

Respiratory Anesthetic Emergencies in Oral and Maxillofacial Surgery

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Background:

- Respiratory anesthetic emergencies are the most common complications during the administration of anesthesia in both adults and pediatric populations.
- A thorough review of the patient's health history, including the past medical history, medications, prior anesthesia history, and complete physical examination is pertinent to promote the safety regarding anesthesia in the office.
- The diseases that affect the pulmonary system are asthma, chronic obstructive pulmonary disease (COPD), and upper respiratory infections (URI).

Respiratory Physiology:

- There must be ventilation at the alveolar level, diffusion through the capillary membranes, and circulation of the pulmonary capillary bed to achieve gas exchange in the pulmonary system.
- Preoxygenation is a very important element during anesthesia to maintain high levels of tissue oxygenation for the periods of apnea during an anesthetic induction process.
- The ratio of the oxygen bound to hemoglobin and the oxygen diffused in the plasma produces an arterial oxygen tension pressure (P_{aO_2}). This pressure gradient is how the unbound oxygen enters the plasma and is delivered to the tissues of the body.

Common Respiratory Diseases:

Asthma

- Most common chronic inflammatory respiratory disease, affecting 6% of the US population.
- Asthma is chronic inflammation of the respiratory tract submucosal tissue, caused by intrinsic factors such as infection, exercise induced or emotional changes, and extrinsic factor (allergen mediated).
- Questions to ask: causes, initial diagnosed date, emergency visit/hospitalization, last attack, medication list, recent change in medications, last time to use a rescue medication, and frequency of inhaler use.
- The bronchoconstriction is alleviated by beta agonists, most commonly albuterol as a rescue inhaler, and epinephrine (0.2-0.5ml of 1:1000 for adults, 0.01mg/kg to a max of 0.5mg for children).
- Consider pretreating asthmatic patients with beta agonist inhalers and corticosteroids.
- Instruct patients to bring their rescue inhalers to the surgical appointment.
- Caution with narcotics use for asthmatic patients as they cause respiratory depression, rigid chest, and mast cell degranulation.

COPD

- Chronic bronchitis
 - Blue bloaters.
 - Increased airflow resistance from hypersecretion in the bronchi causes arterial hypoxemia, hypercarbia and cor pulmonale.
- Emphysema
 - Pink puffers.
 - Abnormal enlargement of the airway characterized by the loss of elasticity, collapsing the airway during

exhalation.

- Clinically, patients show dyspnea, cough, sputum production, and decreased exercise tolerance.
- Patients exhibit hypercarbia, hypoxemia and heart failure - signs and symptoms for COPD are irreversible unlike asthma.
- High levels of carbon dioxide and low oxygen levels are the driving force of respiration.
- Patient can tolerate <40% of oxygen. However, to maintain the adequate O₂ level during sedation, 1 to 4L/min nasal cannula or nasal hood can be safely used without affecting hypoxic drive.

URI

- Children with URI can have hyperreactivity of the airway for up to 6 weeks after the infection. American Society of Anesthesiologist (ASA) recommends to postpone any anesthetic for 2 weeks after all signs and symptoms are gone.

Common Respiratory Emergencies in Adults:

Laryngospasm

- Definition: Spasm of the intrinsic muscles of the larynx causing closure of the airway at the vocal cords as a protective reflex to prevent irritants entering the lower airway.
- Signs: high-pitched stridor or crowding (partial obstruction), silence (complete obstruction), paradoxical chest wall and abdominal movements and O₂ desaturation.
- Prevention: Throat pack, proper suctioning, sniffers head position, adequate sedation.
- Emergency protocol
 1. Administer 100% O₂ via nasal or full face mask.
 2. Control bleeding and suction oral cavity, oropharynx, and hypopharynx with tonsil suction tip.
 3. Pull tongue and mandible forward.
 4. Depress patient's chest and listen for rush of air.
 5. Break spasm with positive pressure ventilation with 100% oxygen.
 6. Administer succinylcholine IV (10-20mg IV for partial, 20-40mg for complete).
 7. Administer intubating dose of succinylcholine (1mg/kg)/rocuronium (0.6-1.2mg/kg) and intubate airway.

Bronchospasm

- Definition: Reflex bronchiolar constriction that can be centrally mediated or a local response to airway irritation.
- Signs: expiratory wheezing and increased airway resistance.
- Emergency protocol
 1. Administer 4-6 puffs (2-4 puffs for peds) of B agonists via inhaler or nebulizer.
 2. 100% oxygen via full face mask.
 3. If sedated, use albuterol nebulizer via face mask.
 4. If bronchospasm is still present, 0.3-0.5 mg epinephrine (1:1000) subcutaneous.
 5. Consider reversal of sedative medications.
 6. Consider intubation to secure airway.

Airway Obstruction

- Usually located in the upper airway and caused by the loss of pharyngeal muscle tone, resulting in posteriorly displaced tongue.
- Signs: paradoxical breathing with sternal retraction and abdominal muscle activity.
- Treatment: head tilt-chin lift maneuver, anterior position of tongue, chest/abdominal thrusts to increase airway

pressure. If all maneuvers fail, positive pressure ventilation with a full face mask, then intubation.

