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To evaluate the effect of change in end tidal carbon dioxide on optic nerve sheath diameter under general anaesthesia: A prospective study

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Background:

Elevated Intra-Cranial Pressure (ICP) is a common and potentially life-threatening condition. The trans-orbital ultrasonography is a non-invasive method which detects raised ICP by evaluating increases in the Optic Nerve Sheath Diameter (ONSD). Dynamic responsiveness of ONSD, in association with acute change in EtCO2, (both hypercapnia and hypocapnia) which can affect ICP, still has not been well investigated. We hypothesized that there would be dynamic changes in ONSD in response to corresponding changes in EtCO2.

Objectives:

Primary objective is to evaluate the change in Optic Nerve Sheath Diameter (ONSD) with change in End tidal Carbon Dioxide (EtCO2). Secondary objective is to evaluate if the change in ONSD in response to change in end tidal carbon dioxide is immediate (real time). To evaluate if the change in ONSD is reversible with restoration of end tidal carbon dioxide to previous level.

Methods:

56 patients, with age between 18-60 years, either sex, or admitted to undergo elective spine surgery under general anaesthesia were included. All patients were exposed to both hypercapnia and hypocapnia and the ONSD values were recorded. However, for the purpose of the study, after induction of GA the respiratory rate was adjusted to attain the desired EtCO2 value (normocapnia, hypocapnia or hypercapnia). ONSD values were obtained at normo, hyper and hypo-capnia in all the patients.

Results:

A strong correlation was found between the corresponding EtCO2 and ONSD values with Pearson's correlation coefficient of 0.89 (Figure 1). There was no statistical difference between ONSD values at 0 and 5 minutes after attaining the desired EtCO2 level. The change in ONSD was reversible with EtCO2 reversibility.

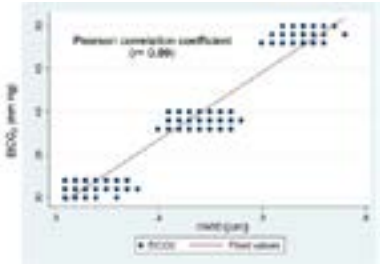

Figure 1. Correlation between ONSD and EtCO2.

Conclusion:

ONSD has a strong correlation with EtCO2 and it changes directly and significantly in response to changes in EtCO2.

Biography

Niraj Kumar is Professor, in the Department of Neuroanesthesiology and critical care, at AIIMS, New Delhi, India. He is actively involved in conducting Research projects (e.g., Intramural, extramural, DM thesis). He has developed novel pressure measuring device for the ultrasound probe with AIIMS–IIT Delhi collaborative project (as Principal investigator), the device is under the patent process. He has completed a fellowship Program: (Clinical Research Methodology and Evidence-Based Medicine) at AIIMS, New Delhi. He is the instructor (Faculty) of–ATLS, ANC, ACCC, AIIMS–EM-SONO, AUTLS, AIIMS cadaver airway. He is the Course Director of-Cadaveric Airway Management Course. He has delivered a series of talks in ultrasound as Course Director-Ultrasound POCUS SERIES-Classroom an online ISNACC initiative. He has given a series of lectures in the National Live Webinar Series-Neuroanesthesia, conducted by NBEMS (National board of examinations in Medical Sciences).

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