

Complications of Hypothermia

Anesthetic Pearls: Anesthetic Implications and Complications of Hypothermia

Hypothermia is defined as a core body temperature lower than 35°C (95°F) and can be classified as either primary (accidental) or secondary. **Accidental hypothermia** is defined as a spontaneous decrease of core temperature to less than 35°C (usually in a cold environment). **Secondary hypothermia** is characterized by dysfunction of hypothalamic thermoregulation usually due to underlying illness or drug induced. Hypothermia affects virtually every organ system owing to generalized slowing of enzymatic activity, peripheral vasoconstriction, and uncoupling of oxygen-dependent metabolic processes.

Cardiovascular

Alterations in cardiovascular physiology include an early catecholamine-mediated increase in HR, CO, and MAP. Later, negative inotropic and chronotropic effects of hypothermia lead to a decreased effective blood volume, diminished CO, and reduced tissue perfusion. The EKG may demonstrate sinus bradycardia and slowing of conduction with A-V block, prolonged QT interval, widened QRS complex, and T-wave inversion. When core temperature declines to 32°C, the classic Osborne (or J) wave appears on EKG. The cold heart becomes highly irritable, and any physical stimulation may lead to ventricular fibrillation (~ 32°C).

Respiratory

Patients may initially be tachypnic, but as hypothermia becomes pronounced, there is depression of the respiratory center. Shivering increases oxygen consumption. Because alveolar ventilation is decreased, PaO₂ may decline to subnormal values. ABG values should be temperature corrected for hypothermia. PaO₂ and PaCO₂ values are abnormally high and pH becomes abnormally low. These values should be decreased or increased based upon temperature / pH nomograms.

Endocrine / Renal

Because of enzyme damage, renal concentrating ability is lost which results in very dilute urine and systemic hyperosmolarity. As the process continues, ATN may develop secondary to decreased renal perfusion. Lab abnormalities include metabolic acidosis, hyperkalemia, hyperglycemia, hyperphosphatemia, and hyponatremia. Rhabdomyolysis may also occur leading to further complications of the renal system.

Hematologic

Alterations of the hemostatic system include hemoconcentration, increased blood viscosity, thrombocytopenia, granulocytopenia, and consumptive coagulopathy.

Gastrointestinal

Dilatation of both the large and small bowel, ileus, upper GI bleeding, acute pancreatitis, and severe hepatic dysfunction may occur with prolonged severe hypothermia.