- Off the menu!
 - GTN
 - Morphine

Long-term

- Salt restricted diet
- Cardiac rehab course
- Oral loop diuretics
- Spironolactone/Eplerenone
- ACE-i/A2RB
- β -blocker
- Ivabradine
- Anti-platelets
- Defibrillator/Resynchronisation



What causes heart failure?

- Ischaemic heart disease
- Valvular disease
- Hypertension
- Cardiomyopathy
 - Lots of rare causes

Why decompensation?

- Infarction
- Infection
- Drugs/diet
- Arrhythmia
- Thyroid disease
- Hypertension
- Medication failure

Heart Failure

Symptoms classification

New York Heart Association:

- NYHA I
 - No symptoms
- NYHA II
 - Mild symptoms during daily life
- NYHA III
 - Symptoms with any exertion
- NYHA IIII
 - Symptoms at rest

Heart Failure – Ejection Fraction

Mild $>45\%$

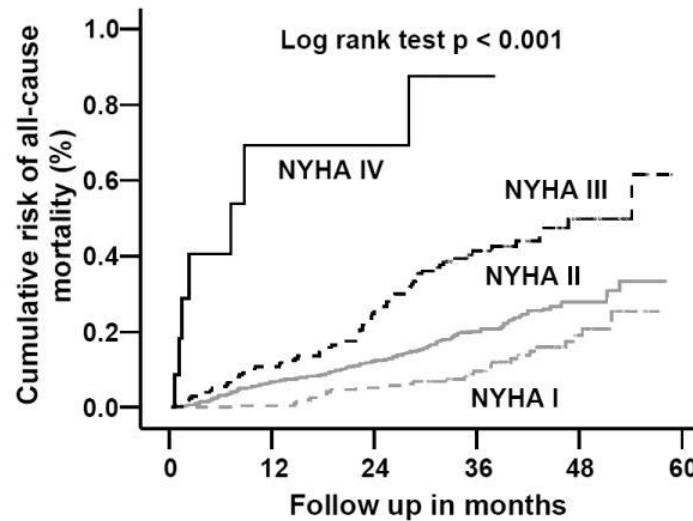
Moderate 35-45%

Severe $<35\%$

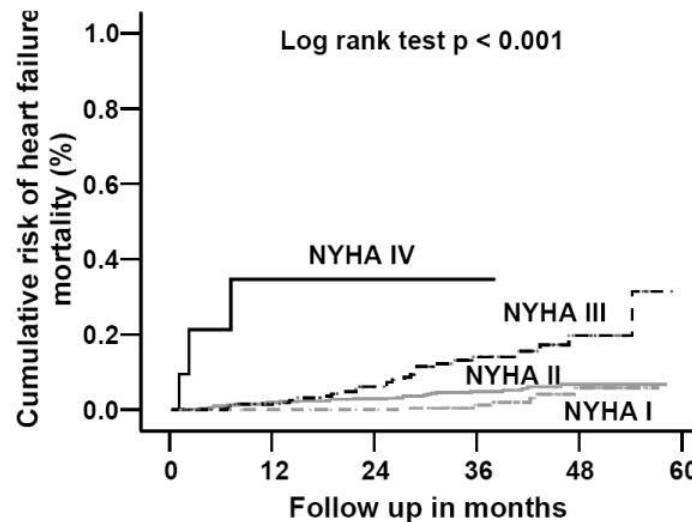
Heart Failure

Prognosis

(a)



(b)



OSCE tips

- Hard to get a decompensated patients in your exam
- Feel for a pacemaker or an ICD
- Look for RV signs without LV signs
 - JVP raised
 - Peripheral oedema
 - NO pulmonary oedema.

Case 4

88 ♂

Loss of Consciousness

Case 4

History

- Sitting at church
- Suddenly felt “wrong”
- Woke up on floor
- Immediately knew was in church
- No tongue biting/urinary incontinence/injury

Case 4

Collateral

- Went pale
- Slumped off seat
- No shaking
- Out for “minutes”
- Normal on recovery

Case 4

PMHx

- Hypertension
- Cholesterol

DHx

- Amlodipine
- Simvastatin

SHx

- Non-smoker
- No alcohol
- Independent

FHx

- Nil

Case 4

Examination

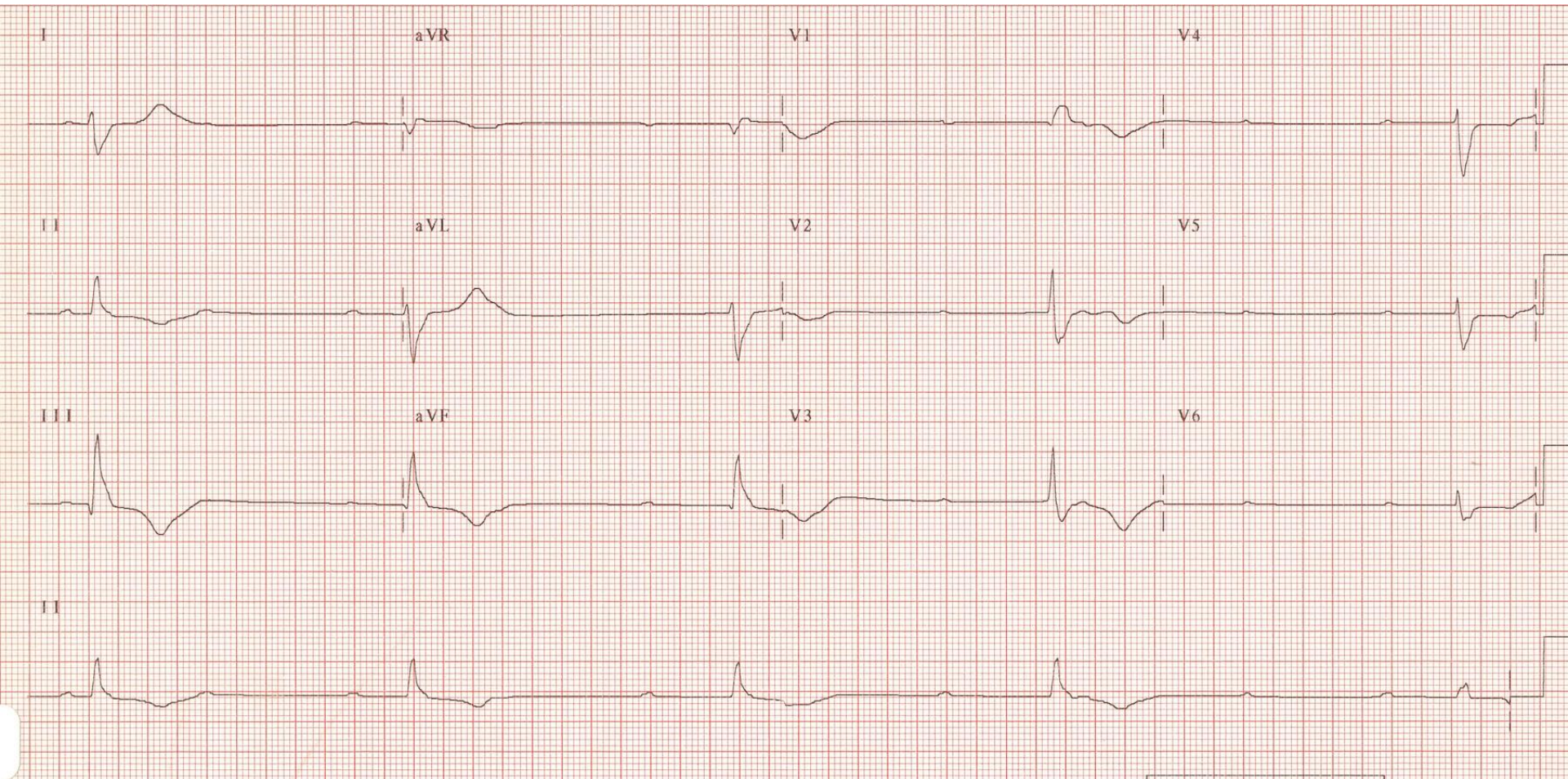
- Looks well
- BP 190/70, HR 40, RR 16, sats 95% RA
- Ejection systolic murmur

