

Cardiology Update

Paediatric cardiology:

33% of infants with a life threatening heart condition will leave hospital undiagnosed.

- Limitations in antenatal care: Abnormality scan done at 20 week gestation.
- Physiology changes at birth: Duct dependent lesions often manifest in neonatal period after arterial duct closes – these lesions missed on one week checks
- Lack of awareness of CHD as differential: difficulty in identify cause of illness in infants due to clinical overlap of signs in infants

- Congenital heart disease
 - Cyanotic
 - Acyanotic
- Arrhythmia
 - SVT
 - Bradycardia (Heart block)
 - Channelopathies (Long QT)
- Infections
 - Myocarditis
 - Infective endocarditis
- Cardiomyopathy
 - Dilated cardiomyopathy Vs Hypertrophic
 - Reversible causes:
 - Myocarditis
 - ALCAPA (Anomalous origin of the left coronary artery from the pulmonary artery)
 - Idiopathic cardiomyopathy
 - Vitamin D deficient cardiomyopathy
 - Other metabolic conditions (carnitine deficiency)
 - Chest pain is rarely cardiac in kids

Stratifying symptoms and signs

Symptoms	Qualifying	Caution
Cyanosis	Central or peripheral	Hard to see in dark skin
Murmur	Innocent vs path	New murmur (espec in older child)
Chest pain	Usually non cardiac	On exertion/assoc with fast HR then do exercise test
Syncope	Most common is vagal	FHhx sudden/early death (e.g. unexplained car accident/swimming)
SOB	Usually respiratory	Hepatomegaly(failure)
Palpitations	Ectopic/SVT	Exertion (/burden)

If Fever : Always consider Kawasaki (typically seen in kids under 5) fever for more than 5 days and at least four of the following:

- bilateral conjunctival injection
- change in mucous membranes
- change in the extremities
- polymorphous rash
- cervical lymphadenopathy

Newer test for trisomies: Non-invasive Prenatal testing (analysing cell-free DNA in maternal blood)

Reflex anoxic seizure: A minor bump to the head is the most commonly reported precipitant, followed by syncope and then convulsion [there can be urinary incontinence as well]. Recovery is often rapid, but usually the child is sleepy after the attack, and there may be persisting pallor. The trigger may be surprise, being frightened, upset, or merely excited.

Rare complication of chickenpox can be staph aureus infection which if it spreads to blood can cause infective endocarditis. If previous chickenpox in the last week or two and fever with murmur suspect endocarditis.

Determining degree of coronary vessel stenosis

- History if often more useful than lots of tests
 - Exertional symptoms of angina may be better than any physiological test of functional mismatch
 - Chest pain: Always exertional unless ACS
 - Angina equivalent: SOB/fatigue : In elderly/Hypertensive/Diabetic
- If SOB on effort EXCLUDE pulmonary/Valve disease

For unstable angina: New onset and some effort variation

Death rate in stable angina is 3-4% per year but in new onset angina this increases to 14% in 6 months

Signs:

High cholesterol

Abnormalities in other vascular territories: Neck/Limbs/Abdomen

ECG:

ST elevation: normally sign of complete vessel occlusion

Incomplete occlusion: assoc with ST depression, variable T wave abnormalities or with normal ECG

Fractional flow reserve (FFR):

is a technique used in coronary catheterization to measure pressure differences across a coronary artery stenosis to determine the likelihood that the stenosis impedes oxygen delivery to the heart muscle. It is usually done in a hyperaemia state by giving adenosine.

If significant LAD occlusion : patient may not c/o chest pain but only fatigue as there is PAN ischaemia.

Functional imaging

Test	Pro	Cons	Avoid
Stress echo	Availability Cost Valvular Assessment	Image quality Reproducibility Drug	Resting abnormality VT
CMR (MRI)	Structure and function Viability Good images independent of body habitus	Cost/infrastructure Intensive (staffing) More demanding on patients	Contraindication to MRI Claustrophobia Can't/won't hold breath and cooperate
Myocardia perfusion scan	Good imaging even in lung disease Can be used with resting WMA (wall motion abnormality) May be better than DSE (Dopamine stress echo) at higher PTP (pretest probability)	Spatial resolution Radiation	Young

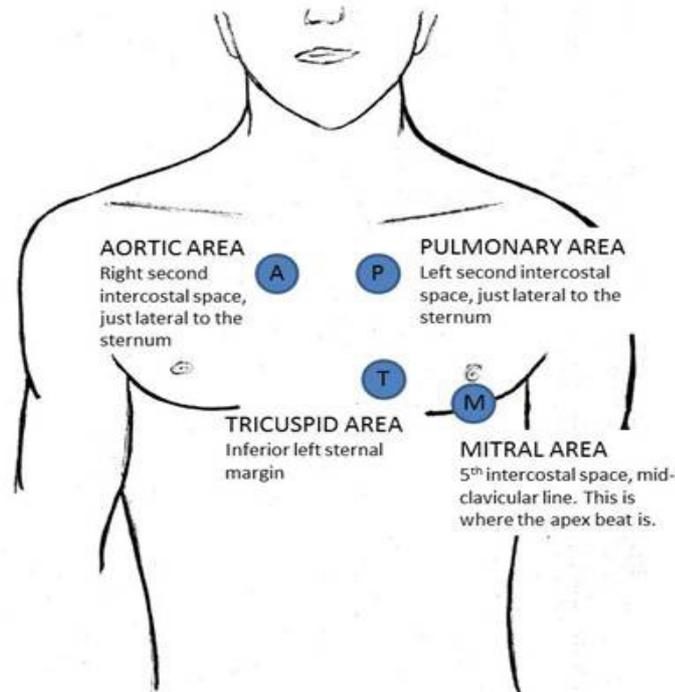
VALVE DISORDERS

Heart Sounds

- **1st Lub [S1]:** Tricuspid and Mitral snap shut. Pulmonary and Aortic open
- **2nd Dub [S2]:** Pulmonary and aortic snap shut. Tricuspid and Mitral open

