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Question: 1323

A 55-year-old female is being treated with an IABP for cardiogenic shock. Her labs show a platelet count of $45,000/mm^3$ (down from $180,000/mm^3$ at admission). There are no signs of bleeding. What is the most likely mechanism for the thrombocytopenia?

A. Sepsis-associated coagulopathy
B. Heparin-induced thrombocytopenia (HIT)
C. Mechanical destruction of platelets by the balloon

Answer: C

Explanation: Thrombocytopenia is a very common side effect of IABP therapy. It is primarily caused by the mechanical trauma and "trapping" of platelets by the continuous inflation and deflation of the balloon against the aortic wall. While HIT is always a consideration in patients receiving heparin for IABP anticoagulation, mechanical destruction (pseudothrombocytopenia or consumptive thrombocytopenia) is a direct consequence of the device itself and usually stabilizes after the first few days.

Question: 1324

During an LVAD (Left Ventricular Assist Device) implantation, the anesthesiologist

must closely monitor the right ventricle. Which of the following describes the effect of the LVAD on the interventricular septum?

A. It pulls the septum toward the left ventricle, potentially causing RV dysfunction.
B. It has no effect on septal position.
C. It pushes the septum toward the right ventricle, improving RV filling.

Answer: A

Explanation: An LVAD works by decompressing the left ventricle and pumping blood into the aorta. If the LVAD speed is too high, it can create a "suction" effect, pulling the interventricular septum toward the left. This "leftward septal shift" changes the geometry of the right ventricle, making it more crescent-shaped and less efficient, which can lead to acute right heart failure.

Question: 1325

A patient with severe COPD and secondary polycythemia is undergoing CABG. After the PAC is floated into the wedge position, the clinician observes that the PAWP waveform is "damped" and does not show clear a and v waves. However, the PAWP value is 25 mmHg while the pulmonary artery diastolic (PAD) pressure is 18 mmHg. Which of the following is the most likely explanation?

A. There is a technical obstruction or air bubble in the PA transducer tubing
B. The catheter is in a Zone 1 or Zone 2 position of the lung
C. The PAD is a more accurate reflection of LAP than the PAWP

