Continous End-Tidal CO_2 ($P_{ET}CO_2$) Monitoring in Respiratory Distress Syndrome.

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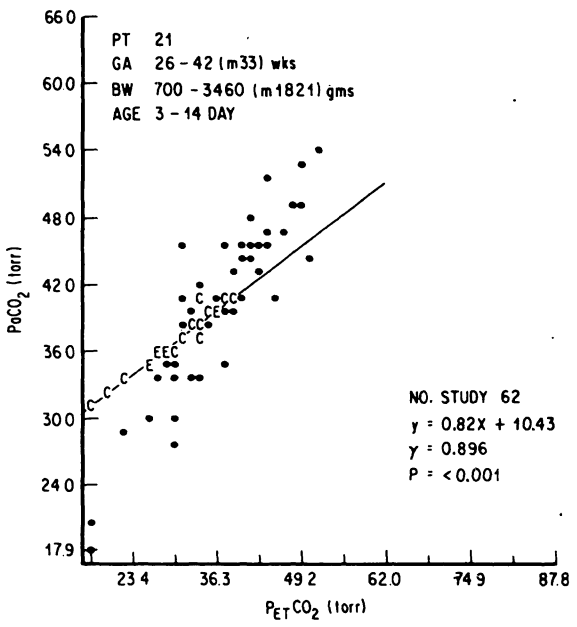
Continuous end-tidal CO_2 monitoring has not been widely used in neonatal respiratory care mainly because of technical difficulty arising from large instrumental dead space relative to small air way and tidal volume of newborns, especially preterm infants. Recently this problem has been overcome by using a minimal dead space ET tube adapter and a high flow sampling rate (150 ml/min). The purpose of this study is to evaluate the relationship between end-tidal CO_2 and arterial CO_2 tension ($PaCO_2$) in non-distressed newborns as well as newborn infants suffering from respiratory distress syndrome.

Material & Method. Study I. Eleven infants (age 1-14 days, GA 26-40 wks, B.W. 760-4120 gm) considered to have no major respiratory disease were studied during spontaneous breathing. A Foregger End-Tidal CO_2 monitor was used to follow $P_{ET}CO_2$ continuously via a sampling tube placed at the posterior nasopharynx through a nostril. Arterial PCO_2 was determined by IL 813 blood gas analyzer. Study II. Twenty-one patients (age 3-14 days, GA 26-42 wks, B.W. 700-3460 gms) were studied. $P_{ET}CO_2$ was monitored via ET tube during mechanical ventilation one day prior to extubation. Study III. Using the same procedure as that of Study II, we further studied Alveolar-arterial PCO_2 difference ($AaDCO_2=PaCO_2-P_ECO_2$) in 14 neonates being mechanically ventilated because of respiratory distress syndrome. (Mean GA 30.4 wk,range 28-35 wks, mean BW 1370 gm, range 830-2420 gm Age 0-8 days). Relationship between 1). fraction inspired O_2 (FiO_2) and $AaDCO_2$ 2). peak inspiratory pressure (PIP) and $AaDCO_2$ 3). $AaDCO_2$ and duration of mechanical ventilation (IMV) were studied.

Results: Study I: correlation between $P_{ET}CO_2$ obtained via nasopharynx in normal infants and $PaCO_2$ was extremely good. Linear regression analysis revealed a relationship of $PaCO_2=1.00 \times P_{ET}CO_2+3.22$, correlation coefficient $r=0.932$ and $P<0.001$. Study II: See figure I. Study III, see figures 2,3, and 4.

