

Post-Operative Hypoxemia: Causes

Anesthetic Pearls: Anesthetic Implications and Management of Post-Op Hypoxemia

General anesthesia is associated with an inhibition of hypoxic (O₂) and hypercapnic (CO₂) ventilatory drive, a reduction of functional residual capacity (FRC), and inhibition of hypoxic pulmonary vasoconstriction. These changes may persist for a variable period post-op and may predispose the patient to hypoventilation and hypoxemia. Physical signs of hypoxemia include dyspnea, cyanosis, altered mental status, agitation, obtundation, tachycardia, hypertension, and dysrhythmias. Before treating any of these signs, hypoxemia should be ruled out.

Causes of hypoxemia:

- 1. Atelectasis** – predictable consequence of FRC reduction where small lung areas lack gas exchange within alveoli secondary to alveolar collapse or fluid consolidation. Small areas of alveolar collapse re-expand with deep breathing and coughing.
- 2. Hypoventilation** – due to residual low levels of volatile anesthetics, opioids, and large doses of benzodiazepines. Less commonly, respiratory drive may be impaired following intracranial and carotid surgery, head injury, and intra-operative stroke.
- 3. Diffusion Hypoxia** – An abrupt transient decrease in alveolar oxygen tension when room air is inhaled at the conclusion of a nitrous oxide anesthesia. This can be prevented by oxygen administration.
- 4. Upper Airway Obstruction** – common etiologies: incomplete recovery from general anesthesia and/or neuromuscular blockade, airway edema, wound hematoma (following thyroid, parathyroid surgery, neck dissections, and carotid endarterectomy) and vocal cord paralysis.
- 5. Pulmonary Edema** – may occur post-op as a result of either cardiogenic failure or increased pulmonary capillary permeability. The latter can occur as a result of sepsis, head injury, aspiration pneumonitis, transfusion reaction, anaphylaxis, or upper airway obstruction. Increased pulmonary capillary permeability is characterized by hypoxemia without the signs of left ventricular overload.
- 6. Pneumothorax** – may complicate a thoracotomy, mediastinoscopy, bronchoscopy, high retroperitoneal dissection for nephrectomy / adrenalectomy, spine surgery, and central line placement.
- 7. Bronchospasm**
- 8. Pulmonary Embolism**
- 9. Aspiration of Gastric Contents**