Emesis and Aspiration

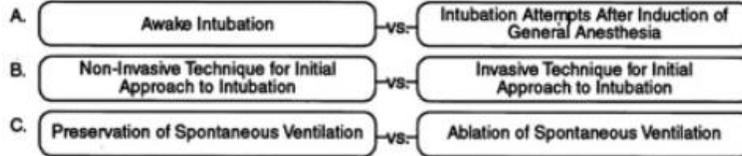
- Causes: anxiety, narcotics, pain and anesthesia.
- Medical conditions that increase the likelihood of aspiration: obesity, hiatal hernia, pregnancy, GERD, obstruction of the GI tract.
- Prevention: follow the ASA's fasting guidelines (8hrs for solid food, 2hrs for clear liquid).
- Signs: rales, dyspnea, tachycardia, bronchospasm, airway obstruction.
- Emergency protocol
 1. Trendelenburg position with head down at 15 degrees and rolled to right.
 2. Clear airway of vomitus with suction and Magill forceps.
 3. If no change, intubate airway, 100% oxygen.

Difficult Airway

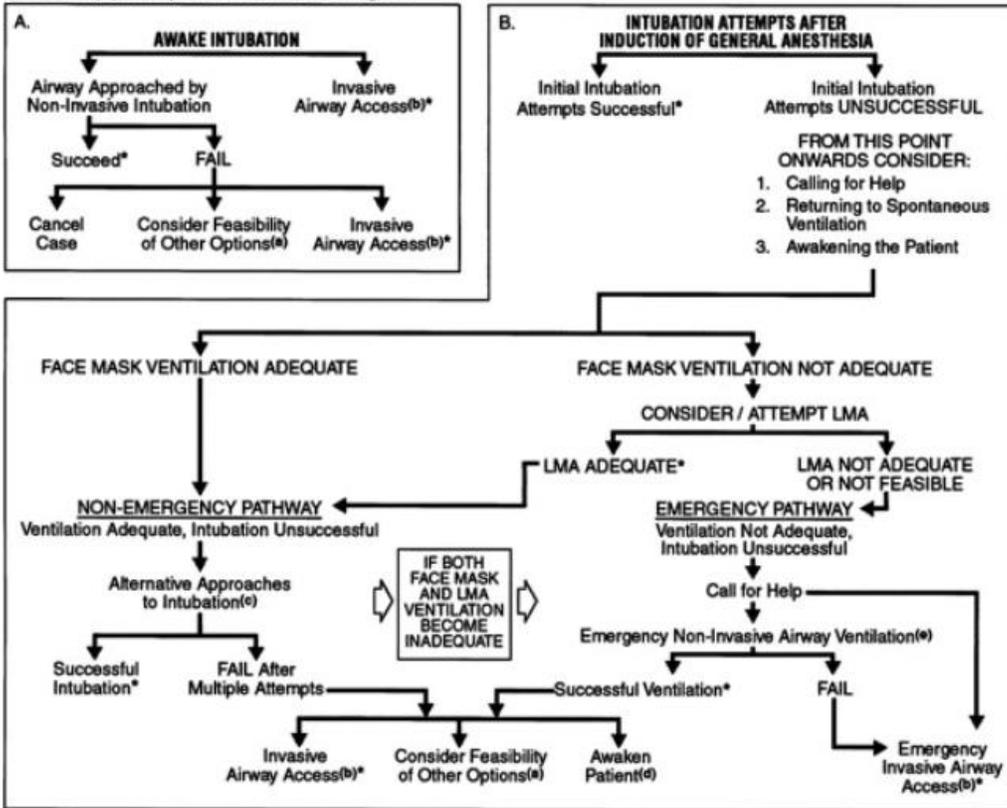
- Emergency protocol
 1. Chin lift/jaw thrust.
 2. Pull tongue forward, reposition airway.
 3. Full face mask, 100% oxygen, positive pressure ventilation.
 4. Consider oral and nasal airways, LMA.
 5. Consider intubation.
 6. Consider cricothyrotomy needle versus surgical.
 7. Consider tracheostomy.
- Difficult Airway Algorithm

DIFFICULT AIRWAY ALGORITHM

- Assess the likelihood and clinical impact of basic management problems:
 - Difficult Ventilation
 - Difficult Intubation
 - Difficulty with Patient Cooperation or Consent
 - Difficult Tracheostomy
- Actively pursue opportunities to deliver supplemental oxygen throughout the process of difficult airway management
- Consider the relative merits and feasibility of basic management choices:



- Develop primary and alternative strategies:



* Confirm ventilation, tracheal intubation, or LMA placement with exhaled CO₂

a. Other options include (but are not limited to): surgery utilizing face mask or LMA anesthesia, local anesthesia infiltration or regional nerve blockade. Pursuit of these options usually implies that mask ventilation will not be problematic. Therefore, these options may be of limited value if this step in the algorithm has been reached via the Emergency Pathway.

b. Invasive airway access includes surgical or percutaneous tracheostomy or cricothyrotomy.

c. Alternative non-invasive approaches to difficult intubation include (but are not limited to): use of different laryngoscope blades, LMA as an intubation conduit (with or without fiberoptic guidance), fiberoptic intubation, intubating stylet or tube changer, light wand, retrograde intubation, and blind oral or nasal intubation.

d. Consider re-preparation of the patient for awake intubation or canceling surgery.

e. Options for emergency non-invasive airway ventilation include (but are not limited to): rigid bronchoscope, esophageal-tracheal combitube ventilation, or transtracheal jet ventilation.

Summary:

- Respiratory emergencies are the most common complications during administration of anesthesia in the office.
- Diseases that present many challenges are asthma, COPD, and respiratory infections.
- Take a thorough history of patients and be prepared with the protocols in case of encountering respiratory emergencies.

Reference:

Daniel J. Gesek Jr. Respiratory anesthetic emergencies in Oral and Maxillofacial Surgery. *Oral Maxillofacial Surg Clin N Am* 25 (2014) 479-486.