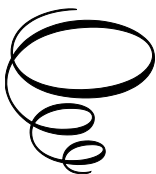


Single Best Answer Questions for Adult Cardiac Surgery

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By
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**Cambridge
Scholars
Publishing**



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This book first published 2024

Cambridge Scholars Publishing

Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

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ISBN (10): 1-5275-5280-2

ISBN (13): 978-1-5275-5280-7

To my mother for being a role model who taught her children self-awareness, positivity, humility, empathy, professionalism, and integrity.

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ACKNOWLEDGEMENT

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PREFACE

Single Best Answer (SBA) examinations are an increasingly popular means of testing those undertaking postgraduate qualifications in a number of subject areas. Written by an experienced clinician and medical educationist, **Single Best Answer Questions for Adult Cardiac Surgery** provides invaluable guidance from an author who understands from personal experience that detailed and accurate explanations are the key to successful revision.

The comprehensive collection of questions, coupled with the clear discussion of how the correct answer was reached and other options ruled out for every question, make this book an excellent learning aid during all stages of adult cardiac surgical training. **Single Best Answer Questions for Adult Cardiac Surgery** may be used both for examination practice and as a source of knowledge on many of the key topics in the syllabus. From the author of **250 SBAs in Cardiothoracic Surgery, 200 Practice Questions in Cardiothoracic Surgery** and **Single Best Answer Questions in Cardiothoracic Surgery**, all outstanding exam preparation sources for postgraduate examinations, this book provides challenging questions and well researched explanations to help you through the exam. Candidates can work through the questions systematically or dip in and out of the book using the SBA index as a guide to where questions on a specific topic can be found.

With more than 300 questions and extensive answer explanations, it is the definitive resource for those attempting the Specialist Fellowship Examinations in Adult Cardiac Surgery. The book is comprehensive and authoritative. It is the essential revision guide for those preparing for the exit fellowship examination.

Shahzad G. Raja, FRCS(CTh)
London
July 2023

QUESTIONS

SECTION 1: SURGERY FOR ISCHAEMIC HEART DISEASE

Directions: Each of the questions below, which may take the form of an incomplete statement, is followed by several suggested answers or completions. Select the **ONE** which is **BEST** in each case.

1.1 The left internal thoracic artery (ITA) as a bypass graft to the left anterior descending coronary artery has been proven to provide superior early and late survival and better event-free survival after CABG. The unparalleled long-term patency and better clinical outcomes associated with the use of the ITA make it the conduit of first choice for anastomosis to the left anterior descending coronary artery in almost all patients regardless of age and establish an argument to use the right ITA as conduit to other targets as well. The ITA

- A.** arises from the superior surface of the first portion of the subclavian artery opposite the thyrocervical trunk.
- B.** on the left side originates as a common trunk with other arteries in 70% of patients.
- C.** is covered by transversus thoracis muscle along its entire length.
- D.** bifurcates into its terminal branches at the level of the sixth rib.
- E.** on the left is slightly shorter than the right.

1.2 The use of the radial artery (RA) as a conduit for coronary bypass was originally described by Carpentier and associates in 1973. Which of the following statements regarding the RA is correct?

- A.** The radial artery (RA) originates from the brachial artery just distal to the biceps tendon.
- B.** The recurrent RA originates from the lateral aspect of the RA soon after its origin from the brachial artery.
- C.** Multiple small muscular branches emerge from the superior surface of the artery.
- D.** Throughout its course, the RA is accompanied by the median nerve.
- E.** The average length of the RA ranges between 10 and 15 cm.

1.3 In patients with coronary artery disease and concomitant asymptomatic severe carotid stenosis, combined simultaneous coronary artery bypass grafting (CABG) and carotid endarterectomy (CEA) has been widely performed despite lack of evidence from randomized trials. The CABACS (Coronary Artery Bypass Graft Surgery in Patients with Asymptomatic Carotid Stenosis Study) is a randomized, controlled, multicenter, open trial. Patients with asymptomatic severe ($\geq 70\%$) carotid stenosis undergoing CABG were allocated either CABG+CEA or CABG alone, and follow-up was 5 years. Which of the following statements regarding CABACS is correct?

- A. By 5 years, the rate of stroke or death significantly differed between groups.
- B. Higher albeit statistically nonsignificant rates of nonfatal strokes occurred at any time following CABG+CEA versus CABG alone.
- C. Major secondary end points included myocardial infarction and cardiac death.
- D. Subgroup analyses revealed significant effect of age, sex, preoperative modified Rankin Scale and center on outcome events.
- E. The study was stopped prematurely as there was an unacceptably high stroke rate in CABG + CEA group.