Case 4

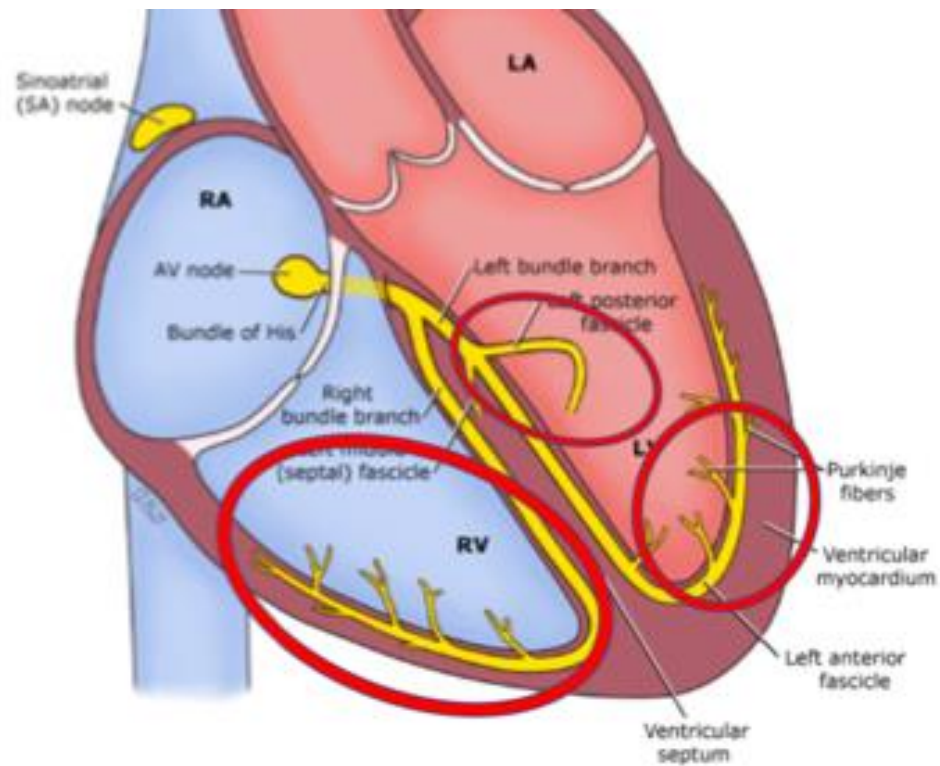
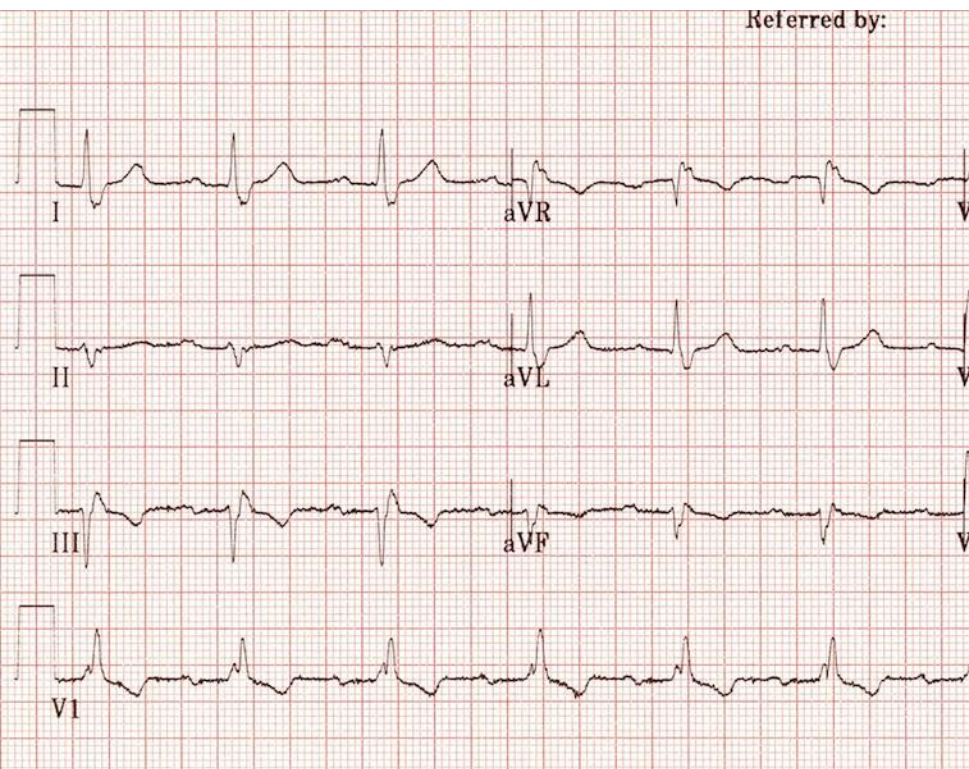
Investigations

- Bloods
- CXR
- ECG
- Echo?

ECG



ECG



ECG



Pacemaker Indications

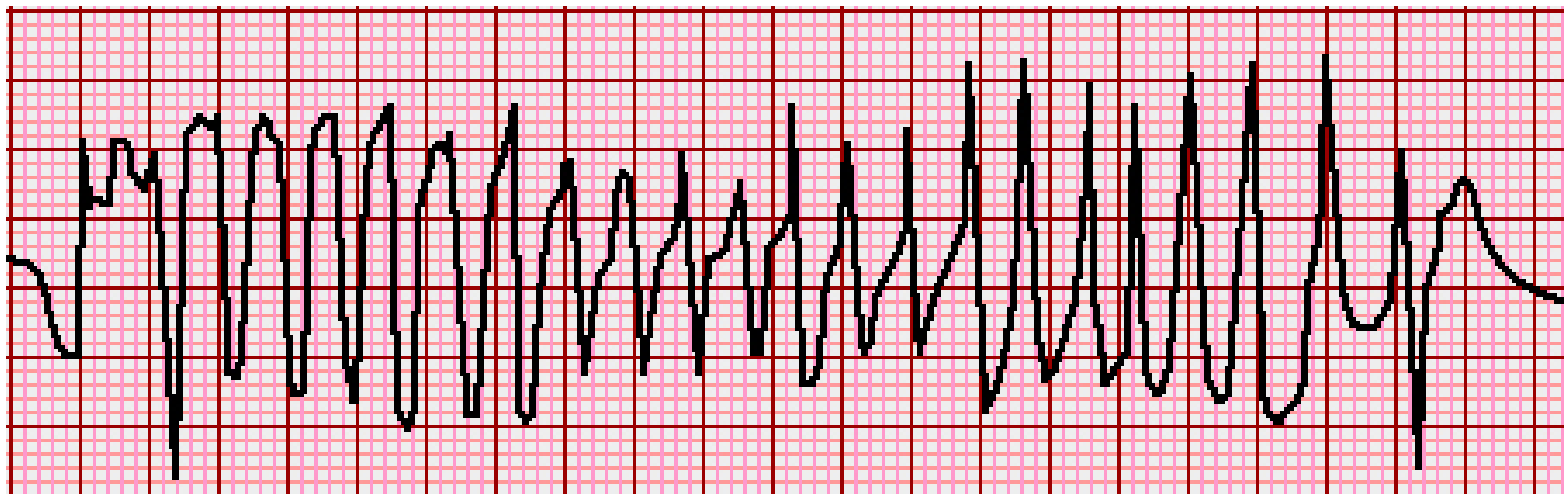
- 1st Degree HB
- 2nd Degree HB
 - Mobitz 1
 - Mobitz 2 (2:1, 3:1)
- Tri-fascicular block
- 3rd Degree HB (Complete)

