

A Laboratory Comparison of the Newest “Motion-Resistant” Pulse Oximeters during Motion and Hypoxemia.

Barker S.J., Morgan S. *Proceeding of the 2004 Society for Technology in Anesthesia*. 2004; Abs 8.

Introduction

Pulse oximeters are subject to well-documented errors caused by patient motion. We have developed a standardized volunteer protocol that has been previously used to compare the performances of many oximeters during motion and hypoxemia. (1,2) Our protocol has yielded results that are consistent with published clinical studies. (3) In the present experiment, we compared five recent instruments that claim to be “motion resistant” with each of them set in their fastest time-response mode.

Methods

Ten volunteers participated, with IRB approval and informed consent. Using our standard protocol, each subject was instrumented with three oximeters sensors on the moving (test) hand; and three on the stationary (control) hand. Instruments studied include the Datex-Ohmeda 3900, Masimo Radical, Novamatrix MARS, Nellcor N-595, and Philips Viridia. All were set in their fastest (short averaging time) mode. Motor-driven hand motions were used as described earlier. (2) Values obtained during motion were compared with simultaneous values from the control hand. Data were recorded during motion both while breathing room air, and during rapid desaturations to SpO₂ = 75%. Tabulated results include sensitivity and specificity for detection of hypoxemia (threshold: SpO₂ <90%), missed hypoxemic events, false alarms, and averaging time.

Results

Results are shown in Table 1. Masimo Radical had the highest sensitivity followed by the Philips C1. Radical also has the highest specificity (fewer false alarms) followed by Datex-Ohmeda 3900. Sensitivity was lowest for the Datex-Ohmeda and specificity was lowest for the Novamatrix.

Missed Hypoxic Events. Sensitivity , False Alarms, Specificity, Averaging Time.

Pulse Oximeter	Missed Events	Sensitivity %	False Alarms	Specificity %	Averaging sec
Masimo (v 4.1)	1	99	4	97	2
Philips (C1)	9	78	11	82	5
D-O 3900 (V 9/11)	16	60	7	88	3
N-595 (v 3000)	15	63	16	73	2
MARS (v 2001)	15	63	30	50	2

Discussion

These are the first laboratory experiments to compare the latest “motion resistant” oximeters in their fastest time response modes. Using our standardized motion/hypoxemia protocol, we found a wide range in sensitivity and specificity values. The Masimo Radical performed much better than all four of the other models tested.