ANESTHETIC PHARMACOLOGY

Hypercapnic Hyperventilation Shortens Emergence Time from Isoflurane Anesthesia

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BACKGROUND: To shorten emergence time after a procedure using volatile anesthesia, 78% of anesthesiologists recently surveyed used hyperventilation to rapidly clear the anesthetic from the lungs. Hyperventilation has not been universally adapted into clinical practice because it also decreases the PaCO₂, which decreases cerebral bloodflow and depresses respiratory drive. Adding deadspace to the patient’s airway may be a simple and safe method of maintaining a normal or slightly increased PaCO₂ during hyperventilation.

METHODS: We evaluated the differences in emergence time in 20 surgical patients undergoing 1 MAC of isoflurane under mild hypocapnia (ETCO₂ approximately 28 mmHg) and mild hypercapnia (ETCO₂ approximately 55 mmHg). The minute ventilation in half the patients was doubled during emergence, and hypercapnia was maintained by insertion of additional airway deadspace to keep the ETCO₂ close to 55 mmHg during hyperventilation. A charcoal canister adsorbed the volatile anesthetic from the deadspace. Fresh gas flows were increased to 10 L/min during emergence in all patients.

RESULTS: The time between turning off the vaporizer and the time when the patients opened their eyes and mouths, the time of tracheal extubation, and the time for normalized bispectral index to increase to 0.95 were faster whenever hypercapnic hyperventilation was maintained using rebreathing and anesthetic adsorption (P < 0.001). The time to tracheal extubation was shortened by an average of 59%.

CONCLUSIONS: The emergence time after isoflurane anesthesia can be shortened significantly by using hyperventilation to rapidly clear the anesthetic from the lungs and CO₂ rebreathing to induce hypercapnia during hyperventilation. The device should be considered when it is important to provide a rapid emergence, especially after surgical procedures where a high concentration of the volatile anesthetic was maintained right up to the end of the procedure, or where surgery ends abruptly and without warning.