1.4 The Future Revascularization Evaluation in Patients with Diabetes Mellitus: Optimal Management of Multivessel Disease (FREEDOM) trial used contemporary percutaneous coronary intervention (PCI) and coronary artery bypass grafting (CABG) techniques and currently recommended ancillary medical therapies to determine whether CABG or PCI with drug-eluting stents is the superior approach to revascularization in patients with diabetes and multivessel coronary artery disease. Which of the following statements regarding FREEDOM trial is correct?

- A. The trial enrolled 900 patients.
- B. The trial enrolled more women than men.
- C. The 5-year rates for stroke were similar for the two groups.
- D. The primary outcome measure was repeat revascularization.
- E. The primary outcome occurred more frequently in the PCI group.

1.5 A 72-year-old man with a history of long-standing ischaemic heart disease and previous myocardial infarctions was admitted with an acute myocardial infarction. Echo showed severe LV dysfunction (EF 20%), normal diastolic function, good right ventricular (RV) function

and no valvular abnormalities. A myocardial viability study suggested large areas of hibernating myocardium. An IABP was placed preoperatively and the patient has just undergone multivessel CABG. All graft flows are checked and are reasonable. However, he cannot be weaned from cardiopulmonary bypass despite high-dose inotropes and the IABP.

Which of the following is the best strategy in this situation?

- A. administration of a coronary vasodilator agent
- B. exchange of the IABP for a larger balloon pump
- C. implantation of a passive LV restraint device
- D. insertion of a paracorporeal continuous-flow left ventricular assist device (LVAD)
- E. placement of an intracorporeal continuous-flow LVAD as destination therapy

1.6 A 68-year-old man was recently admitted with a NSTEMI and his angiogram shows a 50% distal left main stenosis. The patient is stable and is ambulating without angina. How should antithrombotic therapy be managed prior to surgery?

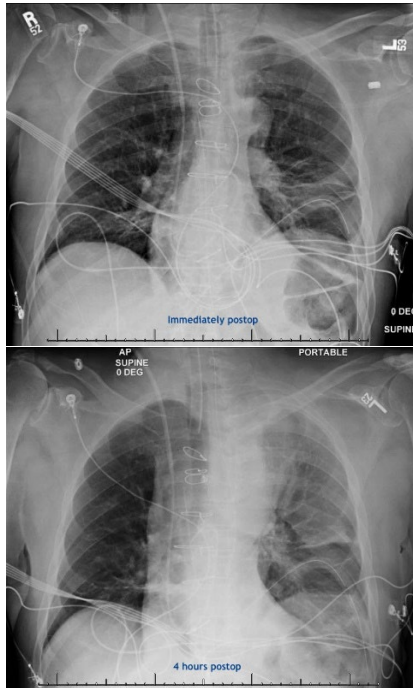
- A. If he is on aspirin and clopidogrel, they should both be held for 7 days for surgery.
- B. If he is on abiciximab, it should be held for 12 hours before surgery.
- C. If he is on eptifibatide, it should be held for at least 3 days before surgery.
- D. If he is on prasugrel, it should be held for at least 5 days before surgery.
- E. If he is on tirofiban, it should be held for at least 2 days before surgery.

1.7 A 73-year-old man presented with Canadian Cardiovascular Society (CCS) Class II angina. Studies showed a positive exercise stress test and 3-vessel coronary artery disease on angiography with good distal targets, left ventricular ejection fraction = 50%, a mean gradient across his aortic valve of 19 mmHg, aortic valve area = 1.6 cm², and a peak velocity of 2.5 m/s across the valve. Which of the following plans is most appropriate?

- A. Coronary artery bypass grafting (CABG) alone now
- B. CABG and aortic valve replacement now
- C. CABG now and regular surveillance of the aortic valve with serial transthoracic echocardiography
- D. Delay the coronary artery bypass surgery until the aortic valve stenosis becomes more significant

E. Refer the patient for percutaneous coronary interventions with a plan for aortic valve replacement in the near future

1.8 A 65-year-old man underwent a CABG for the third time. Vital signs after 4 hours in the ICU are HR 92 (NSR), BP 100/60, RR 16 on 60% O₂ (intubated, IMV). His hourly chest tube outputs have been 355, 320, 270, and 150 mL/hour. Hct is 28% and urine output has been 30 mL/hour for the last 2 hours. He is on two inotropes and cardiac index is 1.8, SVR = 1650, PA = 26/18, and CVP = 16. His ECG is unchanged from preop. Immediate postop and repeat chest radiographs are shown.



