QEEG Changes Correlate with Quality of Emergence from General Anesthesia.
Gugino L., Chabot R., Aglio L., Block-Salisbury E., Prichep L., John E.R. *Anesthesiology* 2001; 95:A288.

Introduction

Most patients undergoing anesthesia emerge from anesthesia in a drowsy state. Occasionally, patients regain consciousness in an excited and/or restless state. The latter quality of emergence was noted in volunteers anesthetized with an etomidate based total intravenous technique but not after anesthesia with sevoflurane, propofol, nitrous oxide, or methohexital. This report examined the short-term cognitive and neurophysiological consequences of five different anesthetic agents. In all cases, indices of cognitive function and the QEEG obtained 45 to 60 minutes post anesthesia were compared to the same indices collected prior to the initiation of anesthesia.

Methods

Six ASA I volunteers (mean age = 30.3 years) were recruited for this IRB approved study. The volunteers were exposed to targeted step increases of propofol, sevoflurane, etomidate or methohexital on different occasions separated by one month. After loss of consciousness all agents were increased to 1.4 x MAC or MEC1. After administration of succinylcholine and intubation, the hypnotics were decreased in 0.1 targeted steps until return of consciousness (ROC) after which the anesthetic was increased to 1 MAC then turned off with the volunteer being allowed to regain consciousness. A second group of six volunteers induced with propofol were switched to N2O anesthesia at 70% by volume after intubation. The nitrous oxide was then reduced in 10% decreasing steps until ROC was achieved. QEEG was collected prior to induction and 45 to 50 minutes after return of consciousness with cognitive status assessed after the QEEG was obtained. Cognitive function was tested using the trigger/dot and digit/symbol substitution tests. The Neurometric analysis technique was used for calculating absolute power in the delta, theta, alpha, and beta frequency bands from the 19 channel QEEG at baseline and after emergence. Differences in absolute power for each frequency band were obtained 45 minutes after ROC for each anesthetic by comparison to preinduction values. QEEG values were expressed in standard deviation units. The differences were obtained by averaging across 7 frontal, 5 central, and 7 posterior recording regions. A one way ANOVA was used to compare the difference magnitudes for each region and frequency band across the different agents.

Results

Etomidate caused residual increases in delta and theta absolute power across all regions in comparison to the other anesthetic agents ($p < .0001$). The increased slow wave activity tended to be greater in the anterior recording leads. Methohexital caused increased frontal and central theta and increased central beta in comparison to sevoflurane, N2O, and propofol which did not differ from each other. One hour after ROC volunteers anesthetized with etomidate showed decreased performance compared to the pre-anesthesia baseline state, on both the trigger/dot and digit/symbol tests, and those with methohexital decreased performance on the trigger/dot test ($p < .05$). Performance on these tests was at baseline levels for those anesthetized with sevoflurane, propofol, and N2O.