Difference Between PAO2 and SAO2

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Key Difference – PAO2 vs SAO2

The transport of oxygen (O_2) by blood in the arteries is a critical process and is governed by many factors such as pH of the blood, partial pressures of the gases in blood, saturation levels of O_2, concentration of available hemoglobin and cardiac efficiency. The balance of these factors will assure the efficient transport of O_2 to peripheral tissue based on the requirement of the particular tissue. The partial pressure and the saturation of O_2 are two very important parameters which determine healthy transport of O_2 in blood that is characterized by the Oxygen-Hemoglobin dissociation curve which depicts the saturation of hemoglobin with O_2, the partial pressure and the concentration of O_2 in blood. **The partial pressure of O_2 (PAO_2) is the pressure exerted by O_2 on the arterial walls while saturation of O_2 (SAO_2) is the overall percentage of hemoglobin binding sites occupied by O_2.** This is the key difference between PAO2 and SAO2.

What is PAO_2?

Partial Pressure is defined by Dalton's law of Partial pressures, where it is stated that the total pressure of a system is equal to the sum of the individual pressures exerted by the gases present in the mixture. The partial pressures of dissolved gases in blood are measured by assuming that the blood was allowed to equilibrate with a volume of gas. Thus, Partial Pressure of O_2 (PAO_2) also known as the **O_2 tension in blood**, is the pressure exerted by O_2 on the arterial wall. It is important to note that O_2 in blood is dissolved in a mixture of other gases such as carbon dioxide and carbon monoxide, but O_2 is the only gas that exerts a pressure on the arterial wall.

When the concentration of O_2 in the blood is higher, the PAO_2 also rises, allowing the blood to carry higher amounts of O_2 in comparison with other fluids such as water. Measuring and recording PAO_2 is important during disease states because there are certain physiological processes that depend on changes in O_2 in their microenvironments which are characterized by the changes in PAO_2.

What is SAO_2?

Saturation of O_2 (SAO_2) in blood defines the percentage of hemoglobin binding sites that are occupied by O_2. Each hemoglobin molecule can occupy four O_2 molecules as it can allosterically modify its conformation to facilitate binding of O_2 to its binding site. During 100% saturation, all hemoglobin binding sites are occupied by O_2, and any increase in partial pressure or the concentration of O_2 in blood would not cause an increase in saturation. This is depicted by the plateau area of the oxygen-hemoglobin dissociation curve. This saturation pattern is the reason for the characteristic sigmoid shaped curve of the O_2 – Hemoglobin curve.

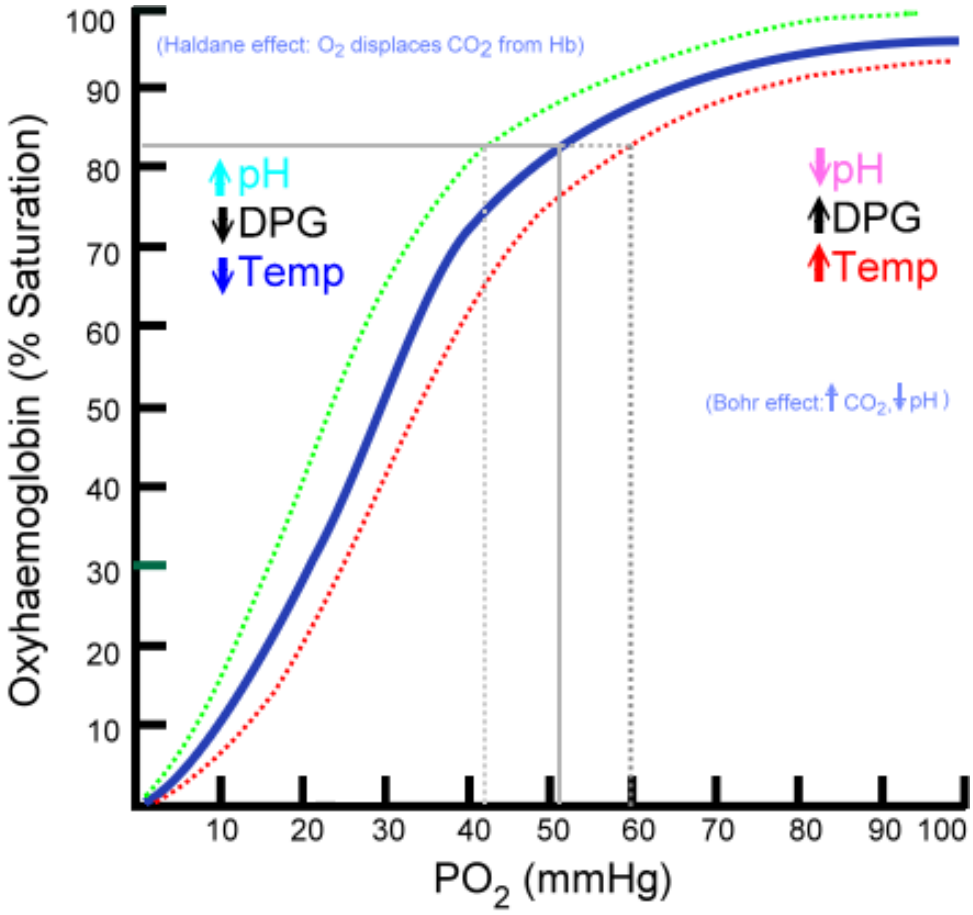

Figure 01: Oxygen-Hemoglobin dissociation curve

What are the similarities between PAO_2 and SAO_2?

- PAO_2 and SAO_2 depend on the concentration of O_2 present in the blood and lungs.

- Both parameters can be used as indicators to suggest imbalances of hemoglobin, O_2, cardiac efficiency and respiratory efficiency.
- PAO_2 and SAO_2 are directly proportional until O_2 reaches its maximum saturation.

What is the difference between PAO_2 and SAO_2?

PAO_2 vs SAO_2	
PAO_2 is the pressure exerted by O_2 on the arterial wall.	SAO_2 is the percentage of hemoglobin binding sites that are occupied by O_2.
Units of Expression	
PAO_2 is expressed in Pascal (pressure measuring units).	SAO_2 is expressed as a percentage.
Depending Factor	
Dissolved O_2 concentration affects the PAO_2.	The number of available O_2 binding sites and the PAO_2 affect the SAO_2.

Summary – PAO_2 and SAO_2

PAO_2 and SAO_2 define cardiac efficiency and are considered as markers to assess the metabolic conditions of the lungs and heart in terms of Oxygen levels. PAO_2 is the pressure exerted by O_2 on the arterial wall. SAO_2 is the percentage of hemoglobin binding sites that are occupied with O_2. This is the main difference between PAO2 and SAO2. The normal PAO_2 of a healthy person should lie above 17 kPa or 128 mmHg which will result in a 100% SAO_2 whereas the normal SAO_2 is greater than 90%. Deviations of these levels act as markers and are important in analyzing the abnormalities in hemoglobins and Carbon monoxide poisoning.

References:

1.Collins, Julie-Ann, et al. “Relating oxygen partial pressure, saturation and content: the haemoglobin–oxygen dissociation curve.” Breathe, European Respiratory Society, Sept. 2015, Available here. Accessed 21 Aug. 2017.

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1.” Oxyhaemoglobin dissociation curve” By Ratznium at English Wikipedia Later versions were uploaded by Aaronsharpe at en.wikipedia. – Transferred from en.wikipedia to Commons. (Public Domain) via Commons Wikimedia

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