

Anesthesiology Rounds
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Physiology of Acute Isovolemic Anemia: Practical Concerns

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Objectives:

- To review the principal mechanisms allowing the maintenance of tissue oxygen delivery during acute anemia
- To describe the major clinical factors that alter the physiologic response to anemia
- To present different therapeutic options that have been proposed to improve patients' tolerance to acute anemia
- To discuss "the transfusion trigger" in view of the current literature

Questions (only 1 answer is correct)

1. In terms of the physiologic response to acute isovolemic hemodilution, which one of the following statements is **true**?
 - a) The increase in cardiac output is essentially related to a rise in heart rate.
 - b) The adequate cardiac output response appears independent of the presence of an intact autonomic nervous system.
 - c) Isovolemic hemodilution is associated with a redistribution of blood flow to "flow-dependent" organs at the expense of "flow-independent" ones.
 - d) The main effect of hemodilution on the microcirculation is a decrease in red blood cell velocity.
 - e) An increase in the affinity of hemoglobin for oxygen occurs as a result of an increased synthesis of 2,3 diphosphoglycerate with declining hemoglobin after 12 to 36 hours.
2. In aspects of tolerance and limits to acute anemia, which one of the following statements is **false**?
 - a) Physiologic adjustments allow the maintenance of tissue oxygen balance until the hematocrit falls to about 5%.
 - b) For a given cardiac output and oxygen extraction response, any increase in tissue oxygen demand will require a higher hemoglobin level.
 - c) Age alone is not a major factor in determining tolerance to anemia.
 - d) The use of alpha-blocking agents may interfere with the normal regional redistribution of blood flow occurring during hemodilution.
 - e) Hemodilution could attenuate hypoxic pulmonary vasoconstriction.

3. Which of the following statements is **false**?

- a) Hypovolemia blunts the effects of the decreased blood viscosity on venous return.
- b) Contribution of the dissolved oxygen in the plasma increases marginally during hemodilution.
- c) Hyperoxemia partially reverses the decrease in systemic vascular resistance associated with isovolemic anemia.
- d) Hypothermia increases the affinity of hemoglobin for oxygen.
- e) The most important effect of anesthesia on the physiologic adjustments to hemodilution is a decrease in cardiac output.

4. Which of the following statements is **false**?

- a) Clinical signs of inadequate tissue oxygenation during anemia are both sensitive and specific.
- b) Mixed venous oxygen saturation (SvO₂) might be a reliable physiologic Guide to transfusion.
- c) Application of a restrictive strategy reduces the likelihood for patients to be transfused.
- d) Universal leukoreduction might reduce the mortality and the morbidity associated with blood transfusion.
- e) The decision to transfuse a given patient depends partially on the available monitoring.

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