



## Paper No. 32

# Correlation between end-tidal and arterial carbon dioxide partial pressure in patients undergoing craniotomy

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## Abstract:

**Background:** Both end-tidal carbon dioxide pressure (ETCO<sub>2</sub>) is used routinely as an indicator of arterial partial pressure of carbon dioxide (PaCO<sub>2</sub>) and thus adequacy of ventilation. Accurate determination of the PaCO<sub>2</sub> level in neuroanesthesia is quite important because of its effect on cerebral blood flow and also hyperventilation is often used to reduce intracranial pressure in neurosurgical patients. This study was aimed to evaluate the relationship between ETCO<sub>2</sub> and arterial PaCO<sub>2</sub> in neurosurgical patients undergoing craniotomy to assess the predictive value of ETCO<sub>2</sub> as an indicator of PaCO<sub>2</sub> level.

**Methods:** Forty-five consecutive adult patients with inclusion criteria, scheduled to undergo elective craniotomy surgery were enrolled in this prospective study. Measurements of PaCO<sub>2</sub> and ETCO<sub>2</sub> were performed at three different intervals: Time 1: 10 min after induction of general anesthesia; time 2: after cranium opening prior to dural incision; and at time 3: start of dural closure. All patients received the same anesthetic agent (propofol, sufentanil, atracurium, oxygen). Data were initially analyzed using Pearson's Correlation to assess the relationship between PaCO<sub>2</sub> and ETCO<sub>2</sub> at different stages of the operation. A p-value (P) of less than 0.05 was considered significant. The agreement between the measures of CO<sub>2</sub> was assessed using Bland-Altman method, where mean difference and average between PaCO<sub>2</sub> and ETCO<sub>2</sub> were calculated. The 95% confidence intervals for the lower and upper limits of agreement were presented. .

**Results:** A total of 44 patients, aged 18 to 65 years, ASA grades 1 and 2 were participated in the study. Mean difference, standard deviation and correlation coefficient of the parameters were calculated for three time periods. The values for PaCO<sub>2</sub>, ETCO<sub>2</sub>, (PaCO<sub>2</sub>- ETCO<sub>2</sub>), and correlation coefficient for 10 min after anesthetic induction, prior to dural incision, and start of dural closure were  $35.4 \pm 3.2$ ,  $32.1 \pm 3.2$ ,  $3.8 \pm 2.1$ , and  $0.565$ ,  $36.2 \pm 3.1$ ,  $32.6 \pm 3.2$ ,  $4.8 \pm 3.1$ , and  $0.574$ , and  $36.7 \pm 2.4$ ,  $33 \pm 3.2$ ,  $3.8 \pm 2.3$ , and  $0.627$ , respectively (p less than 0.01 for all analyses). The greatest mean difference occurred just prior to dural incision. The lowest mean difference was observed at 10 min post-anesthetic induction.

**Conclusions:** To the present study was aimed to correlate between End-tidal and arterial carbon dioxide partial pressure in neurosurgical patients undergoing craniotomy. Findings of this study showed that ETCO<sub>2</sub> consistently underestimates the value of PaCO<sub>2</sub> during craniotomy indicating that ETCO<sub>2</sub> value can be used instead of PaCO<sub>2</sub>.

## Keywords:

**End-tidal carbon dioxide pressure, Arterial partial pressure of carbon dioxide, Craniotomy**

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