Basic and Clinical Sciences (BCSE) Practice Exam (Sample)

Study Guide

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Questions

1. Which of the following pathologies is associated with an increase in pulmonary vascular resistance (PVR)?

A. Left to right shunts

B. Congenital heart disease

C. Hypoxia-induced vasoconstriction

D. Liver cirrhosis

2. What is the most common type of childhood TB?

A. Extrapulmonary TB

B. Primary TB

C. Pulmonary TB

D. Latent TB infection

3. What happens to PvO2 levels in stagnant hypoxia?

A. Increased PvO2

B. Decreased PvO2

C. Normal PvO2

D. Non-detectable PvO2

4. What is a normal Aa gradient in mmHg?

A. 5 mmHg

B. 10 mmHg

C. 15 mmHg

D. 20 mmHg

5. Which symptom is commonly associated with tuberculosis in children?

A. Weight gain

B. Joint swelling

C. Frequent headaches

D. Skin rashes

6. Which of the following is a symptom of hypermagnesaemia?

A. Increased neuronal excitability

B. Spinal headaches

C. Nausea and vomiting

D. Muscle spasms

7. What is the first step in the CABCDE approach during a primary survey?

A. Assure airway maintenance

B. Control catastrophic bleeding

C. Assess circulation

D. Evaluate disability

8. Which part of the brain is responsible for limiting inspiration to increase respiratory rate?

A. Pneumotaxic center

B. Dorsal respiratory group

C. Ventral respiratory group

D. Medullary respiratory center

9. What is an essential adjunct to a primary survey in clinical assessment?

A. ECG

B. Trans-urethral catheter

C. Imaging

D. Surgical intervention

10. What is a common manifestation of urticaria?

A. Vesiculobullous lesions

B. Erythematous, edematous patches

C. Melanoma-like growths

D. Fungal infections

Answers

1. C
2. C
3. B
4. B
5. B
6. C
7. B
8. A
9. A
10. B

Explanations

1. Which of the following pathologies is associated with an increase in pulmonary vascular resistance (PVR)?

A. Left to right shunts

B. Congenital heart disease

C. Hypoxia-induced vasoconstriction

D. Liver cirrhosis

Increased pulmonary vascular resistance (PVR) can occur due to several mechanisms, but one of the most significant contributors is hypoxia-induced vasoconstriction. This refers to the physiological response of pulmonary arteries to low oxygen levels, where the blood vessels constrict in order to redirect blood flow away from poorly ventilated areas of the lung. This mechanism helps to optimize ventilation-perfusion matching but leads to an overall increase in PVR when widespread hypoxia is present, as is often seen in conditions such as chronic obstructive pulmonary disease (COPD) or high altitude exposure. Other pathologies like left to right shunts and congenital heart disease typically decrease pulmonary vascular resistance in the short term by increasing pulmonary blood flow. In these conditions, blood that would normally circulate systemic pathways is redirected into the pulmonary circulation, often resulting in lower resistance due to sheer volume and the resultant alterations in vascular dynamics. Liver cirrhosis, while affecting hemodynamics, primarily impacts systemic vascular resistance and portal circulation rather than directly influencing PVR in a significant manner. Hence, hypoxia-induced vasoconstriction stands out as a clear association with increased PVR due to the direct physiological response of pulmonary vasculature to low oxygen levels.

2. What is the most common type of childhood TB?

A. Extrapulmonary TB

B. Primary TB

C. Pulmonary TB

D. Latent TB infection

The most common type of childhood tuberculosis is indeed pulmonary TB. In children, TB infection often manifests primarily in the lungs, similar to adults. However, the presentation and progression can vary because children can have a strong immune response that may contain the infection, leading to less severe symptoms upfront compared to adults. Primary TB is a term that refers to the initial infection, which may not always lead to clinical disease. Many children may become infected with Mycobacterium tuberculosis, but they may not develop active pulmonary disease; instead, they might have latent TB, where the bacteria remain dormant and do not cause symptoms. Extrapulmonary TB is also noteworthy in children; it can occur but is less common than pulmonary TB in this demographic. Extrapulmonary manifestations, though significant when they occur, do not represent the majority of TB cases in children. Understanding that pulmonary TB is the most common manifestation in children is crucial for diagnosis and treatment, as early recognition and intervention can prevent complications and further spread of the disease.

