

Intermediate End of Block Exam

INTRODUCTION

You have 1 hour to complete this test. Each multiple choice question has only one correct answer. The short answer questions (SAQ's) will dictate how many marks each question is worth in brackets.

Q1

Describe the cardiac axis for a patient whose ECG shows a positive QRS in lead I, a negative deflection in aVF and a positive QRS in lead II

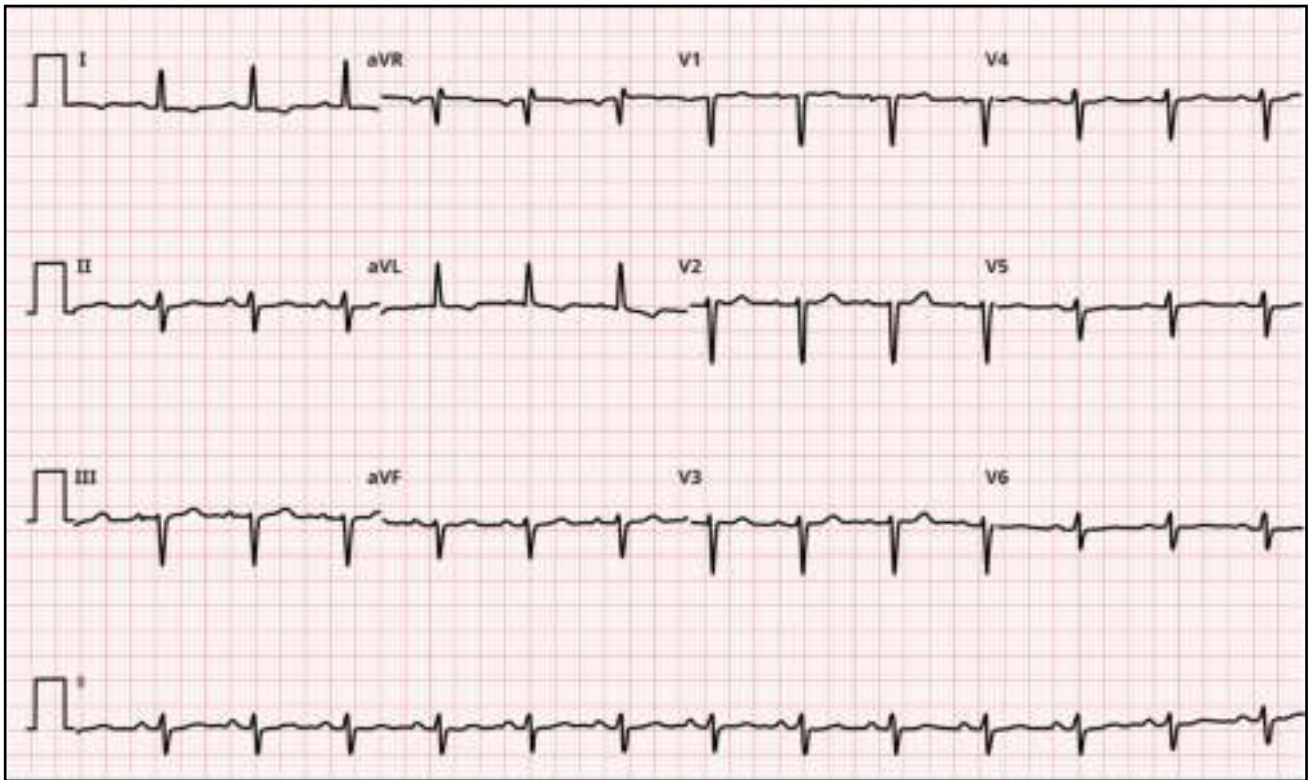
- A. Normal axis
- B. Left axis deviation
- C. Right axis deviation
- D. Extreme axis deviation
- E. Can't determine axis without more information

Explanation

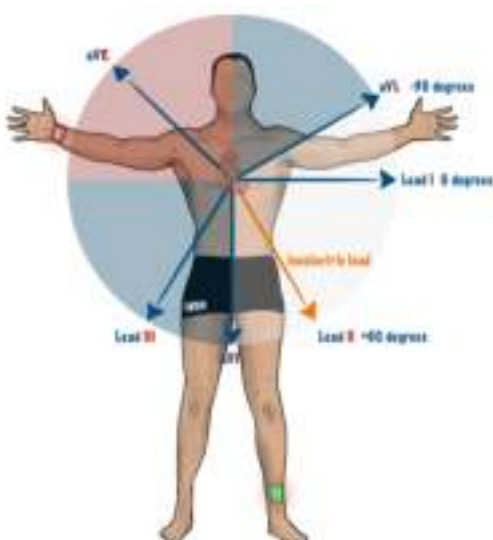
This is a normal axis pattern. Although lead aVF is negative, because lead II is positive the axis is still within the normal range. Remember that a normal cardiac axis runs from -30 to +90 degrees, not 0 degrees to 90 degrees. It is likely that the true cardiac axis for this ECG lies between 0 and -30

Q2

Calculate the cardiac axis in degrees for the following ECG?



