

## Muscle Relaxants and Electroencephalogram

To the Editor:

I was surprised to read in the report of Ueyama *et al.*<sup>1</sup> the erroneous statement, "A muscle relaxant itself does not have an effect on electroencephalogram." We described an increase in duration of electroencephalography isoelectric interval during burst suppression after the administration of pancuronium in dogs anesthetized with isoflurane.<sup>2</sup> This effect was then reversed by antagonism of neuromuscular blockade with neostigmine. The failure of Ueyama *et al.*<sup>1</sup> to control for neuromuscular blockade in their study of pregnant patients may present a confounding variable.

**Arthur E. Schwartz, M.D.,** Mount Sinai Medical Center, New York, New York. arthur.schwartz@mountsinai.org

### References

1. Ueyama H, Hagihira S, Takashina M, Nakae A, Mashimo T: Pregnancy does not enhance volatile anesthetic sensitivity on the brain: An electroencephalographic analysis study. *ANESTHESIOLOGY* 2010; 113:577-84
2. Schwartz AE, Navedo AT, Berman MF: Pancuronium increases the duration of electroencephalogram burst suppression in dogs anesthetized with isoflurane. *ANESTHESIOLOGY* 1992; 77: 686-90

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In Reply:

Thank you for your interest in our article.<sup>1</sup> Schwartz *et al.*<sup>2</sup> reported that pancuronium increased the duration of isoelectricity produced by isoflurane during burst suppression in experiments with canines. When a burst and suppression pattern was observed in a clinical situation, the anesthetic level was considered too deep. Contrary to this, Ge *et al.*<sup>3</sup> reported that vecuronium did not alter the bispectral index during isoflurane anesthesia. Grief *et al.*<sup>4</sup> also showed that mivacurium did not affect the bispectral index value during propofol anesthesia. In these reports, the index (BI<sup>hx</sup> in Ge *et al.*<sup>3</sup> and bispectral index in Grief *et al.*<sup>4</sup>) was approximately 40-50, which indicated the usual clinical level of anesthesia. The authors analyzed many electroencephalograms and concluded that vecuronium did not change electroencephalographic waveforms or derivatives during sevoflurane/opioid anesthesia in the usual clinical settings. The authors speculated that the phenomenon that Schwartz AE *et al.*<sup>2</sup> observed was specific for pancuronium or in a deep anesthetic level.

It is well known that contamination of electromyograms may falsely increase electroencephalographic derivatives, and

administration of a neuromuscular blocker restores them. In our study, the level of electromyograms was kept adequately low, thereby making the possibility that muscle afferents might alter the level of consciousness unlikely. The authors believe that muscle relaxants would not affect our results.

**Hiroshi Ueyama, M.D.,\* Satoshi Hagihira, M.D., Ph.D.**

\*Osaka University Graduate School of Medicine, Osaka, Japan. ueyama@hp-op.med.osaka-u.ac.jp

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1. Ueyama H, Hagihira S, Takashina M, Nakae A, Mashimo T: Pregnancy does not enhance volatile anesthetic sensitivity on the brain: An electroencephalographic analysis study. *ANESTHESIOLOGY* 2010; 113:577-84
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3. Ge SJ, Zhuang XL, He RH, Wang YT, Zhang X: Neuromuscular block with vecuronium reduces the rapidly extracted auditory evoked potentials index during steady state anesthesia. *Anaesthesia* 2003; 50:1017-22
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## Ethics and Human Experimentation

To the Editor:

I thank James Eisenach, MD for asking Edward Domino, MD<sup>1</sup> to provide us with a fascinating historic overview of the development of ketamine, a compound for which new uses are being found almost 50 yr after its introduction into US clinical practice. I commend Eisenach for asking Susan Palmer, MD,<sup>2</sup> to provide an ethical commentary about the experimentation on prisoners that was used to test the safety of phencyclidine and then ketamine. I agree with Palmer's conclusion that the results of Domino's experiments should be retained in the research literature. On the other hand, I respectfully disagree with her statements that respect for patient autonomy was not clearly defined in 1965 and that a clear understanding of a researcher's obligation to human subjects was achieved only after the development of federal regulations and their publication in the Code of Federal Regulations.

First, the Nuremberg Code, a response to unethical human experimentation on prisoners, clearly described informed consent and "free power of choice" in its first article in 1947.<sup>3</sup> Second, the Declaration of Helsinki, as adopted by the World Medical Association in June 1964, clearly described what is needed for informed consent in patients, such as prisoners, who are in a dependent relationship with the investigator.<sup>4</sup> Meanwhile, one anesthesiologist, Henry K.