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Pulse oximetry not reliable for diabetic patients?

Summarized from

Pu L, Shen Y, Lu L *et al*. Increased blood glycohemoglobin A1c levels lead to overestimation of arterial oxygen saturation by pulse oximetry in patients with type 2 diabetes. Cardiovascular Diabetology 2012; 11: 110. As accessed: www.cardiab.com/content/11/1/110 December 2012.

Pulse oximeters, which are ubiquitous in nearly all areas of clinical care, provide the means for safe, non-invasive continuous monitoring of blood oxygen saturation. The validity of using pulse oximetry to assess patient blood oxygenation status depends on SpO_2, the parameter measured by pulse oximetry, being a reliable estimate of arterial oxygen saturation (sO_2(a)), the parameter directly measured during blood gas analysis.

In most clinical contexts SpO_2 is more or less equal to sO_2(a), but that is not always the case and it is important to be aware of the limitations of pulse oximetry and define clinical situations when there is no alternative to blood gas analysis for accurate assessment of blood oxygenation.

According to the results of a recent clinical study, pulse oximetry may not be suitable for assessment of blood oxygenation among type 2 diabetic patients with poor glycemic control and consequent increased HbA1c. The study population comprised 261 type 2 diabetes patients who were critically ill and required oxygen therapy and/or mechanical ventilation.

Their care included continuous monitoring of oxygen saturation using a pulse oximeter. Fasting blood was sampled from each study patient for glucose and HbA1c. Arterial blood was sampled for blood gas analysis, including measurement of sO_2(a). As arterial blood was sampled, the patient's SpO_2 reading from pulse oximeter was recorded.

For the purposes of this study poor glycemic control was defined as HbA1c > 7.0 %; by this definition 114 of the 261 patients (44 %) had poor glycemic control. There was essentially no difference between SpO_2 and sO_2(a) among those with adequate glycemic control: mean SpO_2 95.1 % ± 2.8 and mean sO_2(a) 95.3 % ± 2.8.

However, there was a significant difference (bias) between the two parameters among those with poor glycemic control: mean SpO_2 98.0 % ± 2.6 and mean sO_2(a) 96.2 % ± 2.9. The magnitude of the bias was demonstrated to correlate with HbA1c, so that the higher the HbA1c the greater is the difference between SpO_2 and sO_2(a).

The authors were able to conclude that among patients with poorly controlled type 2 diabetes, pulse oximetry overestimates arterial oxygen saturation. It may be more appropriate to use arterial blood gas analysis, rather than pulse oximetry, to monitor treatment of hypoxemia in these patients.