- A. 0 degrees
- B. -30 degrees
- C. +60 degrees
- D. +150 degrees
- E. -90 degrees

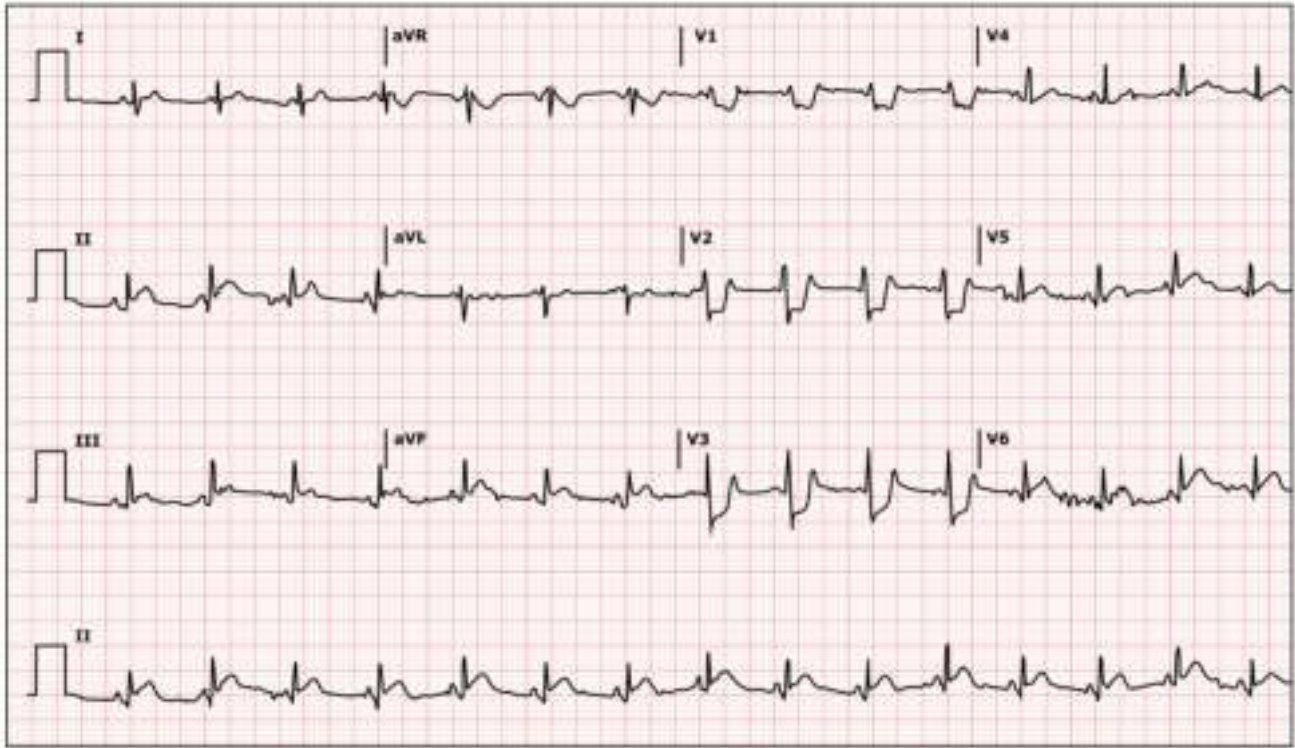


Explanation

This is a similar ECG to the one described in question 1 although this time we need to use the isoelectric lead method to work out the exact axis. The isoelectric lead (lead where the QRS is equal parts positive and negative) in this ECG is lead II. We know that because lead II is isoelectric, the cardiac axis is running at 90 degrees from lead II. Since lead I picks up electrical activity at +60 degrees, that means that our cardiac axis is either -30 degrees or +150 degrees. To determine which of these is correct, we have to use some other clues from lead I and aVF. Lead aVF is negative and lead I is positive so the electrical axis is moving towards lead I. Therefore from our 2 options only -30 degrees fits

Q3

A previously fit and well 65 year old gentleman presents to the emergency department in a large hospital with central crushing chest pain that started 1 hour ago and has been unrelieved by GTN. He has been given aspirin and ticagrelor in the ambulance. His ECG is shown below. Which of the following is the most



appropriate definitive management option.