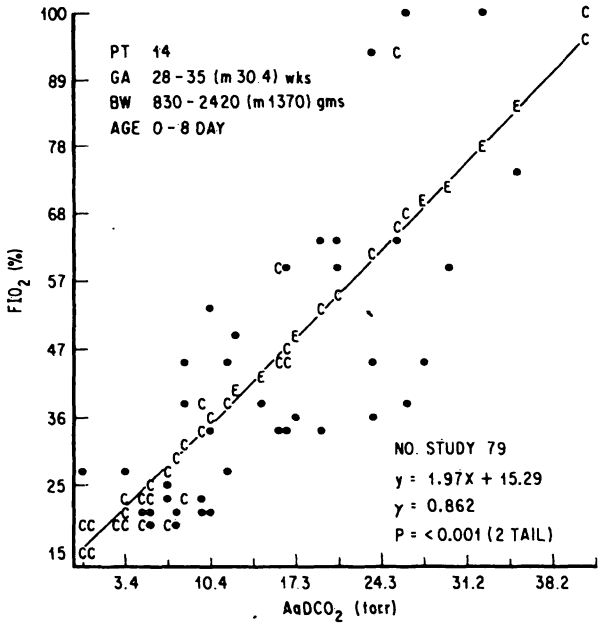
Conclusion: End-tidal CO_2 correlates very well with $PaCO_2$ in normal and near normal lungs of preterm as well as term newborn infants. 2. The severer the RDS, the greater the $AaDCO_2$, 3. The greater the $AaDCO_2$, the higher the FiO_2 requirement, 4. The greater the $AaDCO_2$, the higher PIP is needed to ventilate the patient, 5. The greater the $AaDCO_2$, the longer the duration of mechanical ventilation, 6. When $AaDCO_2$ is less than 5, the patient is ready to be extubated. End tidal CO_2 monitoring is non-invasive, it reduces the loss of blood due to frequent blood gas samplings, it helps monitor PCO_2 continuously and it proves to be an important asset in the respiratory care of the newborn infant.

$P_{ET}CO_2$ ($PACO_2$) VS. $PaCO_2$ IN NEWBORNS
$P_{ET}CO_2$ VIA ET TUBE
BEFORE SUCCESSFUL EXTUBATION



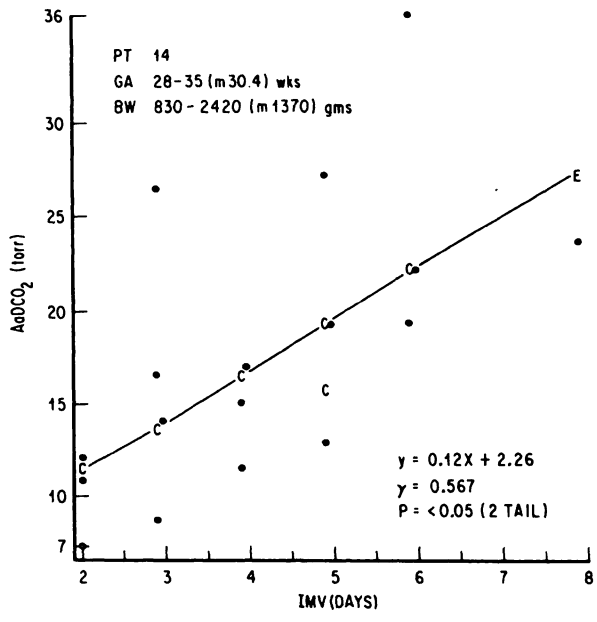
$PaCO_2 = 0.8\ P_ECO_2 + 10$
$mAaDCO_2 = 4$ torr

$AaDCO_2$ VS. FiO_2 IN IRDS



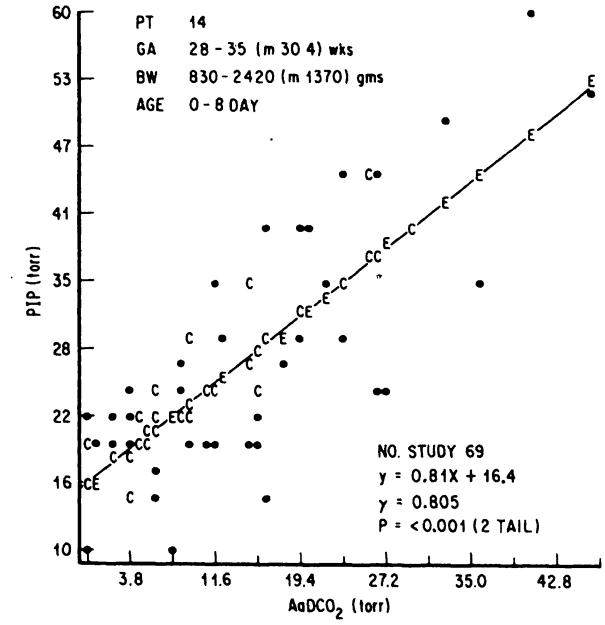
$FiO_2 = 1.97\ AaDCO_2 + 15.29$

$AaDCO_2$ VS. IMV DAYS IN IRDS



IMV DAYS = $0.12\ AaDCO_2 + 2$

$AaDCO_2$ VS. PIP IN IRDS



PIP = $0.81\ AaDCO_2 + 16.4$

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