The Cardiovascular System

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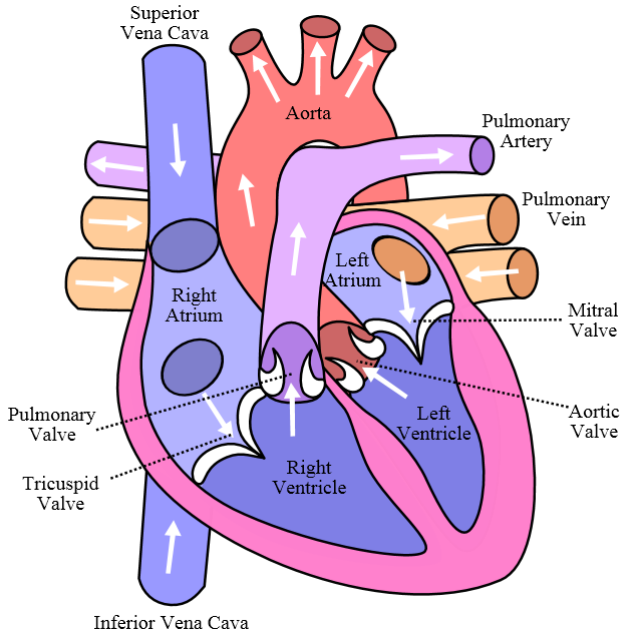
Who am I?

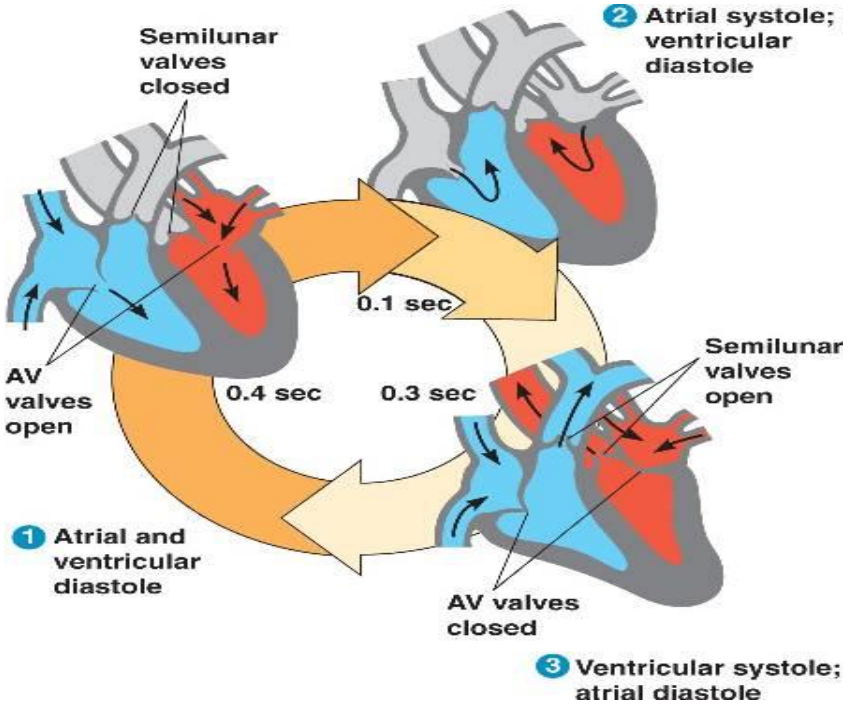
- Qualified UCH, London in 1976.
- Worked at St. Thomas' and St Bartholomew's London, Southampton, and Massachusetts General Hospital, Boston.
- Worked as Consultant Cardiologist, Hull and East Yorkshire Hospital 1990-2012.
- Cardiology advisor to the Office of the Parliamentary and Health Service Ombudsman 2008-11.
- Currently work at the Spire Hull and East Riding Hospital.

What will be covered

- Anatomy and physiology of the heart
- Cardiac investigations
- Ischaemic heart disease
- Valvular heart disease
- Heart failure
- Aortic aneurysms
- Standards and guidance

