

Valvular Heart Disease

The questions signed by * are hard: read their explanation. ● Past Years ● TBL ● Others

This file belongs to the PULSE Cardiology question book: the explanations of the multiple choice answers and the model answers of the essay questions, in the words of the handout.

Answer Key | Multiple Choice Questions

Question no.	1	2	3	4	5	6	7	8	9	10	11	12
Answer	b	b	d	a	c	b	b	a	a	b	b	a

Question no.	13	14	15	16	17	18	19	20	21	22	23	24
Answer	b	c	b	c	d	b	b	a	d	e	b	a

Question no.	25	26	27	28	29	30	31	32	33	34	35	36
Answer	c	a+c+d	b	c	a	c	c	b	c	d	b	b

Question no.	37	38	39	40	41	42	43	44	45
Answer	a	b	b	a	d	b	a	d	b

► Second | Questions with a Note

Question no.	1	2	3	4
Answer	d	b	d	c

► Why this answer?

- The following investigations are used in diagnosis of valvular heart lesions except:
(b) CT chest
Trans-thoracic and trans-esophageal echo and coronary angiography before open heart surgery are the investigations used. CT chest is not one of them; only a CT aortogram is used, in patients with aortic aneurysm.
- Apical systolic murmur is not due to:
(b) Aortic regurgitation
The murmur of aortic regurgitation is a soft blowing decrescendo (diastolic) murmur best heard at the second aortic area. MR gives a holosystolic murmur on the apex, and the aortic stenosis murmur is propagated to the neck and to the apex.

- 3 *Heaving apex is found in the following lesion:*
(d) Aortic stenosis.
 The apex is sustained (heaving) in left ventricular hypertrophy and hyperdynamic in dilatation; aortic stenosis gives signs of left ventricular hypertrophy with a sustained apex. Aortic regurgitation gives a hyperdynamic apex.
- 4 *Diastolic thrill over the apex is usually due to:*
(a) Mitral stenosis
 A palpable diastolic thrill at the apex is a sign of mitral stenosis. MR gives a palpable systolic thrill at the apex, and aortic stenosis a systolic thrill at the first aortic area.
- 5 *Which of the following is an indication of aortic valve replacement:*
(c) Severe aortic stenosis and severe aortic regurgitation.
 Surgical aortic valve replacement is indicated in severe aortic stenosis and in severe aortic regurgitation. Mild and moderate aortic lesions are not indications.
- 6 *Aortic valve surgery is indicated in:*
(b) Severe aortic stenosis
 Aortic valve replacement (SAVR or TAVR) is indicated in severe aortic stenosis. The other options are mitral lesions.
- 7 *Mitral valve surgery is indicated in:*
(b) Severe mitral stenosis
 Mitral valve intervention (PBMV or surgical replacement) is indicated when the mitral valve area is $< 1.5 \text{ cm}^2$, and severe MS is an area $< 1 \text{ cm}^2$. The other options are aortic lesions.
- 8 *All are true about mechanical valve except:*
(a) Long-term anticoagulant and warfarin is not needed
 A metallic (mechanical) prosthesis needs warfarin for life with INR 2.5-3.5, so (a) is false. Lifelong warfarin brings a bleeding risk, and the valve carries a clot risk, while its durability is long.
- 9 *All are false about bioprosthetic valve except:*
(a) Long-term anticoagulant and warfarin is not needed
 A bio prosthesis needs warfarin for 3-6 months, then antiplatelet therapy, so long-term warfarin is not needed. Its durability is short and its risks of thromboembolism and bleeding are low.
- 10 *Aortic valve surgery is indicated in:*
(b) Severe aortic regurgitation
 Surgical aortic valve replacement is indicated in severe aortic regurgitation. Mild or moderate aortic stenosis and mitral lesions are not indications.
- 11 ** All are true about mechanical valve except:*
(b) Decreased durability
 A mechanical valve is durable, so 'decreased durability' is false. It needs warfarin for life, which brings its clot and bleeding risks; durability is inferred from the line 'If metallic prosthesis: warfarin for life', as the handout does not state it.
- 12 *All are true regarding bioprosthetic valves except:*
(a) Long-term anticoagulant is needed
 A bio prosthesis needs warfarin for 3-6 months, then antiplatelet therapy, not long-term anticoagulation. It is less durable and has less risk of thromboembolism and bleeding.
- 13 *Mitral valve surgery is indicated in:*
(b) Severe mitral regurgitation
 Intervention or surgery is indicated in severe MR, symptomatic or asymptomatic with EF $< 60\%$ and/or a dilated LV. Moderate MR is not an indication, and aortic stenosis is treated on the aortic valve.
- 14 *Which of the following is indicated for mitral valve surgery:*
(c) Severe mitral stenosis and severe mitral regurgitation.
 Mitral valve intervention is indicated in MS with a valve area $< 1.5 \text{ cm}^2$ and in severe MR. Mild lesions and moderate MR are not indications.

