The Effect of Rocuronium on the Response of CVI to Laryngoscopy

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Introduction: The Composite Variability Index (CVI) is a novel measure of the combined variability in BIS and frontal EMG activity that may be useful in assessing the nociception/anti-nociception balance for patients under general anesthesia. In a multi-center trial of 120 patients undergoing general surgery without neuromuscular blockade (NMB), CVI was strongly associated with involuntary, intraoperative patient movement[1]. Since frontal EMG is a subcomponent of CVI, the effect of NMB drugs may limit the utility of CVI. This study describes the effect of different NMB doses on CVI response to laryngoscopy

Methods: 80 patients undergoing general surgery were enrolled across two clinical sites. General anesthesia was established with target-controlled infusion of propofol (4 mg/ml, Marsh model) and remifentanil (2 ng/ml, Minto model). Patients were randomized to receive 0, 0.2, 0.4, or 0.6 mg/kg of rocuronium prior to laryngoscopy. Three minutes after administration of rocuronium, a clinician blinded to the rocuronium dose performed a 20-second laryngoscopy. EEG was monitored via a BIS Bilateral EEG sensor (Covidien, Boulder, CO, USA). Raw EEG, processed BIS parameters, and the times of the laryngoscopy were recorded electronically via Rugloop II software (Demed, Temse, Belgium). CVI (v2.1) was computed offline. Data were available and analyzed for 75 of the 80 subjects enrolled. The maximum values of CVI (maxCVI) and sEMG (maxSEMG), a subcomponent of CVI that measures the variability of frontal EMG, were computed over the three minute period following laryngoscopy. One-way ANOVA was used to test whether mean maxCVI varied with rocuronium dose. The average value of maxCVI and maxSEMG for each of the four rocuronium groups was compared against the average maxCVI and maxSEMG values for all patients in the one minute period prior to laryngoscopy. Comparisons of the means were accomplished via student's t-test with Bonferroni correction for multiple comparisons. $P < 0.05$ was considered statistically significant.

Results: Figure 1 shows the mean (± SD) for maxCVI post laryngoscopy for each of the 4 rocuronium groups. The mean of maxCVI pre-laryngoscopy for all 75 subjects is shown for comparison. One-way ANOVA shows that mean maxCVI is affected by rocuronium dose ($p < 0.001$). However, mean maxCVI was higher post-laryngoscopy than pre-laryngoscopy for all rocuronium doses (0 mg/kg: $p < 0.001$; 0.2 mg/kg: $p < 0.001$; 0.4 mg/kg: $p = 0.001$; 0.6 mg/kg: $p = 0.016$). The difference was much weaker for the 0.4 and 0.6 mg/kg doses. Mean maxSEMG was statistically higher post-laryngoscopy vs pre-laryngoscopy for rocuronium doses 0 mg/kg ($p < 0.001$), 0.2 mg/kg ($p < 0.001$), and 0.4 mg/kg ($p = 0.003$), but not for the 0.6 mg/kg dose ($p = 0.9$).

Conclusions: CVI response to laryngoscopy is reduced by rocuronium. While the responses at the highest rocuronium doses are still statistically significant, the reduced response may not

be clinically useful. These results suggest that CVI may still be useful at moderate levels of neuromuscular blockade.