

# PIP Changes During Anesthesia

**Anesthetic Pearls:** Anesthetic Implications and Management of PIP Changes during Anesthesia

**Increased Peak Inspiratory Pressures (PIP)** is a relatively common intra-operative problem anesthesiologists encounter. There are a wide variety of causes which constitute totally different treatments. Thus it is advantageous to have a quick mental categorical checklist to review when faced with this circumstance intra-operatively:

1. Bronchospasm (see table)
2. Upper Airway Obstruction
3. Mainstem Intubation
4. Severe COPD
5. CHF
6. Hemothorax / Pneumothorax
7. Pulmonary Aspiration
8. Pulmonary Edema
9. Pulmonary Embolus
10. Mechanical
  - a. Kinking of Tube
  - b. Secretions / Mucous Plug
  - c. Over-inflation of Cuff

## Causes of Intra-Operative Wheezing

1. *Bronchospastic Disease*
  - Asthma
  - COPD
2. *Induced Bronchospasm During Anesthesia*
  - Tracheal intubation
  - Aspiration of gastric contents
  - Allergic reactions (to blood / drugs)
  - Light anesthesia or surgical stimulation
  - Pulmonary embolism
  - Negative airway pressure
  - Irritation of carina by ETT
3. *Conditions Mimicking Bronchospasm*
  - Airway obstruction
    - Kinked ETT
    - Over-inflation of ETT cuff
    - Airway secretions / edema

A variety of equipment problems can result in excess airway pressures. Increased airway pressures may develop whenever an equipment malfunction causes excessive pressure delivery, obstruction to expired gas flow, or inadequate pressure relief. Excess inflow to the breathing circuit from the machine during the inspiratory phase can produce increased PIP and barotrauma. The most common example is oxygen flushing.

Management of Bronchospasm:

1. Increase inspired oxygen concentration until cause is identified and problem corrected
2. Check placement and patency of ETT by examining patient and passing a suction catheter through ETT to remove secretions
3. If abdomen is distended, pass an NG tube to decompress the stomach (especially helpful in kids)
4. Ensure adequate depth of anesthesia & muscle relaxation
5. Once all above have been checked and eliminated as causes; **begin specific treatment for bronchospasm**

**Decreased Peak Inspiratory Pressure:**

Breathing circuit disconnection is a leading cause of critical incidents in anesthesia. Pneumatic and electronic pressure monitors are helpful in diagnosing disconnections. An audible and / or visual alarm is actuated if PIP of breathing circuit does **not** exceed the threshold pressure alarm limit. This alarm sounds very quickly in case of a total circuit disconnect. However, it is possible to have a partial disconnect (leak) and be unrecognized by the low-pressure monitor if the threshold pressure alarm limit is set too low. Thus, it is recommended the anesthesiologist should set the pressure alarm limit to approximately 5 cm H<sub>2</sub>O pressure below the PIP of the patient.