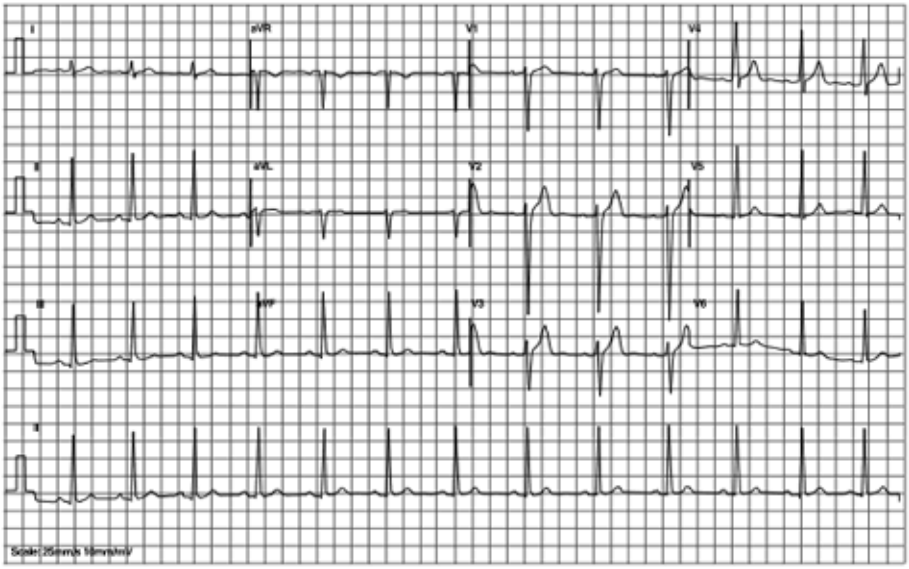
Anatomy and physiology of the heart

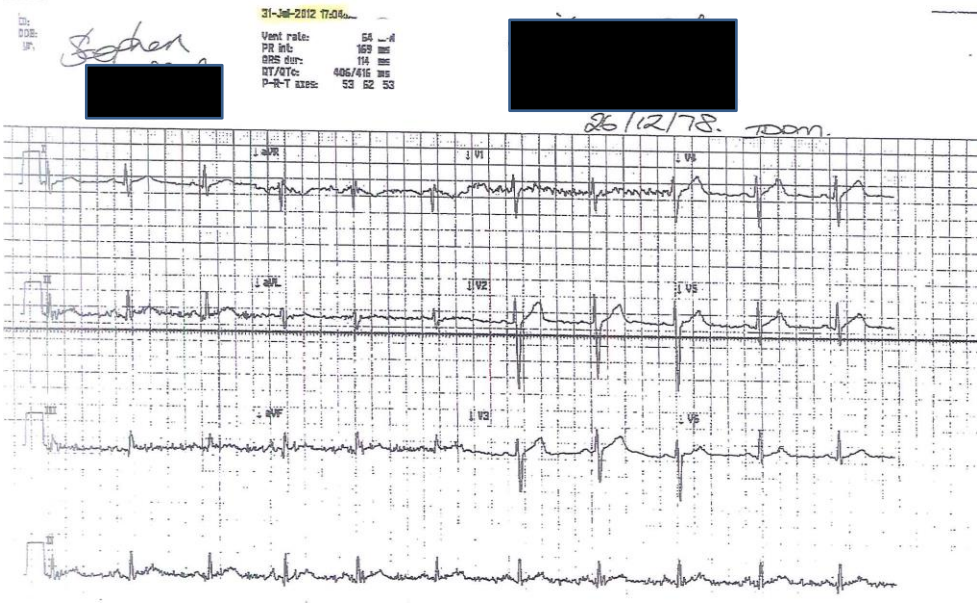


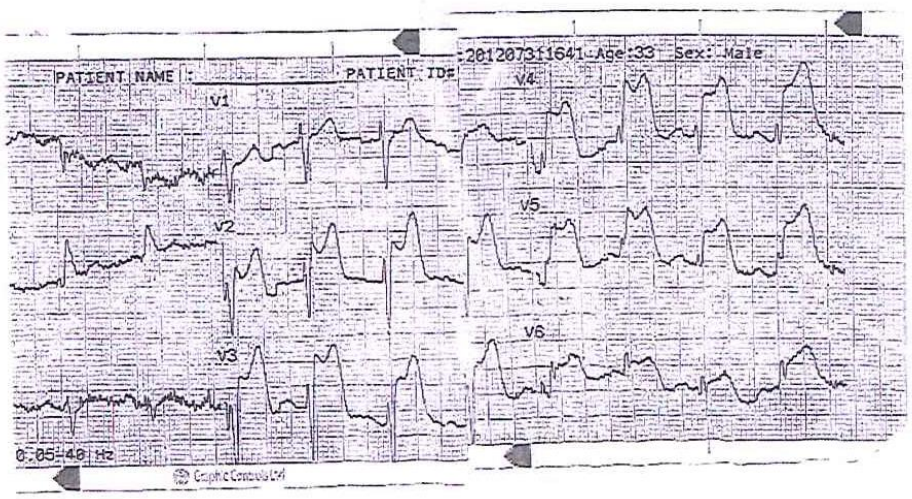


Investigations

- Is it the right patient?
- Is it the right date?
- Is it the right time?
- Was it correctly interpreted?
- Was an adequate report in the records?
- Was it correctly acted upon?




[redacted]
31-Jul-2012 17:04
Vent rate: 54
PR int: 169 ms
QRS dur: 114 ms
QT/QTc: 406/416 ms
P-R-T axes: 53 62 53
[redacted]
26/12/78.