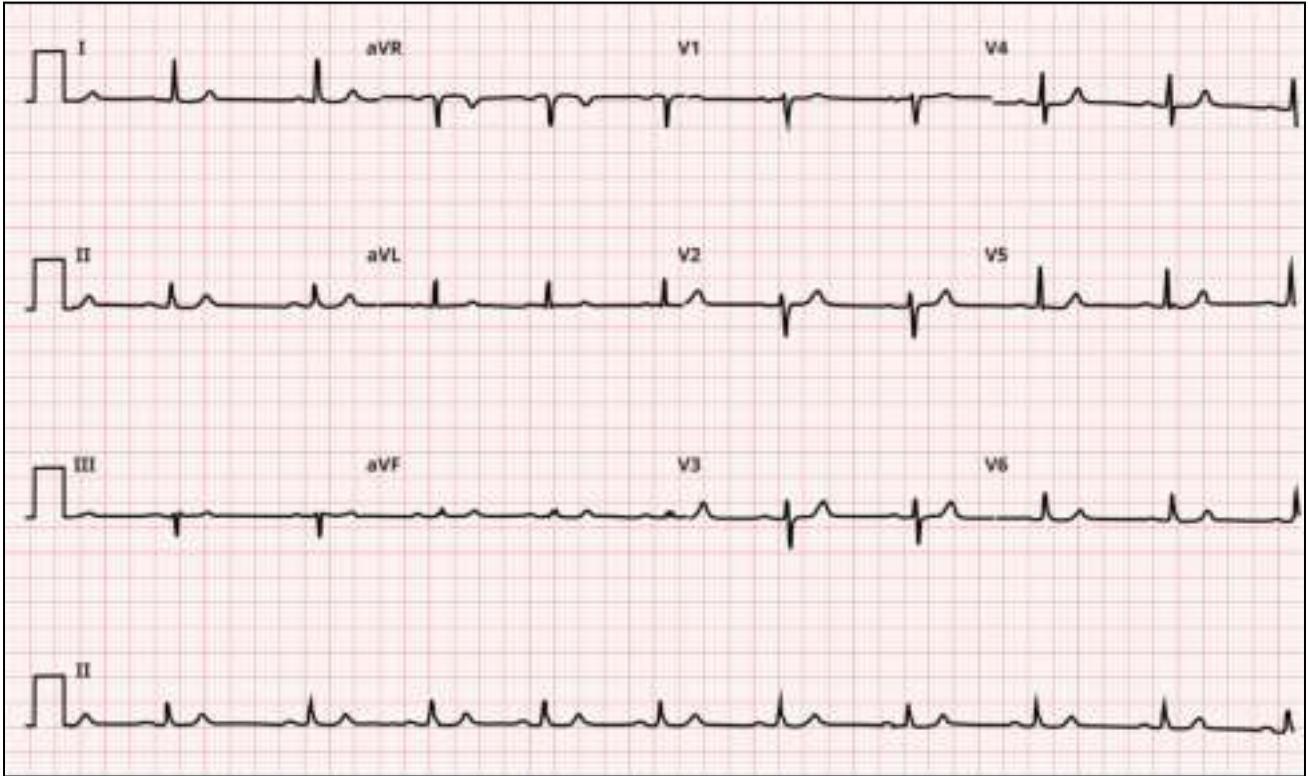
- A. Urgent cardiology opinion regarding percutaneous coronary intervention
- B. Perform an ECHO to assess LV function and treat if evidence of heart failure present
- C. Continue on dual anti-platelet therapy, add in fondaparinux, beta blocker, ramipril, morphine PRN, metoclopramide and statin. Admit to the acute medicine ward with telemetry
- D. Start an intravenous nitrate infusion for ongoing chest pain and admit to CCU
- E. Measure troponin levels before deciding on further management

Explanation

This ECG shows deep ST depression in the anterior/septal leads. Whilst this may initially make you think of an NSTEMI (in which case option C may be the most appropriate) this ECG more likely represents a posterior STEMI which requires urgent PCI given the timescale. Option B is not a definitive acute treatment, option D is appropriate for an NSTEMI patient with ongoing chest pain but if unresolving PCI will be needed regardless and option E would be appropriate if the diagnosis is unclear but in the context of potential STEMI it would just delay PCI

Q4

A 77 year old female with a background of ischaemic heart disease, diabetes, TIAs and Parkinson's disease presents to the acute medical receiving unit because of complaints of cardiac sounding chest pain that has been ongoing for the last 6 hours. She takes 75mg of aspirin daily, 2.5mg bisoprolol and 20mg of atorvastatin. She has had multiple sprays of GTN with no relief and is getting concerned. Her BP is 110/70 and temp is 36.5. O₂ sats are 97% on air. Her ECG is shown below and her troponin result at 6 hours was <0.04. What is the best management option?