Case 3.1

27♂

DEAD

DEAD



Torsade de Pointes

Treatment

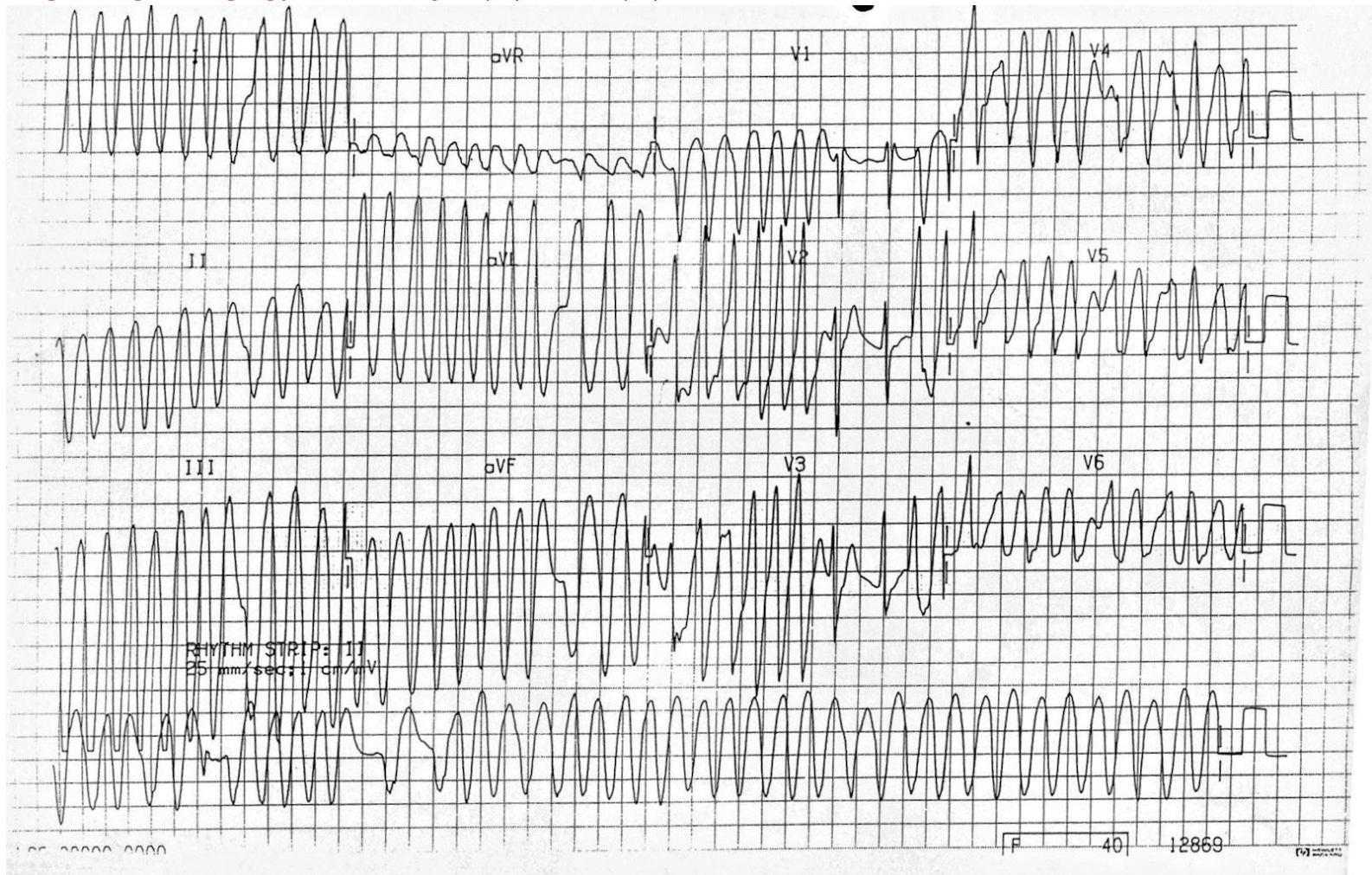
- 1) Electricity
- 2) Magnesium (2g/10mins) (when alive)

Diagnosis?

- Drugs (cocaine, speed, MDMA)
- LQTS 1,2,3 (up to 13!)
- Brugada syndrome
- ARVC
- HCM