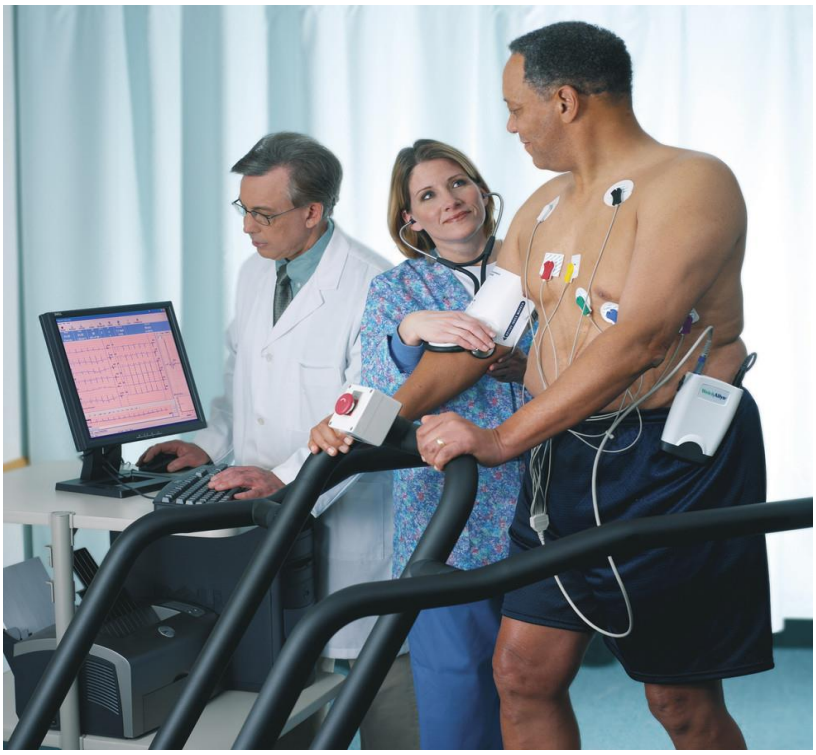


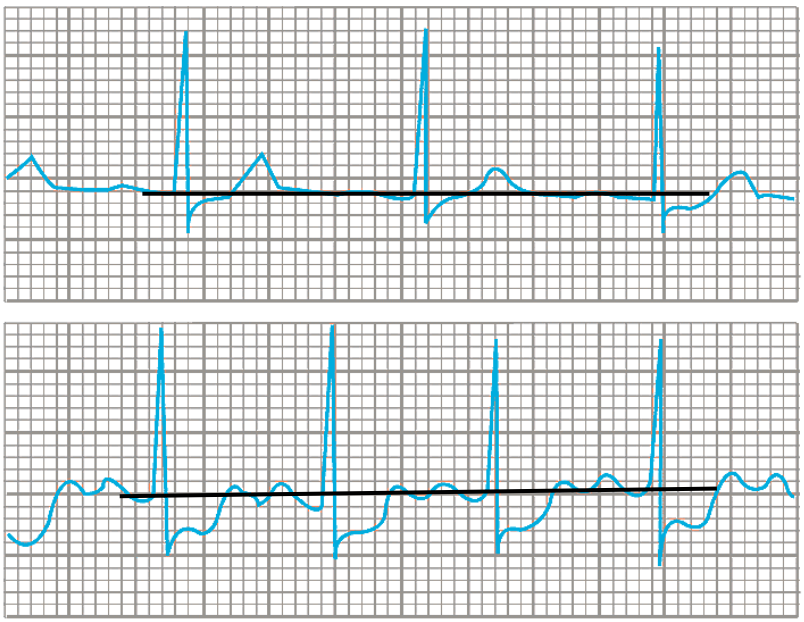
ECG Example

- Patient admitted to A&E after a collapse at work preceded by chest pain.
- Admitted as “collapse”, but chest pain also documented.
- ECG seen by junior doctor and consultant and recognised as abnormal.
- Discharged, then had a cardiac arrest in the car park and could not be resuscitated.

CXR Example

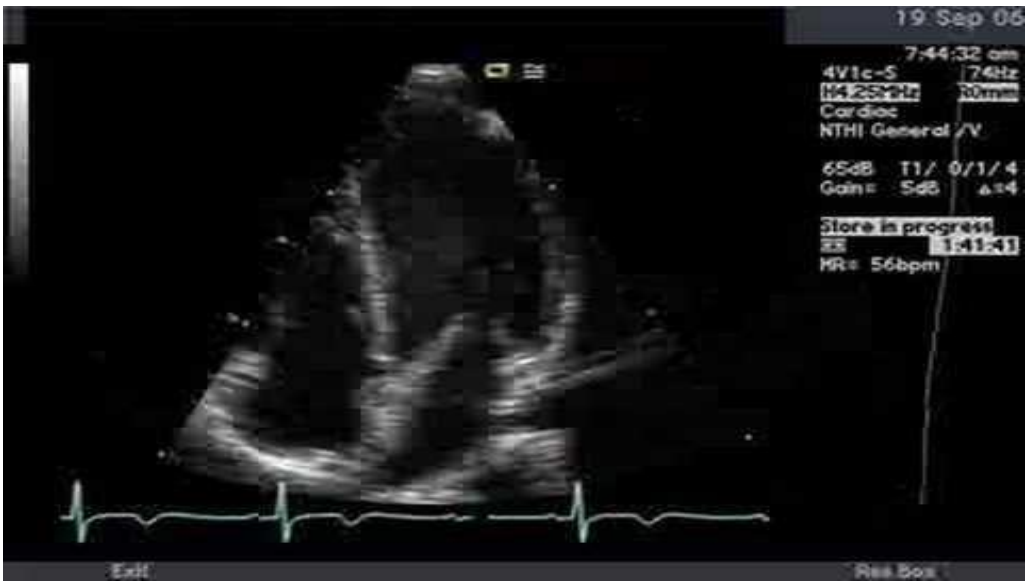
- Patient with congenital heart disease and multiple previous operations.
- Recurrent problems and CXR performed which showed a possible mass.
- Mass confirmed on CT scan, possibly tumour but report not acted upon.
- Curable lung cancer missed, and when returned for possible heart surgery, now incurable with rapid decline and death.