Optimal management is

- A. cardiac catheterisation
- B. mediastinal exploration
- C. placement of a left chest tube
- D. transoesophageal echocardiogram
- E. transfusion of packed red cells

1.9 A 61-year-old man with hyperlipidemia is presently undergoing coronary artery bypass grafting using cardiopulmonary bypass. Pre-bypass baseline haematocrit was 30% and platelet count was 174 K/mm³. Baseline activated clotting time (ACT) was 126 seconds. Three hundred IU/kg of heparin was given via the central venous line, and the resultant ACT was 270 seconds. A second full dose (300 IU/kg) of heparin was administered after assuring good blood return through the line.

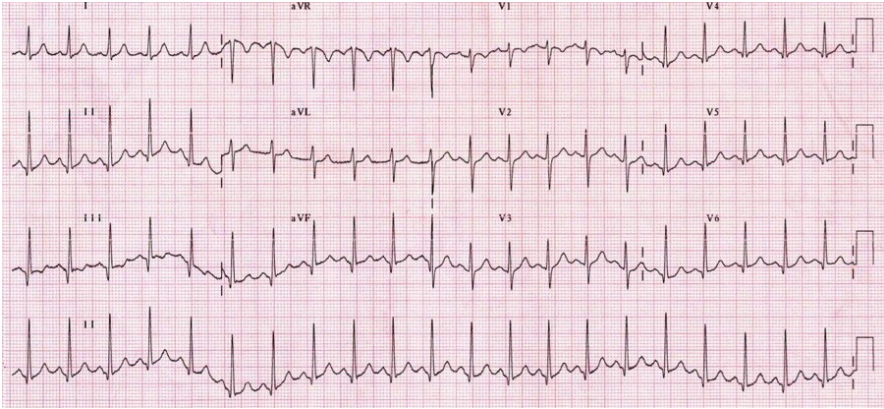
Which of the following therapies is appropriate to establish safe parameters to initiate bypass in this patient?

- A. infusion of a third dose (300 IU/kg) of heparin
- B. infusion of factor VII
- C. infusion of aminocaproic acid
- D. infusion of antithrombin III
- E. transfusion of 6 units of platelets

1.10 A 67-year-old man is scheduled to undergo elective coronary artery bypass grafting on cardiopulmonary bypass (CPB). He has been taking clopidogrel for cerebrovascular disease and will stop this medication 10 days prior to his operation. In addition to baseline activated clotting time (ACT) and intraoperative ACT, which of the following is the best approach to prevent excess post-cardiotomy bleeding, and to minimize drug reactions?

- A. platelet transfusion immediately following separation from CPB in addition to protamine reversal
- B. 1 mg/kg fixed dose protamine and verification of return to ACT baseline
- C. protamine dose following CPB calculated from residual heparin concentration measurement
- D. fixed protamine dose (3 mg/kg) following CPB
- E. fixed dose protamine (1 mg/kg) administration following CPB

1.11 A 62-year-old woman underwent redo CABG and postoperative progress was satisfactory. Her chest tubes were removed on POD#2 and pacing wires were removed on POD#3. On the morning of POD#5, she was found to be somnolent and markedly short of breath. Her vital signs included heart rate 110 and BP 90/60. Blood gas values were pH 7.28; pO₂ 85; pCO₂ 32; and Base Excess -5. Her urine output was 70 mL for the last shift. The current ECG is shown.



The best diagnostic test for this patient is

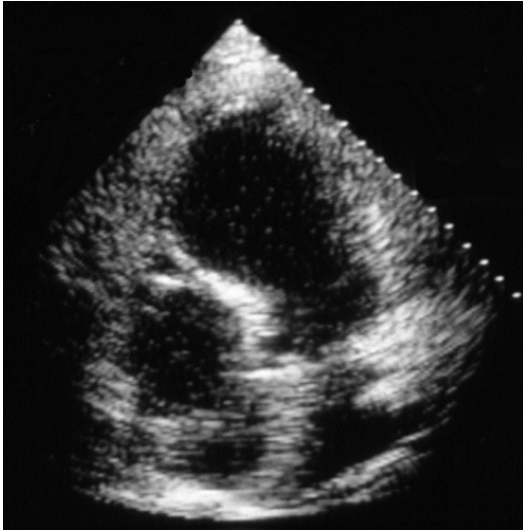
- A. brain CT scan
- B. cardiac catheterisation
- C. echocardiogram
- D. PE protocol CT
- E. ventilation perfusion scan

1.12 A 62-year-old diabetic patient who is an active smoker is being evaluated for coronary artery bypass grafting. Catheterization reveals a right-dominant system with 75% proximal left anterior descending (LAD) coronary artery and 80% ostial left circumflex artery disease.

This patient is at highest risk for sternal wound infection with which of the following revascularisation strategies?

- A. bilateral pedicled internal thoracic artery grafts
- B. bilateral skeletonised internal thoracic artery grafts
- C. a skeletonised internal thoracic artery graft and a right gastroepiploic artery graft
- D. a pedicled left internal thoracic artery graft and a radial artery graft
- E. a skeletonised left internal thoracic artery graft and a radial artery graft

1.13 A 53-year-old woman suffered a myocardial infarction 3 years ago. She now has stable angina and a chest CT and routine echocardiogram were performed (see figures).