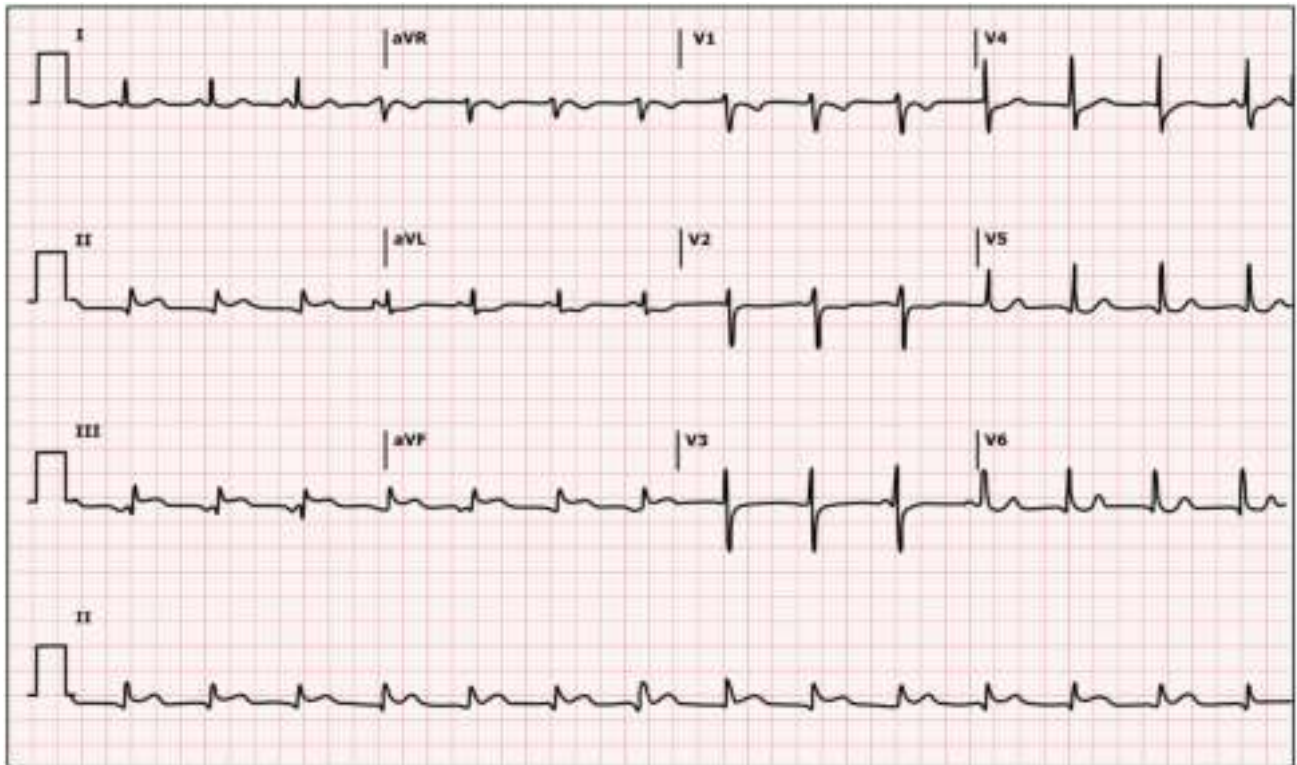
- A. Urgent cardiology opinion regarding percutaneous coronary intervention
- B. Perform an ECHO to assess LV function and treat if evidence of heart failure present
- C. Give an extra 225mg of aspirin + 180mg of ticagrelor + 2.5mg s/c fondaparinux. Admit to the acute medicine ward with telemetry and urgent cardiology assessment.
- D. Repeat troponin at 12 hours and admit for observation
- E. Discharge home

Explanation

The diagnosis in this case is unstable angina which should be treated as an acute coronary syndrome. She is already taking aspirin at home but her dose needs increased to 30mg total. Treatment is the same as with NSTEMI. Her ECG does not show any ischaemic changes but this does not rule out unstable angina.

Q5.

A 62 year old gentleman suffers from an acute cardiac event. His ECG is shown below. Which coronary artery has most likely been compromised?



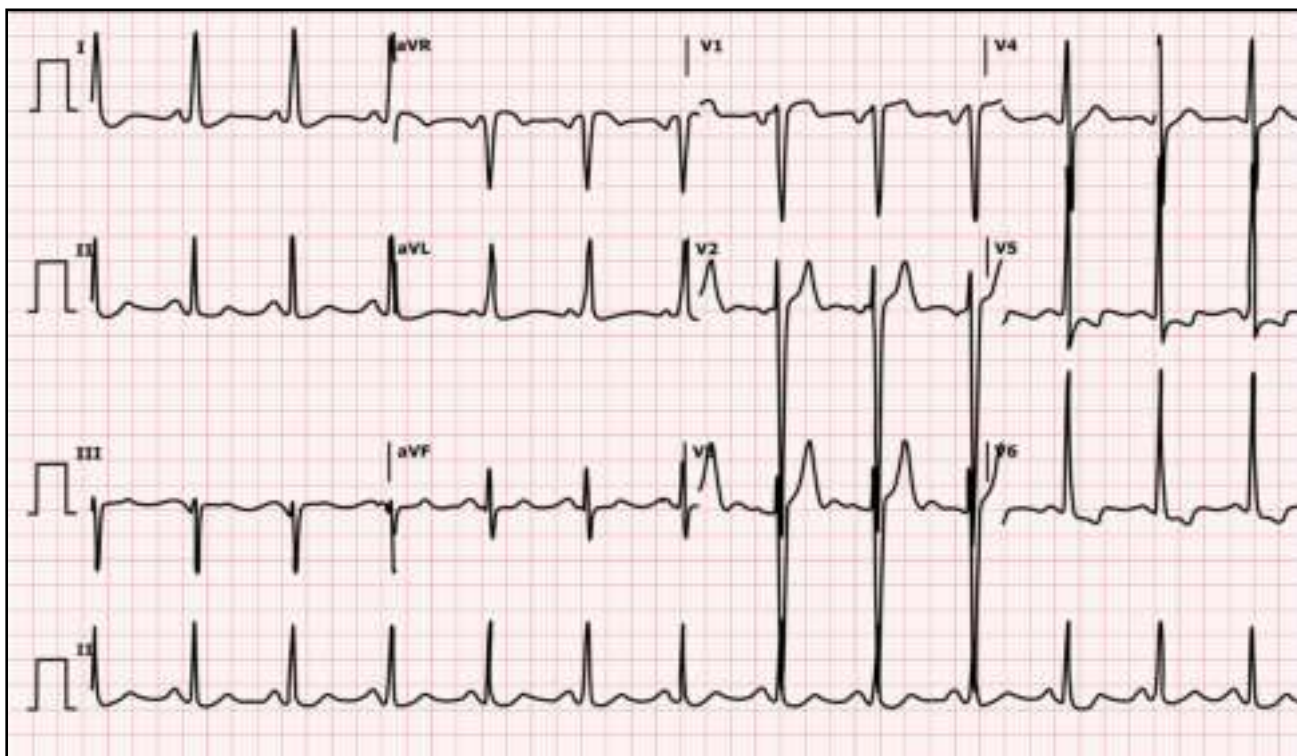
- A. Left mainstem artery
- B. Circumflex artery
- C. Posterior descending artery
- D. Left anterior descending artery
- E. Right coronary artery

