

METHAEMOGLOBINAEMIA: EFFECT ON CO DIFFUSION (DLCO)

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We present a patient with methaemoglobinaemia referred to the Respiratory Laboratory for lung function tests. Methaemoglobinaemia (Met-Hb >1%) refers to the oxidation of ferrous to ferric iron within the haemoglobin (Hb) molecule, often an acute response to drugs used in a hospital setting. Met-Hb levels > 15% are accompanied by cyanosis & dyspnoea; Levels > 50% can be fatal. The effect of Met-Hb on measurements such as pulse oximetry and arterial blood gases are well recognised, however its effect on the DLCO measurement has never been published, despite the importance of total Hb & CO-Hb on DLCO calculations. Met-Hb will not bind CO, leading to an “anaemia effect” and reducing the effective haemoglobin available to bind with CO during the DLCO manoeuvre.

The recommended correction to DLCO calculations for Hb in males is:

$DLCO \text{ (Hb corrected)} = DLCO \text{ (measured)} * ((10.22 + Hb) / 1.7Hb)$. – Equation 1.

We suggest the “anaemia effect” of Met-Hb would reduce the amount of effective haemoglobin ($Hb_{\text{effective}}$) even further, warranting additional DLCO correction.

$Hb_{\text{effective}} = Hb * (100 - \text{MetHb} / 100)$ – Equation 2.

Results: Our subjects DLCO was 15.5ml/min/mmHg (74% predicted). Correction for the measured Hb of 12.4g/dL increased the DLCO to 16.6ml/min/mmHg. We calculated $Hb_{\text{effective}}$ to be 10.8g/dL. Inserting this value into equation 1, the Met-Hb corrected DLCO becomes 17.9 ml/min/mmHg (80% predicted).

Discussion: Correction for the “anaemia effect” of Met-Hb in this subject resulted in a 7% increase in reported DLCO. The effect of elevated Met-Hb is likely to be more pronounced in the presence of a marked anaemia. In such instances a Met-Hb of 20% could result in a 15% underestimation in DLCO unless a correction for effective Hb is made. Fortunately the incidence of elevated Met-Hb is low – only 5 cases >5% Met-Hb were reported at our hospital in the past 2 years, and only 1 (our index case) had a DLCO measurement performed.

Conclusion: Any DLCO in the presence of methaemoglobinaemia should be corrected to account for the “anaemic effect” of the Met-Hb.

Key words: DLCO, methaemoglobin