RevMED: 300 SBAs in Medicine and Surgery
By Lasith Ranasinghe & Oliver Clements
(Imperial College London, UK)

25% off with the online code
WSREVMED25
Valid until 31 August 2020

Only at
www.worldscientific.com
Cardiology: Chest Pain

Laz
Overview

- Ischaemic Heart Disease
- Pericarditis
- Arrhythmia
- Syncope

DISCLAIMER: MedED does not represent the ICSM Faculty or Student Union. This lecture series has been designed and produced by students. We have made every effort to ensure that the information contained is accurate and in line with Learning Objectives featured on SOFIA, however this guide should not be used to replace formal ICSM teaching and educational materials.
A 76-year-old woman is brought into A&E with central crushing chest pain that radiates to her jaw and left arm. An ECG is performed, which shows ST elevation in leads II, III and aVF. Her SaO$_2$ is 89%. Before she is sent to the cathlab for percutaneous coronary intervention, she is started on a combination of drugs. Which of the following should **NOT** be given?

A  Morphine  
B  Oxygen  
C  Aspirin  
D  Clopidogrel  
E  Warfarin
A 54-year-old man has been brought into A&E with a suspected acute coronary syndrome. An ECG is performed, which reveals ST elevation in leads I, aVL, V5 and V6. Which coronary artery has been occluded?

A  Left main stem  
B  Left anterior descending coronary artery  
C  Left circumflex coronary artery  
D  Right coronary artery  
E  Posterior descending artery
Stable Angina: chest pain resulting from myocardial ischaemia that is precipitated by exertion and relieved by rest.

Causes

• Atherosclerotic disease (MOST COMMON)
• Rare types of angina:
  • **Decubitus angina** – symptoms occur when lying down
  • **Prinzmetal angina** – symptoms caused by coronary vasospasm
  • **Coronary syndrome X** – symptoms of angina but with normal exercise tolerance and normal coronary angiograms

Management

**Conservative**

• Stop smoking
• Lose weight
• Exercise

**Medical**

• Anti-anginals (BB/CCB)
• Symptomatic (GTN spray)
• Risk factor reduction (aspirin, statins, ACEi)
Acute Coronary Syndrome: a constellation of symptoms caused by sudden reduced blood flow to the heart muscle.

Acute Coronary Syndrome
- Unstable Angina Pectoris – chest pain at rest due to ischaemia without cardiac injury
- Non-ST elevation MI
- ST-elevation MI

Symptoms and Signs
- Acute-onset central, crushing chest pain
- Radiates to arms/neck/jaw
- Pallor
- Sweating
- NOTE: silent infarcts in elderly and diabetics
Acute Coronary Syndrome

Investigations
• ECG
  • STEMI: Hyperacute T waves, ST elevation, new-onset LBBB
  • UAP/NSTEMI: ST depression, T wave inversion
  • Heart Block: AV node involved
  • Old Infarct: pathological Q waves
• Troponins
  • Elevated troponins suggests myocardial injury (i.e. STEMI or NSTEMI)

ECG Leads and Site of Infarct
• Inferior (right coronary artery): II, III, aVF
• Anterior (left anterior descending): V1-V5
• Lateral (left circumflex): I, aVL, V5/6
• Posterior (posterior descending): tall R wave + ST depression in V1-3
Acute Coronary Syndrome

General ACS Management

- Morphine
- Oxygen
- Nitrates
- Antiplatelets (aspirin + clopidogrel)
- Beta-blockers
- ACE inhibitors
- Statins
- (Heparin)

AIM OF STEMİ TREATMENT: Coronary reperfusion either by PCI or fibrinolysis

Patient presenting < 12 hours from onset of symptoms

- Send to cathlab for PCI if it can happen within 120 mins of the time that fibrinolysis could have been administered

Patient presenting > 12 hours from onset of symptoms

- Coronary angiography followed by PCI if indicated
Acute Coronary Syndrome

NSTEMI/UAP Management
Immediate
• Aspirin + other antiplatelet (e.g. clopidogrel, ticagrelor)
• Fondaparinux – if low bleeding risk unless coronary angiography planned within 24 hrs of admission
• UFH – if coronary angiography is planned