3. What happens to PvO2 levels in stagnant hypoxia?

A. Increased PvO2

B. Decreased PvO2

C. Normal PvO2

D. Non-detectable PvO2

In stagnant hypoxia, the primary issue is that there is a reduced blood flow to tissues, which limits the delivery of oxygen despite potentially normal levels of oxygen in the blood. As a result, the consumption of oxygen by the tissues exceeds the delivery due to impaired circulation. This situation leads to a decreased PvO2, which represents the partial pressure of oxygen in the venous blood returning to the heart. The reduced transit of blood through the capillaries contributes to inadequate oxygen being picked up by the blood, resulting in lower levels of oxygen in the venous circulation. Therefore, in stagnant hypoxia, where the oxygen delivery is compromised due to stasis in blood flow, the levels of PvO2 decrease, which aligns accurately with the physiological understanding of how blood oxygen levels respond under conditions of impaired perfusion.

4. What is a normal Aa gradient in mmHg?

A. 5 mmHg

B. 10 mmHg

C. 15 mmHg

D. 20 mmHg

The normal alveolar-arterial (Aa) gradient typically falls within the range of 5 to 15 mmHg in healthy individuals, with many references citing around 10 mmHg as a standard value. This gradient is a measure of the difference between the oxygen concentration in the alveoli and that in the arterial blood, which reflects the efficiency of gas exchange in the lungs. A gradient of around 10 mmHg indicates that oxygen transfer from the alveoli into the bloodstream is functioning well, and that the individual does not have significant ventilation-perfusion mismatches or diffusion impairments. An increasing Aa gradient can suggest problems such as shunting, diffusion defects, or hypoventilation, which can lead to insufficient oxygenation. While values can vary with age and other physiological factors, a gradient of approximately 10 mmHg is widely recognized in clinical practice and textbooks as being indicative of normal lung function.

5. Which symptom is commonly associated with tuberculosis in children?

A. Weight gain

B. Joint swelling

C. Frequent headaches

D. Skin rashes

Tuberculosis (TB) in children often presents with specific symptoms that are indicative of the infection's impact on the body. One commonly associated symptom is joint swelling, which can occur as a part of extrapulmonary tuberculosis, where the Mycobacterium tuberculosis bacteria affect areas outside the lungs, including bones and joints. In children, TB can lead to conditions such as tuberculosis arthritis or osteomyelitis, which result in inflammation and swelling of joints. These manifestations can be more challenging to diagnose in children since they may not exhibit the classic symptoms of pulmonary TB, such as a persistent cough. Understanding the signs and symptoms of TB in children is crucial for timely diagnosis and treatment, as early intervention can significantly improve outcomes. The other symptoms listed, including weight gain, frequent headaches, and skin rashes, are not typically found as core symptoms associated with TB in children. Instead, substantial weight loss, persistent fever, and respiratory issues tend to be more relevant.

6. Which of the following is a symptom of hypermagnesaemia?

A. Increased neuronal excitability

B. Spinal headaches

C. Nausea and vomiting

D. Muscle spasms

Hypermagnesaemia refers to an elevated level of magnesium in the blood, which can occur due to various factors including renal failure, excessive intake of magnesium-containing medications, or certain endocrine disorders. One of the hallmark symptoms of hypermagnesaemia is gastrointestinal discomfort, which includes nausea and vomiting. This symptom arises because high levels of magnesium can inhibit the normal function of the gastrointestinal tract, leading to disturbances such as these. High magnesium levels can also lead to a variety of other symptoms, such as muscle weakness, lethargy, and alterations in cardiovascular function. However, nausea and vomiting are particularly significant symptoms that can be indicative of elevated magnesium levels. The other options tend to correlate with conditions of low magnesium levels or other disorders. Increased neuronal excitability, for instance, is more typically seen with hypomagnesaemia (low magnesium). Spinal headaches are not a classic symptom of hypermagnesaemia and are generally more associated with other medical conditions. Similarly, muscle spasms are associated with low magnesium levels rather than high; in hypermagnesaemia, muscle weakness is more common due to the depressant effects on neuromuscular transmission. Thus, nausea and vomiting are clear indicators of hypermagnesaemia, making this