Which of the following assessments is correct in evaluating this patient?

- A.** A 2 cm diameter inferior wall pseudoaneurysm should be repaired because of the tendency to enlarge and rupture.
- B.** Dyskinesia of aneurysm wall must be documented prior to surgical intervention.

- C. Removal of a large anterior scar with ventricular remodelling as an adjunct to coronary artery bypass grafting improves ejection fraction and may improve long term survival.
- D. Thrombus in a true aneurysm is an indication for aneurysm repair.
- E. Ventricular aneurysm resection should be offered to treat angina only if there are associated coronary stenoses which can be bypassed.

1.14 A 52-year-old man presented to the emergency department with a 2-day history of substernal chest pain and new onset shortness of breath. ECG showed ST-segment elevations in the lateral leads and the initial troponin I was 13.6.

Haemodynamics began to deteriorate when the patient arrived in the catheter lab. Urgent transoesophageal echocardiography (TOE) showed a pericardial effusion and suggested left ventricular free wall rupture. Catheter showed an ostial occlusion of the obtuse marginal branch of the left circumflex artery. Pericardiocentesis improved his blood pressure temporarily and he was taken to the operating room. Median sternotomy allowed removal of clot from the pericardial cavity and a linear tear was identified in the lateral wall of the heart in the center of a large, oozing infarct zone.

The best management is

- A. bovine pericardial patch and glue repair of the free wall infarct and possible grafting of obtuse marginal vessel
- B. complete drainage of the pericardial effusion and placement of a mediastinal drain.
- C. infarct excision and Dacron[®] patch reconstruction with cardiopulmonary bypass, plus possible CABG to marginal branch
- D. off-pump pledgeted compression suture repair using an apical stabilisation device
- E. off-pump PTFE felt external patching around the perimeter of the myocardial perforation

1.15 A 74-year-old man with insulin-dependent diabetes and class IV angina was referred for transmyocardial laser revascularization (TMLR). He underwent multiple percutaneous coronary interventions in the past and his coronary anatomy is not amenable to further revascularization by percutaneous coronary interventions (PCI) or surgery. He is a compliant patient whose angina has been refractory to maximal medical therapy. A recent echo shows left ventricular (LV) ejection fraction of 35% and there is reversible ischaemia of the left ventricular free wall on a thallium nuclear study.

Which of the following statements about TMLR is correct?

- A. Ejection fraction improves after treatment.
- B. Patients with preoperative ejection fractions <30% derive the greatest survival benefit.
- C. Patients with acute or evolving myocardial infarction who are not candidates for coronary artery bypass graft (CABG) or PCI benefit more from TMLR than patients with stable angina.
- D. Post-TMLR readmission rates are similar to those for patients treated medically.
- E. TMLR provides symptomatic relief of angina but 1-year survival is not altered.

1.16 A 70-year-old man with CCS class III angina has a 60% left main lesion and a 90% lesion in the proximal left anterior descending artery. Echocardiography demonstrates an ejection fraction of 35%, an anterolateral region of dyskinesia, and a left ventricular end-systolic volume index of 67 mL/m². There is no mural thrombus and no ventricular arrhythmias have been documented.

With this patient in mind, which of the following recommendations for treatment is most reasonable?

- A. CABG alone, because the addition of surgical ventricular reconstruction does not significantly reduce ventricular volume
- B. CABG alone, as there is no difference in survival with the addition of surgical ventricular restoration
- C. CABG alone, because minimising the operative risk is of paramount importance
- D. CABG plus surgical ventricular reconstruction, because overall survival and quality of life are improved
- E. CABG plus surgical ventricular reconstruction, because this will reduce his hospital readmission rate

1.17 A 77-year-old woman underwent four-vessel coronary artery bypass grafting. Four hours after returning to the intensive care unit, her total chest tube drainage is 1300 cc (300-400 cc/hr). She remains haemodynamically stable, and has the following clinical and laboratory values:

weight = 55 kg

haematocrit = 23%

platelet count = 75,000/mm³

International Normalized Ratio (INR) = 1.5

partial thromboplastin time = 32 sec (control = 28 sec)

Which of the following interventions is most appropriate?

- A. increase the level of positive end-expiratory pressure (PEEP)
- B. open the lower portion of the sternotomy incision at the bedside to assess the level of mediastinal bleeding
- C. return to the operating room for exploration of sternotomy incision
- D. start aprotinin therapy
- E. transfuse fresh-frozen plasma to normalize clotting parameters

1.18 Beating-heart on-pump coronary artery bypass grafting (BH-ONCAB) offers a hybrid coronary revascularization technique that may confer the benefits of an "off-pump" operation while maintaining the haemodynamic stability and mechanical support of conventional on-pump CABG (C-ONCAB). Which of the following statements regarding outcomes of BH-ONCAB compared to C-ONCAB is correct?