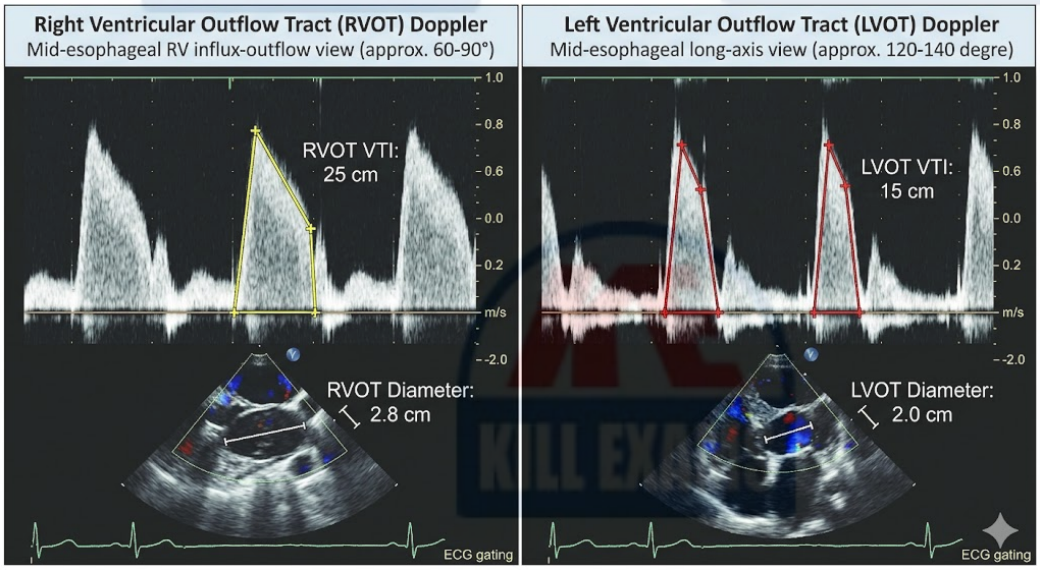
Answer: B

Explanation: Normally, PAWP should be less than or equal to PA**D.** If PAWP is

significantly higher than PAD ($PAWP > PAD$), it suggests the catheter tip is in a non-West Zone 3 location (Zone 1 or 2). In these zones, the alveolar pressure (P_A) exceeds the venous pressure (P_v), causing the catheter to "see" alveolar pressure rather than left atrial pressure. This is common in patients with high PEEP or severe lung disease.

Question: 1326

A patient with a history of an uncorrected large secundum ASD presents with worsening dyspnea. TEE shows a significant left-to-right shunt. You calculate the pulmonary-to-systemic flow ratio (Q_p/Q_s).



Using the formula $Q_p/Q_s = \frac{CSA_{RVOT} \times VTI_{RVOT}}{CSA_{LVOT} \times VTI_{LVOT}}$, what is the approximate ratio?

A. 2.2:1

B. 3.3:1

C. 1.5:1

Answer: B

Explanation:
First, calculate the cross-sectional areas ($CSA = \pi \times r^2$):
$CSA_{RVOT} = 3.14 \times (1.4)^2 \approx 6.15 cm^2$
$CSA_{LVOT} = 3.14 \times (1.0)^2 = 3.14 cm^2$
Then calculate the stroke volumes:
$SV_{RVOT} = 6.15 \times 25 = 153.75 mL$
$SV_{LVOT} = 3.14 \times 15 = 47.1 mL$
Finally, the ratio:
$Q_p/Q_s = 153.75/47.1 \approx 3.26$
The approximate ratio is 3.3:1. A Q_p/Q_s > 1.5:1 is typically considered an indication for surgical or percutaneous closure.

Question: 1327

A 28-year-old male with a Fontan circulation (extracardiac conduit) is undergoing non-cardiac surgery under general anesthesia. During mechanical ventilation, the end-tidal CO_2 is maintained at 30 mmHg, and the mean airway pressure is 12 mmHg. The patient becomes progressively hypotensive with a falling cardiac index. What is the most appropriate initial physiological adjustment?

A. Increase positive end-expiratory pressure (PEEP) to improve oxygenation and reduce pulmonary vascular resistance
B. Decrease respiratory rate to increase expiratory time and lower mean airway pressure
C. Initiate a phenylephrine infusion to increase systemic vascular resistance and support the conduit flow

Answer: B

Explanation: Fontan physiology relies entirely on a passive pressure gradient between the systemic venous system and the pulmonary arteries, as there is no sub-pulmonary ventricle. Passive flow is highly sensitive to intrathoracic pressure. High mean airway pressures, often caused by high PEEP or short expiratory times, increase pulmonary vascular resistance (PVR) and decrease the transpulmonary gradient ($TPG = mPAP - LAP$), leading to decreased preload to the systemic ventricle and subsequent hypotension. Lowering mean airway pressure is the most direct way to restore passive pulmonary blood flow.

Question: 1328

A patient on CPB for 3 hours at 32°C develops an escalating requirement for norepinephrine to maintain a MAP of 60 mmHg. An intraoperative glucose check reveals a blood sugar of 280 mg/dL. What is the primary mechanism for hyperglycemia during hypothermic CPB?

A. Activation of the parasympathetic nervous system stimulating glycogenolysis
B. Reduced peripheral glucose uptake due to alpha-stat acid-base management
C. Hypothermia-induced insulin resistance and suppressed endogenous insulin secretion

Answer: C

Explanation: CPB induces a profound stress response characterized by high levels of catecholamines and cortisol. Hypothermia specifically contributes to hyperglycemia by both inhibiting the release of insulin from the pancreatic beta cells and inducing a state of peripheral insulin resistance. Hyperglycemia during CPB is associated with worse neurological outcomes and increased risk of postoperative infection.