- 15 *The worst prognosis in aortic stenosis, when the patient presents with:*
(b) Heart failure
 Average survival in symptomatic aortic stenosis is 2 years with heart failure, 3 years with syncope and 5 years with chest pain, so heart failure has the worst prognosis.
- 16 *All of the following are not indications for aortic valve surgery, except:*
(c) Severe aortic stenosis and severe aortic regurgitation.
 Aortic valve replacement is indicated in severe aortic stenosis and severe aortic regurgitation. In every other option the aortic lesion is mild.
- 17 *As regards surgical options of severe mitral regurgitation, all the following are true except:*
(d) Percutaneous balloon mitral valvuloplasty
 Percutaneous balloon valvuloplasty is the intervention for mitral stenosis, not regurgitation. MR is treated by surgical repair or by replacement with a bio or metallic prosthesis.
- 18 *As regards surgical options of mitral stenosis, all of the following are true except:*
(b) Transcatheter aortic valve implantation (TAVI).
 Transcatheter aortic valve replacement is a treatment of severe aortic stenosis, not of the mitral valve. Mitral stenosis is treated by PBMV or surgical mitral valve replacement.
- 19 *A 59-year-old M, with breathlessness, auscultation demonstrates systolic murmur at base of heart. Which one...*
(b) Left ventricular enlargement
 A systolic murmur at the base (first aortic area) is the murmur of aortic stenosis. The ECG in aortic stenosis shows left ventricular hypertrophy.
- 20 *A 55-year-old F presented with exertional dyspnea. Chest X-ray showed large pulmonary arteries & left atrial...*
(a) MS
 Prominent main pulmonary arteries and an enlarged left atrium on chest X-ray are findings of mitral stenosis. Mitral stenosis leads to pulmonary hypertension with right ventricular strain, which fits the right-sided ECG signs; AS, AR and low EF load the left ventricle.
- 21 ** TR can be due to:*
(d) All of above
 Congenital heart disease and infective endocarditis are listed causes of tricuspid regurgitation. Inferior wall infarction is not named; it is inferred from the cause 'Functional (RV dilatation...)', as an infarction reaching the right ventricle dilates it.
- 22 *A 5-year-old boy, asymptomatic. On a routine health check, his doctor accidentally auscultated a systolic...*
(e) AR
 The murmur of aortic regurgitation is diastolic. MR gives a holosystolic murmur and AS a systolic murmur; VSD and PS also give systolic murmurs.
- 23 *If the patient has mitral stenosis as a cause of his heart failure symptoms, which of the following drugs...*
(b) Isosorbide dinitrate
 Pulmonary congestion in mitral stenosis is controlled with diuretics and beta-blockers, which slow the heart rate and increase the diastolic time; diltiazem also slows the rate. A nitrate lowers the filling pressure while the narrow valve fixes the output, so it can cause marked hypotension.
- 24 *If the patient presented with acute mitral regurge, which of the following is typically present:*
(a) Coarse crepitations over his back
 Acute MR presents with bilateral coarse crepitations of acute pulmonary edema. Bedside echo shows no left ventricular dilatation, so the apex is not shifted; marked lower limb edema belongs to right sided heart failure in chronic disease.
- 25 ** Tricuspid stenosis is a rare cause of systemic congestion. Which of the following supports its diagnosis?*
(c) Diastolic hepatic pulsations
 Tricuspid stenosis gives a giant a wave and slow y descent in the JVP; the a wave comes with atrial contraction at the end of diastole, so the liver pulsation is diastolic. This is inferred from the line 'Giant a wave and slow y descent in JVP'; systolic expansion of neck veins and a pulsatile liver belong to tricuspid regurgitation.