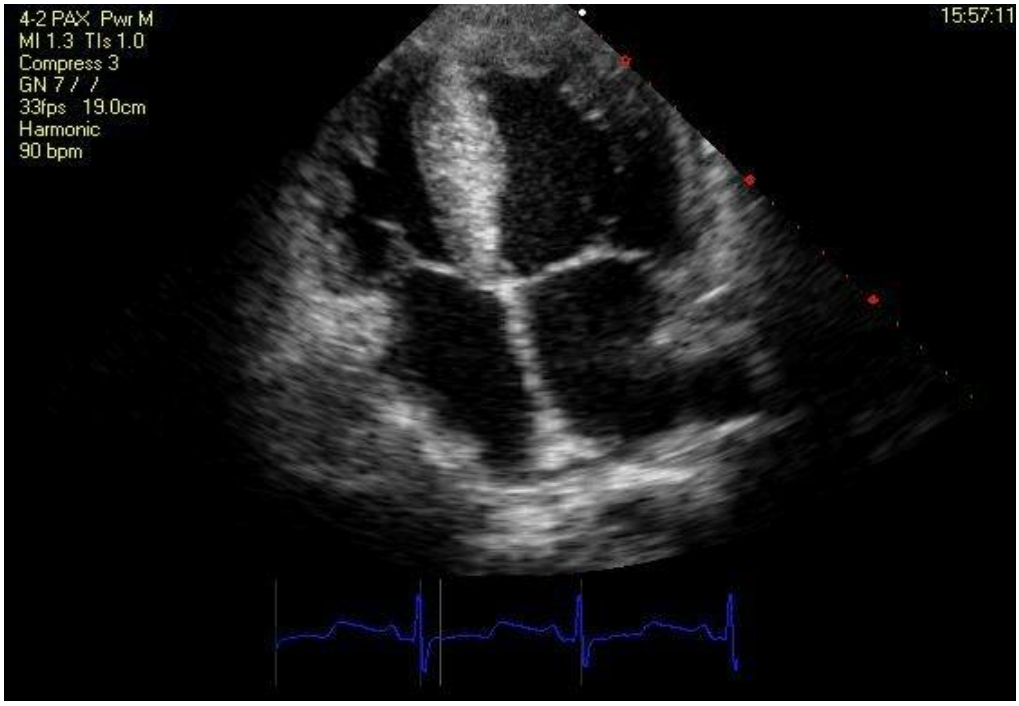


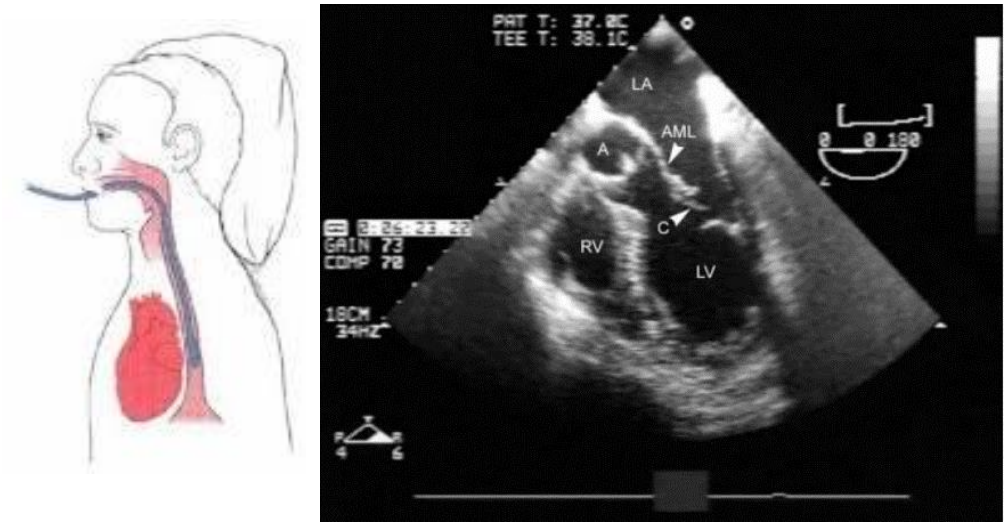


Exercise ECG Example

- Patient admitted with chest pain.
- Very abnormal physical signs including a heart murmur.
- No echocardiogram performed, exercise ECG ordered.
- Trust policy states patients with murmurs should have echocardiogram before exercise ECG.
- Cardiac arrest and dies on treadmill. PM shows ruptured aneurysm.

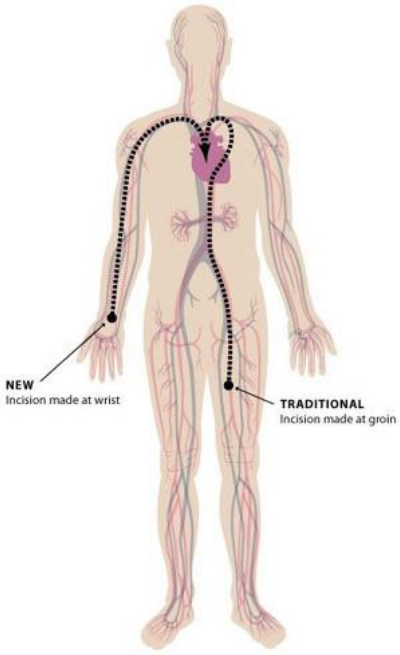

19 Sep 06
7:44:32 am
4V1c-S
74Hz
Cardiac
NTHI General /V
65dB
Gain= 5dB
Store in progress
HR= 56bpm
Exit


4-2 PAX Pwr M
MI 1.3 TIs 1.0
Compress 3
GN 7 / /
33fps 19.0cm
Harmonic
90 bpm
15:57:11