- A. There is an increase in 30-day mortality after BH-ONCAB.
- B. There is no difference in midterm survival between BH-ONCAB and C-ONCAB.
- C. C-ONCAB is associated with significantly fewer postoperative myocardial infarction events.
- D. Fewer anastomoses are performed with BH-ONCAB.
- E. Fewer strokes occur with BH-ONCAB.

1.19 A 78-year-old man with diabetes, high cholesterol, and well controlled hypertension presented with exertional chest pain and shortness of breath. He has never had a stroke or TIA. He lives independently and remains active. Non-specific ECG changes and criteria for left ventricular hypertrophy were present on ECG. Cardiac catheterization demonstrated severe multivessel disease with an ejection fraction of 50%, and a carotid duplex showed a 50-70% and 60-75% stenoses of the right and left internal carotid arteries, respectively. At the time of surgery the initial TEE demonstrates an aortic valve area of 1.15 cm² and heavy calcification of the annulus and leaflets.

Which of the following is the best operation for this patient?

- A. Off-pump multivessel bypass grafting alone and surveillance of the carotid stenoses and aortic stenosis.
- B. Off-pump multivessel bypass grafting with anticipated percutaneous transcatheter aortic valve replacement in the near future.
- C. On-pump multivessel bypass grafting and surveillance of the carotid stenoses and aortic stenosis.

- D. On-pump multivessel bypass grafting and replacement of the aortic valve with a bioprosthetic valve.
- E. On-pump multivessel bypass grafting, bioprosthetic AVR and left carotid endarterectomy.

1.20 Fifteen years ago a 75-year-old woman underwent coronary artery bypass grafting with saphenous vein grafts to the LAD, obtuse marginal, and posterior descending arteries. She developed unstable angina and a cath revealed a 90% left main stenosis and occlusions of the native right coronary and the OM and PDA grafts. There was a 90% stenosis of the saphenous vein graft to the LAD. At reoperation, a LIMA was placed to the LAD and the old saphenous vein graft was ligated. New saphenous vein grafts were placed to the obtuse marginal and PDA. The patient cannot be weaned from bypass because of left heart failure and anterior akinesis. TEE shows no valve pathology, and ultrasonic flow measurements of the LAD, OM and PDA grafts are 26, 50, and 35 mL/min respectively. Which of the following is the most appropriate action to take?

- A. Go back on bypass and re-do the LIMA-LAD anastomosis.
- B. Place a left ventricular assist device.
- C. Remove the ligature from the saphenous vein graft to the LAD.
- D. Place an intra-aortic balloon pump and add inotropic support.
- E. Return to bypass and place a saphenous vein graft to the LAD.

1.21 A 68-year-old man is about to undergo coronary bypass grafting and mitral valve surgery. Coronary angiography reveals severe 3-vessel disease and preoperative transthoracic echocardiography shows severe ischaemic mitral valve regurgitation with LVEF 35% and moderate-to-severe tricuspid valve regurgitation. Pre-bypass TEE now shows mild mitral regurgitation and mild tricuspid valve regurgitation. Which of the following statements is correct?

- A. CABG and mitral valve repair will lower PA pressure, so concomitant tricuspid annuloplasty is not indicated.
- B. A complete tricuspid ring annuloplasty is preferred to avoid future dilatation of the posterior annulus.
- C. A flexible mitral annuloplasty ring is best to preserve mitral annular mobility and ventricular contractility.
- D. The patient's poor left ventricular function suggests that concomitant tricuspid valve repair is prudent.
- E. The present TEE findings indicate that CABG alone is adequate - mitral annuloplasty is not required.

1.22 A 63-year-old woman presented to the emergency department complaining of shortness of breath and recurrent chest pain. Five days before she had acute chest pain that spontaneously resolved. Her past medical history was notable only for hypertension. Physical examination confirms dyspnoea at rest. Blood pressure is 80/50, heart rate is 100, and her skin is cool and clammy. An ECG shows sinus tachycardia with ST elevation in the anterior leads. This woman's echocardiogram shows a large anterior effusion with diastolic RV collapse and impaired LV function with posterior akinesis suggesting postinfarction free wall ventricular rupture. This patient is best managed by

- A.** Angioplasty, bare metal stenting of the LAD, and delayed coronary artery bypass grafting.
- B.** Beta blockers, IV fluids, and septal myomectomy when stable.
- C.** Emergent circumflex CABG and myocardial reinforcement with sutures and felt pledgets.
- D.** Pericardiocentesis, intra-aortic balloon placement, and inotropic support.
- E.** Prompt surgical intervention with a glued epicardial patch.

