Title : INTRAOPERATIVE TRANSCUTANEOUS pO_2 MONITORING IN INFANTS

Authors : J. T. Messner, M.D., P. C. Loux, D.O., and L. B. Grossman, M.D.

Affiliation: Department of Anesthesia, The Milton S. Hershey Medical Center, The Pennsylvania State University, 500 University Drive, Hershey, Pennsylvania 17033

Introduction: This is a preliminary study in anesthetized infants to assess the Litton Transcutaneous Oxymonitor as an Indicator of oxygenation intraoperatively with respect to it's correlation with arterial blood gases and it's use as a trend monitor of arterial oxygen tension.

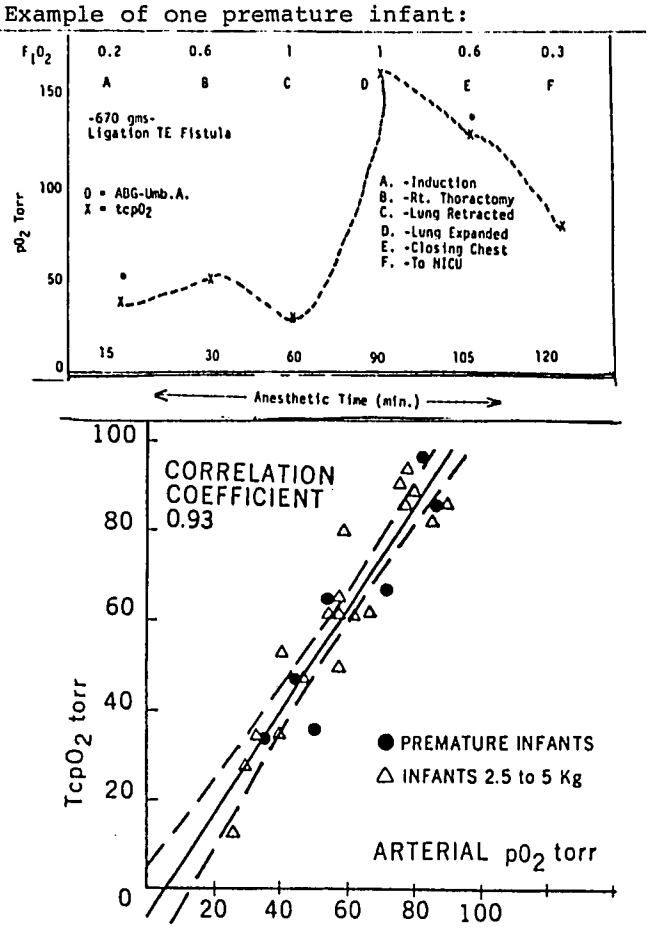
Methods: The unit's Transoxode (a small transducer patterned after a heated Clark electrode) was applied to the skin of infants with an adhesive ring, theoretically arterializing the capillary bed beneath it by thermal hyperemization. Arterial blood gases were drawn from umbilical or radial arterial lines and were recorded upon the anesthetic records, along with the simultaneously appearing $tcpO_2$ from the Oxymonitor digital display. The printed record from the Litton recorder run at a paper speed of 10 mm/min., was retained for review, including data written upon it indicating significant surgical and anesthetic events, as they coincided with the continuous $tcpO_2$ recording. Two groups of infants were compared: premature infants (under 2 Kg.) and infants 2.5-5 Kgs. A variety of anesthetic agents and relaxants were used.

Results: Twenty-seven points were plotted upon a graph showing correlation of arterial pO_2's drawn simultaneously with $tcpO_2$ readings. Within the range of 40 thru 100 torr the correlation coefficient was .93 regardless of the anesthetic agent or muscle relaxant selected. In premature infants when pCO_2 was less than 25 torr, the $tcpO_2$ was falsely lower compared with simultaneous arterial pO_2 results. Above 100 torr the relationship of $tcpO_2$ to arterial pO_2 was not reliable. In all children, the trends of the $tcpO_2$ provided early clues to a variety of potentially hypoxic situations: endobronchial intubation; disconnection from the anesthetic circuit; ventilation-perfusion mismatch; underperfusion from acute blood loss; and cardiac arrest.

Discussion: Numerous centers are reporting their experience with transcutaneous electrodes, particularly in neonatal units, as monitors of arterial oxygenation.[1,2] Anesthesiologists are additionally concerned about unsuspected and undocumented periods of hypoxia and/or hyperoxia during surgery, affecting not only the brains, but also the retinas of small babies.[3] Although at present the Oxymonitor is not a substitute for arterial blood gas samples, it suggests a safer course for anesthetized premature infants: It correlates well with arterial blood gases in a 40-100 torr pO_2 range; and indicates early changes in oxygenation and/or perfusion. Severe hyperventilation of premature infants may adversely affect reliable correlation, however. In those small babies where arterial catheterization is not practical, the Oxymonitor may guide the anesthesiologist in more appropriately altering oxygen concentrations during anesthesia.

Illustrations:

Example of one premature infant:



References:

1. Clarke, TA, Mannino, F, Gluck, L: Use of transcutaneous pO_2 ($tcpO_2$) monitor in routine neonatal intensive care (Abstr). American Academy of Pediatrics Spring Session - Anesthesiology Section, 1978
2. Indyk, L: pO_2 in the seventies. Pediatrics 55:153-156, 1975
3. Betts, EK, Downes, JJ, Schaffer, DB, et. al.: Retrolental fibroplasia and oxygen administration during general anesthesia. Anesthesiology 47:518-520, 1977