peebrothers.com, for detailed information on cardiology books, visit our website www.jaypeebrothers.com, for detailed information on cardiology books

CARDIOLOGY

Examination Paper

for DM (Cardiology) Students



Barun Kumar

Foreword
Gurpreet S Wander

JAYPEE

Contents

Paper 2 (Set 1) Long-essay Questions and Answers 1
Short Questions and Answers 4

Paper 2 (Set 2) Long-essay Questions and Answers 14
Short Questions and Answers 17

Paper 2 (Set 3) Long-essay Questions and Answers 31
Short Questions and Answers 35

Paper 2 (Set 4) Long-essay Questions and Answers 42
Short Questions and Answers 45

Index *53*

DM CARDIOLOGY EXAMINATION

Paper 2 (Set 1)

LONG-ESSAY QUESTIONS AND ANSWERS

Q 1. Discuss etiology, clinical features, diagnosis, and management of cardiac tamponade. ***(Refer 2019 MUHS)***

Ans. Cardiac tamponade is a serious medical condition caused by the accumulation of fluid in the pericardial sac, leading to compression of the heart and impaired cardiac function. Here is an overview of its etiology, clinical features, diagnosis, and management:

Etiology

- *Pericardial effusion:* Usually caused by inflammation (e.g., pericarditis), infection, malignancy, or trauma.
- *Hemopericardium:* Bleeding into the pericardial sac, often due to trauma, aortic dissection, or bleeding disorders.
- *Iatrogenic:* Complication of procedures such as cardiac surgery, catheterization, or pacemaker insertion.

Clinical Features

- *Beck's Triad:*
  - *Hypotension:* Due to decreased cardiac output
  - *Muffled heart sounds:* Caused by fluid accumulation around the heart
  - *Jugular venous distension:* Elevated jugular venous pressure due to impaired filling of the right ventricle
- *Pulsus paradoxus:* Exaggerated decrease in systolic blood pressure during inspiration, typically exceeding 10 mm Hg
- *Tachycardia:* Due to the compensatory response to maintain cardiac output
- *Dyspnea:* Resulting from reduced cardiac output and pulmonary congestion
- *Chest pain:* Often sharp and pleuritic, especially in cases of pericarditis
- *Electrical alternans:* Alternating amplitude of the QRS complex on ECG due to swinging of the heart in the pericardial fluid.

Diagnosis

- *Clinical evaluation:* Including history, physical examination (e.g., Beck's triad), and vital signs
- *Echocardiography:* To visualize pericardial effusion and assess its hemodynamic significance

JAYPEE BROTHERS

- *Electrocardiogram (ECG):* May show low voltage, electrical alternans, or other signs of pericardial effusion.
- *Chest X-ray:* Can show an enlarged cardiac silhouette or water bottle-like appearance in severe cases.
- *CT or MRI:* May be used for further evaluation, especially in complex cases or when other imaging modalities are inconclusive.

Management

- *Pericardiocentesis:* Immediate drainage of the pericardial fluid to relieve tamponade physiology
- *Pericardial window:* Surgical procedure to create a permanent opening in the pericardium for drainage, especially in recurrent cases
- *Fluid resuscitation:* Intravenous fluids to maintain blood pressure and cardiac output
- *Inotropic support:* Drugs to improve cardiac contractility if needed.
- *Treatment of underlying cause:* Address the underlying condition (e.g., infection, malignancy) to prevent recurrence.

Cardiac tamponade is a life-threatening condition that requires prompt recognition and intervention. Early diagnosis and treatment are crucial to prevent serious complications and improve outcomes.

Q 2. Discuss etiology, clinical features, diagnosis, and management of heart failure with preserved ejection fraction.

(Refer 2019 MUHS, 2018 MGR)

Ans. Heart failure with preserved ejection fraction (HFpEF) is a type of heart failure where the heart's ability to fill with blood is impaired, leading to reduced cardiac output despite a preserved ejection fraction (EF). Here is an overview of its etiology, clinical features, diagnosis, and management:

Etiology

- *Hypertension:* Chronic high blood pressure can lead to left ventricular hypertrophy and diastolic dysfunction.
- *Aging:* Structural changes in the heart with age can contribute to diastolic dysfunction.
- *Obesity:* Increased body mass index is a significant risk factor for HFpEF.
- *Diabetes mellitus:* Can cause microvascular changes and myocardial fibrosis.
- *Coronary artery disease:* Ischemic heart disease can lead to myocardial stiffness and impaired relaxation.
- *Valvular heart disease:* Especially aortic stenosis, can contribute to diastolic dysfunction.