Explanation

The ECG above shows ST elevation in leads II, III and aVF. This is the inferior territory of the heart which corresponds to a right coronary artery infarct.

Q6

A 25 year old gentleman presents to the cardiology clinic with complaints of reduced exercise tolerance and pre syncope. He has no other medical problems of note and doesn't take any medicines other than antihistamines. His ECG is shown below. What is the most likely diagnosis?



- F. Antero-septal STEMI
- G. Pulmonary embolism
- H. Hypertrophic cardiomyopathy
- I. Paroxysmal AF
- J. Normal ECG for age and body habitus

Explanation

This ECG fits the sokolow-lyon criteria for left ventricular hypertrophy. The voltages are large which can be normal in a slim young patient, however there is evidence of an LV strain pattern here with ST depression and T-wave inversion in V5 and V6. Coupled with the symptoms of reduced exercise tolerance this likely represents hypertrophic cardiomyopathy. The pre-syncope episodes may be non-sustained ventricular arrhythmias. There is no evidence of atrial fibrillation and it is also rare to get AF in this age group. The ST elevation in the anterior leads is likely a phenomenon known as high take off, which is common in young healthy patients. There are no complaints of chest pain making a STEMI unlikely.

Q7

Which of the following would classify as a bifascicular block

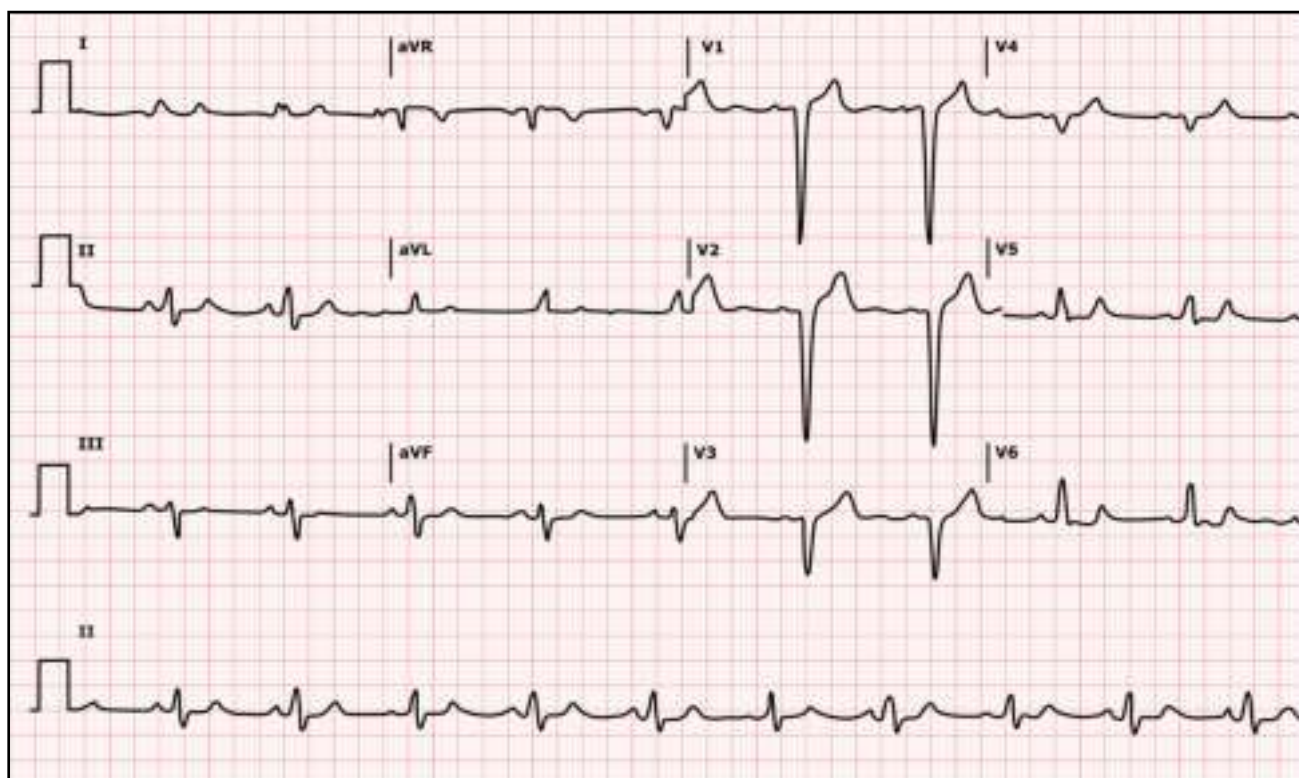
- A. Right axis deviation and left bundle branch block
- B. 1st degree AV block with right axis deviation
- C. 1st degree AV block with normal axis
- D. Left axis deviation and Right bundle branch block
- E. Left axis deviation and Left bundle branch block