Echocardiogram Example

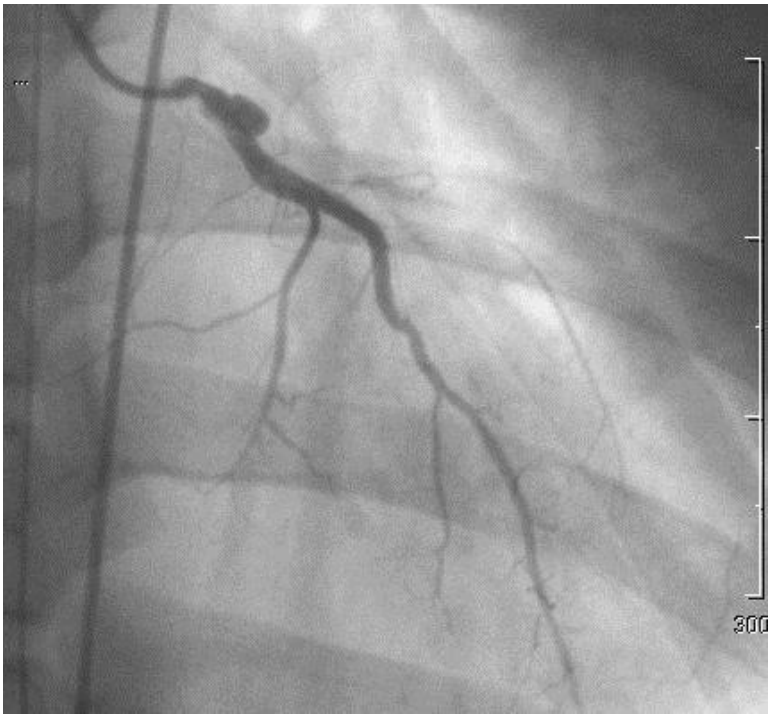
- Patient with previous congenital heart surgery.
- Routine echocardiogram shows a possible small mass, which is felt to be related to previous surgery.
- MRI scan does not confirm mass, and suggests that the appearance may be related to previous surgery.
- Subsequent stroke probably due to embolisation of mass which in retrospect was likely to be a blood clot.