7. What is the first step in the CABCDE approach during a primary survey?

A. Assure airway maintenance

B. Control catastrophic bleeding

C. Assess circulation

D. Evaluate disability

In the CABCDE approach used during a primary survey in trauma care, the first step focuses on controlling catastrophic bleeding. This prioritization is essential because uncontrolled hemorrhage is a leading cause of preventable death in trauma patients. Immediate control of bleeding can significantly impact the patient's survival chances, making it vital to identify and manage severe bleeding as soon as possible. Following the initial step of addressing bleeding, subsequent actions would then involve ensuring the airway is clear, assessing circulation (including checking pulse and capillary refill), evaluating disability (an assessment of neurological status), and finally exposing the patient for a thorough examination while preventing hypothermia. Each step in the CABCDE approach builds on the others, but controlling catastrophic bleeding is prioritized due to its potential for rapid deterioration in a patient's condition.

8. Which part of the brain is responsible for limiting inspiration to increase respiratory rate?

A. Pneumotaxic center

B. Dorsal respiratory group

C. Ventral respiratory group

D. Medullary respiratory center

The pneumotaxic center plays a critical role in regulating the rhythm and rate of breathing by providing inhibitory signals to the medullary respiratory centers. It is located in the pons of the brainstem and helps to fine-tune respiratory patterns by limiting the duration of inhalation. This limitation enhances the respiratory rate by promoting a quicker transition between inspiration and expiration, thereby ensuring that breathing remains efficient and adequately meets the body's metabolic demands, especially during times of increased activity. In contrast, other regions such as the dorsal and ventral respiratory groups primarily facilitate inspiration and expiration without specifically limiting the duration of inspiratory effort in the way that the pneumotaxic center does. The medullary respiratory center is involved in the automatic control of breathing but relies on inputs from areas like the pneumotaxic center to adjust the overall respiratory patterns. The integrated functionality of these centers allows for a well-coordinated respiratory response to varying physiological requirements, particularly under conditions that necessitate increased ventilation.

9. What is an essential adjunct to a primary survey in clinical assessment?

A. ECG

B. Trans-urethral catheter

C. Imaging

D. Surgical intervention

In clinical assessment, particularly in emergency situations, the primary survey focuses on identifying life-threatening conditions, ensuring the airway is open, breathing is adequate, and circulation is stable, among other critical evaluations. An essential adjunct to this primary survey is the use of an electrocardiogram (ECG). An ECG is crucial because it provides vital information about the heart's electrical activity, helping to quickly identify arrhythmias, ischemia, or other cardiac issues that may be contributing to a patient's condition. Rapid identification of these issues is essential for effective management, especially in cases of cardiac emergencies. The real-time data from an ECG can guide treatment decisions and prioritize interventions. The other options, while important in specific contexts, do not serve as essential adjuncts to the primary survey in the same immediate and critical capacity as an ECG. For instance, a trans-urethral catheter is usually employed in managing urinary retention or output assessment, imaging helps in diagnosing injuries or conditions but may not be feasible in acute life-threatening scenarios, and surgical intervention is typically a more delayed response based on findings rather than a simultaneous assessment tool. Thus, the ECG is paramount for immediate assessment and intervention, making it the correct answer.

10. What is a common manifestation of urticaria?

A. Vesiculobullous lesions

B. Erythematous, edematous patches

C. Melanoma-like growths

D. Fungal infections

Urticaria, commonly known as hives, is characterized by the presence of raised, itchy welts on the skin, which are erythematous and edematous. This means the affected areas are red (erythematous) and swollen (edematous) due to an accumulation of fluid in the dermis, leading to wheals that can vary in size and shape. The primary feature of urticaria is the transient nature of these lesions, which can appear and resolve within a short period, often in response to triggers such as allergens, medications, or infections. The other options describe conditions that do not align with the typical presentation of urticaria. For instance, vesiculobullous lesions are associated with conditions that produce blisters, melanoma-like growths refer to skin cancers, and fungal infections would present with different dermatological findings such as scaling or crusting rather than the distinct wheals of urticaria. Therefore, the manifestation of erythematous, edematous patches is the hallmark feature of urticaria, making it the correct answer.