- All rare

Pre-excited AF/WPW



Delta-waves

QTc 392

--Axis--

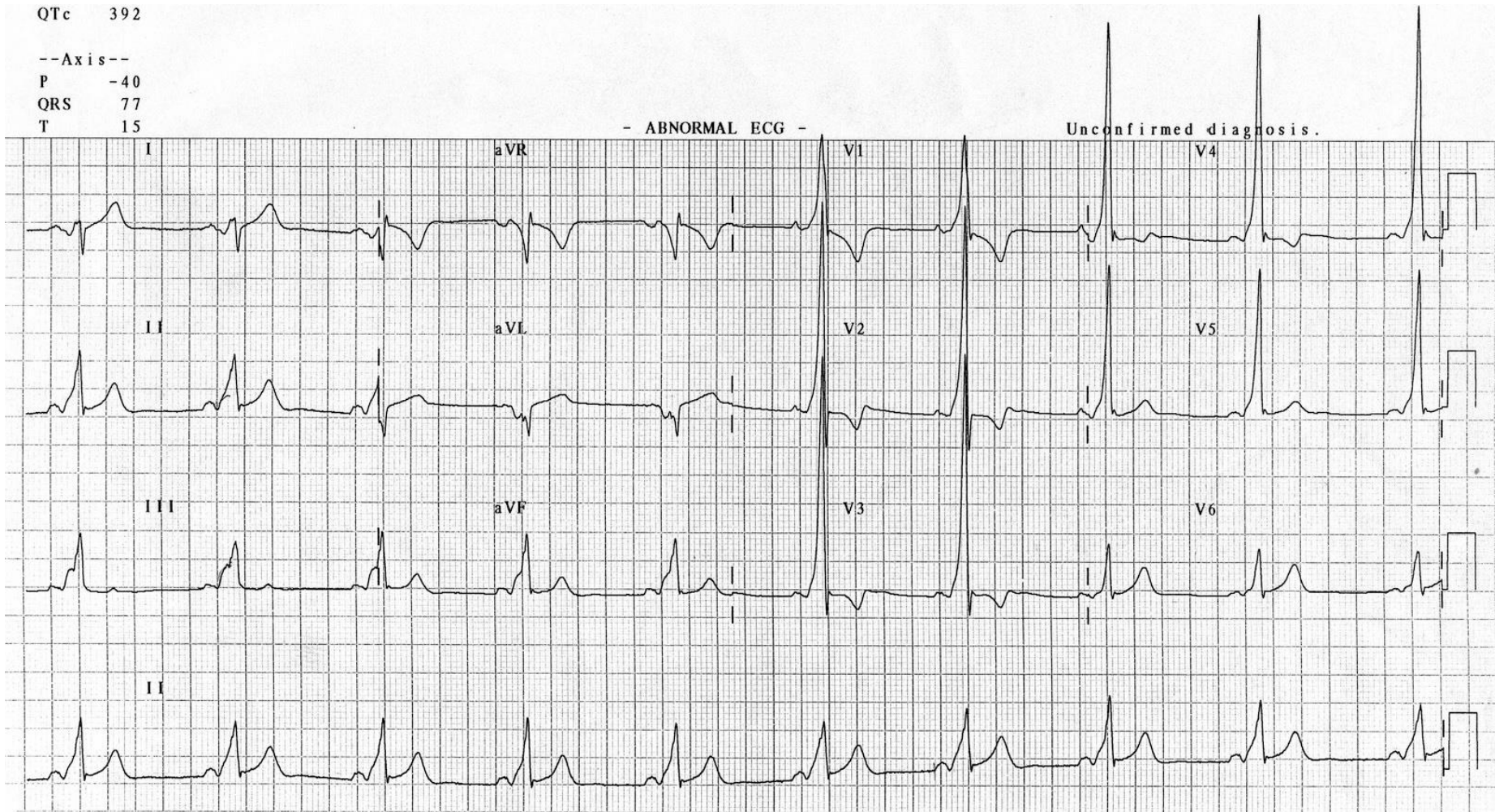
P -40

QRS 77

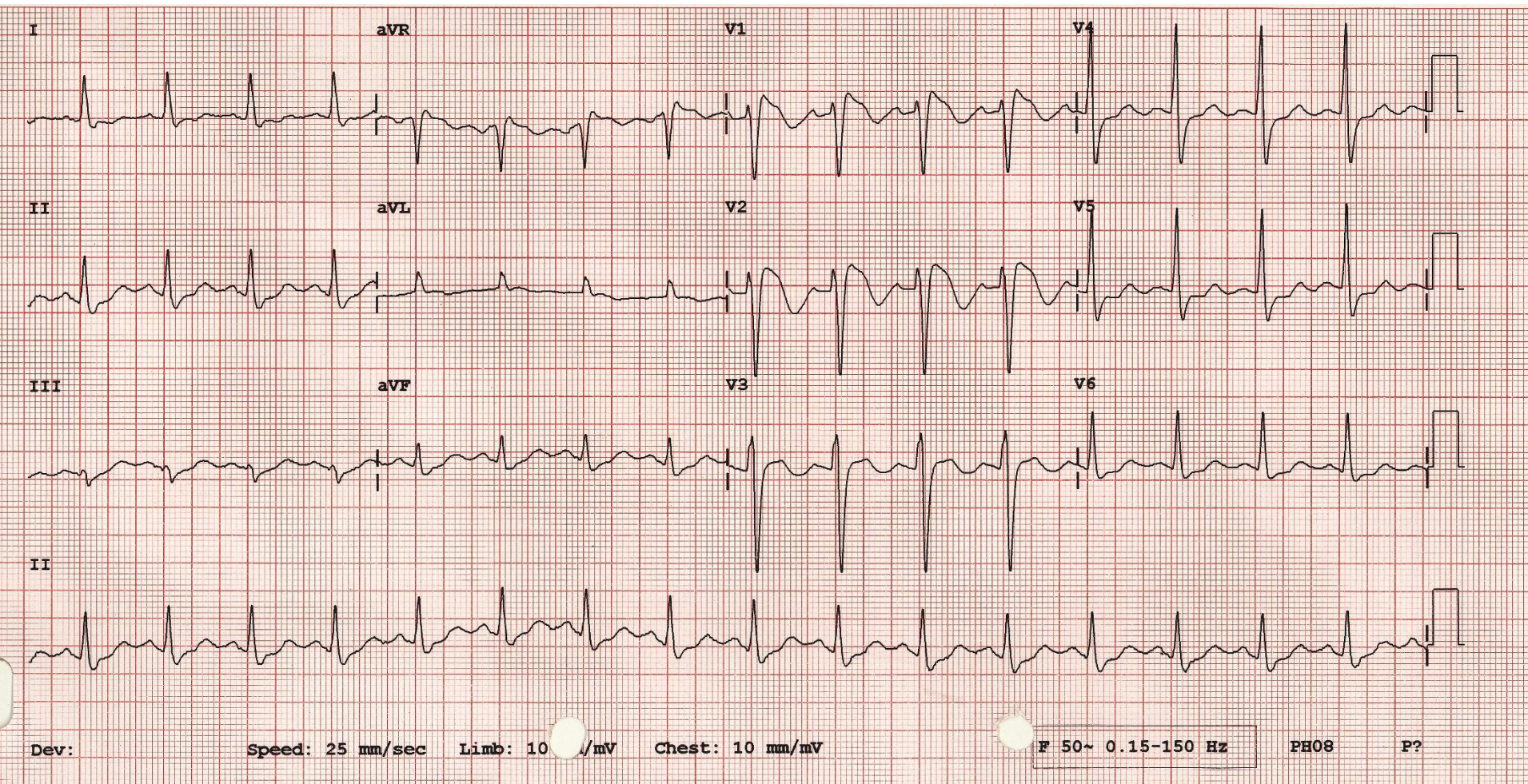
T 15

- ABNORMAL ECG -

Unconfirmed diagnosis.



Brugada



Case 5

57 ♂

Chest pain on
Exertion

Case 5

History

- Worsening chest pain on exertion
- Associated with breathlessness
- Never lost consciousness

