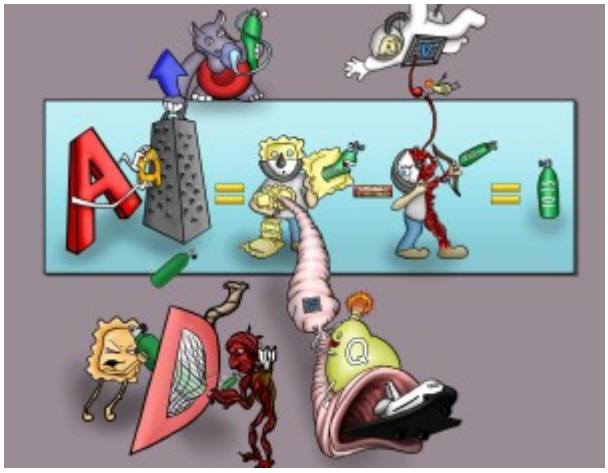
A-a Gradient

The A-a gradient represents the difference in partial pressure of oxygen between the alveoli and the arteries. The normal A-a gradient is 10 to 15 mmHg. An increase in A-a gradient can occur in hypoxemia and the causes include V/Q mismatch such as dead space or shunting and diffusion problems. V/Q mismatch means a mismatch of ventilation to perfusion (V/Q) ratio and can represent either too little perfusion due to blood flow obstruction (high V/Q) or too little ventilation due to airway obstruction (low V/Q). High V/Q is also called dead space and low V/Q is called shunting. Diffusion problems can occur when the alveolar walls are fibrosed and oxygen cannot diffuse across the alveolar wall into the blood stream. All three of these conditions can contribute to an increase in A-a gradient and cause hypoxemia. The A-a gradient can be calculated by subtracting the alveolar partial pressure of oxygen, which is calculated using the alveolar gas equation, by the arterial partial pressure of oxygen, measured with arterial blood gas (ABG).



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Partial pressure of alveolar oxygen (PAO2)
Partial Pressure-gauge with Ravioli O2-Tank
Partial pressure of alveolar O2 (PAO2) is the partial pressure of oxygen in the alveoli.

Partial Pressure of Arterial O2 (PaO2)
Partial Pressure-Gauge Artery-Archer with O2-Tank
Partial pressure of arterial O2 (PaO2) is the partial pressure of oxygen in the arteries. This can be measured with arterial blood gas (ABG).

Normal 10 to 15 mmHg
10 -15 O2-Tank
The A-a gradient in a normal person is approximately 10 to 15 mmHg. Values outside this range indicate possible pathology.

Hypoxemia with an Abnormal A-a Gradient
Hippo-blood-O2 with Up-arrow A-a Grater
Hypoxemia means a decrease in the partial pressure of oxygen in the arteries below normal levels. Hypoxemia becomes very serious when the decreased partial pressure of oxygen in blood is less than 60 mm Hg.

Diffusion problem
D-fuse Blocking O2-tank between Ravioli and Artery-archer
A diffusion problem occurs when the oxygen fails to diffuse across the alveolar wall to enter the blood. This occurs when the walls are thickened or diseased such as in the case of pulmonary fibrosis.

Shunting (Low V/Q)
Shuttle Down-low and Little V-vent OVER Big Q-pear-fuse
Shunting is a type of V/Q mismatch that happens when the alveoli of the lungs are perfused with blood, but ventilation fails to supply the perfused region. In this case, the ventilation/perfusion ratio (V/Q ratio) is zero. Examples are when the alveoli are filled with fluid like in CHF.

Dead space (high V/Q)
Dead Space-man Up-high with big V-vent OVER little Q-pear-fuse
Dead space is a type of V/Q mismatch that occurs when there is a perfusion issue in the lungs, such as a blood clot that is obstructing the blood flow (PE). This causes V/Q to increase abnormally and can lead to an increase in A-a gradient.

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