Explanation

Bifascicular block is defined either as RBBB + either right or left axis deviation (which indicates a left anterior or posterior fascicular block). Incomplete trifascicular block has a 1st degree AV block as well. True trifascicular block is complete heart block (covered in the advanced tutorial)

Q8

An ECG is taken from an asymptomatic patient at a routine cardiology clinic appointment. Which of the following is the correct description of this ECG.



- A. Right bundle branch block
- B. Left bundle branch block
- C. Incomplete left bundle branch block
- D. Left anterior fascicular block
- E. Left posterior fascicular block

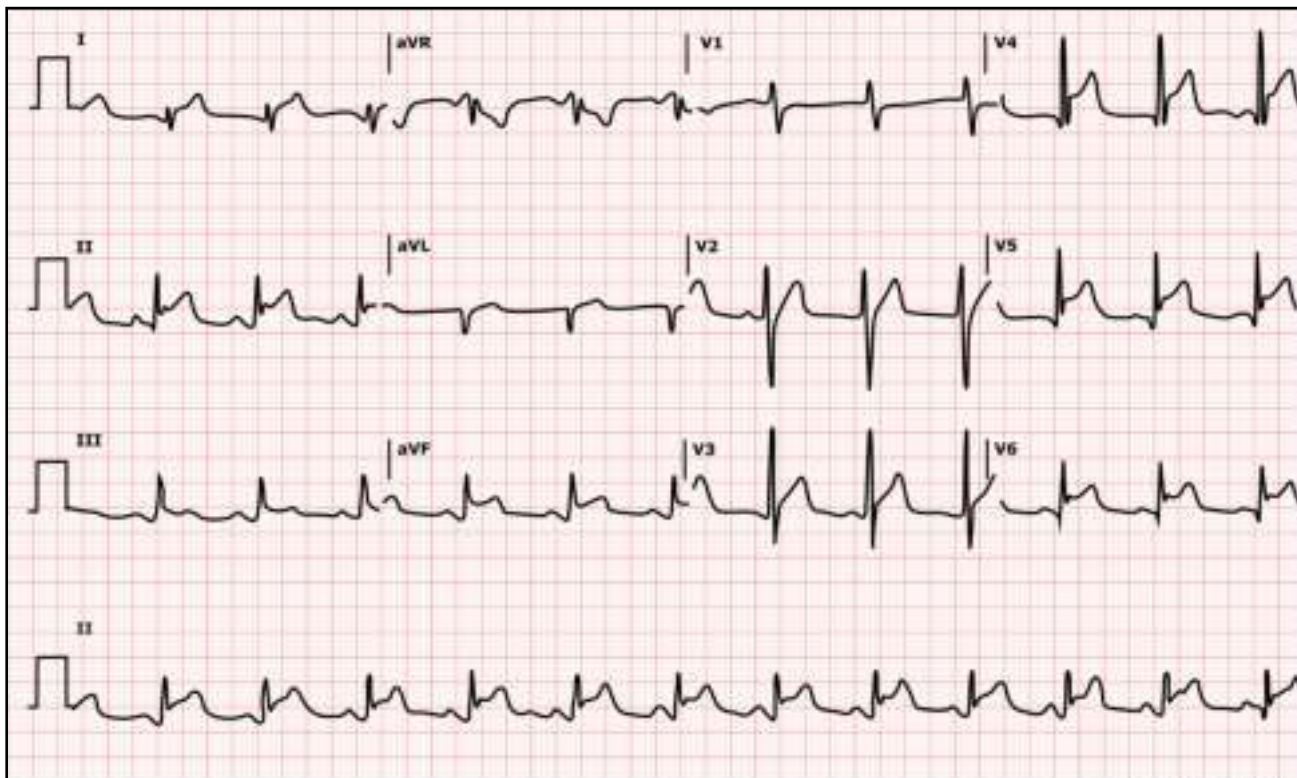
Explanation

This ECG shows some features of a LBBB but crucially the QRS duration is 0.12s which is within the normal limits. Thus the diagnosis is incomplete left bundle branch block

Q9

A 25 year old male patient with known lupus presents to the emergency department with new onset chest pain and general decline. He has been feeling unwell for the past couple of days and routine bloods were sent on admission. The results of these were as follows - Na⁺ 143mmol/L (135-155), K⁺ 3.4mmol/L (3.5-5.5), Creatinine 345mmol/L (60- 120), eGFR 12ml/min (>60). Troponin 7.0ng/L (normal <5)

