Date

Title : ACCURACY OF A NEW NON-INVASIVE OXYGEN SATURATION MONITOR

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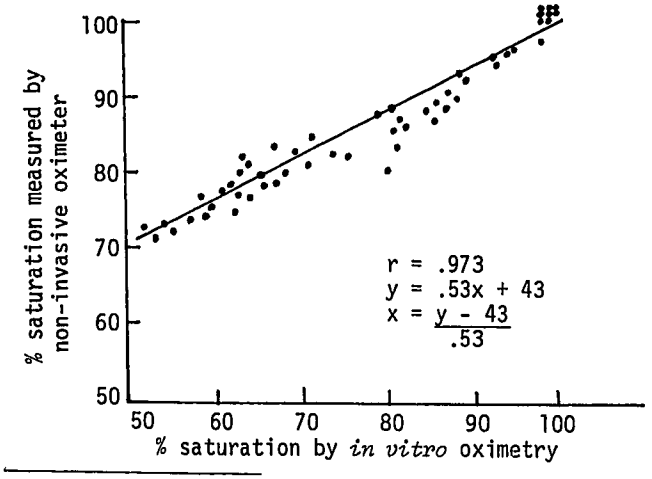
Introduction. Hemoglobin saturation is a major determinant of the blood's ability to carry oxygen. A simple, accurate, continuous, non-invasive oxygen saturation meter would be a valuable monitor because many anesthetic mishaps are associated with the late recognition of hypoxemia.

This study compared oxygen saturations obtained by a new non-invasive monitor* with results from a standard *in vitro* oximeter,** in volunteers in whom inspired oxygen percentages were varied sufficiently to produce the entire range of physiological oxygen saturations.

Methods. Five healthy males volunteered for the study and gave informed consent to a protocol approved by the Stanford Medical Committee for the Protection of Human Subjects in Research. Each subject had two non-invasive oximeters affixed to two fingertips on the same hand. A teflon catheter was placed in the radial artery of the opposite arm. The subject then breathed oxygen-nitrogen mixtures with various percentages of oxygen delivered through a Mapleson "D" circuit. The fresh gas inflow rate was fifteen liters per minute. Following stabilization of the non-invasive oximeter readings, arterial blood samples were collected in heparinized glass syringes and analyzed for hemoglobin saturation. This sequence was repeated several times using different oxygen-nitrogen mixtures.

Results. A comparison of the results obtained by the two methods are presented in Figure 1. An excellent linear correlation between the two methods was found.

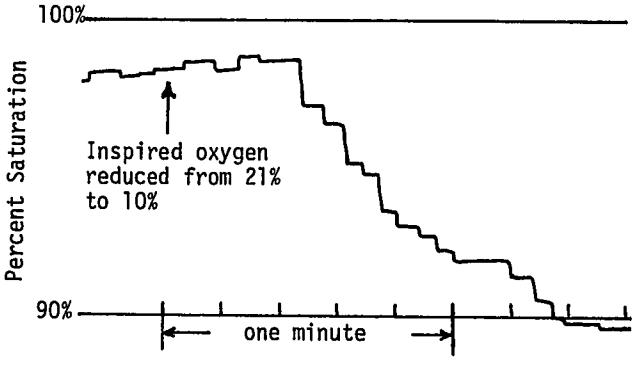
Figure 1.



*Minolta Oximeter Model 101
**Radiometer Model OSM2 Hemoximeter

The rapid response of the non-invasive oximeter to a change in the inspired oxygen concentration is shown in Figure 2. The average time from a change in the inspired gas mixture to a distinct change in the non-invasive monitor's reading was less than one minute. The two non-invasive oximeters always recorded values within three percentage points of one another.

Figure 2. Response time of the non-invasive oximeter.



Discussion. The non-invasive oximeter measures hemoglobin saturation by transilluminating a fingertip and comparing the absorption of two wavelengths of light through the finger during systole and diastole. The change of absorption of light during the cardiac cycle is related to the oxygen saturation of hemoglobin. The new instrument computes saturation from these data and displays the result digitally. The results obtained with this oximeter have been reported to correlate well with *in vitro* oximetry at hemoglobin saturations above 90%,[1] and our study supports that finding. As the saturation drops, however, the new instrument's measurements deviate progressively more from the results obtained by *in vitro* oximetry, with the non-invasive device consistently overestimating the hemoglobin saturation. Since this deviation is linear, as shown in Figure 1, the instrument could be programmed to make this correction or the user could make the correction.

The ease of use and the speed and linearity of the response of this non-invasive oximeter make it a promising monitoring device for use in anesthesia.

Reference. 1. Suzukawa M, Fujisawa M, Matsushita F, et al: Clinical application of fingertip pulse wave oximeter. (Translation) MASUI Jap J Anesth (Tokyo) 27:(6), 1978

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