ICU
MANAGEMENT & PRACTICE

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

For patients with Traumatic Brain Injury (TBI), the partial pressure of CO_2, arterial ($PaCO_2$) 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 CO_2 ($EtCO_2$) and is often used for paediatric patients as an alternative to arterial cannulation.

$EtCO_2$ measurements have previously been used to predict $PaCO_2$ 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 $PaCO_2$ less than 30mm Hg in the initial 48 hours after submission. But there is no recommendation either for or against the use of $EtCO_2$. This study was conducted to evaluate the validity of using $EtCO_2$ as an indicator of $PaCO_2$ in children and adolescents. Using secondary analysis, researchers explored the agreements of $PaCO_2$-$EtCO_2$ measurements in 137 patients in the PICU.

Study findings show that less than 50% of the $PaCO_2$-$EtCO_2$ pairs were in agreement, with only moderate correlation in the first 24 hours. Results suggest that $PaCO_2$-$EtCO_2$ substitutions may be even more unreliable within the first 8 hours of admission, as the differences in $PaCO_2$-$EtCO_2$ 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 $PaCO_2$-$EtCO_2$ agreement. On average, $PaCO_2$ was 9.9mm Hg higher than its paired $EtCO_2$ value in patients who developed PARDS within the first 24 hours of admission. The median $PaCO_2$-$EtCO_2$ 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 $PaCO_2$-$EtCO_2$ differences in indicating PARDS occurrence.

Based on these results, $EtCO_2$ should not be substituted for $PaCO_2$ measurements in paediatric patients. Researchers recommended that $PaCO_2$ should be used when monitoring CO_2 levels in the first 24 hours after TBI.

Source: JAMA Network Open
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