Does hyperventilation improve operating condition during supratentorial craniotomy? A multicenter randomized crossover trial.

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Abstract

BACKGROUND:

Hyperventilation has been an integral, but poorly validated part of neuroanesthetic practice. We conducted a two-period, crossover, randomized trial to evaluate surgeon-assessed brain bulk and measured intracranial pressure (ICP) in patients undergoing craniotomy for removal of supratentorial brain tumors during moderate hypocapnia or normocapnia.

METHODS:

Two-hundred and seventy-five adult patients with supratentorial brain tumors were randomized to one of two treatment sequences: hyperventilation (arterial carbon dioxide tension, PaCO\textsubscript{2} = 25 +/- 2 mm Hg) followed by normoventilation (PaCO\textsubscript{2} = 37 +/- 2 mm Hg) or normoventilation followed by hyperventilation. Ventilation and end-tidal CO\textsubscript{2} tension were kept constant for 20 min. Patients were also randomly assigned to receive a propofol infusion or isoflurane anesthesia. At the end of each study period, subdural ICP was measured and the neurosurgeon, blinded to the treatment group, was asked to rate the brain bulk using a four-point scale.

RESULTS:

Using a generalized estimation equation model, we found that hyperventilation decreased the risk of increased brain bulk by 45\%, P = 0.004, 95\% confidence intervals 22\% to 61\%, and the number needed to treat was 8. The mean (+/-SD) ICP during hyperventilation, 12.3 +/- 8.1 mm Hg, was lower than that during normoventilation, 16.2 +/- 9.6 mm Hg, P < 0.001. Anesthetic regimen did not affect brain bulk assessment or ICP.
CONCLUSIONS:

In patients with supratentorial brain tumors, intraoperative hyperventilation improves surgeon-assessed brain bulk which was associated with a decrease in ICP.