acute coronary syndromes [created by Paul Young 06/10/07]

general
- coronary artery disease accounts for over 30% of deaths in Western countries.

classification
Unstable angina:
- ischaemic chest pain with is recent in origin, is more frequent, severe, or prolonged than the patient's usual angina; is more difficult to control with drugs; or is occurring at rest or with minimal exertion
- cardiac biomarkers are not elevated

Myocardial infarction:
- ischaemic symptoms with raised cardiac biomarkers
- STEMI: ST elevation
- NSTEMI: no ST elevation

risk factors
modifiable:
(i) by life-style
- smoking
- obesity
- physical inactivity
(ii) by pharmacotherapy or lifestyle
- hypertension
- dyslipidaemia
- diabetes
- hyperhomocysteinaemia

non-modifiable:
- increasing age
- male gender
- family history

ECG changes in AMI
hyperacute (0-20 minutes)
- tall peaking T waves & progressive upward curving & elevation of ST segments

acute (minutes - hours)
- persistent ST elevation with gradual loss of R wave in the infarcted area. ST segments begin to fall & there is progressive inversion of T waves

early (hours to days)
- loss of R wave and development of pathological Q waves in the area of ischaemia. Return of ST segments to baseline with persistence of T wave inversion

indeterminate (days to weeks)
- pathological Q waves with persisting T wave inversion. ST segments normalise (unless there is aneurysm)

old (weeks to months)
- persisting deep Q waves with normalised ST segments

criteria for AMI in LBBB
(i) new LBBB
(ii) concordant ST elevation of >1mm
(iii) concordant ST depression of >1mm in V1, V2 or V3
(iv) discordant ST elevation of >5mm

thrombolysis contraindications
absolute contraindications:
(i) active bleeding or bleeding diasthesis (excluding menses)
(ii) significant closed head injury or facial trauma within 3 months
(iii) suspected aortic dissection
(iv) risk of intracranial haemorrhage (any prior ICH, ischaemic stroke within 3 months, cerebral vascular lesion, brain tumour)

relative contraindications:
- risk of bleeding
(i) current use of anticoagulants (the higher the INR the higher the risk)
(ii) non-compressible vascular punctures
(iii) recent major surgery
(iv) prolonged CPR >10 minutes
(v) internal bleeding within 4 weeks
(vi) active peptic ulcer
- risk of ICH
(i) history of chronic, severe, poorly controlled hypertension
(ii) severe uncontrolled HTN on presentation (>180mmHg systolic; or >110mmHg diastolic)
(iii) ischaemic stroke more than 3 months previously
- other
(i) pregnancy

anatomical patterns of myocardial injury

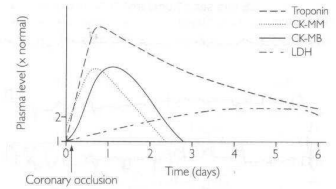
Location of injury	affected Leads	Infarct-related artery
Anterior/Septal	V_2, V_3, V_4	Mid LAD or Diagonal branch of LAD
Inferior	II , III, aVF	RCA or posterolateral branch of Cx
Lateral	I, aVL, V_5, V_6	Cx or LV branch of Cx
True Posterior*	V_1 and V_2	Posterolateral branch of Cx or Posterior Descending Branch of RCA
Anterolateral	I, aVL, $V_2 - V_6$	Proximal LAD
Inferolateral	II, III, aVF	
	aVL, V_5, V_6	Proximal Cx or large LV in left dominant system
Right Ventricular	V_3R, V_4R	RCA

- 8% of patients with MI will only display ST elevation in posterior or right precordial leads

biomarkers in ACS
Troponin I or T:
- troponin rise indicates myonecrosis & is a high risk feature in non ST elevation acute coronary syndrome
- troponin remains elevated for 5-14 days and therefore may not be useful for identifying early reinfarction
-troponin elevation is often delayed by 4-6 hours after infarction

CK:
- should be monitored for 48 hours serially & can be measured subsequently if there is suspected reinfarction

CK-MB:
- more specific than CK for myocardial infarction & may be used to confirm a reinfarction
- earliest rise of CK & CK-MB occurs at 3-4 hours with a peak at 12-24 hours and normalisation by 48 hours



management of non ST elevation acute coronary syndromes
- high risk patients require aggressive medical management and coronary angiography
- intermediate risk patients require inpatient monitoring and investigation and provocative testing
- low risk patients can be discharged with follow-up
- ESSENCE trial showed that low molecular weight heparin (enoxaparin) reduced the combined end point of death, MI or recurrent ischaemia at both 14 & 30 days when compared with heparin

risk stratification of non ST elevation acute coronary syndromes
(i) high risk consists of clinical features of ACS with any of the following:
- repetitive or prolonged (>10mins) ongoing CP
- elevated cardiac biomarkers
- persistent or dynamic ECG changes (ST depression or TWI)
- transient ST elevation
- cardiogenic shock
- sustained VT
- syncope
- EF<40%
- prior CABG
- percutaneous coronary intervention within 6 months
- presence of known diabetes with typical ACS features
- chronic renal failure with typical ACS features