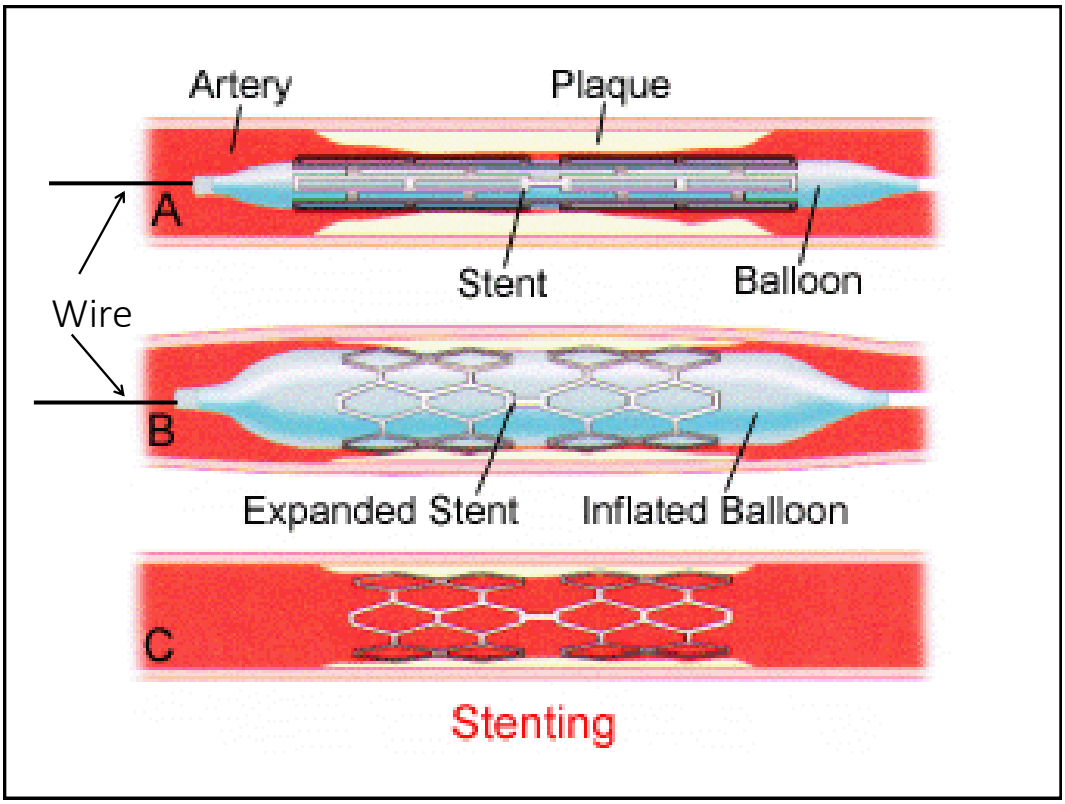


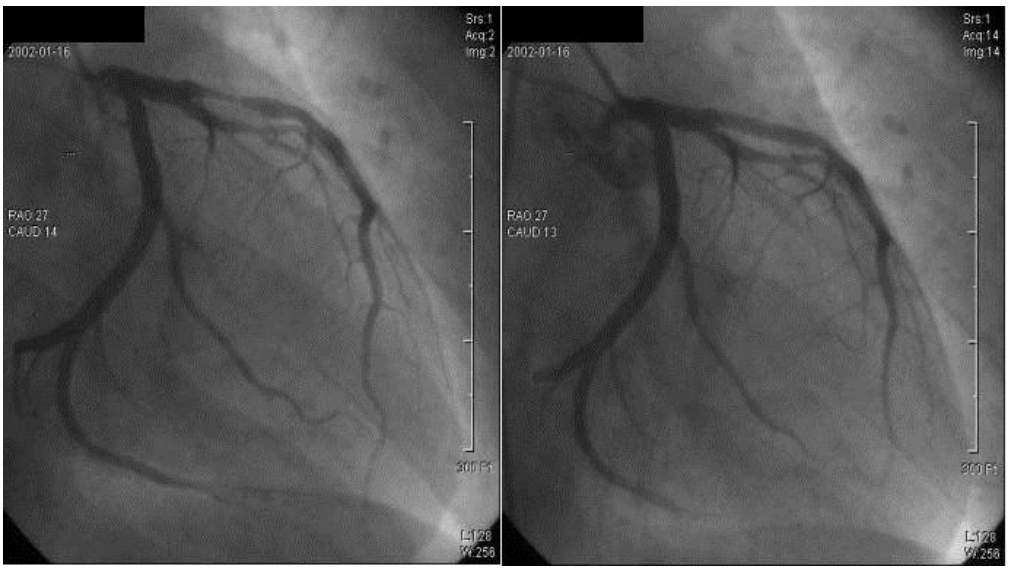
- Is the site appropriate?
- Are there the requisite skills?
- Is the consent adequate?
- Was the procedure prolonged?
- Was the aftercare adequate?
- Is the documentation and are the decisions appropriate?

Cardiac Catheterisation Site Example

- Patient with previous right knee replacement.
- Admitted with chest pain.
- Angioplasty performed from right groin. Red rash noted in right groin prior to procedure.
- No initial complication and goes home.
- 2 days later admitted with pain swollen right knee.
- Knee replacement infected with skin bacteria.
- Requires prolonged antibiotic therapy and knee still stiff and painful.




Artery
Plaque
A
Stent
Balloon
Wire
B
Expanded Stent
Inflated Balloon
C
Stenting


2002-01-16
RAO 27
CAUD 14
2002-01-16
RAO 27
CAUD 13

Catheterisation Example

- Patient with previous normal angiogram, known difficult RCA engagement.
- Seen in RACPC by nurse practitioner. Normal exercise ECG, but put on catheter list without discussion with consultant.
- Procedure done by staff grade doctor. Difficult to engage RCA, multiple catheter exchanges and no “call for help”. Leg pain starts during prolonged procedure.
- Leg pain not evaluated on ward and discharged.
- Eventually readmitted (after 2 A&E attendances!) with ischaemic leg. Continued problems despite multiple procedures on leg.

Angioplasty Example

- Femoral artery procedure with full blood thinning.
- Planned closure device use, femoral angiogram performed. This showed additional leak from artery which was not recognised.
- Closure device used and then developed low BP and shock, eventual diagnosis of large retroperitoneal blood clot.
- Prolonged delays in ICU and non-availability of vascular surgeon.
- Persistent medical problems after delayed surgery.

Ischaemic Heart Disease

- Coronary artery disease = coronary heart disease = ischaemic heart disease.
- Usually narrowing or blockage is a coronary artery.
- Spectrum from:

