Emergency Department Management of Suspected Carbon Monoxide Poisoning: Role of Pulse CO-Oximetry

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Study Objective

The RAD-57 pulse CO-oximeter is a lightweight device allowing noninvasive measurement of blood carboxyhemoglobin (SpCO). We assessed the diagnostic value of pulse CO-oximetry, comparing SpCO to standard laboratory blood measurement (COHb) in emergency department (ED) patients with suspected carbon monoxide (CO) poisoning.

Methods

This was a prospective, diagnostic accuracy study according to STARD criteria (Standards for the Reporting of Diagnostic accuracy studies) in consecutive adult ED patients with suspected CO poisoning. Transcutaneous SpCO was obtained using the RAD-57 simultaneously with blood sampling for laboratory blood gas analysis, with no change to standard management of CO poisoning. Correlation between SpCO and COHb was assessed using Bland and Altman's method. Diagnostic performances of SpCO for the screening of CO poisoning were determined using ROC curve analysis. Blood COHb levels >5% and 10% for non-smokers and smokers respectively were applied as the reference standard.

Results

93 patients were included (56 smokers, 37 non-smokers). CO poisoning was diagnosed in 26 patients (28%). SpCO values ranged from 1% to 30%, with a median of 4% (IQR: 2.7 - 7.3). COHb values ranged from 0% to 34%, median: 5% (IQR: 2 - 9). Mean differences between COHb and SpCO values was -0.2% ± 3.3%, with 95% limits of agreement (LOA) [-6.7%, +6.3%] COHb (-0.7%, LOA [-7.7, +6.2] for non-smokers ; +0.6%, LOA [-5.0, +6.2] for smokers). 6% and 9% SpCO provided optimal thresholds for detecting CO poisoning, in smokers and non-smokers respectively.

Conclusion

SpCO measurement using the RAD-57 pulse-oximeter cannot be used as a substitute for standard blood COHb measurement. However, noninvasive pulse CO-oximetry could be useful as a first-line screening test, enabling rapid detection and management of CO poisoned patients in the ED.