(ii) intermediate risk consists of clinical features with any of the following:
- resolved chest pain that occurred at rest or was repetitive or prolonged
- age >65
- known CAD
- two or more of the following risk factors (hypertension, family history, active smoking or hyperlipidaemia)
- presence of known diabetes mellitus with atypical ACS features
- presence of chronic renal failure with atypical ACS features
- prior aspirin use

(iii) low risk
- presentation with clinical features of an acute coronary syndrome without intermediate or high risk features

heart block in AMI

Feature	Inferior	Anterior
Onset	Slow (usually via Mobitz I)	Sudden (usually via Mobitz II)
QRS complex	Narrow	Wide
Ventricular rate	>45 bpm	<45 bpm (often 20–30 bpm)
Escape pacemaker	Stable	Unstable
Drug response (e.g. atropine)	Yes	No
Haemodynamic effects	No (usually)	Yes
Permanent pacing	No (usually)	Yes (if high degree A-V block persists)
Prognosis	Good	Very poor

management of ST elevation AMI
reperfusion therapy:
- reperfusion can be obtained with fibrinolytic therapy or PCI
- a combination of fibrinolysis and PCI can also be used
- CABG surgery may occasionally be more appropriate with particular anatomy & may be considered as rescue therapy in patients who fail revascularisation
- PCI is the best available treatment; however, benefit depends on prompt access to service and if delay is longer than 90 minutes until balloon inflation thrombolysis should be administered.
- PCI is clearly better in the presence of cardiogenic shock

antiplatelet therapy:
- aspirin 300mg should be given to all patients with STEMI unless contraindicated
- both the VA Cooperative Study Group and the Canadian Multicentre Trial showed that aspirin reduces the risk of death or myocardial infarction by 50% in patients with unstable angina or non-Q wave infarction
- clopidogrel should be given as a load 600mg to all patients who require a stent & should be continued for at least 12 months; clopidogrel should be given to selected patients given fibrinolysis. If urgent CABG is likely, clopidogrel should be withheld
- in the CURE trial, clopidogrel given in addition to aspirin within 24hrs of unstable angina symptoms led to significantly reduced of cardiovascular death from 11.4% to 9.3% but was associated with a 1% absolute increase in major, non life threatening bleeds as well as a 2.8% increase in major bleeds associated with CABG within 5 days
- ticlopidine & clopidogrel (thienopyridins) are second generation platelet inhibitors acting independently & theoretically synergistically with aspirin

antithrombin therapy:
(i) with PCI: unfractionated heparin should be administered with dose dependent or whether IIb/IIIa inhibitors are used; the role of enoxaparin in acute STEMI following PCI remains to be determined
(ii) with fibrinolysis: heparin or enoxaparin should be used fibrin-specific fibrinolytic agents. The use of antithrombin therapy in conjuction with streptokinase is optional.

glycoprotein IIb/IIIa inhibitors:
- reasonable to use post primary PCI although data are conflicting regarding efficacy. They reduce mortality the 30-day risk of non-fatal AMI by 38& in NSTEMI in patients undergoing PCI. They have not been shown to be beneficial in the routine management of medically treated patients (GUSTO-IV-ACS)
- there are two classes of glycoprotein IIb/IIIa inhibitors
(i) murine monoclonal (eg abciximab)
(ii) 'small molecule' inhibitors (eg tirofiban & eptibatide)
- should be avoided with fibrinolytic therapy because of risk of bleeding; platelet infusion may treat significant bleeding in patients receiving abciximab but not in those receiving tirofiban or eptifibatide)

nitrates:
- reduce myocardial oxygen demand through afterload reduction and may on improve myocardial oxygen delivery through coronary vasodilation
- may lead to dramatic resolution of ischaemia in coronary vasospasm
- GISSI-3 and ISIS-4 trials failed to demonstrate mortality reduction from acute or chronic nitrates; nevertheless, they remain first line therapies for symptomatic angina and when myocardial infarction is complicated by CCF

beta blockers:
- iv beta blockers should be considered for patients with tachycardia or hypertension post infarct in the acute setting
- oral beta blockers decrease mortality after myocardial infarction and should be administered to all patients who can tolerate them

ACEIs:
- SAVE trial showed that captopril in patients with EF<20% post AMI lead to a 21% reduction in mortality
- ISIS-4 showed a smaller reduction in mortality for all patients treated with captopril post AMI
- HOPE showed patients with vascular disease or high risk of atherosclerosis benefited from ramipril

statins:
- decrease risk of adverse ischaemic events in patients with CAD