Case 5

PMHx

Nil

DHx

None

SHx

- Non-smoker
- 6 units/week
- Independent

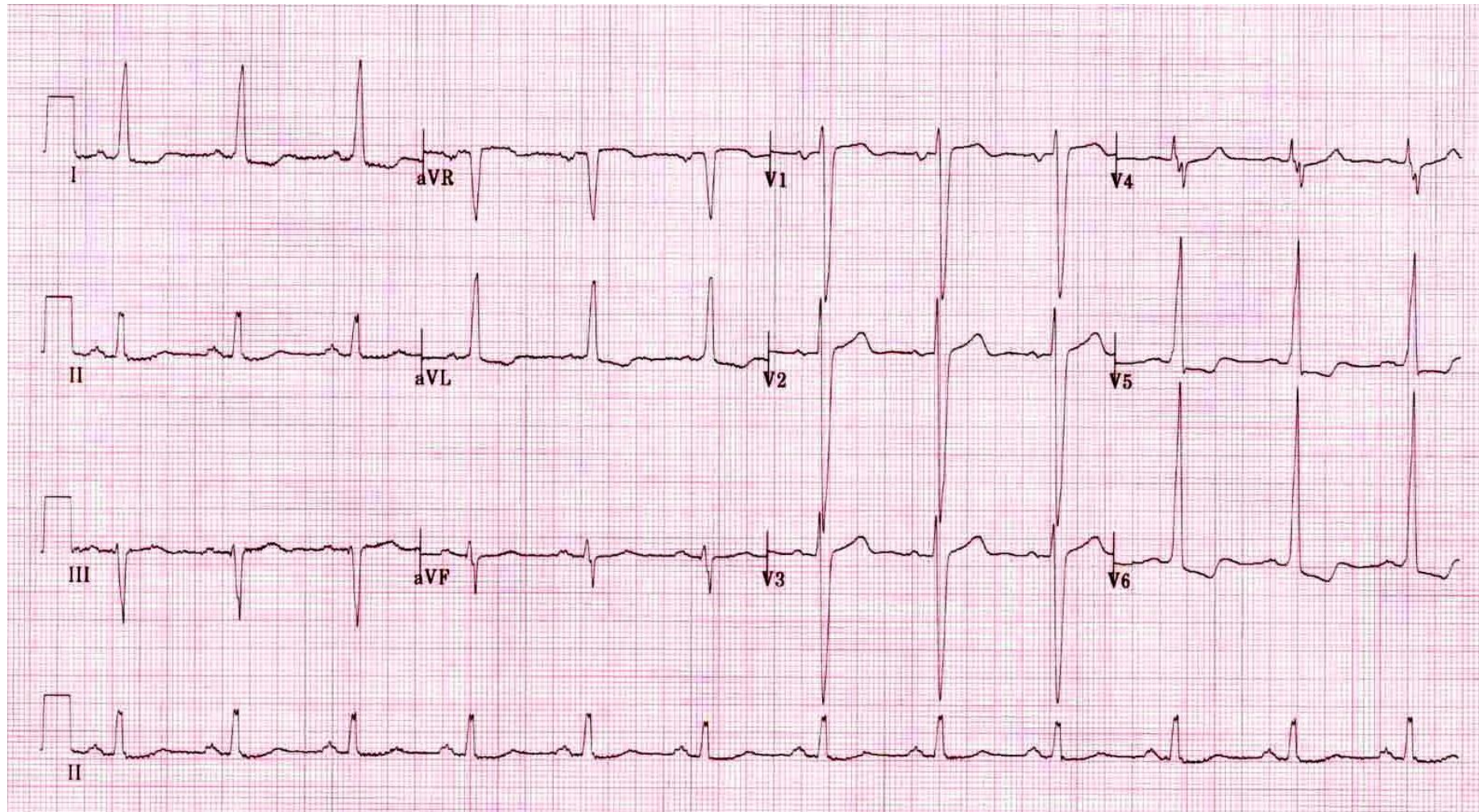
FHx

- Nil

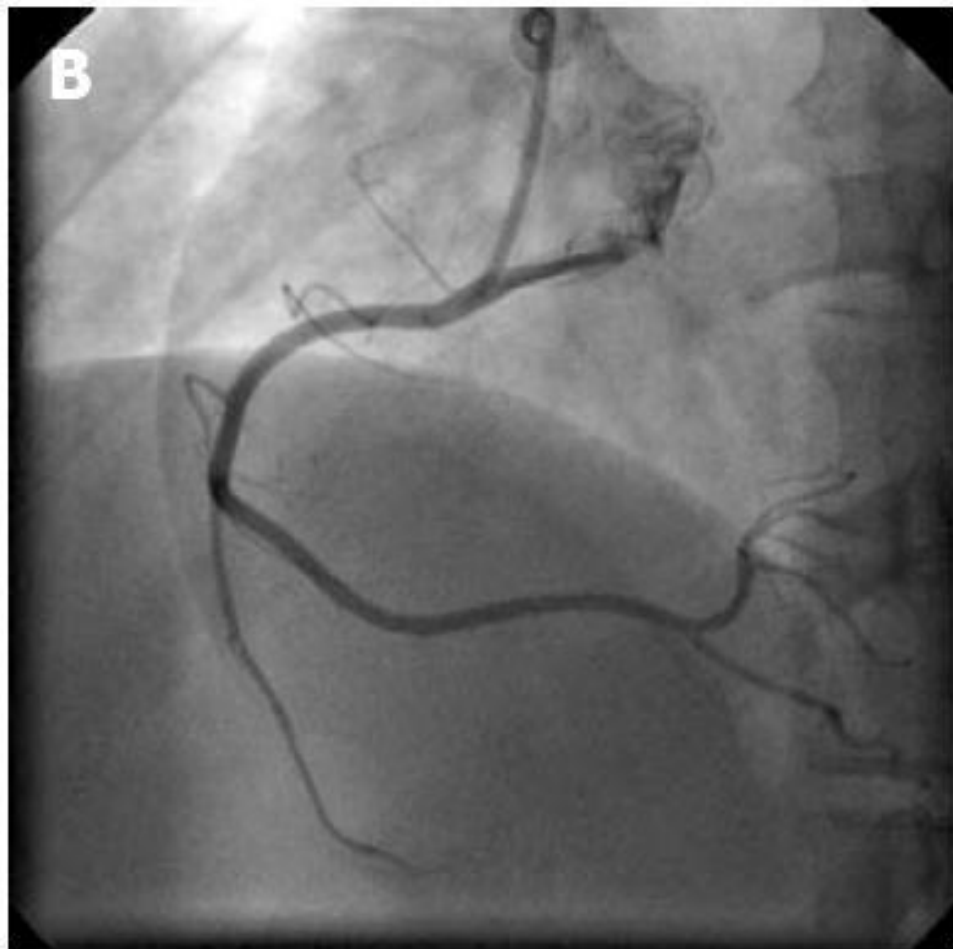
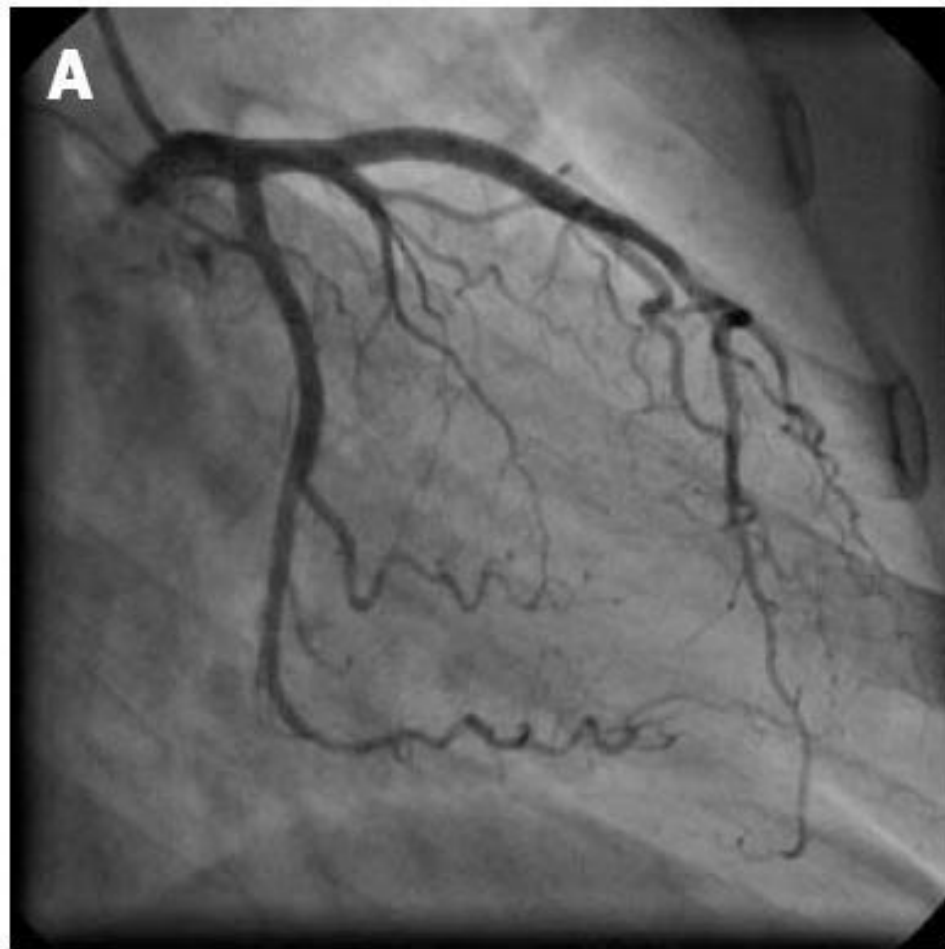
Case 5

- BP 100/80, HR 70, sats 96%, RR 16
- Murmur heard:
 - Ejection systolic
 - Loudest over aortic region
- Radiates to carotids.
- Quiet second heart sound.
- Slow rising pulse