Risk Stratify using GRACE score
• HIGH risk
  • GlpIIb/IIIa inhibitor (e.g. tirofiban)
  • Coronary angiography (within 72 hours)
• LOW risk
  • Conservative management (control risk factors)

Complications of ACS: DARTH VADER
Death, Arrhythmia, Rupture, Tamponade, Heart failure
Valve disease, Aneurysm, Dressler’s syndrome, Embolism, Reinfarction
Anticoagulants vs Antiplatelets

Venous (e.g. DVT, PE) → Activation of Coagulation Factors → Anticoagulants

Arterial Thrombosis (e.g. MI, Stroke) → Platelet Activation → Antiplatelets
A 76-year-old woman is brought into A&E with central crushing chest pain that radiates to her jaw and left arm. An ECG is performed, which shows ST elevation in leads II, III and aVF. Her $\text{SaO}_2$ is 90%. Before she is sent to the cathlab for percutaneous coronary intervention, she is started on a combination of drugs. Which of the following should not be given?

A. Morphine
B. Oxygen
C. Aspirin
D. Clopidogrel
E. Warfarin

**IMPORTANT**: warfarin causes an initial pro-thrombotic phase because it blocks protein C and protein S. Therefore, heparin must be co-administered with warfarin to begin with, until the INR stabilises (between 2-3).
A 54-year-old man has been brought into A&E with a suspected acute coronary syndrome. An ECG is performed, which reveals ST elevation in leads I, aVL, V5 and V6. Which coronary artery has been occluded?

A  Left main stem
B  Left anterior descending coronary artery
C  Left circumflex coronary artery
D  Right coronary artery
E  Posterior descending artery
A 54-year-old man is complaining of sharp, central chest pain that has arisen over the last 24 hours. On inspection, the patient is sitting forward on the examination couch. On auscultation, a scratching sound is heard – loudest over the lower left sternal edge, when the patient is leaning forward. He has a past medical history of a ST-elevation MI which was diagnosed, and treated with PCI, 6 weeks ago. What is the most likely diagnosis?

A  Viral pericarditis
B  Constrictive pericarditis
C  Cardiac tamponade
D  Dressler syndrome
E  Tietze syndrome
A 27-year-old man presents complaining of sharp chest pain. He mentions that he has taken a few days off work recently because of the flu. What would you expect to see on his ECG?

A  ST elevation in leads II, III and aVF  
B  Widespread saddle-shaped ST elevation  
C  ST depression  
D  Tented T waves  
E  Absent P waves
Pericarditis

**Definition:** *inflammation of the pericardium*

**Causes**
- Idiopathic
- Infective (e.g. Coxsackie B)
- Connective tissue disease (e.g. sarcoidosis)
- **Dressler Syndrome** (2-10 weeks after MI)
- Malignancy

**Symptoms and Signs**
- Sharp, central chest pain
- Pleuritic
- Relieved by sitting forward
- Fever/flu-like symptoms (if viral)
- Pericardial friction rub
- Tamponade (if pericardial effusion)

**Investigations**
- ECG
- Bloods (FBC, CRP)
- CXR (pericardial effusion)
‘widespread saddle-shaped ST-elevation’
A 54-year-old man is complaining of sharp, central chest pain that has arisen over the last 24 hours. On inspection, the patient is sitting forward on the examination couch. On auscultation, a scratching sound is heard – loudest over the lower left sternal edge, when the patient is leaning forward. He has a past medical history of a ST-elevation MI which was diagnosed, and treated with PCI, 6 weeks ago. What is the most likely diagnosis?

A  Viral pericarditis
B  Constrictive pericarditis
C  Cardiac tamponade
D  Dressler syndrome
E  Tietze syndrome
A 27-year-old man presents complaining of **sharp chest pain**. He mentions that he has taken a few days off work recently because of the **flu**. What would you expect to see on his ECG?

