The Cardiovascular System

Dr John L Caplin, Consultant Cardiologist
Spire Hull and East Riding Hospital

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
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?
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.
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.
**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.
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.
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.
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!

Dr John Caplin BSc(Hons) MD FRCP,
Consultant Cardiologist
Spire Hull and East Riding Hospital,
Lowfield Road,
Anlaby, Hull HU10 7AZ.

Phone: 01482 672477 (ask for Sarah Pullen)

E-mail (direct): johncaplin@yahoo.com
E-mail (secretary): sarah.pullen@spirehealthcare.com