End-Tidal CO2 Levels vs. Arterial CO2 Levels in Children with TBI

For patients with Traumatic Brain Injury (TBI), the partial pressure of CO2, arterial (PaCO2) can be adjusted to help with the regulation of cerebral perfusion. However, this can prove difficult to carry out in children. The non-invasive method of capnography measures end-tidal CO2 (EtCO2) and is often used for paediatric patients as an alternative to arterial cannulation.

EtCO2 measurements have previously been used to predict PaCO2 levels in adults but as such, no major clinical evidence is available to confirm or deny the accuracy of this method in paediatric patients with TBI. The Brain Trauma Foundation has published guidelines that recommend avoidance of prophylactic hyperventilation and PaCO2 less than 30mm Hg in the initial 48 hours after submission. But there is no recommendation either for or against the use of EtCO2. This study was conducted to evaluate the validity of using EtCO2 as an indicator of PaCO2 in children and adolescents. Using secondary analysis, researchers explored the agreements of PaCO2-EtCO2 measurements in 137 patients in the PICU.

Study findings show that less than 50% of the PaCO2-EtCO2 pairs were in agreement, with only moderate correlation in the first 24 hours. Results suggest that PaCO2-EtCO2 substitutions may be even more unreliable within the first 8 hours of admission, as the differences in PaCO2-EtCO2 were largest during this period.

Findings also show that the presence of Paediatric Acute Respiratory Distress Syndrome (PARDS) in the first 24 hours of admission to the PICU was associated with a lower likelihood of PaCO2-EtCO2 agreement. On average, PaCO2 was 9.9mm Hg higher than its paired EtCO2 value in patients who developed PARDS within the first 24 hours of admission. The median PaCO2-EtCO2 differences were found to be higher overall with those that developed PARDS in the week after TBI, compared to those who did not develop PARDS. However, more research is needed for the use of PaCO2-EtCO2 differences in indicating PARDS occurrence.

Based on these results, EtCO2 should not be substituted for PaCO2 measurements in paediatric patients. Researchers recommended that PaCO2 should be used when monitoring CO2 levels in the first 24 hours after TBI.

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