A. ST elevation in leads II, III and aVF  
B. Widespread saddle-shaped ST elevation  
C. ST depression  
D. Tented T waves  
E. Absent P waves
Other causes of chest pain

Respiratory
- PE
- Pneumothorax
- Pleurisy

Gastrointestinal
- Oesophagitis (due to GORD)
- Oesophageal spasm
- Peptic ulcer disease/gastritis
- Boerhaave’s perforation

Other
- Costochondritis
- Anxiety

These topics will be covered by other MedED lectures.
A 46-year-old man has been admitted to A&E after experiencing palpitations, which began about 4 hours ago. An ECG is performed, which reveals atrial fibrillation. He has no previous history of ischaemic heart disease. He refuses DC cardioversion. What is the next most appropriate treatment option?

A  Defibrillation  
B  Low molecular weight heparin  
C  Warfarin  
D  Flecainide  
E  Digoxin
A 27-year-old man presents with palpitations and light-headedness. An ECG shows features consistent with a supraventricular tachycardia. Adenosine is administered and the SVT is terminated. A repeat ECG shows a short PR interval and a QRS complex with a slurred upstroke. What is the diagnosis?

A  Brugada syndrome
B  LBBB
C  Romano-Ward syndrome
D  Wolff-Parkinson-White syndrome
E  Complete heart block
A 52-year-old man was watching TV yesterday when he suddenly became very aware of his heart beating rapidly. This lasted for around 45 mins and then subsided spontaneously. It has happened several times over the past 2 months. An ECG reveals no abnormalities. However, due to the strong suspicion of atrial fibrillation, the patient is placed on a 24-hr tape, which confirms the diagnosis. Which scoring system should be used to determine the benefit of long-term anticoagulation in this patient?

A QRISK2 score  
B ABCD2 Score  
C GRACE score  
D CHA$_2$DS$_2$-VASc score  
E CURB-65 score
Definition: characterised by rapid, chaotic and ineffective atrial electrical conduction.

Causes – ABSOLUTELY LOADS
Examples
- Pneumonia
- PE
- Hyperthyroidism
- Ischaemic heart disease
- Alcohol
- Pericarditis

Symptoms and Signs
- Palpitations
- Syncope
- Symptoms of underlying causes
- Irregularly irregular pulse

Investigations
- ECG
- Tests for underlying cause

‘irregularly irregular tachycardia with no p waves’
Atrial Fibrillation - Management

IMPORTANT: if the patient is **haemodynamically UNSTABLE** – **DC CARDIOVERSION**

Rhythm Control
- **< 48 hrs** since onset of AF
  - DC cardioversion
  - **OR** chemical cardioversion (flecainide or amiodarone)
  - NOTE: flecainide is **contraindicated** if there is a history of IHD
- **> 48 hrs** since onset of AF
  - anticoagulate for 3-4 weeks before attempting cardioversion

Rate Control
- Verapamil
- Beta-blockers
- Digoxin

TREAT THE CAUSE

Stroke Risk Stratification
- **CHA\(_2\)DS\(_2\)-Vasc score**
- **LOW** risk → nothing
- **HIGH** risk → warfarin
Supraventricular Tachycardia

Definition: a regular, narrow-complex tachycardia with no p waves and a supraventricular origin.

Symptoms: palpitations, syncope, dyspnoea, chest discomfort

Atrioventricular Nodal Re-entry Tachycardia (AVNRT)
- A local circuit forms around the AV node

Atrioventricular Re-entry Tachycardia (AVRT)
- A re-entry circuit forms between the atria and ventricles due to the presence of an accessory pathway (Bundle of Kent)
Supraventricular Tachycardia

Investigation - ECG

ECG during tachycardia
- Regular
- Narrow complex tachycardia
- Absent p waves

ECG after termination of SVT
- AVNRT = normal
- AVRT = ‘Delta wave’ (slurred upstroke on QRS complex)

Presence of an accessory pathway resulting in a delta wave on ECG: Wolff-Parkinson-White Syndrome
Wolff-Parkinson White Syndrome

The accessory pathway allows early depolarisation of the ventricles (i.e. pre-excitation).

This gives rise to the slurred upstroke.

If a wave of depolarisation travels retrograde back into the atria, it can set up a re-entry circuit between the atria and ventricles.

