

A New Time Domain Display Method to Monitor an EEG Signal During Anesthesia

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Introduction: Propofol plus an opioid such as fentanyl is one example of a category of anesthesia protocol known as “total IV anesthesia” (TIVA). A common progression of EEG signals from high to low concentration of propofol (“pathway”) is illustrated with one case below. A time domain method based on digital filters which can be used to monitor the anesthetic is used in the illustration below.

Methods: The EEG signal was previously recorded with a BIS™ monitor. A Custom program using LabView™ was used to generate the illustration. Superimposed rectified filtered frequency bands were used to display the peak to peak amplitude of each of the five standard EEG frequency bands. Delta is red, theta is green, and alpha is blue. All three signals are rectified and displayed on the upper half illustration on the same scale. Beta is yellow and gamma is purple. Both are rectified and displayed on the lower half of the illustration. Beta is on the same scale as delta, theta, and alpha but gamma is on a scale that makes it appear five times larger than it would if on the same scale as the other bands.

The left of the illustration is the entire procedure which lasted almost 40 minutes. The three panes in the left of the illustration are from 0, 20, and 29 minutes at a much more expanded time scale.

Results: The illustrated method shows the changes in the five frequency bands from 3.9 mcg/ml to 0.7 mcg/ml propofol in a manner that is easy to follow. The Increase and then decrease in the power of the alpha band (blue) is easy to appreciate.

Conclusions: The illustrated time domain method provided an alternative to frequency domain methods for the monitoring of an EEG signal during an anesthetic. This method may be easier for clinicians to interpret and respond to changes more quickly than traditional frequency domain methods and offers more complexity than an index such as BIS™.