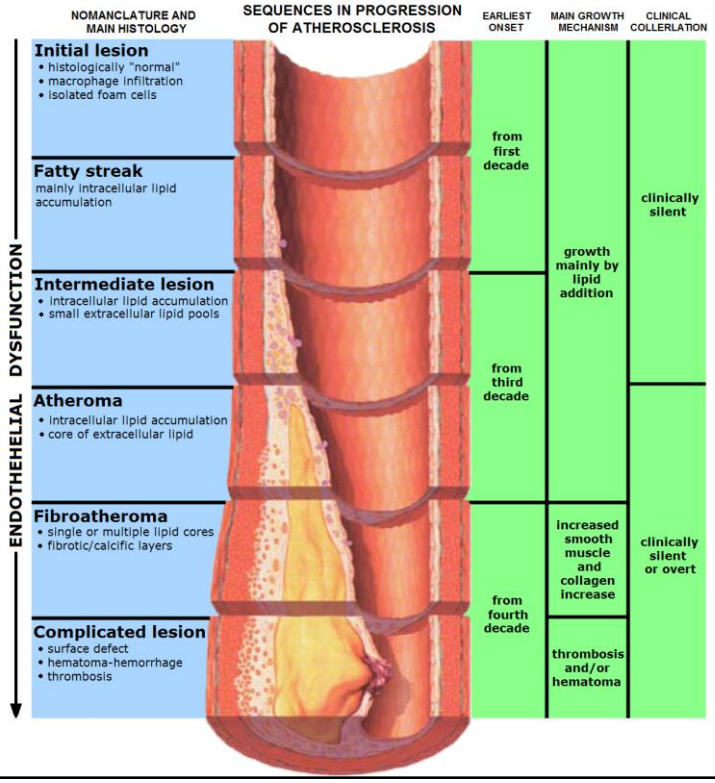
no symptoms,

stable angina,

acute coronary syndrome,

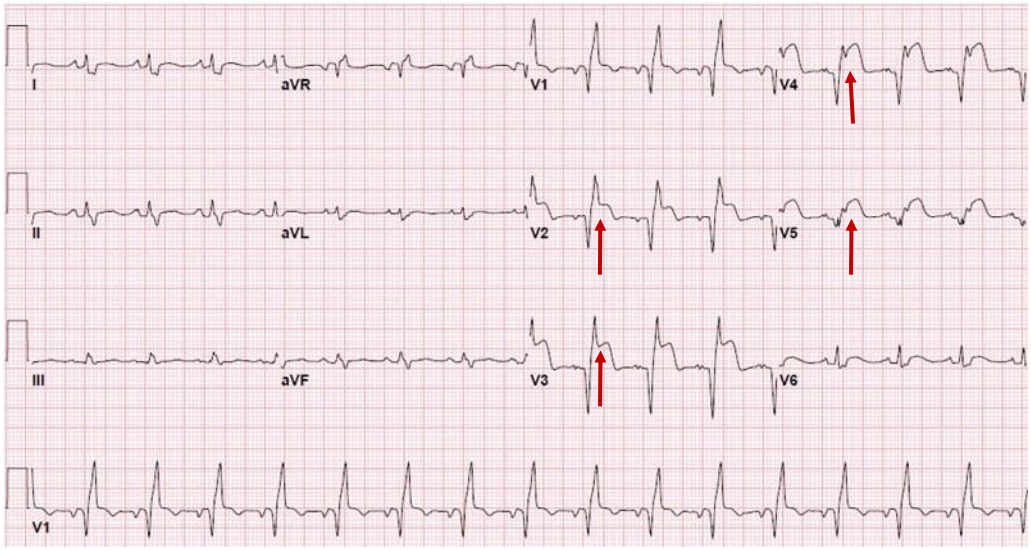
heart failure,

sudden death.



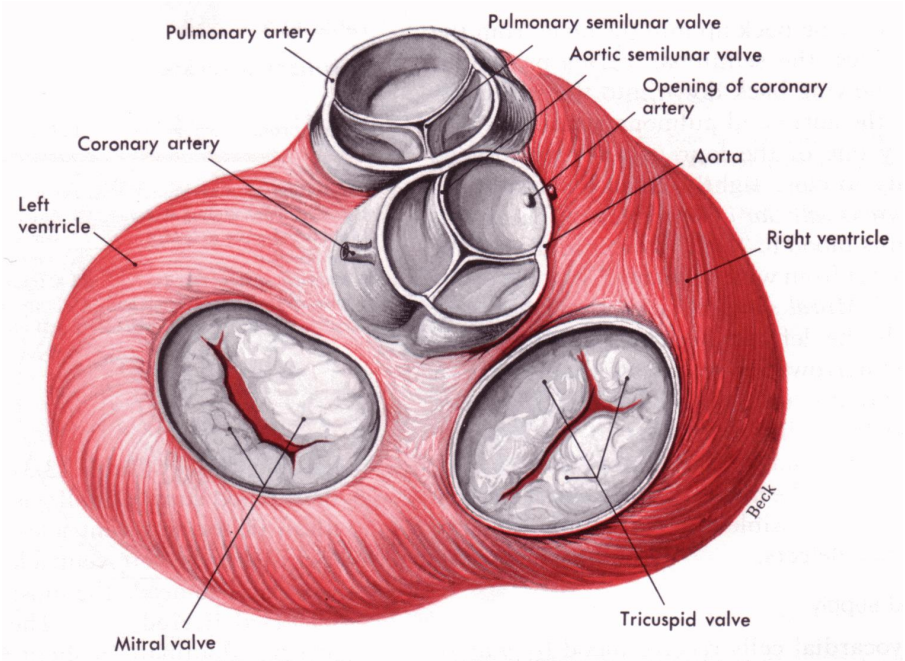
Myocardial Infarction (heart attack)

- Treatment depends upon the ECG at presentation.
- Some types require “reperfusion”: primary angioplasty or clot busting drugs.
- Some types require medical therapy or angioplasty or surgery.
- Extensive evidence base for treatment.



Myocardial Infarction Example

- Elderly patient run over at low speed by taxi driver.
- Initially thought to have minor injuries, but X-rays showed fractured pelvis treated conservatively .
- 9 days later develops chest pain and seen by junior cardiology doctor, but ECG misinterpreted.
- No discussion with senior cardiologists and patient develops worsening heart failure and dies.
- Taxi driver prosecuted for causing death by dangerous driving.



The valves of the heart viewed from above. The atria are removed to show the mitral and tricuspid valves.

Heart Valves

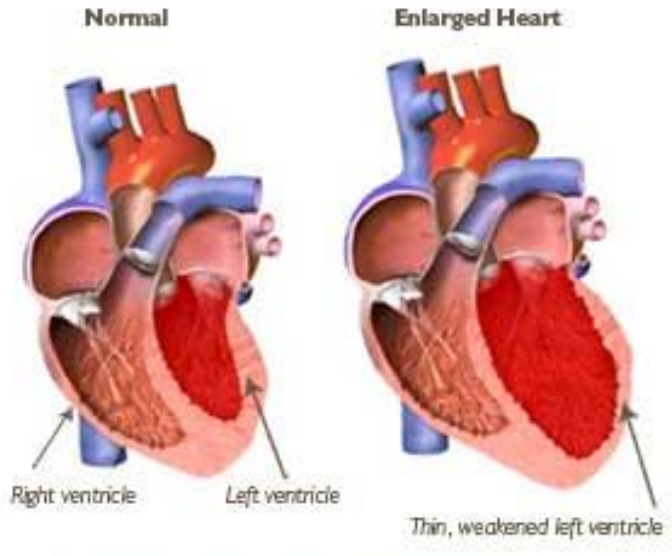
- Main problems usually occur with left sided heart valves, aortic or mitral valves.
- Valves may become narrowed (stenosis) and/or leaky (regurgitation).
- Some valve problems are best left until the patient has symptoms, but some require surgery in a pre-symptomatic state if the heart is under strain.
- New techniques of surgery and intervention.