Question: 1329

A 55-year-old male with unstable angina is started on an intravenous nitroglycerin infusion. After 24 hours of continuous therapy at 100 mcg/min, the patient reports a return of chest pain despite no change in hemodynamics. What is the biochemical mechanism responsible for this observation?

A. Downregulation of cyclic AMP receptors
B. Induction of cytochrome P450 enzymes
C. Depletion of intracellular sulfhydryl groups

Answer: C

Explanation: Nitroglycerin requires conversion to nitric oxide, a process that involves mitochondrial aldehyde dehydrogenase and intracellular sulfhydryl (thiol) groups. Continuous administration leads to "nitrate tolerance," primarily due to the depletion of these sulfhydryl donors and increased production of free radicals that inhibit the conversion process. This is why "nitrate-free" intervals are clinically recommended.

Question: 1330

A 50-year-old male with a history of obesity and a sedentary lifestyle is scheduled for a gastric bypass. He is unable to perform an exercise stress test. A preoperative Pharmacologic SPECT scan shows a "decreased uptake" in the inferior wall that "normalizes" with gated imaging to show normal wall motion. This is most likely:

A. Prior inferior wall infarction
B. Inferior wall ischemia
C. Diaphragmatic attenuation artifact

Answer: C

Explanation: In SPECT imaging, diaphragmatic attenuation often causes a false-positive perfusion defect in the inferior wall, especially in obese males. If gated SPECT (which looks at the wall motion during the cardiac cycle) shows that the inferior wall is contracting normally, the "perfusion defect" is likely an artifact rather than true ischemia or infarction.

Question: 1331

A patient post-CABG has a cardiac output of $4.0 L/min$, a heart rate of 80 bpm, and a hemoglobin of 8 g/dL. The arterial oxygen saturation (SaO_2) is 98% and the mixed venous oxygen saturation (SvO_2) is 60%. What is the calculated oxygen extraction ratio (OER)?

A. 0.25
B. 0.39
C. 0.50

Answer: B

Explanation: $OER = \frac{SaO_2 - SvO_2}{SaO_2}$. Using the provided values: $OER = \frac{0.98 - 0.60}{0.98} \approx 0.387$ or 39%. A normal OER is approximately 25%. An OER of 39% indicates that the tissues are extracting a higher fraction of delivered oxygen, likely due to low delivery (DO_2) caused by the low hemoglobin.

Question: 1332

A patient on VA ECMO following a massive pulmonary embolism is being weaned. During a trial of low flow (1.5 L/min), the pulmonary artery pressure increases from 30/15 mmHg to 60/40 mmHg, and the RV begins to dilate.

A. Return to full ECMO flow and consider a longer recovery period
B. Administer a bolus of heparin
C. Proceed with decannulation and start a vasopressin infusion

Answer: A

Explanation: In the context of pulmonary embolism, the RV must be able to pump against the pulmonary vascular resistance. An increase in PA pressures and RV dilation during a weaning trial indicates that the RV is not yet capable of handling the full cardiac output and that the pulmonary vascular obstruction or vasoconstriction has not resolved sufficiently.

Question: 1333

Which of the following describes the "Bowditch Effect" (also known as the Treppe phenomenon)?

A. Increase in wall stress leads to hypertrophy
B. Increase in preload leads to increased stroke volume
C. Increase in heart rate leads to increased contractility

Answer: C

Explanation: The Bowditch Effect is the frequency-dependent regulation of inotropy. As the heart rate increases, the sarcoplasmic reticulum is unable to fully sequester all the calcium that enters during each action potential, leading to a

progressive accumulation of intracellular calcium. This results in an increase in the force of contraction (contractility) at higher heart rates.

Question: 1334

A patient presents for repair of a sinus venosus atrial septal defect (ASD). Which TEE view is most likely to demonstrate the associated anomalous pulmonary venous return, typically involving the right upper pulmonary vein?