- 26** Aortic stenosis is a cause of increased afterload on the left ventricle. Before failure of compensation, it...
(a) Sustained apex + (c) Systolic murmur on the apex + (d) Systolic thrill on the neck
 In compensated aortic stenosis the left ventricle hypertrophies without dilating, so the apex is sustained but localized and not shifted. The handout says the aortic stenosis murmur is propagated to the neck and to the apex, and a carotid (neck) thrill could be felt. A shifted apex down and out means dilatation, which comes only after failure of compensation.
- 27** Acute severe mitral regurg could manifest as:
(b) Coarse crepitations over his back.
 Acute severe MR presents with tachycardia, hypotension and bilateral coarse crepitations of acute pulmonary edema. There is no left ventricular dilatation, so no cardiomegaly, and marked lower limb edema is a sign of right sided heart failure.
- 28** What is the most probable diagnosis:
(c) Congestive heart failure on top of mitral valve disease.
 Thickening, fibrosis and restricted mobility of the leaflets mean primary MR (structural damage of the leaflets), not secondary MR, which has no structural problem with the valve. Pulmonary and systemic congestion together mean left plus right sided failure, 'Lt. to Rt. = CHF'.
- 29** What is the most probable cause of the patient's condition?
(a) Rheumatic heart disease
 Rheumatic fever causes primary MR mostly combined with mitral stenosis, and rheumatic mitral stenosis is more common in females. Dilated and ischemic cardiomyopathy give secondary MR with no structural problem of the valve.
- 30** Which of the following could predict higher risk of stroke in this patient?
(c) Dilated left atrium.
 As left atrial pressure remains elevated the left atrium increases in size, with a greater chance of atrial fibrillation. A dilated left atrium > 50 mm is itself an indication for oral anticoagulation.
- 31** The patient has mild mitral stenosis. This means that the mitral valve area is:
(c) 1.5 - 4 cm²
 Mild MS is a mitral valve area > 1.5 cm², moderate 1-1.5 cm² and severe < 1 cm²; the normal area is 4-6 cm².
- 32** The most common cause of the patient presentation is:
(b) Rheumatic heart disease.
 A diastolic rumbling murmur on the apex with an accentuated P2 means mitral stenosis with pulmonary hypertension. Rheumatic fever is the most common cause of mitral stenosis.
- 33** What is the expected character of the patient's apex?
(c) Hyperdynamic.
 An apex shifted down and outward with a palpable systolic thrill and an apical systolic murmur means MR with signs of LV dilatation, and the apex is hyperdynamic. A sustained apex is the sign of left ventricular hypertrophy in aortic stenosis.
- 34** Which of the following is not an option of management of such patient?
(d) Aortic valve replacement.
 The patient has mitral and tricuspid regurgitation with no aortic lesion, so aortic valve replacement has no place. Coronary angiography before open heart surgery, mitral valve replacement and tricuspid valve repair are all options.
- 35** Which of the following clinical signs is most commonly associated with mitral stenosis?
(b) Loud S1 with an opening snap and mid-diastolic murmur
 Mitral stenosis gives an accentuated 1st heart sound and a diastolic rumbling murmur on the apex. A systolic murmur at the aortic area is aortic stenosis and a continuous machinery murmur is PDA.
- 36** What is the most likely cause of the patient's stroke?
(b) Cardioembolism from atrial fibrillation
 In mitral stenosis the dilated left atrium gives a greater chance of AF, and embolic stroke could occur secondary to AF, resulting in hemiplegia. She was not taking the anticoagulation that AF requires.

- 37 Which of the following echocardiographic findings is most characteristic of severe mitral stenosis?
(a) Mitral valve area <1 cm²
 Severe MS is a mitral valve area < 1 cm² on echocardiography.
- 38 The least common complication of MS is:
(b) Subacute bacterial endocarditis
 Infective endocarditis is not common in MS because of marked fibrosis and low pressure. Pulmonary hypertension, atrial fibrillation and stroke are the usual complications.
- 39 * All of the following clinical findings are consistent with severe mitral stenosis except:
(b) Opening snap late after S2
 In severe mitral stenosis the left atrial pressure is high, so the valve opens early and the opening snap comes soon after S2, not late; this is inferred from that line, as the handout does not give the timing of the snap. AF and pulmonary congestion and a pulsatile liver from associated tricuspid regurgitation all fit severe MS.
- 40 Which of the following parameters is typically reduced in chronic severe aortic regurgitation?
(a) Diastolic blood pressure
 Chronic AR gives a wide pulse pressure with increased systolic and decreased diastolic pressure. The left ventricular preload increases and the ventricle dilates.
- 41 What is the most common cause of obstruction to left ventricular inflow?
(d) Rheumatic mitral disease
 Obstruction to left ventricular inflow is mitral stenosis, and rheumatic fever is its most common cause. Degenerative annular calcification and congenital causes are uncommon causes.
- 42 In cases of severe mitral stenosis, which of the following parameters is typically increased?
(b) Left atrial pressure
 Mitral stenosis causes an increase in left atrial pressure, while the cardiac output decreases as it progresses.
- 43 Which cardiac valvular lesion is most common in patients with ankylosing spondylitis?
(a) Aortic regurgitation
 Ankylosing spondylitis is an inflammatory cause of primary aortic root disease (annular dilatation), which causes aortic regurgitation.
- 44 * Mitral stenosis is frequently complicated by pulmonary hypertension. Which of the following is a cause of...
(d) All of the above
 The raised left atrial pressure is transmitted to the pulmonary vasculature, and long standing passive pulmonary hypertension leads to pulmonary arteriolar vasoconstriction. Edema in the walls of the small vessels is inferred from the pulmonary congestion of mitral stenosis, as the handout does not state it.
- 45 Most common cardiac lesion in carcinoid syndrome is:
(b) Tricuspid incompetence
 Carcinoid syndrome is listed among the causes of tricuspid regurgitation; it is not named as a cause of the other lesions.

