Difference Between PAO2 and SAO2

www.differencebetween.com

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 SAO₂?**

Saturation of O₂ (SAO₂) in blood defines the percentage of hemoglobin binding sites that are occupied by O₂. Each hemoglobin molecule can occupy four O₂ molecules as it can allosterically modify its conformation to facilitate binding of O₂ to its binding site. During 100% saturation, all hemoglobin binding sites are occupied by O₂ and any increase in partial pressure or the concentration of O₂ 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 O₂—Hemoglobin curve.

![Oxygen-Hemoglobin dissociation curve](image)

**Figure 01: Oxygen-Hemoglobin dissociation curve**

**What are the similarities between PAO₂ and SAO₂?**

- PAO₂ and SAO₂ depend on the concentration of O₂ present in the blood and lungs.
Both parameters can be used as indicators to suggest imbalances of hemoglobin, O₂, cardiac efficiency and respiratory efficiency.

PAO₂ and SAO₂ are directly proportional until O₂ reaches its maximum saturation.

What is the difference between PAO₂ and SAO₂?

<table>
<thead>
<tr>
<th><strong>PAO₂ vs SAO₂</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>PAO₂ is the pressure exerted by O₂ on the arterial wall.</td>
</tr>
<tr>
<td><strong>Units of Expression</strong></td>
</tr>
<tr>
<td>PAO₂ is expressed in Pascal (pressure measuring units).</td>
</tr>
<tr>
<td><strong>Depending Factor</strong></td>
</tr>
<tr>
<td>Dissolved O₂ concentration affects the PAO₂.</td>
</tr>
</tbody>
</table>

Summary – PAO₂ and SAO₂

PAO₂ and SAO₂ define cardiac efficiency and are considered as markers to assess the metabolic conditions of the lungs and heart in terms of Oxygen levels. PAO₂ is the pressure exerted by O₂ on the arterial wall. SAO₂ is the percentage of hemoglobin binding sites that are occupied with O₂. This is the main difference between PAO₂ and SAO₂. The normal PAO₂ of a healthy person should lie above 17 kPa or 128 mmHg which will result in a 100% SAO₂ whereas the normal SAO₂ 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:
