Title: ACCURACY OF PULSE OXIMETRY IN CYANOTIC CONGENITAL HEART DISEASE

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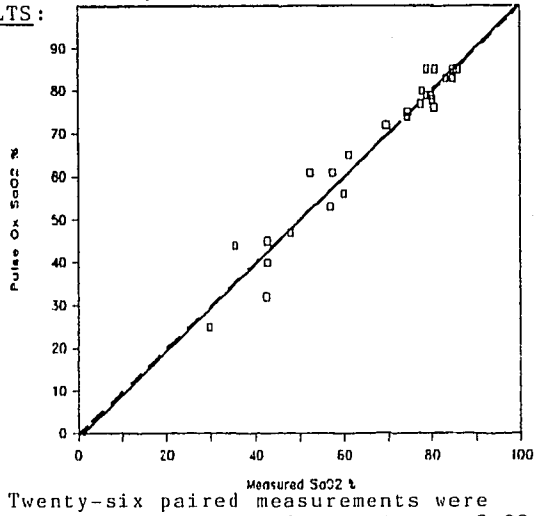
INTRODUCTION:

Children with cyanotic congenital heart disease (CCHD) during their perioperative course can undergo rapid changes in their physical status. Measurement of oxygen saturation (SaO2) is an invaluable monitor to detect hypoxemia, as well as to optimize pulmonary and systemic blood flows during anesthesia and in the ICU (1). While several investigators have evaluated oximetry in the 90 % SaO2 range (1,2,3), we have investigated the accuracy of SaO2 values less than 85 % as derived from pulse oximetry.

METHODS:

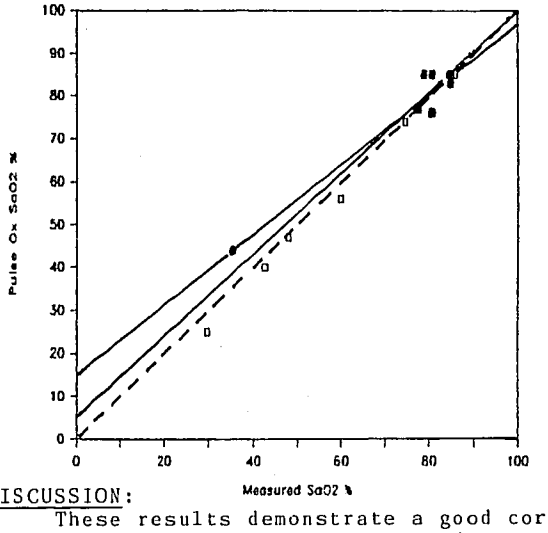
Nine children, ages 4 days - 18 months with various CCHD defects were studied. This study was approved by the Institutional Review Board. Simultaneous routine measurements of SaO2 by pulse oximetry and arterial blood gas co-oximetry in the same extremity were obtained perioperatively. Blood drawn from an indwelling arterial line was evaluated for pH, pO2, pCO2, HCO3, SaO2 and hemoglobin content. The co-oximeter, an Instrumentation Laboratories IL282, measured the arterial blood SaO2 (% O2 Hgb). Continuous SaO2 was monitored using the Nellcor N-100 pulse oximeter. Co-oximeter and pulse oximeter SaO2 values were compared by linear regression analysis.

RESULTS:




Twenty-six paired measurements were made of pulse oximetry and co-oximetry SaO2 of values less than or equal to 85%. Linear regression analysis of the paired arterial blood and pulse oximetry SaO2 values revealed a correlation Y = 1.01x - 0.71, r = 0.97. The standard error of the estimate (SEE) = 4.1, N = 26. The regression is demonstrated by the solid line and the dashed line is the line of identity in the figure above.

The question has been raised as to whether the regression analysis of such pooled patient data is valid.(4) Individual linear regression analysis was performed in two of our patients with N > 4. The regression equations were: Y = 0.823x + 14.9, r = 1.0, SEE = 3.2, N = 7 and Y = 1.06x - 5.7, r = 1.0, SEE = 1.2, N = 6. These are illustrated in the following figure:




DISCUSSION:

These results demonstrate a good correlation between pulse oximeter and arterial blood co-oximeter SaO2 for values less than or equal to 85%. Pulse oximetry allows accurate continuous assessment of the patient's arterial oxygenation by means of a rapid noninvasive method of measurement.

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