► Second | Questions with a Note: why this answer?

- 1 Which of the following investigations are needed for valvular heart diseases:
(d) All the above.
 Echocardiography, trans-thoracic and trans-esophageal, assesses the valve lesion, and coronary angiography is done in patients with suspected ischemic heart disease before open heart surgery. So all the above are used.
- 2 Which of the following diseases is characterized by localized and shifted down apex?
(b) Aortic stenosis
 A localized apex directed outwards and downwards is a sign of left ventricular enlargement, while right ventricular enlargement gives a diffuse apex, so aortic stenosis is the only left-sided lesion offered. In aortic stenosis itself the handout gives the apex as localized and not shifted.

- 3 A 49-year-old F with aortic root dilatation & AR. Which one of the following is the least likely indication...

(d) Dilated LV dimensions

In severe AR, symptoms, LVEF < 50% and open heart surgery for other cause (CABG) are each an indication for valve replacement. LV dilatation counts only when the systolic diameter is > 50 mm, so 'dilated LV dimensions' with no size given is the weakest choice.

- 4 * All of the following are potential causes of tricuspid regurgitation except:

(c) Inferior wall myocardial infarction

Congenital heart disease, infective endocarditis and rheumatic fever are listed causes of tricuspid regurgitation. Inferior wall MI is the only option not named in that list, so it is the expected answer.

Model Answers | Essay Questions

- 1 List the different surgical options for surgery in case of mitral stenosis.

Intervention treatment

- * **Percutaneous Balloon Mitral Valvuloplasty (PBMV):** indicated when there is **suitable anatomy** and mitral valve area < **1.5 cm²** with:
 - Symptomatic.
 - Or asymptomatic with:
 - High risk of thromboembolism.
 - Pulmonary hypertension.
 - Desire of pregnancy.
 - Undergoing major non cardiac surgery.

Surgical treatment

- * **Surgical mitral valve replacement**
 - Indications: the same indications of PBMV when:
 - Anatomy is not suitable.
 - Or the patient needs open heart surgery for other reason.
 - Post-operative medications:
 - If **metallic prosthesis**: warfarin for life with INR adjustment between **2.5 and 3.5**.
 - If **bio prosthesis**: warfarin for **3-6 months**, then antiplatelet therapy.

Note The handout gives only these two options for mitral stenosis; other operations are not covered.

- 2 List the different surgical options for mitral valve surgery.

Mitral stenosis

- * **Percutaneous Balloon Mitral Valvuloplasty (PBMV):** indicated when there is **suitable anatomy** and mitral valve area < **1.5 cm²** with:
 - Symptomatic.
 - Or asymptomatic with:
 - High risk of thromboembolism.
 - Pulmonary hypertension.
 - Desire of pregnancy.
 - Undergoing major non cardiac surgery.
- * **Surgical mitral valve replacement**
 - Indications: the same indications of PBMV when:
 - Anatomy is not suitable.
 - Or the patient needs open heart surgery for other reason.

Mitral regurgitation: modes of intervention

- * **Surgical mitral valve repair:** when leaflets are **not damaged** as in most cases of MV prolapse and secondary MR (due to annular dilatation).
- * **Surgical mitral valve replacement:** when leaflets are **damaged** as in most cases of rheumatic valvular disease.
- * **Transcatheter end-to-end repair:** a new technique that aims to fix both leaflets at certain scallops using clips applied trans-catheter without need to surgical intervention.

Post-operative medications

- * If **metallic prosthesis:** warfarin for life with INR adjustment between **2.5 and 3.5**.
- * If **bio prosthesis:** warfarin for **3-6 months**, then antiplatelet therapy.
- * After **surgical valve repair:** warfarin for **3 months**.

3

List the indications of aortic valve replacement in a patient with aortic regurgitation.

Chronic aortic regurgitation: surgical aortic valve replacement (SAVR)

- * Indications: **severe aortic regurgitation:**
 - If symptomatic.
 - Or asymptomatic with one of the following:
 - LVEF **< 50%** and/or LV dilatation (systolic diameter **> 50 mm**).
 - Significantly dilated aortic root or ascending aorta.
 - Patient is undergoing open heart surgery for other cause.

Management of acute aortic regurge

- * **Emergency surgical intervention** for aortic valve replacement ± aortic root replacement.
- * Surgery may be **deferred** in patients with acute AR secondary to active infective endocarditis who are **hemodynamically stable** for **5 to 7 days** of antibiotic therapy.