This results in AVRT.
**Supraventricular Tachycardia - Management**

**STEP 1**: is the patient haemodynamically stable?
- NO □ Synchronised DC cardioversion
- YES □ STEP 2

**STEP 2**: Vagal Manoeuvres – did it work?
- YES □ Good Job
- NO □ STEP 3

**STEP 3a**: IV Adenosine 6 mg – did it work?
- YES □ Good Job
- NO □ Step 3b, if that fails, Step 3c, then, Step 4
  - STEP 3b: IV Adenosine 12 mg
  - STEP 3c: IV Adenosine 12 mg (again)

**STEP 4**: Choose from:
- IV β-blocker (e.g. metoprolol)
- IV amiodarone
- IV digoxin
- Synchronised DC cardioversion
Supraventricular Tachycardia - Management

Haemodynamically Stable

YES

Vagal Manoeuvres

Adenosine 6 mg

Adenosine 12 mg

Adenosine 12 mg

NO

Synchronised DC cardioversion

IF ADENOSINE IS CONTRAINDICATED (e.g. ASTHMA), USE:

VERAPAMIL

IV β-blocker
OR
IV digoxin
OR
IV amiodarone
OR
Synchronised DC cardioversion
A 46-year-old man has been admitted to A&E after experiencing palpitations, which began about 4 hours ago. An ECG is performed, which reveals atrial fibrillation. He has no previous history of ischaemic heart disease. He refuses DC cardioversion. What is the next most appropriate treatment option?

A  Defibrillation  
B  Low molecular weight heparin  
C  Warfarin  
D  Flecainide  
E  Digoxin
A 27-year-old man presents with palpitations and light-headedness. An ECG shows features consistent with a supraventricular tachycardia. Adenosine is administered and the SVT is terminated. A repeat ECG shows a short PR interval and a QRS complex with a slurred upstroke. What is the diagnosis?

A  Brugada syndrome
B  LBBB
C  Romano-Ward syndrome
D  Wolff-Parkinson-White syndrome
E  Complete heart block
A 52-year-old man was watching TV yesterday when he suddenly became very aware of his heart beating rapidly. This lasted for around 45 mins and then subsided spontaneously. It has happened several times over the past 2 months. An ECG reveals no abnormalities. However, due to the strong suspicion of atrial fibrillation, the patient is placed on a 24-hr tape, which confirms the diagnosis. Which scoring system would be used to determine the benefit of long-term anticoagulation in this patient?

A. QRISK2 score
B. ABCD2 Score
C. GRACE score
D. CHA\textsubscript{2}DS\textsubscript{2}-VASc score
E. CURB-65 score

AF can be PAROXYSMAL
(coming and going)
A 21-year-old woman has fainted 4 times in the past 3 months. She becomes sweaty and nauseous before she faints and is usually unconscious for a few seconds. Her friends have told her that she looks abnormally pale before she collapses. She doesn’t know if she jerks whilst unconscious, but has not lost control of her bladder or bitten her tongue. When she regains consciousness, she feels slightly dizzy but does not feel confused. What is the most likely cause of her fainting?

A  Hypoglycaemia  
B  Epileptic seizure  
C  Vasovagal syncope  
D  Arrhythmia  
E  Hypertrophic obstructive cardiomyopathy
A 52-year-old man has collapsed 3 times in the past couple of months. His father died of a heart condition when he was 56 years old, although he cannot recall the details of the condition. On examination, a jerky carotid pulse is palpated and a crescendo-decrescendo murmur is heard over the carotid artery. What is the most likely diagnosis?

A  Aortic stenosis
B  Hypertrophic obstructive cardiomyopathy
C  Left heart failure
D  Mitral regurgitation
E  Constrictive pericarditis
A 76-year-old man is found collapsed in the care home and has a suspected hip fracture. He says that he temporarily lost consciousness as he got up from his arm chair and came about, a matter of seconds later, on the floor. He has never experienced a fall before. He has a past medical history of a total knee replacement and heart failure which is treated with ramipril, furosemide and bisoprolol. What is the most likely cause of his collapse?

