

Intra-Operative Hypothermia

Anesthetic Pearls: Mechanisms of Intra-Operative Hypothermia

Hypothermia is the most common temperature disorder resulting from anesthesia and surgery. Body temperature is normally maintained at approximately 37 degrees Celsius. Up to 60% of patients have temperatures less than 36 degrees Celsius on admission to the PACU.

Types of Heat Loss (in the OR):

- A. Radiation accounts for 60% of heat loss
- B. Evaporation from skin surface and lungs (insensible loss) account for 25%
- C. Convection (12%)
- D. Conduction for (3%)

Factors contributing to hypothermia:

1. Cold OR suites maintained at 18 - 21 degrees Celsius for surgeon comfort.
2. IV fluids are the same temperature as the OR unless a warmer is used.
3. Patient's body core is exposed to the environment as well as cold irrigating solutions.
4. Body heat is lost to dry and non-humidified inspired anesthetic gases.
5. Reduces body metabolism (decreased heat production)
6. Vasodilation (increased heat loss)
7. Anesthesia interferes with hypothalamic thermoregulatory mechanisms.
8. Surgical duration

Physiologic consequences of hypothermia:

- A. Hypothermia reduces anesthetic requirements. Drugs relying on liver metabolism or renal excretion have prolonged half-lives.
- B. Blood viscosity increases leading to decreased perfusion through small capillaries.
- C. Shivering and increased metabolism help restore normothermia at the expense of 400-500% increase in tissue oxygen consumption which requires increased minute ventilation to provide additional transportable oxygen and increased cardiac output to assure oxygen delivery to peripheral tissues.
- D. Peripheral vasoconstriction secondary to hypothermia decreases with re-warming and may result in vasodilatory shock (Rx with volume loading and SVR mediators).

Warming Methods:

Heat production occurs by means of cellular metabolism that is affected by basal metabolic rate, muscular activity, sympathetic arousal, hormonal activity and exogenously administered heat.

The best approach is to avoid heat loss in the first place!

1. Radiant heat lamps
2. Warming blankets (Bair hugger) and heat-retaining drapes
3. Heated humidifiers and lower fresh gas flows
4. Warmer operating rooms
5. Heated blood & IV fluids
6. Newborns and infants have a special brown fat tissue located between the scapulae and around large blood vessels and produce heat through **Non-Shivering Thermogenesis**. When exposed to cold temperatures, this brown fat breaks down and releases heat as a by-product thereby having the cardiac output to distribute heat throughout body.