1.23 A 56-year-old man underwent a 3-vessel coronary artery bypass following a recent myocardial infarction. Grafts included LIMA to LAD, radial artery graft to OM1, and saphenous vein graft to the PDA. This was done on cardiopulmonary bypass with a warm beating heart. Thirty-six hours postoperatively the patient is noted to be in severe respiratory distress with increased work of breathing. He is on a face mask with 100% inspired oxygen. Pulmonary artery pressure is 55/35, cardiac index is 1.7, and mean arterial pressure is 50 mmHg. Physical exam reveals significant rales and a systolic murmur. His chest radiograph shows severe pulmonary oedema. Which of the following is the next step in the management of this patient?

- A.** Begin an epinephrine (adrenaline) infusion
- B.** Do a stat coronary catheterization
- C.** Initiate a furosemide infusion
- D.** Obtain a stat echocardiogram
- E.** Start a phenylephrine infusion

1.24 Three months ago a 56-year-old man suffered an anterior wall myocardial infarction. An echocardiogram shows an apical aneurysm. Which of the following statements about his condition is true?

- A. All lesions of this type that exceed 3 cm should be repaired regardless of symptoms.
- B. Five-year survival for asymptomatic patients with this condition is 90% with medical therapy.
- C. The leading cause of death for medically managed patients with this condition is heart failure.
- D. The majority of these lesions are posterior and at the base of the heart.
- E. Surgical repair of the condition should be attempted before recommending transplantation.

1.25 A 75-year-old man had a history of congestive heart failure, aortic regurgitation, coronary artery disease with myocardial infarction, and severe ischaemic mitral regurgitation. Preoperative echo details included an ejection fraction of 30%, normal mitral leaflets, and an area of akinesis in the lateral wall. CABG, AVR and mitral repair were done. Bypass and crossclamp times were long, and he was weaned on an intra-aortic balloon pump, milrinone at 0.7 µg/(kg*min) and epinephrine at 0.1 µg/(kg*min). Still in the operating room now, his BP is 95/50, PA = 60/20, CVP = 17, pH = 7.25, CI = 1.5, SVO₂ = 40%, and he is making little to no urine. All grafts appear to be functioning based on Doppler interrogation and TEE shows normal prosthesis function, global LV hypokinesis, lateral wall akinesis (unchanged from preop) and no significant mitral regurgitation. The patient has been closely monitored for the last 30 minutes and there has been no change.

The most appropriate next step is to

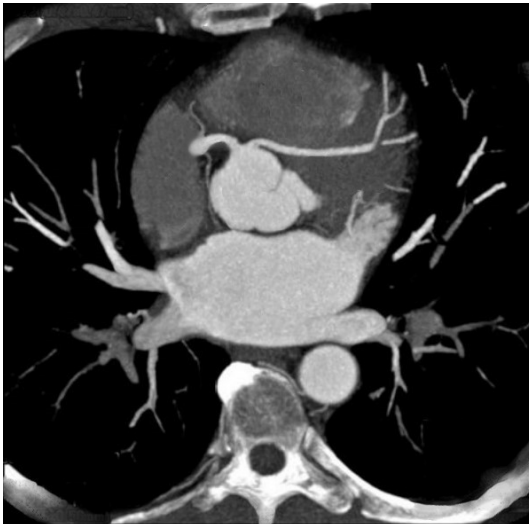
- A. Add a vasoconstrictor such as noradrenaline (norepinephrine).
- B. Cannulate and start venoarterial ECMO and transfer to the ITU.
- C. Give bicarbonate and inhaled nitric oxide.
- D. Perform additional coronary bypass grafts.
- E. Place a temporary ventricular assist device.

1.26 A 64-year-old man (BSA 1.9 m²) presented with severe chest pain and cardiogenic shock. Catheterization revealed severe triple vessel disease. An intra-aortic balloon pump did not stabilize his hemodynamics so emergent on-pump CABG x 4 was done (LIMA to LAD, SVG to PDA, and sequential SVG to OM1 and OM2). He was weaned from cardiopulmonary bypass with 4 drugs and the balloon

pump, but haemodynamics deteriorated following chest closure and bypass was reinstated. TEE revealed poor left ventricular function with anteroapical wall akinesis. A saphenous vein graft was placed to the LAD distal to the LIMA anastomosis to no avail. A short-term LVAD was placed with left atrial inflow via the right superior pulmonary vein and an outflow graft anastomosed to the ascending aorta. The next day his hemodynamics included: LVAD flow 4.0 L/min, PA 33/25 (mean 29), RA 27, heart rate 95. His urine output was 20 mL/hour on a furosemide drip at 20 mg/hour. Serum creatinine was 2.5 mg/dL (rising), and he remained coagulopathic despite massive blood component transfusion. Reoperation is now considered necessary and the short-term device is to be replaced with a long-term LVAD as a bridge to transplant. The most life-threatening complication anticipated for this patient is