A. Mid-esophageal aortic valve short-axis view
B. Upper esophageal aortic arch long-axis view
C. Mid-esophageal bicaval view

Answer: C

Explanation: Sinus venosus ASDs are located at the junction of the superior vena cava (SVC) and the right atrium. The mid-esophageal bicaval view is ideal for visualizing this region. Anomalous drainage of the right upper pulmonary vein into the SVC or the right atrium is a frequent finding associated with this type of ASD and is best identified by sweeping the probe in the bicaval or high esophageal views.

Question: 1335

A study finds that women undergoing CABG are less likely to receive a radial artery graft compared to men, even when vessel quality is similar. This is an example of:

A. A necessary clinical adjustment based on the smaller size of female radial arteries
B. A disparity in the quality of care provided based on gender

C. A difference in patient preference, as women are more likely to refuse arterial grafting

Answer: B

Explanation: Research has shown that women often receive less aggressive or less optimized surgical treatments for coronary artery disease than men, contributing to worse outcomes. When these differences cannot be explained by clinical factors (like vessel size or comorbidities), they represent a healthcare disparity that must be addressed through standardized protocols and bias awareness.

Question: 1336

When calculating the Mitral Valve Area using the continuity equation, which three parameters must be measured?

A. Mitral Valve PHT, LVOT VTI, and Heart Rate
B. Peak Mitral velocity, LA diameter, and LVOT VTI
C. LVOT diameter, LVOT VTI, and Mitral Valve VTI

Answer: C

Explanation: The continuity equation is based on the principle that stroke volume (SV) through the LVOT equals the SV through the mitral valve (in the absence of significant MR). $SV = Area \times VTI$. Therefore, $MVA = (Area_{LVOT} \times VTI_{LVOT})/VTI_{MV}$. The $Area_{LVOT}$ is derived from the LVOT diameter.

Question: 1337

A patient on CPB for 120 minutes exhibits a sudden drop in urine output and the presence of reddish-brown urine in the drainage bag. The plasma is noted to be pinkish-red. The current hematocrit is 22% and the pump flow is 2.4 L/min/m^2. What is the most likely cause of this renal finding?

A. Myoglobinuria from cross-clamp induced skeletal muscle ischemia
B. Acute tubular necrosis from low-flow non-pulsatile perfusion
C. Hemoglobinuria resulting from mechanical hemolysis by the roller pump

Answer: C

Explanation: Mechanical hemolysis is a known complication of CPB, caused by the shear stress of the roller or centrifugal pumps, suction of blood from the field (cardiotomy suction), and air-blood interfaces. When free hemoglobin exceeds the binding capacity of haptoglobin, it is filtered by the glomeruli, causing hemoglobinuria and potentially leading to pigment-induced acute kidney injury (AKI). This is distinguished from myoglobinuria by the presence of pink/red plasma (hemoglobinemia); in myoglobinuria, the plasma remains clear because myoglobin is a much smaller molecule and is cleared rapidly.

Question: 1338

An attending anesthesiologist is observed by a resident to be frequently distracted by their phone during the weaning phase of cardiopulmonary bypass (CPB). The attending appears drowsy and has missed several minor changes in the hemodynamic profile.

A. Notify the clinical director or department chair immediately regarding concerns for provider impairment or fatigue
B. Address the behavior directly with the attending after the case concludes to

provide peer feedback

C. Document the behavior in a private log for use during the end-of-rotation evaluation

Answer: A

Explanation: Patient safety is the paramount concern in the operating room. If a provider appears impaired or excessively fatigued to the point of missing clinical cues during a critical phase like weaning from CPB, the observer has a professional obligation to report this to leadership immediately. This ensures that a fit provider can take over and that the individual receives appropriate support or intervention.

Question: 1339

A patient is diagnosed with Cor Pulmonale. This condition is specifically defined as:

A. Right heart failure due to primary lung disease

B. Valvular heart disease involving the tricuspid valve

C. Left heart failure due to chronic hypertension

Answer: A

Explanation: Cor pulmonale is defined as hypertrophy or dilation of the right ventricle (which may lead to right-sided heart failure) resulting from diseases affecting the structure or function of the lungs or the pulmonary vasculature (e.g., COPD, pulmonary fibrosis, or chronic thromboembolic disease). It excludes right heart failure caused by left-sided heart disease or congenital heart defects.

