

## Cardiac Murmurs

Valve disease	Murmur character	Best heard (→ radiation)	Pathology	Symptoms	Signs	Causes	
<b>Systolic (radiate)</b>							
<b>Expiration</b>	<b>Aortic stenosis</b> <i>CI = nitrates, ACEi</i>	Ejection systolic <i>(differentiate from MR by separate S2)</i>	Upper RSE (→ carotids and apex)	Stops carotid outflow → Limited CO and LV hypertrophy	Exertional dyspnoea Syncope Angina (coronary perfusion impaired)	Slow rising pulse Narrow pulse pressure Heaving apex beat Soft or absent S2 (depending on AS severity) May be LVF (S3, pulmonary oedema)	Senile calcification (most) Congenital Bicuspid aortic valve (e.g. Turners syndrome) Rheumatic
	<b>Aortic sclerosis</b>	Ejection systolic	Upper RSE ( <u>doesn't radiate</u> )	Valve hard and inflexible → Turbulence (thickening NOT narrowing) → Local sound only	None	No abnormal signs <i>(differentiate from AS by normal pulse, apex and S2)</i>	Senile calcification (most)
	<b>Mitral regurgitation</b>	Pan-systolic	Apex (→ left axilla)	Regurgitation to left atrium → Left atrial dilation → LV dilation and failure IF acute, LA pressure increases and causes pulmonary oedema	Dyspnoea Fatigue palpitations	AF Displaced thrusting apex (volume overload) Soft S1 LVF (S3, pulmonary oedema) Pulmonary hypertension (RV heave, loud P2)	Papillary muscle dysfunction (post-MI) Dilated cardiomyopathy Rheumatic Infective endocarditis Congenital Connective tissue disorders (e.g. Marfan's)
	<b>Mitral valve prolapse</b>	Mid-systolic click and/or late systolic murmur <i>(differentiate from MR by normal S1 then gap before murmur)</i>	Apex (→ left axilla and back)	In ventricular systole, a mitral valve leaflet prolapses to left atrium	Atypical chest pain	Murmur only	Associations: primary congenital, Marfan's, PKD, congenital heart disease, congestive cardiomyopathy, HOCUM, myocarditis, Ehlers-Danlos, osteogenesis imperfecta, SLE, muscular dystrophy
	<b>Ventricular septal defect</b>	Pan-systolic	Lower LSE (loud → whole precordium)	During systole some blood from left ventricle leaks into right ventricle	Often none if small	Loud P2	Congenital
<b>Inspiration</b>	<b>Tricuspid regurgitation</b>	Pan-systolic <i>(differentiate from MR by seeing if louder on inspiration because it's on the right + JVP + non-displaced apex)</i>	Lower LSE	Regurgitation to right atrium and systemic backflow	Fatigue Hepatic pain on exertion Ascites, oedema	Giant V waves in JVP ( <i>giant JVP waves without RVF = TR</i> ) Pulsatile hepatomegaly Parasternal heave = severe	RV dilation in pulmonary hypertension (most; e.g. due to chronic lung disease or left heart/valve disease) Rheumatic Infective endocarditis (IV drug user) Ebstein's anomaly (if split S1 and S2)
	<b>(Pulmonary stenosis)</b>	Ejection systolic	Upper LSE (→ back)	Stops pulmonary outflow → RV hypertrophy	Dyspnoea, fatigue, oedema, ascites	Dysmorphic face RV heave	Congenital (most)
<b>Diastolic (need to be accentuated)</b>							
<b>Expiration</b>	<b>Mitral stenosis</b>	Low rumbling mid-diastolic with opening snap	Apex in left lateral position	High left atrial pressure → Pulmonary hypertension → RV hypertrophy → Tricuspid regurgitation → Right heart failure (late)	Dyspnoea Fatigue Haemoptysis Chest pain	Malar flush (due to low cardiac output) AF Tapping apex (palpable S1) Loud S1 Pulmonary hypertension (RV heave, loud P2)	Rheumatic Others rare (e.g. congenital)
	<b>Aortic regurgitation</b>	Early diastolic (Sounds like a breath)	Upper RSE or lower LSE sitting forwards	Systemic backflow	Fatigue SOB Palpitations	Collapsing pulse Wide pulse pressure Very displaced apex Backflow signs: -Corrigan's (visible carotid pulsation) -de Musset's (head nodding pulse) -Quinke's (red colour pulsation in nails) ±Austin Flint murmur (apical diastolic rumble)	<u>Acute causes</u> Infective endocarditis Aortic dissection <u>Chronic causes</u> Connective tissue disorders (e.g. Marfan's, ankylosing spondylitis) Rheumatic Luetic heart disease (syphilis) Congenital Long standing hypertension
	<b>(Tricuspid stenosis)</b>	Early diastolic	Lower LSE	Systemic congestion and R atrial dilation	Fatigue, ascites, oedema	Giant a wave and slow y descent in JVP	Rheumatic (most), Congenital atresia, carcinoid
	<b>(Pulmonary regurgitation)</b>	Decrescendo murmur in early diastole	Upper LSE	Pulmonary backflow	Often none	RV hypertrophy	Any cause of pulmonary hypertension

LV hypertrophy (e.g. due to stenosis on left side) = non-displaced heaving apex beat **VS** LV dilation = LVF (e.g. due to regurgitation on left side) = displaced thrusting apex beat