Correlation of end - tidal CO$_2$ Measurement to Arterial PaCO$_2$ During CO$_2$ Inhalation for Cerebrovascular Reactivity (CVR) test

Abstract: Correlation of end - tidal CO$_2$ measurement to arterial PaCO$_2$ during CO$_2$ inhalation for cerebrovascular reactivity (CVR) test
Varinee Lekprasert M.D.*, Chatchaya Kamnerdthong M.D.*
*Department of Anesthesiology, Faculty of Medicine Ramathibodi Hospital, Mahidol University, Bangkok 10400, Thailand.

Background: The CO$_2$ inhalation was used for evaluating the cerebrovascular reactivity in the patients with cerebrovascular disorders. There were different methods to perform CO$_2$ inhalation. In our study, we designed the CO$_2$ inhalation method, using the Bain circuit and the previously known concept of the correlation between the end - tidal CO$_2$ (EtCO$_2$) and partial pressure of carbon dioxide (PaCO$_2$) in normal ventilation.

Objective: To study the correlation between the EtCO$_2$ and the PaCO$_2$ during CO$_2$ inhalation in the patients with cerebrovascular disorders using the Bain circuit.

Methods: A cross - sectional prospective study was performed in 14 patients. The patients with cerebrovascular disorders who were sent for computed tomography angiography (CTA) of the brain received the CO$_2$ inhalation (5% carbon dioxide in 95% oxygen) via the anesthetic mask using the Bain circuit for approximately 4 - 6 minutes until EtCO$_2$ was 20% higher than baseline value. The EtCO$_2$ and the PaCO$_2$ were measured before (pre - EtCO$_2$, PaCO$_2$) and after the CO$_2$ (post - EtCO$_2$, PaCO$_2$) inhalation.

Results: There were 14 patients who had brain CTA scans and CO$_2$ inhalation. The mean of pre -
EtCO₂ was 35.29 mm Hg and post - EtCO₂ was 42.64 mm Hg. The difference values of EtCO₂ and PaCO₂ was 2.75 mm Hg. EtCO₂ values did correlate with PaCO₂ values significantly both in pre - CO₂ inhalation (p = 0.024, r = 0.6) and post - CO₂ inhalation (p < 0.001, r = 0.9). Four patients had abnormal cerebrovascular reactivity when received CO₂ inhalation. Two of four patients had cerebral revascularization subsequently and the other two patients had clinical observation by a neurosurgeon. Conclusions: There was a correlation of EtCO₂ and PaCO₂ during CO₂ inhalation for cerebrovascular reactivity test in the patients who had cerebrovascular disorders.

Keywords: CO₂ inhalation, cerebrovascular reactivity, Bain circuit

References