compensates for the many intra-patient differences, such as skin pigmentation, hemoglobin concentration, and fingernail polish. Only conditions which preferentially affect only one side of the algorith (*e.g.*, the light absorption of the pulsatile or non-pulsatile compartments) will affect pulse oximetry readings.

* IL282 CO-Oximeter Manual, p. 1.5, 1981.

RICHARD UNGER, M.D.
Assistant Clinical Professor of Anesthesiology

MARK S. SCHELLER, M.D.
Assistant Professor of Anesthesiology

Department of Anesthesiology
UCSD Medical Center
225 Dickinson Street
San Diego, California 92103

REFERENCES

1. Kessler M, Eide T, Bharathi H, Poppers P: Spurious pulse oximeter desaturation with methylene blue injection. ANESTHESIOLOGY 65:435–436, 1986
2. Scheller M, Unger R, Kelner M: Effects of intravenously administered dyes on pulse oximetry readings. ANESTHESIOLOGY 65:550–553, 1986
3. Artru AA, Colley PS: Bunegin-Albin CVP catheter improves resuscitation from lethal venous air embolism in dogs (abstract). Anesth Analg 65:S7, 1986
4. Albin MS, Carroll RG, Maroon JC: Clinical considerations concerning detection of venous air embolism. Neurosurgery 3:380–384, 1978
5. Yelderman M, New W: Evaluation of pulse oximetry. ANESTHESIOLOGY 59:349–352, 1983

(Accepted for publication March 19, 1987.)

Anesthesiology
67:149, 1987

In Reply:—Unger and Scheller suggest that the spurious pulse oximetry desaturation associated with intravenous methylene blue administration, initially described by Kessler and Eide,[1] will return to baseline as the dye distributes into venous capillary blood. It is my understanding that the pulse oximeter measures and compares light transmission at the two selected wavelengths (660 nm and 925 nm), and continuously subtracts the non-pulsatile or reference portion of the transmitted light from the total transmission of the pulsating arterialized blood. Therefore, a varying light transmission through non-pulsatile venous blood, whether caused by a changing concentration of dye or deoxyhemoglobin, would be continuously factored out.

Yelderman and New,[2] in their evaluation of pulse oximetry, state that "because the detected pulsatile wave form is produced solely from arterial blood, using the amplitude at each wavelength and Beer's Law allows exact beat-to-beat continuous calculation of arterial hemoglobin oxygen saturation with no interference from surrounding venous blood, skin, connective tissue, or bone."

Intravenous methylene blue pharmacokinetics have been investigated in dogs,[3] and have shown a very rapid and extensive uptake of the dye by tissues (30% of the injected dose taken up by lungs, liver, kidneys, and heart by 3 min in the rat model), where it is bound in the reduced leucomethylene blue form. Additionally, a very rapid and significant decrease in whole blood concentration of the dye has been demonstrated to occur within 10 min after intravenous injection.

Renal excretion of methylene blue in humans[4] has been shown to be present for up to 5 days after oral administration, with 78% excreted as stabilized, colorless, leucomethylene blue. However, the pharmacokinetics and renal excretion of intravenous methylene blue in humans, to my knowledge, have not yet been studied.

Therefore, perhaps my original statement concerning the normalization of pulse oximetry values after intravenous methylene blue administration should be modified to state that the return to normal values of oxygen saturation most likely reflects the dilution of the dye, and its rapid and extensive uptake by body tissues.

THOMAS R. EIDE, M.D.
Assistant Professor

BHARATHI HUMAYUN-SCOTT, M.D.
Assistant Professor

PAUL J. POPPERS, M.D.
Professor and Chairman

Department of Anesthesiology
State University of New York
Stony Brook, New York 11794

REFERENCES

1. Kessler M, Eide, T, Humayun-Scott B, Poppers P: Spurious pulse oximeter desaturation with methylene blue injection. ANESTHESIOLOGY 65:435–436, 1986
2. Yelderman M, New W: Evaluation of pulse oximetry. ANESTHESIOLOGY 59:349–352, 1983
3. DiSanto A, Wagner J: Pharmacokinetics of highly ionized drugs III: Methylene blue. J Pharm Sci 61:1090–1094, 1972
4. DiSanto A, Wagner J: Methylene blue-absorption, metabolism, and excretion in man and dog after oral administration. J Pharm Sci 61:1086–1089, 1972

(Accepted for publication March 19, 1987.)