Question: 1340

A 68-year-old male undergoes a robotic-assisted mitral valve repair. The anesthesiologist utilizes a paravertebral block for postoperative analgesia. While documenting the procedure for billing, the anesthesiologist notes they spent 45 minutes on the block and 240 minutes on the cardiac anesthesia. For the cardiac anesthesia component (CPT 00567), how many "base units" are typically assigned by the ASA Relative Value Guide (RVG)?

A. 20
B. 15
C. 25

Answer: C

Explanation: CPT 00567 (Anesthesia for direct coronary artery bypass grafting, with pump oxygenator) and related complex cardiac procedures like mitral valve repairs on bypass typically carry 25 base units in the ASA Relative Value Guide. This reflects the high complexity and skill required. 15 units are more common for non-pump thoracic cases, and 20 units are for cases involving pump oxygenator but less complexity than 00567 (like 00562).

Question: 1341

A patient with severe MS is scheduled for an elective MAZE procedure and mitral valve repair. The surgeon notes extensive calcification of the subvalvular apparatus and the chordae tendineae. Which of the following is the most appropriate surgical decision based on these findings?

A. Perform a mitral valve replacement due to the high risk of repair failure
B. Proceed with a posterior leaflet resection only

C. Attempt a commissurotomy to preserve the native valve

Answer: A

Explanation: The Wilkins score (or Inoue score) is used to assess the suitability of a mitral valve for balloon valvuloplasty or repair. It evaluates mobility, thickening, calcification, and subvalvular involvement. Extensive calcification and subvalvular fusion (chordal shortening and thickening) are poor prognostic factors for successful repair or commissurotomy, usually necessitating replacement.

Question: 1342

During CPB rewarming, the perfusionist maintains a temperature gradient of 8°C between the arterial inflow (venous return temperature) and the heater-cooler temperature. Why is the maximum gradient typically limited to 10°C?

A. To avoid excessive protein denaturation
B. To reduce the risk of thermal injury to the venous cannula site
C. To prevent gaseous emboli formation in the blood

Answer: C

Explanation: As blood is rewarmed, the solubility of gases (like nitrogen and oxygen) decreases. If the temperature gradient between the heater-cooler and the blood is too high, gases may come out of solution and form microbubbles, leading to gaseous emboli that can cause organ damage, particularly in the brain.

Question: 1343

During a PCI of the right coronary artery, the patient suddenly develops profound bradycardia and hypotension immediately following stent deployment. The cardiologist notes "no-reflow" on the angiogram. Which of the following is the most appropriate initial pharmacological treatment for the "no-reflow" phenomenon?

A. Intravenous atropine and phenylephrine
B. Intracoronary adenosine or verapamil
C. Intravenous heparin bolus and abciximab

Answer: B

Explanation: The "no-reflow" phenomenon occurs when coronary blood flow is significantly reduced despite the relief of the epicardial stenosis, usually due to microvascular obstruction, distal embolization of plaque debris, and vasospasm. The treatment of choice is the administration of intracoronary vasodilators such as adenosine, verapamil, or nitroprusside to reduce microvascular resistance. Atropine may treat the bradycardia (often a Bezold-Jarisch reflex), but it does not address the underlying microvascular compromise.

Question: 1344

A patient is taking apixaban for stroke prevention. The surgical team plans to use a neuraxial technique for postoperative analgesia in addition to the cardiac surgical procedure. According to ASRA guidelines, how long should apixaban be held before performing a neuraxial block?

A. 24 hours
B. 48 hours
C. 72 hours

Answer: C

Explanation: For high-risk procedures or when neuraxial techniques are employed, ASRA (American Society of Regional Anesthesia) guidelines recommend holding Factor Xa inhibitors like apixaban for 72 hours (or 5 half-lives) to minimize the risk of spinal hematoma.

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