JAYPEE BROTHERS

Clinical Features

- *Dyspnea:* Typically, on exertion, due to increased left ventricular filling pressures.
- *Fatigue:* Reduced cardiac output can lead to systemic symptoms of fatigue and exercise intolerance.
- *Fluid retention:* Peripheral edema and/or pulmonary congestion may occur.
- *Orthopnea and paroxysmal nocturnal dyspnea:* Symptoms worsen when lying flat.
- *Atrial fibrillation:* Commonly associated with HFpEF.
- *Elevated natriuretic peptides:* B-type natriuretic peptide (BNP) or N-terminal pro-BNP (NT-proBNP) levels may be elevated, but less so compared to heart failure with reduced ejection fraction (HFrEF).

Diagnosis

- *Echocardiography:* Shows normal or near-normal EF with evidence of diastolic dysfunction (e.g., impaired relaxation, increased filling pressures).
- *Biomarkers:* BNP or NT-proBNP levels may be elevated, but they are less specific for HFpEF compared to HFrEF.
- *Invasive hemodynamic testing:* May be needed in some cases to confirm the diagnosis and assess filling pressures.
- *Exercise testing:* Can help assess functional capacity and exacerbate symptoms, particularly dyspnea.

Management

- *Control of underlying conditions:* Manage hypertension, diabetes, and other comorbidities.
- *Diuretics:* To manage fluid overload and reduce symptoms.
- *Beta-blockers:* Can be used for rate control in patients with atrial fibrillation.
- *Calcium channel blockers:* Some patients may benefit from these agents, especially those with hypertension.
- *ACE inhibitors or ARBs:* May be considered in select patients, particularly if hypertension is present.
- *Diuretics:* Loop diuretics are often used to manage fluid overload and reduce symptoms.
- *Lifestyle modifications:* Including salt restriction, weight loss, and regular physical activity
- *Regular follow-up:* Monitoring of symptoms, fluid status, and medication adjustments as needed.

HFpEF is a complex and challenging condition to manage, often requiring a multidisciplinary approach involving cardiologists, primary care physicians,

JAYPEE BROTHERS

and other healthcare providers. The management focuses on controlling symptoms, improving quality of life, and reducing hospitalizations.

SHORT QUESTIONS AND ANSWERS

Q 1. Dobutamine stress echocardiography. ***(Refer 2019 MUHS)***

Ans. Dobutamine stress echocardiography (DSE) is a diagnostic test used to evaluate patients with known or suspected coronary artery disease (CAD) who are unable to perform exercise stress testing. It combines the use of dobutamine, a medication that mimics the effects of exercise on the heart, with echocardiography to assess the heart's function and detect ischemia (reduced blood flow to the heart muscle).

Procedure

Preparation: The patient is prepared for the procedure with an intravenous line for the administration of dobutamine and echocardiographic imaging.

Baseline imaging: Echocardiographic images are obtained at rest to assess the heart's function and structure.

Dobutamine infusion: Dobutamine is infused intravenously at increasing doses to simulate the effects of exercise on the heart. The infusion is typically started at a low dose and gradually increased every few minutes.

Imaging during infusion: Echocardiographic images are obtained at each stage of the dobutamine infusion to assess the heart's response to stress. This includes evaluating wall motion abnormalities, which can indicate areas of the heart that are not receiving adequate blood flow (ischemia).

Termination of infusion: The dobutamine infusion is stopped once the target heart rate is achieved, or if the patient experiences significant symptoms or changes on the echocardiogram.

Post-stress imaging: Echocardiographic images are obtained after the dobutamine infusion to assess for any changes in heart function compared to baseline.

Indications

- Assessment of ischemia in patients with known or suspected CAD.
- Evaluation of patients with chest pain or other symptoms suggestive of CAD who are unable to perform exercise stress testing.

Interpretation

- *Normal response:* No new or worsening wall motion abnormalities with stress

JAYPEE BROTHERS

- *Ischemic response:* Development of new or worsening wall motion abnormalities during stress, suggestive of ischemia.
- *Viability assessment:* Detection of viable myocardium (tissue that can recover function with revascularization) in patients with prior myocardial infarction.

Advantages
- Can be performed on patients who are unable to exercise.
- Provides real-time assessment of heart function during stress.

Limitations
- Limited ability to visualize the entire coronary artery tree
- Risk of arrhythmias and other side effects associated with dobutamine infusion.

Dobutamine stress echocardiography is a valuable tool in the evaluation of patients with known or suspected CAD, providing important information about myocardial ischemia and viability. However, it is important to weigh the benefits and risks of the procedure in each individual patient.

Q 2. Low flow-low gradient aortic stenosis. ***(Refer 2019 MUHS)***

Ans. Low flow-low gradient aortic stenosis (LF-LG AS) is a subtype of aortic stenosis characterized by a reduced stroke volume (low flow) and a mean aortic valve gradient that is lower than what is typically seen in severe aortic stenosis. Despite these lower gradients, the condition still results in significant hemodynamic compromise and clinical symptoms.