- A. Bleeding from the left ventricular apical LVAD cuff suture line.**
- B. Bleeding from the outflow graft anastomosis on the ascending aorta.**
- C. Hepatic failure.**
- D. Renal failure.**
- E. Right ventricular failure.**

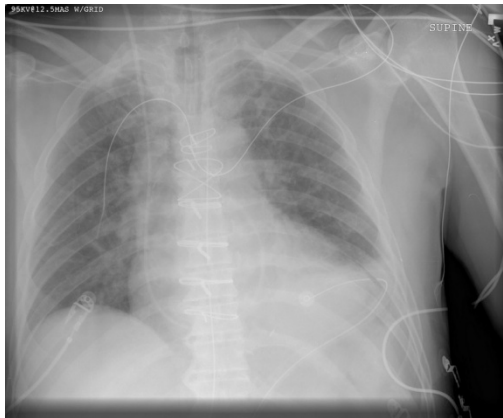
1.27 A 59-year-old man experienced increasing angina during routine activities. He had two episodes during hemodialysis last week and was admitted for further workup. A high resolution CT slice is shown.

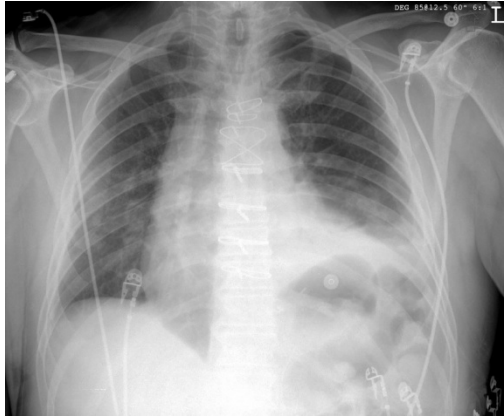


The findings are significant for

- A. accelerated coronary atherosclerosis.
- B. associated valvular anomalies.
- C. exercise-induced coronary spasm.
- D. increased risk of sudden death.
- E. right ventricular failure.

1.28 A 65-year-old man with significant COPD underwent CABG with LIMA to the LAD and three saphenous vein grafts. Now four hours post extubation, he complains of increasing dyspnoea, and he is diaphoretic and tachypnoeic. Breath sounds at the left base are decreased and scattered rhonchi are present. No wheezes are heard. A repeat ABG on 40% FiO₂ mask shows pH= 7.25, pCO₂= 51, pO₂= 92. Pre-extubation and current portable chest radiographs are shown.

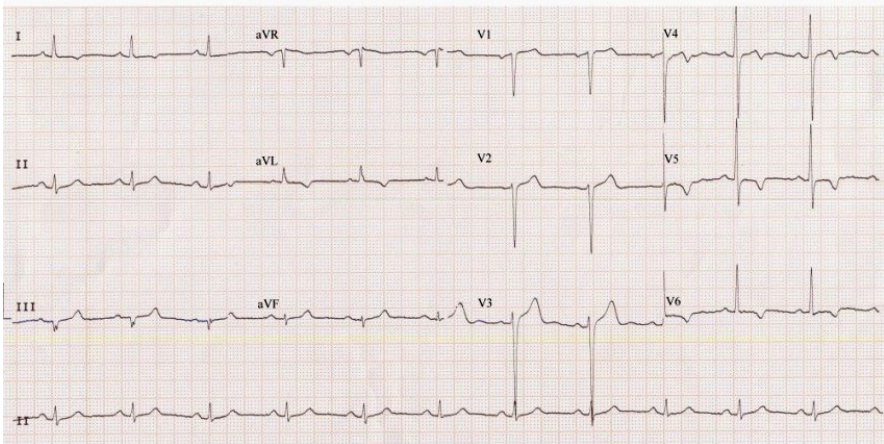




Which of the following is most appropriate?

- A. CT angiogram (pulmonary embolism protocol)
- B. intravenous bicarbonate
- C. left sided thoracentesis
- D. nebulised albuterol
- E. non-invasive positive pressure ventilation (BiPAP)

1.29 A 79-year-old man (NYHA Class III symptoms) underwent mitral ring annuloplasty and three-vessel CABG (LIMA to LAD, vein grafts to first diagonal and dominant right coronaries). The obtuse marginal coronaries were too small for grafting or PCI. Preoperative ejection fraction was 35% with anterior hypokinesia and lateral akinesia. The mitral valve was structurally normal. Four hours after arrival in the ICU, CVP = 11, PCW = 18, BP = 93/58, HR = 107 and CI = 1.7. The ECG is shown. Total chest tube output since ICU arrival has been 260 mL.