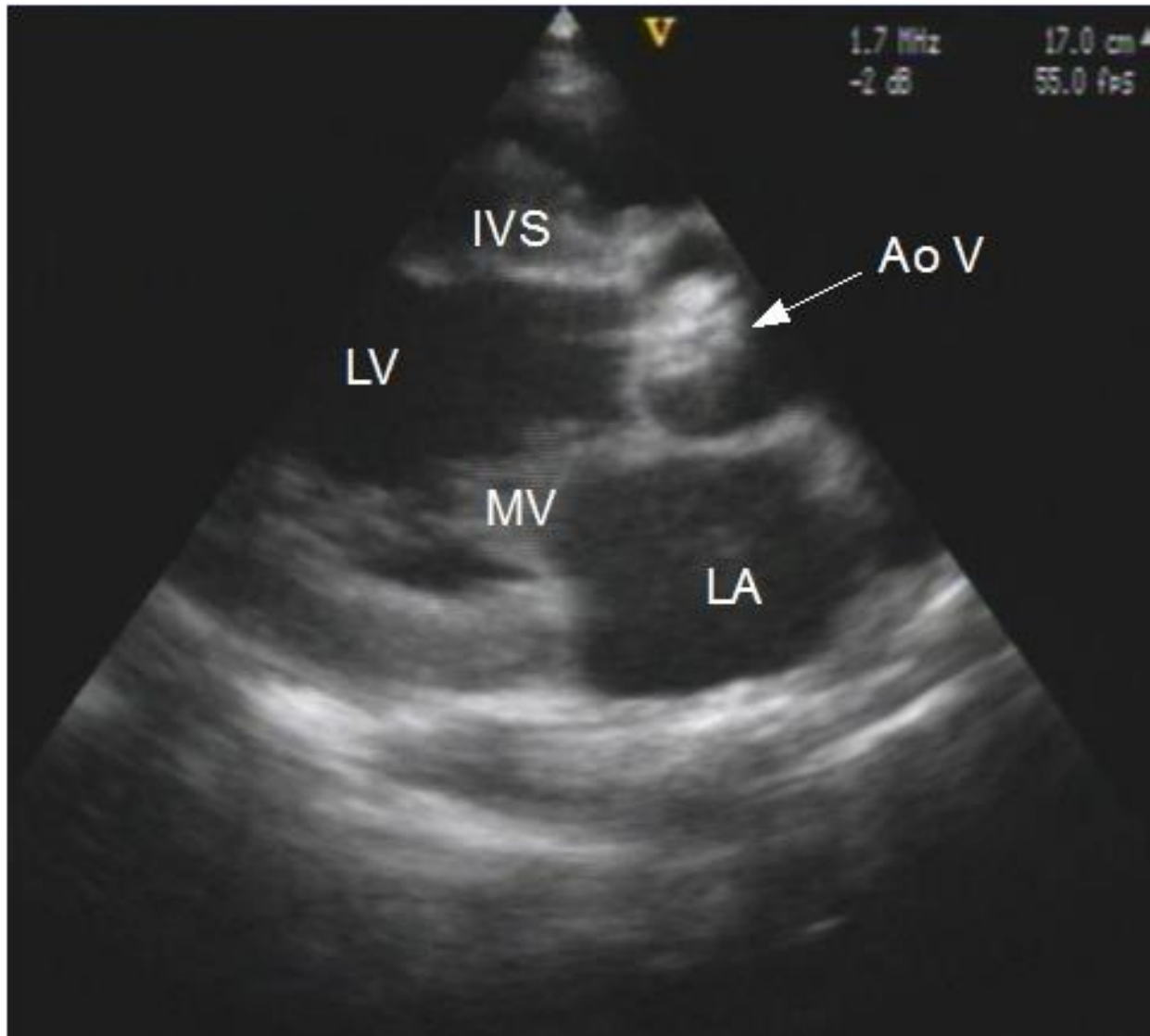
Case 5



Case 5



Case 5



Aortic Stenosis

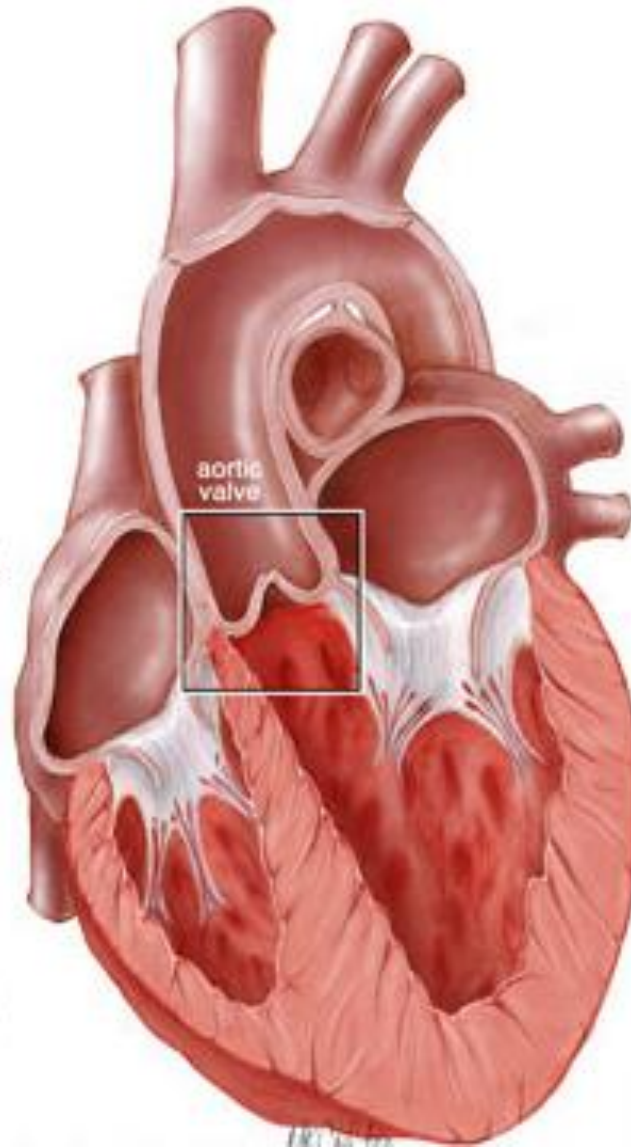
Aortic Valve



*Tricuspid aortic valve
(normal)*

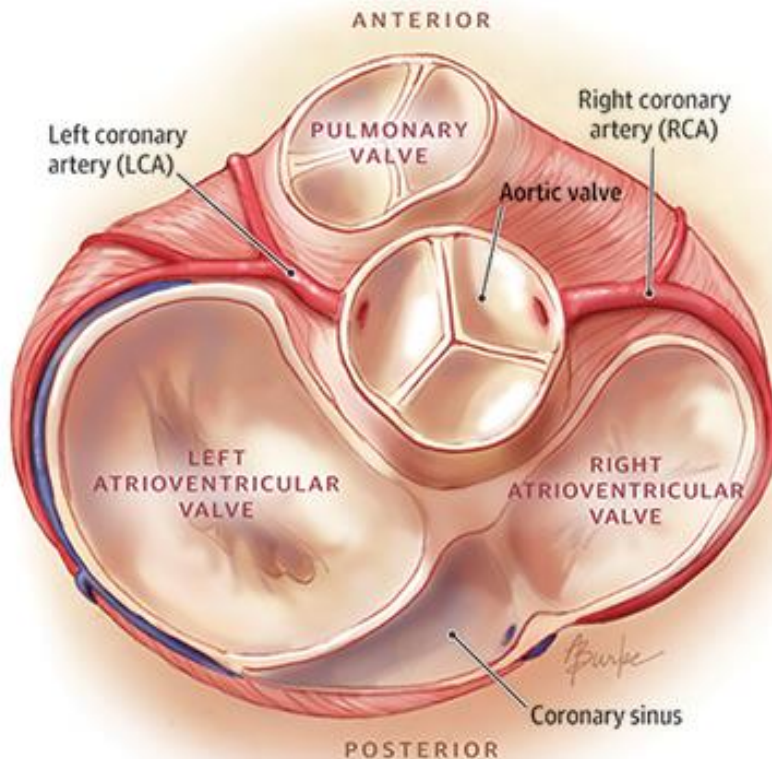


*Bicuspid aortic valve
(abnormal)*

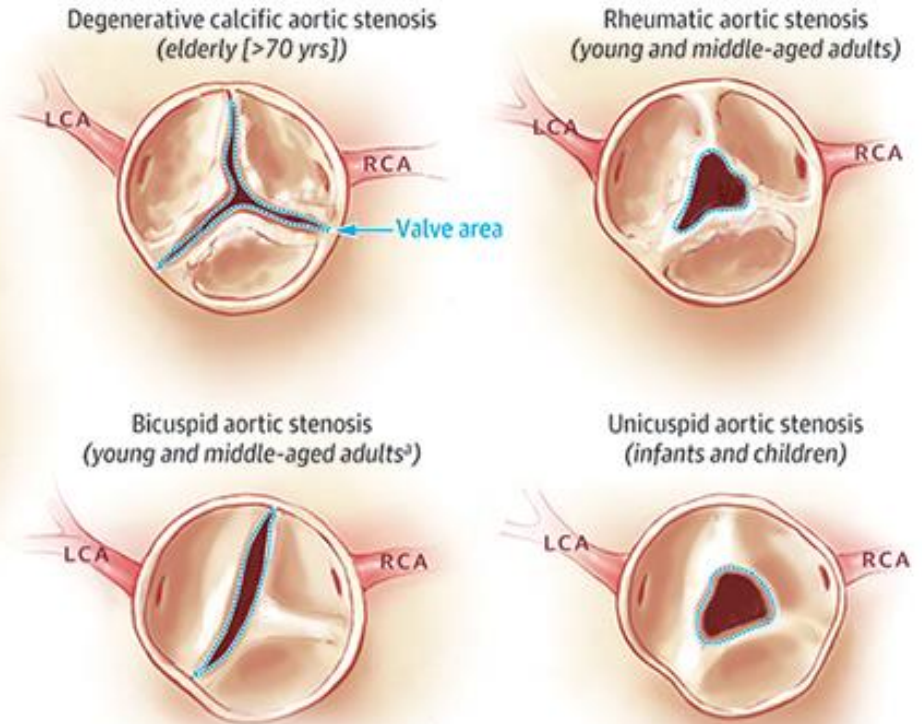


Aortic Stenosis

A Normal heart valve anatomy



B Examples of types of aortic stenosis and age of presentation of aortic stenosis



Aortic Stenosis

Symptoms:

- Angina
- Dyspnoea
- Syncope

Severity:

- Narrow pulse pressure
- Long murmur
- Quiet heart sound

Aortic Stenosis

Prognosis:

- If symptomatic: poor
- 15-50% dead in a year

Treatment:

- **NO GTN for angina!**
- AVR (mechanical or tissue)
- TAVI

OSCE tips: Aortic Stenosis

- Unlikely to be severe in OSCE
 - So you won't get a late peaking murmur
 - Or a low volume pulse
 - But they might invent a narrow pulse pressure on the obs chart.
- More likely to get a sternotomy with a metallic second heart sound.
 - Listen at the carotids!
 - Rule out MR
- Young person → bicuspid valve.