His ECG is shown below. What is the most likely diagnosis



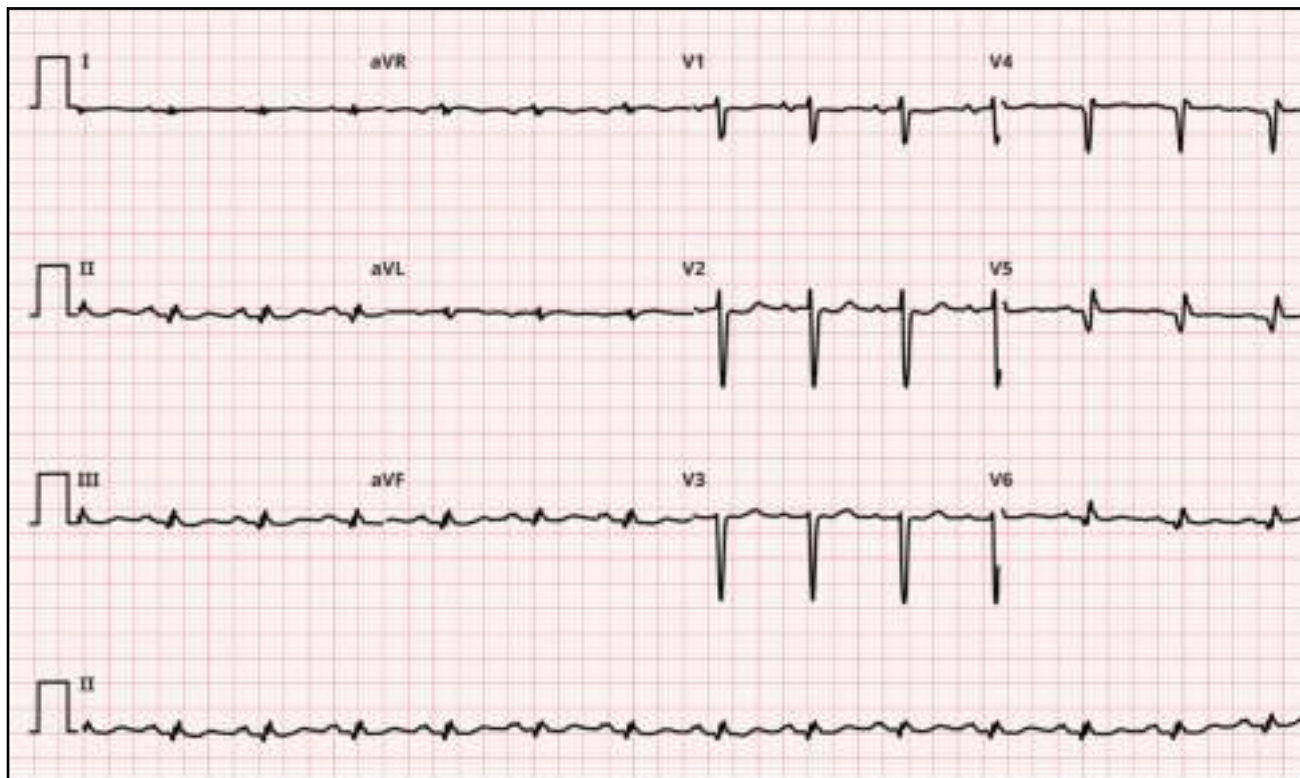
- A. Antero-lateral STEMI
- B. Lupus related cardiomyopathy
- C. Lupus related cardiac conduction block
- D. Pericarditis
- E. Non-cardiac chest pain

Explanation

This ECG shows widespread ST elevation and evidence of PR depression which is specific to pericarditis. There is a mild rise in troponin which may have thrown some candidates however a true STEMI would likely result in much higher levels. Also a STEMI usually localises to one cardiac artery territory, whereas the ST changes here are widespread. Lupus can cause cardiac problems but there is no evidence of conduction block. Lupus related cardiomyopathy is very rare but can occur after repeated episodes of lupus myocarditis. This picture above is much more likely a uraemic pericarditis secondary to worsening chronic kidney disease. There may be some evidence of myocarditis given the troponin rise but that can also be explained by poor renal function and lack of excretion.

Q10

The following ECG is taken from a patient who presented with a myocardial infarction. Given the ECG findings below, what age is the myocardial infarction?