1st to 2nd HS: Systole: Murmur: Aortic stenosis/Mitral regurg

2nd to 1st HS: Diastole: Murmur: Aortic regurg/Mitral stenosis



Aortic Stenosis

Aetiology:

- Congenital: bicuspid aortic valve: 1-2% of population
- Rheumatic fever
- Degenerative/Calcific: Due to hardening secondary to smoking, high blood pressure, high cholesterol diabetes

Initially LV function maintained by compensatory LVH – when can't compensate LV function declines.

Echo : to assess function

- Mild: Every 5 years
- Moderate: Every 2 years
- Severe: Every 6 months to 1 year

Symptoms:

- Angina
- Syncope (often in response to exercise)
- Breathlessness

Signs:

- Slow rising carotid pulse
- Heart sounds: soft and split second heart sound, S4 gallop due to LVH

Management:

- General measures: Antibiotic prophylaxis in dental procedures with prosthetic AV or history of endocarditis
- Vasodilators are relatively contraindicated
- If severe: Valve replacement (AVR)
- if high risk surgery: transcatheter aortic valve replacement (TAVR) is an option

Aortic regurgitation

Leakage of blood into LV during diastole due to ineffective coaptation of aortic cusps

Aetiology:

- Acute AR: Endocarditis/Aortic dissection
- Chronic AR:
 - Bicuspid aortic valve
 - Rheumatic
 - Infective endocarditis
 - Hypertension
 - Root dilatation

Natural history:

- Asymptomatic until 4 or 5th decade
- Rate of progression: 4-6% per year
- Progressive symptoms:
 - Dyspnoea : exertional, orthopnoea and paroxysmal nocturnal dyspnoea
 - Nocturnal angina: due to slowing of heart rate and reduction of diastolic BP
 - Palpitations: due to increase force of contraction

Examination:

- Wide pulse pressure [most sensitive]
- Florid pulmonary oedema
- Hyperdynamic and displaced apical impulse
- Auscultation:
 - Diastolic blowing murmur: left sternal border
 - Systolic ejection murmur: due to increase flow across the aortic valve
- de Musset sign: Visible bobbing of the head

Tests: CXR/serial echo

Management:

- Medical:
 - Vasodilators (ACEI's)
 - Nifedipine improve stroke volume and reduce regurg [only if pt symptomatic or hypertensive]
- Surgical treatment: definitive treatment
 - ANY symptoms at rest or exercise
 - Asymptomatic treatment if: EF drops below 50% of LV becomes dilated

Mitral Regurgitation

Backflow of blood from LV to the LA during systole

Mild (physiological) MR is seen in 80% of normal individuals

Natural history:

- Compensatory phase: 10-15years
- Patients with asymptomatic severe MR has a 5%/year mortality rate
- Once EF <60% and or become symptomatic, mortality rises sharply. Mortality from progressive dyspnoea and heart failure

Aetiology

- Acute:
 - Endocarditis
 - Acute MI
 - Malfunction or disruption of prosthetic valve
- Chronic
 - Myxomatous degeneration (MVP)
 - Ischaemic MR
 - Rheumatic heart disease

- Infective Endocarditis
- Annulus dilatation

Signs:

- Auscultation: soft S1 and holosystolic murmur at apex radiating to axilla
- Exertional Dyspnoea
- Heart failure: may be unmasked if increased haemodynamic burden e.g. pregnancy, infection or atrial fibrillation

Tests:

- ECG: may show, LA enlargement, atrial fibrillation and LV hypertrophy with severe MR
- CXR: LA enlargement, central pulmonary artery enlargement
- ECHO: Estimation of LA, LV size and function. Valve structure assessment.
 - Mild: 2-3 years
 - Moderation: 1-2 years
 - Severe: 6-12 months

Management:

- Medical:
 - Vasodilators: hydralazine
 - Rate control for AF with B blockers, CCB, digoxin
 - Anticoagulation if AF and flutter
 - Diuretics for fluid overload
- Surgical:
 - Severe MR:
 - any symptoms at rest or excise with (repair if feasible) or
 - If asymptomatic: if EF<60% or if new onset atrial fibrillation
 - Repair
 - Replacement
 - Mitraclip

Paravalvular leak : Do not automatically need redo surgery

Palpitations:

- Accurate history is key to the diagnosis [often classical history of suddenly starting and stopping (like a light switch)]
- Holter monitoring normally of minimal value
- Treadmill testing of value if exercise induced
- Catheter ablation: 95% cure rate for simple SVTs (AVNRT [AV nodal reentrant tachycardia], AVRT [Atrioventricular reentrant tachycardia])

Red flag: Syncope on exercise [may indicate arrhythmia due to underlying cardiomyopathy]