Case 6

57 ♀

Palpitations and
breathlessness

Case 6

History

- 12 months of palpitations
- 3 months of exertional dyspnoea

PMHx

- Hypertension

DHx

- Amlodipine

SHx

- Independent
- Non-smoker

Case 6

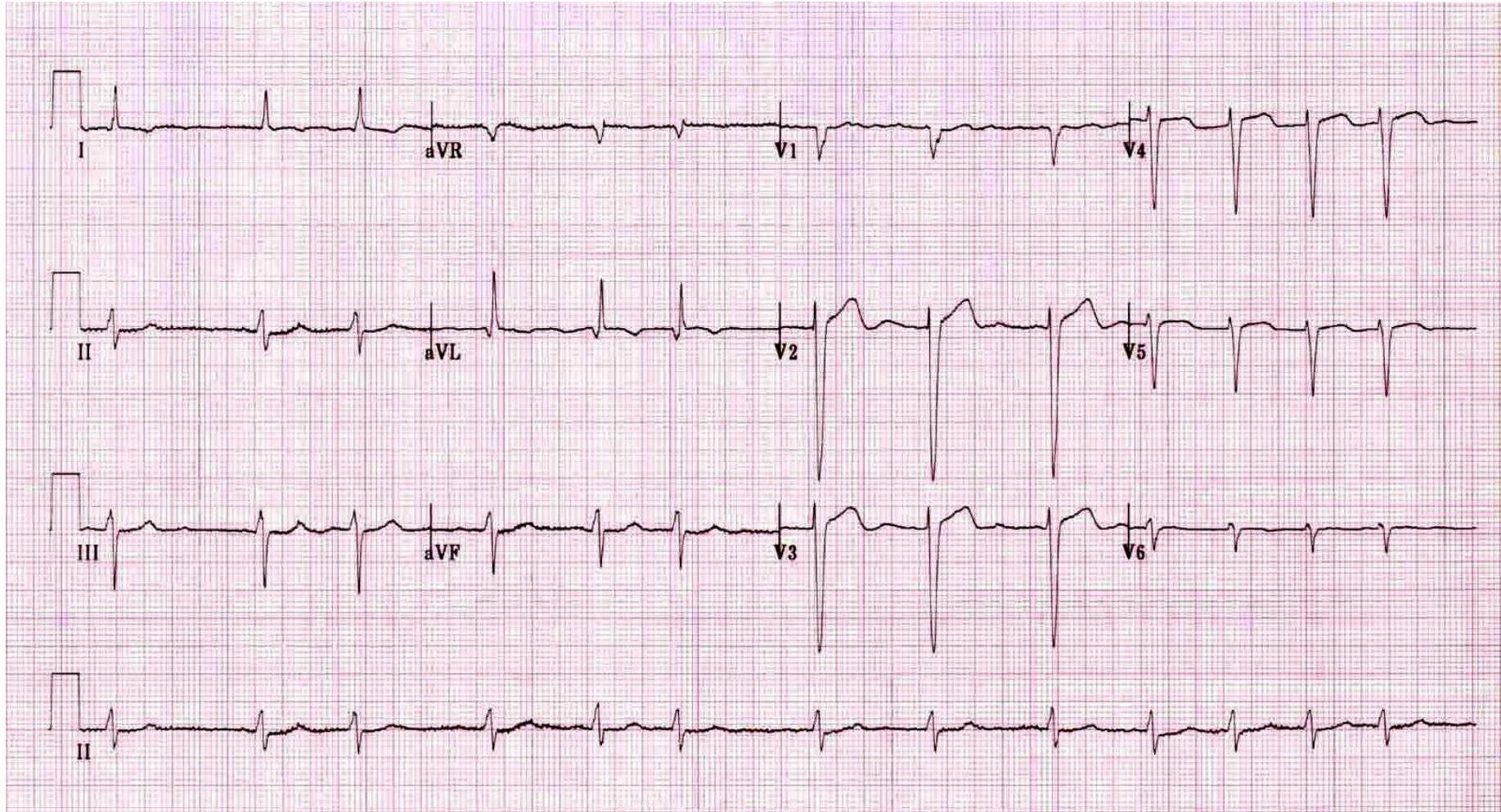
Examination

140/60

HR 100 – irregularly irregular

Pan-systolic murmur, loudest at apex.

Case 6



Mitral Regurgitation

Bonus slide
Endocarditis!!

Duke's criteria:

MAJOR

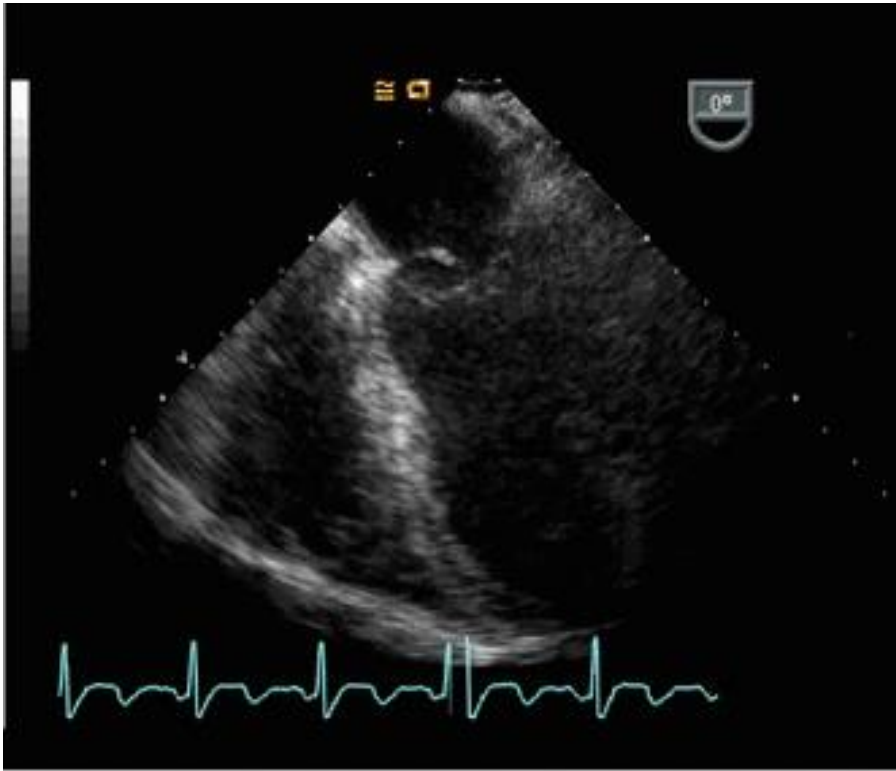
New regurgitant valve lesion

Typical bugs on cultures

- Strep.
- Staph (post op)
- HACEK

Minor

- Vasculitic lesions
- Embolic events
- Non-typical bugs



Mitral Regurgitation

Symptoms

- Breathless on exertion
- Heart failure symptoms
- (Chest pain)
- (Palpitations)

Signs

- Pan-systolic murmur
- Atrial fibrillation
- Heart Failure

Mitral Regurgitation

Prognosis

- Acute: bad
- Chronic, symptomatic: 22% in 5 years

Treatment

Heart failure (medical) management

Anti-coagulate if in AF!