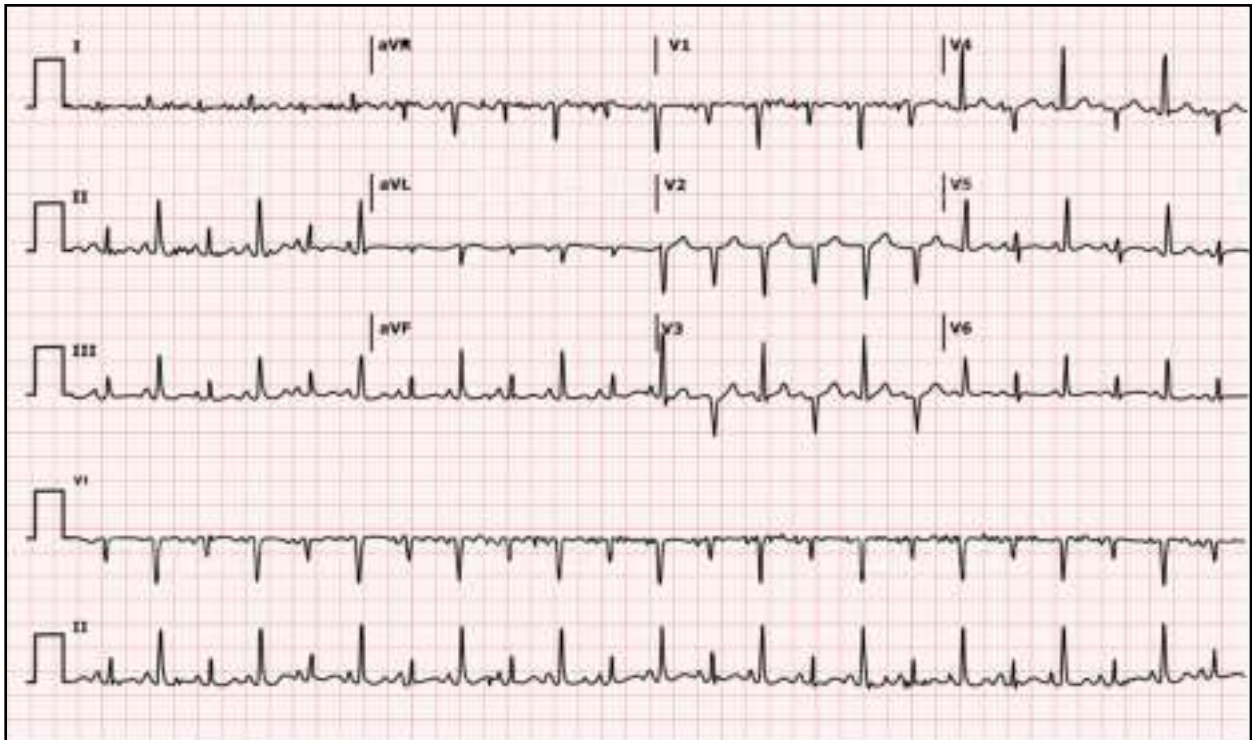
- A. Hyperacute (seconds old)
- B. Minutes to 1 hr
- C. 1 hr to 2 hrs
- D. 2 hours to 6 hours
- E. Greater than one day old

Explanation

The ECG shows deep lateral Q waves and no evidence of any ST changes or T-wave inversion. This is a well established in fact and it is likely that some ventricular remodelling has occurred. Remember that there is no 100% accurate way to age an MI using a single ECG but this certainly isn't a hyperacute event

SAQ 1

A 56 year old male patient on the cardiothoracic ward presents with worsening shortness of breath following a mitral valve repair. His ECG is shown below. Please interpret the ECG.



PR interval (1 mark) - **between 0.12 and 0.2s**

Electrical activity present in all leads? (1 mark) - **yes**

What's the heart rate? (1 mark) - **approx 150bpm**

Is the rhythm irregular? (1 mark) - **yes (regularly irregular)**

Is the QRS complex broad? (1 mark) - **no**

Are there any p-waves? (1 mark) - **yes**

What's the relationship between p-waves and QRS complexes? (1 mark) - **1:1 p-QRS ratio**

Is the electrical activity coming from the sino-atrial node? (1 mark) **Yes**

What is the diagnosis (1 mark) - **Pericardial effusion**



A short section of lead aVF is shown above. Is there any evidence of ventricular ectopic beats (1 mark).
Justify your answer (2 marks) - no evidence of ectopics (1 mark),

Taller QRS complexes look like ectopics but the QRS width is narrow (1 mark), there is no compensatory pause following the beat (1 mark), and p-waves can be seen before the beat (1 mark) max 2 marks for this section

What name is given to the pattern of QRS complexes shown in the above ECG (1 mark) - electrical alternans

What is the cause of the QRS pattern above (1 mark) - the heart swings within the pericardial sack as it beats

Name 2 potential serious complications of this patient's condition (2 marks) - Haemodynamically unstable arrhythmias (1 mark), pericardial tamponade (1 mark)

SAQ2

A 77 year old female patient on the orthopaedic ward is reviewed by the on call medical team due to sudden onset difficulty breathing. Her PMH includes pulmonary stenosis from childhood which was repaired successfully. Her ECG on admission was normal. Currently her observations shows sats of 78% on 10L of O₂ and a BP of 77/40. Her CXR was clear. A repeat 12 lead ECG is taken and is shown below.



Describe 2 abnormalities in the **morphology** of the ECG trace (2 marks) - Evidence of right ventricular hypertrophy (positive QRS in lead V1 which is taller than 7mm) (1 mark), Right ventricular strain pattern noted T-wave inversion and ST depression in V1-V3/4 (1 mark), right axis deviation (1 mark) max 2 marks

NOTE: do not accept tachycardia as an answer as this is a rhythm abnormality not a morphological one

Give 2 likely explanations for the ECG changes (2 marks) - Right ventricular hypertrophy caused by old pulmonary stenosis (1 mark), strain pattern could be caused by acute pulmonary embolism

What imaging modality would be most useful in the management of this patient (1 mark) - CTPA or VQ scan (1 mark)

Total. /30

Pass mark 21/30