

Airway Clearance Indications: Obstructive Airway Diseases

Atelectasis

Atelectasis is the incomplete expansion or collapse of all or part of a lung resulting in diminished lung volume. A very common pulmonary abnormality, in mild form it may be entirely asymptomatic. However, prolonged or severe atelectasis may impair gas exchange leading to respiratory distress. In cases of severe atelectasis, total lung collapse can lead to respiratory failure.

Atelectasis is divided physiologically into obstructive (due to bronchial obstruction) or non-obstructive (caused by compression, loss of surfactant or loss of lung tissue due to scarring) and is distinguished from pneumothorax by the mechanism of the collapse: Atelectatic collapse occurs when the alveoli inside the lung fail to expand and pneumothorax occurs when pressure is lost in the pleural space between the lung and the chest wall.

Risk factors for atelectasis include underlying obstructive lung disease, prolonged immobility, anesthesia, shallow breathing and foreign body aspiration.

What Happens in Atelectasis?

The goal of respiration is the effective exchange of gases. Oxygen, required by every cell in the body, is taken in with each inspiration and carbon dioxide (CO₂) is expelled with each expiration. Gas exchange takes place in the tiny air sacs called alveoli found at the distal (far) ends of the bronchial tubes. Optimal gas exchange occurs when the alveoli remain open and filled with air and when there is sufficient surfactant, a liquid lining that counters the natural tendency of the alveoli to collapse, present on the surface of the alveoli. When airflow to the alveoli is impaired by obstruction or scarring or there is insufficient surfactant the alveoli and surrounding parenchymal (spongy) tissue may collapse, leading to impaired gas exchange and further obstruction. Eventually the mucociliary clearance system becomes overwhelmed and a vicious cycle of secretion retention, inflammation, infection and airway damage.

How Airway Clearance Therapy Can Help Atelectasis

There is currently no known cure for atelectasis. The goal of treatment is to maximize function and maintain or improve quality of life. Keeping the airways clear of excess secretions and thereby reduce the incidence of inflammation and/or infection and is crucial to maintaining respiratory health. Airway clearance therapy using High Frequency Chest Wall Oscillation (HFCWO) has been demonstrated by clinical study to promote excess mucus clearance and improve bronchial drainage. Shear forces are created by HFCWO treatment that mechanically releases adhered secretions from the walls of the pulmonary tract. HFCWO has also been shown to reduce the viscosity of secretions which significantly improves mobilization of excess mucus. By replicating cough, HFCWO can effectively mobilize pulmonary secretions from smaller airways to larger airways where they can be coughed out, swallowed or suctioned. HFCWO has been reported to be an effective and appropriate therapy post-anesthesia and for bedridden or



otherwise immobile patients.

Symptoms of Atelectasis:

- Shortness of breath
- Hypoxemia
- Chest pain (uncommon)

For More Information on Atelectasis:

1. Medline Plus fact sheet: <http://www.nlm.nih.gov/medlineplus/ency/article/000065.htm>
2. Fact sheet from E Medicine: <http://emedicine.medscape.com/article/296468-overview>
3. Fact sheet from the Mayo Clinic: <http://www.mayoclinic.com/health/atelectasis/AN00775>
4. Fact sheet from the Merck Manual: <http://www.merck.com/mmhe/sec04/ch048/ch048a.html>