Heart Valve Example

- Former drug addict with previous heart valve infection causing leakiness.
- Seen in clinic by junior doctor, the significance of heart enlargement not recognised, and routine appointment given only.
- Patient dies suddenly, before next appointment.

Heart Failure

- Reduced function of the heart chambers.
- May be impaired contraction and/or relaxation
- Symptoms include breathlessness, swelling, lethargy, palpitation.
- Investigations include ECG, CXR and echocardiogram.
- Most commonly due to IHD.
- Extensive evidence base for treatment.



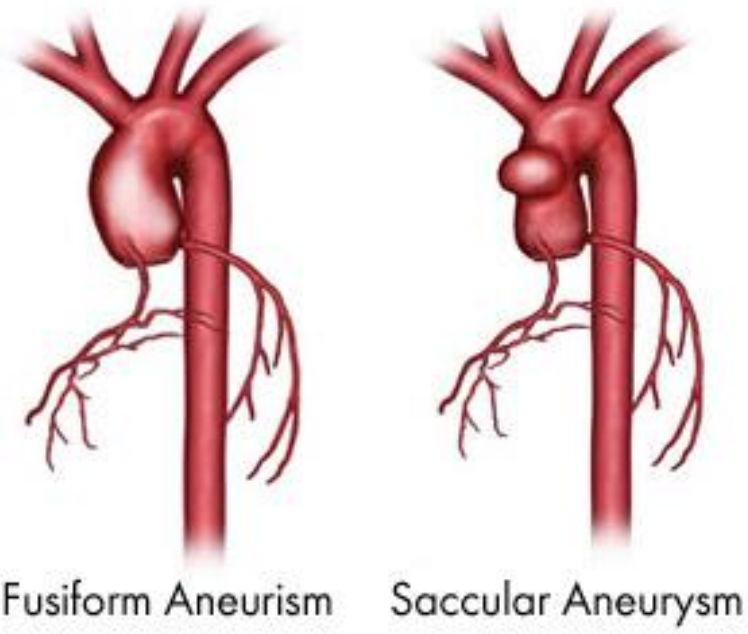
A type of cardiomyopathy. An enlarged heart is a sign that the heart may be overworked.

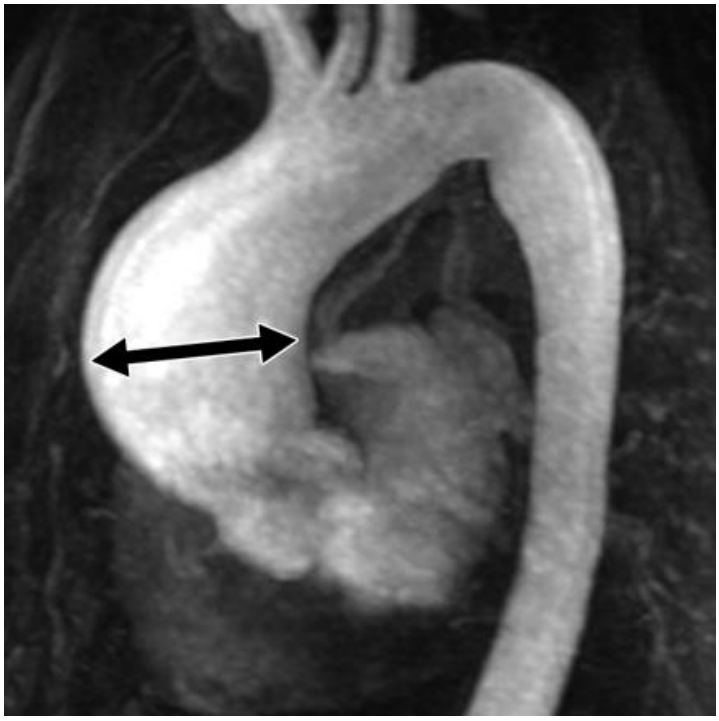
Heart Failure Example

- Patient with metal-on-metal hip replacement.
- No problems with hip, but develops severe heart failure.
- Blood cobalt levels elevated.
- Cobalt is associated with the development of heart failure (cardiomyopathy).

Aortic aneurysm

- Abnormal enlargement of the main artery arising from the heart.
- Normal size relates to age and height.
- Recognised limits for size.
- Require regular follow-up scans.
- Some have a genetic cause.
- Complex surgery or stenting procedures are required.


Fusiform Aneurism
Saccular Aneurysm



Aneurysm Example

- Young patient with Marfan syndrome.
- Known aortic root enlargement.
- On holiday away from home.
- Develops back pain and sees GP.
- GP tries manipulation without success.
- GP phones hospital and speaks to a Consultant and definitely mentions Marfan syndrome.
- Consultant does not suggest admission.
- Patient dies of rupture aneurysm on journey home.

Standards and Guidance

- Governmental – mainly NICE and DOH
- British Cardiovascular Society
- Specialist Societies
- Local NHS (Trust and PCT)
- International (World, European, USA)
- Extensive evidence based medicine (Cochrane Collaboration)

Thank you!

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