Types of Low Flow-Low Gradient Aortic Stenosis

Classical LF-LG AS: Occurs in patients with a reduced left ventricular ejection fraction (LVEF <50%). The reduced ejection fraction contributes to low flow across the aortic valve.

Paradoxical LF-LG AS: Seen in patients with preserved ejection fraction (LVEF ≥50%), but with a small left ventricular cavity and increased arterial load. This results in low stroke volume despite normal ejection fraction.

Pathophysiology
- *Low stroke volume:* Both classical and paradoxical LF-LG AS have low stroke volume index (SVI <35 mL/m^2).
- *Valve area:* Aortic valve area (AVA) is typically less than 1.0 cm^2, indicating severe stenosis.
- *Mean gradient:* Mean transvalvular gradient is less than 40 mm Hg.

Diagnostic Evaluation
- *Echocardiography:* Key diagnostic tool. Doppler echocardiography assesses gradients, AVA, and LVEF.

JAYPEE BROTHERS

  - *Low-flow state:* Confirmed by SVI <35 mL/m².
  - *Gradient:* Mean gradient <40 mm Hg
  - *AVA:* <1.0 cm²
- *Stress echocardiography:* Helps distinguish true severe AS from pseudo-severe AS by evaluating changes in gradient and AVA during increased flow conditions.
- *Cardiac catheterization:* May be used for further hemodynamic assessment.
- *Advanced imaging (CT, MRI):* Provides detailed anatomical and functional information, particularly useful in complex cases.

Management Strategies

- *Medical management:*
  - *Heart failure management:* Includes use of ACE inhibitors, beta-blockers, diuretics, and other heart failure medications.
  - *Optimization of hemodynamics:* Managing blood pressure and volume status.
- *Surgical and interventional treatments:*
  - *Aortic valve replacement (AVR):* Indicated in symptomatic patients with confirmed severe LF-LG AS. Includes:
    - *Surgical AVR (SAVR):* Traditional surgical approach
    - *Transcatheter AVR (TAVR):* Less invasive, preferred in high-risk or inoperable patients
- *Patient selection for AVR:*
  - *Classical LF-LG AS:* AVR is recommended if true severe AS is confirmed, especially in symptomatic patients.
  - *Paradoxical LF-LG AS:* Careful assessment required to ensure true severe AS. AVR considered in symptomatic patients with evidence of hemodynamic compromise.

Prognosis and Outcomes

- *Untreated LF-LG AS:* Poor prognosis due to progressive heart failure and increased mortality.
- *Post-AVR outcomes:* Improved survival and symptom relief, especially in patients with successful hemodynamic correction post-AVR.

Recent Research and Advancements

- *New imaging modalities:* Advanced imaging techniques are improving diagnostic accuracy and patient selection.
- *Biomarkers:* Research on biomarkers to better predict outcomes and tailor management strategies.
- *TAVR techniques:* Ongoing improvements in TAVR technology and procedural techniques enhancing outcomes.

JAYPEE BROTHERS

Practical Guidelines

- *Evidence-based practice guidelines:* Incorporating recommendations from major cardiology societies.
- *Treatment algorithms:* Standardized algorithms for the management of LF-LG AS.
- *Monitoring protocols:* Regular follow-up with echocardiographic assessment and clinical monitoring.

Low flow-low gradient aortic stenosis (LF-LG AS) is a complex condition requiring careful diagnostic and therapeutic approaches. Management includes a combination of medical therapy and timely intervention with AVR, tailored to the individual patient's hemodynamic and clinical status. Recent advancements in imaging and interventional techniques continue to improve the outcomes for these patients.

Q 3. Diagnosis and management of hypertensive emergency.
(Refer 2019 MUHS)

Ans. A hypertensive emergency is a severe elevation in blood pressure (typically, systolic BP >180 mm Hg and/or diastolic BP >120 mm Hg) accompanied by evidence of acute end-organ damage. This is a life-threatening condition requiring immediate medical attention to prevent morbidity and mortality.

Common Causes

- *Essential hypertension:* Sudden, severe elevation
- *Secondary hypertension:* Renal diseases, endocrine disorders (pheochromocytoma, hyperaldosteronism), and medication interactions
- *Substance abuse:* Cocaine, amphetamines
- *Withdrawal syndromes:* From antihypertensive medications or alcohol
- *Pregnancy-related:* Preeclampsia/eclampsia.

