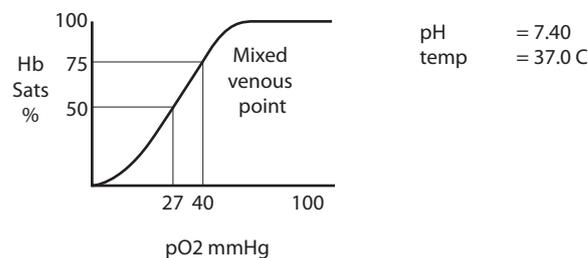


FEB 2008
QUESTION 10

Briefly describe the factors that influence partial pressure of oxygen in mixed venous blood

Mixed venous blood refers to blood taken from the pulmonary artery where mixing between the SVC, IVC and coronary sinus has occurred. The normal partial pressure of MV blood is approximately 40mmHg. (see below)

The partial pressure of oxygen in the sample is dependent on the HbO₂ dissociation curve which is non linear due to the variable binding affinity of the four oxygen molecules to haemoglobin and dependent on pH, temp and 2,3 DPG concentration.



The relationship between Hb saturation in MV blood is dependent on the oxygen content in blood via the formula

$$\text{MV O}_2 \text{ Content} = \text{Hb(sats)}1.34 + \text{dissolved O}_2 \text{ (dissolved is ignored)}$$

MV O₂ content is dependent on oxygen delivery - oxygen extraction

$$\text{Oxygen delivery} = \text{CO}(\text{Hb.Sats}.1.34 + \text{dissolved})$$

normal value 1000ml/min

factors which decrease this value are

- decreased cardiac output (decreased preload, contractility, HR or increased afterload)
- decreased saturations (V/Q mismatch, decreased V, decreased PiO₂, Shunt, increased CO₂)
- decreased Hb (blood loss, iron deficient anaemia, anaemia of chronic disease, etc)

$$\text{Oxygen extraction} = \% \text{ of delivery removed}$$

normal value 250ml/min

factors which increase this value are

- increased metabolic activity (sepsis, exercise, malignancy, pregnancy)
- right shift of HbO₂ curve (CO₂, pH, 2,3 DPG)

Therefore normal values for MV O₂ content is 750ml/min

this equates to a Hb saturation of 75% (other factors being equal)

using a standard HbO₂ curve (pH, 2,3 DPG and temp normal)

gives a pO₂ of MV blood of approximately 40mmHg

Anything that decreases oxygen delivery or increases oxygen demand will result in decreased MV O₂ content and hence MV pO₂. This is why this measure is very useful in the critically ill.