Surgery if severe MR and:

- Symptomatic w/impaired LV
- Asymptomatic w/pHTN or AF

OSCE tips

- Common in OSCEs (because it doesn't need surgery immediately)
- If you feel AF, then listen/feel for mitral disease.
 - Displaced apex
 - Pan-systolic murmur

Case 7

63 ♀

No symptoms

Case 7

- Worried about family history
 - Dad died “of MI” at 40yrs
 - Mum died of heart failure at 70yrs
 - Brother had triple bypass last year.

Risk factor modification

- Blood pressure: 160/70mmHg
- Cholesterol: 6.3
- Diabetes: Don't know
- Smoking: Yes
- Exercise: No

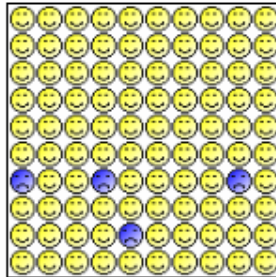
Risk Stratification: www.qrisk.org

Your results

Your risk of having a heart attack or stroke within the next 10 years is:

4.4%

In other words, in a crowd of 100 people with the same risk factors as you, 4 are likely to have a heart attack or stroke within the next 10 years.



Risk of
heart attack or stroke

Your score has been calculated using the data you entered.

Your body mass index was calculated as 20.06 kg/m².

How does your 10-year score compare?

Your score

Your 10-year QRISK [®] 2 score	4.4%
The score of a healthy person with the same age, sex, and ethnicity*	0.8%
Relative risk**	5.8
Your QRISK [®] Healthy Heart Age***	48

Risk factors

- Male sex
- Age (men ≥ 55 years; women ≥ 65 years)
- Smoking
- Dyslipidaemia
- Fasting plasma glucose 5.6–6.9 mmol/L (102–125 mg/dL)
- Abnormal Glucose TT
- Obesity
- Family history of CVD
- Asymptomatic organ damage
 - Pulse pressure (in the elderly) ≥ 60 mmHg
 - LVH
- Carotid wall thickening (IMT > 0.9 mm) or plaque
- Carotid-femoral PWV > 10 m/s
- Ankle-brachial index < 0.9
- Microalbuminuria
 - Diabetes mellitus
 - Established CV or renal disease
 - Stroke
 - Ischaemic Heart Disease
- Heart failure, including heart failure with preserved EF
- Symptomatic lower extremities peripheral artery disease
- Chronic kidney disease
- Advanced retinopathy:

Cholesterol

Primary prevention (no heart attack, yet)

- Atorvastatin 20mg or Rosuvastatin 10mg
- Target is <40% of non-HDL cholesterol

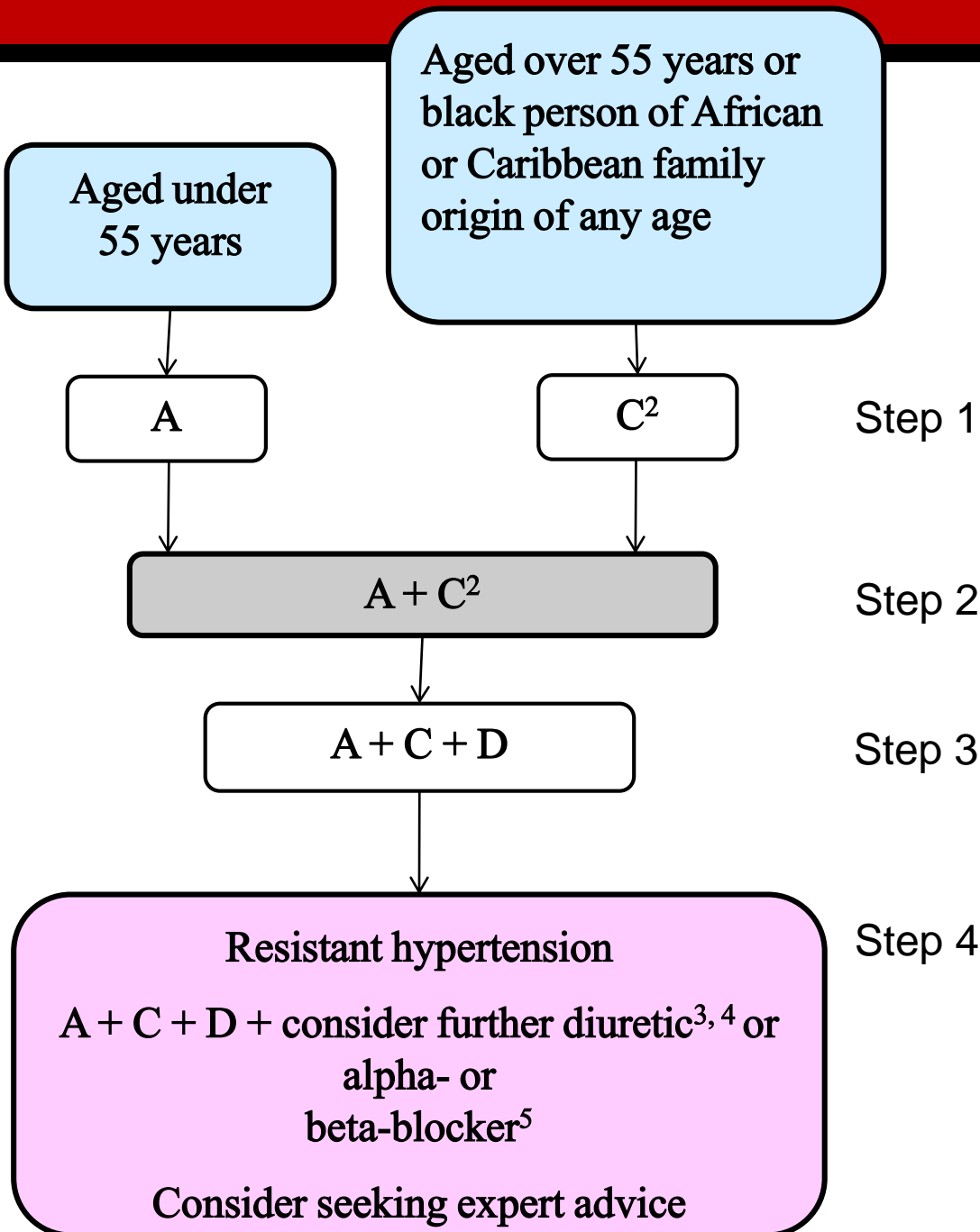
Secondary prevention (had a heart attack)

- Atorvastatin 80mg

Hypertension

- **Stage 1 hypertension:**
 - Clinic blood pressure (BP) is 140/90 mmHg or higher **and**
 - ABPM or HBPM average is 135/85 mmHg or higher.
- **Stage 2 hypertension:**
 - Clinic BP 160/100 mmHg is or higher **and**
 - ABPM or HBPM daytime average is 150/95 mmHg or higher.
- **Severe hypertension:**
 - Clinic BP is 180 mmHg or higher **or**
 - Clinic diastolic BP is 110 mmHg or higher.

Summary of antihypertensive drug treatment



Key

A – ACE inhibitor or low-cost angiotensin II receptor blocker (ARB)¹

C – Calcium-channel blocker (CCB)

D – Thiazide-like diuretic

Summary

- **MI**
 - STEMI/NSTEMI?
 - Aspirin/Oxygen/Nitrates/Morphine
- **Heart Failure**
 - Diuretics then secondary prevention
- **AF**
 - Emergency?
 - Rate vs. Rhythm
- **Valves**
 - AS poor prognosis, early surgery
 - MR better prognosis, AF, later surgery
- **Hypertension + Cholesterol**
 - NICE guidelines

Cool websites

- www.lifeinthefastlane.com
- www.escardio.org (actually not that cool)
- The Simply Forum!