A  Vasovagal syncope
B  Medication side-effect
C  Arrhythmia
D  Anaemia
E  Dilated cardiomyopathy
Syncope

Definition: a form of loss of consciousness in which hypoperfusion to the brain is the cause

Differential Diagnosis of Syncope

• **Vasovagal**
  - ↑ vagal discharge → drop in BP and HR
  - Can be precipitated by situations (e.g. standing for a long time, sight of blood)
  - May feel sweaty/pale before collapse

• **Arrhythmia**
  - Can lead to a low-output state
  - May have palpitations before collapse

• **Outflow Obstruction**
  - E.g. HOCM, aortic stenosis

• **Postural Hypotension**
  - Caused by the failure to compensate for the drop in blood pressure caused by standing up
  - Medications (e.g. antihypertensives) and dehydration are common causes
Hypertrophic Obstructive Cardiomyopathy (HOCM)

Clinical Features
- Jerky carotid pulse
- Double apex beat
- Ejection systolic murmur
- Family history of sudden death at a relatively young age (< 65 yrs)
Other Causes of Collapse

Niche Syncopal Causes
- Vertebrobasilar insufficiency
- Subclavian steal syndrome
- Aortic dissection

Non-Syncopal Causes
- Intoxication
- Head trauma
- Metabolic (e.g. hypoglycaemia)
- Epileptic seizure

OSCE TIP (blackout): ask about missed meals/inappropriate insulin dosing if diabetic
A 21-year-old woman has fainted 4 times in the past 3 months. She becomes sweaty and nauseous before she faints and is usually unconscious for a few seconds. Her friends have told her that she looks abnormally pale before she collapses. She doesn’t know if she jerks whilst unconscious, but has not lost control of her bladder or bitten her tongue. When she regains consciousness, she feels slightly dizzy but does not feel confused. What is the most likely cause of her fainting?

A  Hypoglycaemia  
B  Epileptic seizure  
C  Vasovagal syncope  
D  Arrhythmia  
E  Hypertrophic obstructive cardiomyopathy
A 52-year-old man has collapsed 3 times in the past couple of months. His father died of a heart condition when he was 56 years old, although he cannot recall the details of the condition. On examination, a jerky carotid pulse is palpated and a crescendo-decrescendo murmur is heard over the carotid artery. What is the most likely diagnosis?

A  Aortic stenosis
B  Hypertrophic obstructive cardiomyopathy
C  Left heart failure
D  Mitral regurgitation
E  Constrictive pericarditis
A 76-year-old man is found collapsed in the care home and has a suspected hip fracture. He says that he temporarily lost consciousness as he got up from his arm chair and came about, a matter of seconds later, on the floor. He has never experienced a fall before. He has a past medical history of a total knee replacement and heart failure which is treated with ramipril, furosemide and bisoprolol. What is the most likely cause of his collapse?

A  Vasovagal syncope
B  Medication side-effect
C  Arrhythmia
D  Anaemia
E  Dilated cardiomyopathy
Think carefully...

A 52-year-old patient is recovering on the cardiology ward after undergoing a valve replacement. A routine blood test reveals the following results:

- \( \text{Na}^+ : 135 \text{ mmol/L} \) (135 – 145)
- \( \text{K}^+ : 8.7 \text{ mmol/L} \) (3.5 – 6.0)
- \( \text{Ca}^{2+} : 0.3 \text{ mmol/L} \) (2.2 – 2.6)

An ECG is performed which shows no obvious abnormalities. He has a past medical history of hypertension which is treated with ramipril.

Given the above information, what should be the next step in the management of this patient?

A  Urgently draw another blood sample
B  10 mL 10% calcium gluconate
C  20 mL 20% calcium gluconate
D  50 mL 50% dextrose + 10 U insulin
E  IV salbutamol
Think carefully...

A 52-year-old patient is recovering on the cardiology ward after undergoing a valve replacement. A routine blood test reveals the following results:

- Na⁺: 135 mmol/L (135 – 145)
- K⁺: 8.7 mmol/L (3.5 – 6.0)
- Ca²⁺: 0.3 mmol/L (2.2 – 2.6)

An ECG is performed which shows no obvious abnormalities. He has a past medical history of hypertension which is treated with ramipril.

Given the above information, what should be the next step in the management of this patient?

A  Urgently draw another blood sample
B  10 mL 10% calcium gluconate
C  20 mL 20% calcium gluconate
D  50 mL 50% dextrose + 10 U insulin
E  IV salbutamol
Thank you for listening!

Feedback:

Questions: lpr114@ic.ac.uk