

JULY 2007
QUESTION 24

Explain the causes of differences between measured end tidal and arterial partial pressures of carbon dioxide

PaCO₂ is the partial pressure of CO₂ in a sample of mixed arterial blood.
normal value is 35-45

PETCO₂ is the partial pressure of CO₂ measured at the mouth at the end of expiration
normal value is 32-42

Dead space represents air that is inspired that does not take place in gas exchange.

Apparatus dead space is relevant with respect to patients being mechanically ventilated

Anatomical dead space represents the conducting airways which do not take place in exchange
normal value is 2ml/kg or 150mls

Alveolar dead space is the ventilated alveolus which are not perfused, therefore nil exchange
carbon dioxide concentration approaches 0

The combination of anatomical dead space and alveolar dead space represents physiological dead space

The air at the very end of expiration is exclusively from the alveolus

reduction in CO₂ concentration in PETCO₂ compared to PaCO₂ is therefore a result of the alveolar dead space (where pCO₂ is close to 0)

The main causes of an increased difference (and therefore increased alveolar dead space) are pathological

Pulmonary embolism

Starling resistor mechanisms (external pressure exceeds intravascular pressure - West zone 1 of the lung)

Decreased intravascular pressure

Low cardiac output

Increased external (intrathoracic pressure)

Asthma

PEEP

Another question similar to this included PECO₂

partial pressure of CO₂ in the mixed expired gas of a whole breath (collected in a douglas bag)

may be used with the bohr equation and the paCO₂ to calculate physiological dead space

derived bohr equation $PECO_2(\text{Tidal volume}) = PaCO_2(\text{Tidal volume} - \text{Physiological dead space})$

normal value is around 30mmHg