Clinical Presentation

- *Neurologic symptoms:* Headache, confusion, visual changes, seizures, stroke
- *Cardiovascular symptoms:* Chest pain, dyspnea, myocardial infarction, aortic dissection
- *Renal symptoms:* Oliguria, hematuria, acute kidney injury
- *Other symptoms:* Nausea, vomiting, severe anxiety

Diagnostic Evaluation

- *Blood pressure measurement:* Confirm severe hypertension with accurate readings in both arms
- *History and physical examination:* Focus on symptoms suggesting end-organ damage

JAYPEE BROTHERS

- *Laboratory tests:*
  - Serum electrolytes, creatinine, blood urea nitrogen (BUN)
  - Cardiac enzymes (if myocardial infarction suspected)
  - Urinalysis for hematuria or proteinuria
- *Imaging studies:*
  - *Chest X-ray:* Evaluate for pulmonary edema, aortic dissection
  - *Head CT/MRI:* If neurological symptoms present.
  - *Echocardiography:* To assess for left ventricular dysfunction
  - *Abdominal ultrasound or CT:* In suspected renal pathology

Management Strategies

Immediate goals:

- Lower mean arterial pressure (MAP) by no more than 20–25% within the first hour.
- Gradual reduction to 160/100–110 mm Hg over the next 2–6 hours
- Normalize BP over the next 24–48 hours

Medications:

- *Intravenous antihypertensives:* First line for rapid BP control
  - *Nitroprusside:* Potent vasodilator, titratable
  - *Labetalol:* Alpha- and beta-blocker, useful in various hypertensive emergencies
  - *Nicardipine:* Calcium channel blocker, effective in most cases
  - *Esmolol:* Short-acting beta-blocker, particularly in aortic dissection
  - *Hydralazine:* Direct vasodilator, commonly used in pregnancy-related emergencies
  - *Fenoldopam:* Dopamine agonist, beneficial in renal impairment

Condition-specific management:

- *Acute coronary syndromes:* Beta-blockers (e.g., Esmolol), nitroglycerin
- *Acute pulmonary edema:* Diuretics (e.g., Furosemide), nitroglycerin
- *Acute aortic dissection:* Beta-blockers (e.g., Esmolol) to reduce shear stress, nitroprusside
- *Acute renal failure:* Fenoldopam, avoiding nephrotoxic agents
- *Hypertensive encephalopathy:* Nicardipine, labetalol

Monitoring and follow-up:

- *Continuous BP monitoring:* In ICU setting initially
- *Frequent reassessments:* Neurological, cardiovascular, and renal function
- *Transition to oral antihypertensives:* Once BP is stabilized, tailored to patient's long-term management needs.

Prognosis and Outcomes

- *Short-term outcomes:* Dependent on rapidity and extent of BP control and mitigation of end-organ damage

JAYPEE BROTHERS

for detailed information on cardiology books, visit our website www.jaypeebrothers.com, for detailed information on cardiology books, visit our website w

CARDIOLOGY Examination Paper
for DM (Cardiology) Students

Salient Features

- Serves as a comprehensive and reliable study companion for DM Cardiology students. Its lucid explanations, strategic organization, and relevance to the examination syllabus make it an indispensable resource for students striving to achieve excellence in their academic pursuits. It will greatly benefit the candidates preparing for the DM Cardiology university examination
- *Comprehensive coverage:* Covers a wide range of topics from congenital heart abnormalities to advanced cardiac physiology and pathology, based on previous year questions from top-notch universities
- *Exam-oriented approach:* Structured to mirror the DM Cardiology examination format with long-essay and short questions and answers for effective preparation
- *Clinical correlations:* Provides practical insights and correlations to real-world scenarios to reinforce understanding
- *In-depth discussions:* Detailed explanations aid comprehension of complex concepts, making it suitable for learning and revision.

Barun Kumar MD DM (Cardiology) is an Additional Professor and Interventional Cardiologist, Department of Cardiology, All India Institute of Medical Sciences (AIIMS), Rishikesh, Uttarakhand, India. He is recognized for his role in the establishment of the Department of Cardiology at AIIMS, Rishikesh. He completed DM (Cardiology) from Dr Ram Manohar Lohia Hospital, New Delhi, India. He has been engaged in many teaching endeavors over the past 11 years. For the past 6 years, he has been instructing and educating students in the field of DM Cardiology. He has more than 85 national and international publications including book chapters. He has a particular inclination for teaching. He possesses extensive knowledge and experience in the domain of interventional cardiology.

Printed in India

Available at all medical bookstores
or buy online at www.jaypeebrothers.com



JAYPEE BROTHERS
Medical Publishers (P) Ltd.
EMCA House, 23/23-B, Ansari Road,
Daryaganj, New Delhi - 110 002, INDIA
www.jaypeebrothers.com

Join us on facebook.com/JaypeeMedicalPublishers

Shelving Recommendation
CARDIOLOGY