The most appropriate immediate response is to

- A. begin a nitroglycerin infusion.
- B. insert an intra-aortic balloon pump.
- C. obtain a transoesophageal echo study.
- D. return to operating room for re-exploration.
- E. start an adrenaline infusion.

1.30 A 3-vessel CABG was done on-pump with a single cross-clamp period for proximal and distal anastomoses. Preoperative ventricular function was normal. Cold hyperkalemic blood cardioplegia was delivered every 15 minutes (initial dose antegrade; subsequent doses retrograde). A myocardial temperature probe was used along with retrograde pressure monitoring, and cardiac vein dilation was noted during delivery. Technical details were satisfactory, but intermittent cardiac activity was noted grossly and by ECG. There was considerable blood flow from the arteriotomy sites, even after the cross-clamp was checked. Serial defibrillations for recurrent ventricular fibrillation were necessary at the end of the case, and A-V sequential pacing, low-dose adrenaline and noradrenaline were required to wean from cardiopulmonary bypass. The immediate postoperative echo showed global LV hypokinesis without segmental wall motion abnormalities. Twelve hours following the operation CVP has increased from 7 to 18, base excess is -7, and the serum lactate level is elevated. The proper treatment for this patient is

- A. cannulation for venovenous ECMO (extracorporeal membrane oxygenation).

- B. echocardiography, Swan-Ganz catheter monitoring and IABP placement.
- C. emergent coronary angiography.
- D. immediate reoperation to evacuate clot and evaluate the grafts.
- E. placement of biventricular cardiac assist devices.

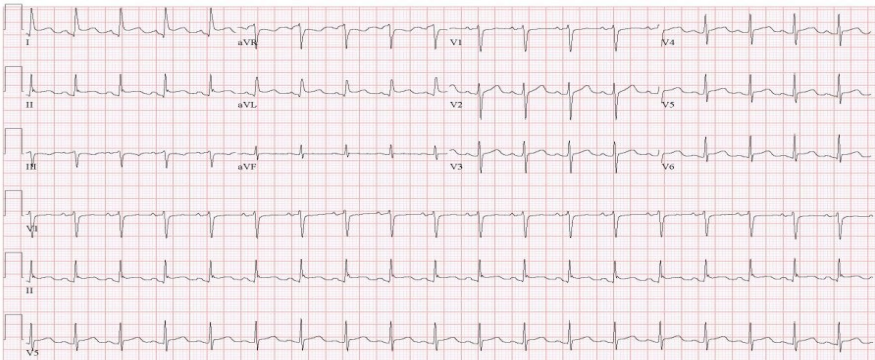
1.31 A 67-year-old diabetic man underwent a 3-vessel off-pump CABG (LIMA to LAD, SVG to obtuse marginal and SVG to PDA). Preoperative left ventricular function was normal and echocardiogram showed no wall motion abnormalities. The day after operation he developed hypotension requiring vasopressors and inotropes, and an ECG suggests lateral wall ischaemia. Serum troponin I was 44 ng/ml. An emergent echo showed a 35% ejection fraction with a lateral wall motion abnormality and moderate-to-severe functional mitral regurgitation. A frame from his emergent repeat catheterization is shown.



Which of the following pairs describes the most likely problem and correct management?

- A. anastomotic problem; stent placement or surgical revascularization
- B. coronary and conduit spasm; intravascular vasodilator administration
- C. graft compression from a sternal wire; revise sternal closure
- D. mitral regurgitation from ischaemic papillary muscle; emergent mitral valve repair
- E. mitral regurgitation from ischaemic papillary muscle; emergent mitral valve replacement

1.32 A 42-year-old woman had chest pain and a positive stress test. Her cardiac cath showed an anomalous origin of the right coronary artery from the left main coronary artery. There was moderate atherosclerotic obstructive disease of the proximal RCA distal to its course between the aorta and pulmonary artery, but only nonobstructive disease in the other coronaries. Through a sternotomy, a pedicled RIMA graft was placed to the distal RCA off-pump. On postop day two she complained of dyspnoea associated with severe substernal chest pain radiating to the left shoulder. Temperature was 99.6 and vital signs were otherwise stable. Physical exam was unremarkable and a portable chest radiograph showed a small right pleural effusion. The 12-lead ECG is shown.



What is the appropriate next step in her care?

- A. emergent CABG.
- B. emergent cardiac cath with coronary angiography.
- C. gated cardiac CT scan.
- D. an intravenous calcium channel blocker.
- E. a non-steroidal anti-inflammatory medication.