Depth of Anaesthesia and Outcomes

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The current practice of general anaesthesia emphasises giving adequate doses of anaesthetic drugs in order to ensure that all patients are unconscious. Additional sedative and analgesic drugs are often then given to prevent or treat haemodynamic instability and in response to changing surgical stimulation. This approach is effective and safe for most of our patients.

However, the dose of anaesthetic that ensures unconsciousness for all patients means those who are sensitive to anaesthetics receive significantly more drug than necessary.[1] Reducing the dose towards the threshold for consciousness becomes a matter of judgement, unless monitors that process the frontal lobe electroencephalograph (EEG) to track anaesthetic depth are used. These monitors make it possible to titrate anaesthetic dose more precisely according to individual patient requirements. Marketing of these monitors, such as the bispectral index monitor (BIS) (Covidien Inc, Colorado, USA), has emphasised their use to ensure sufficient anaesthetic administration to prevent awareness. Their use to reduce unnecessarily deep anaesthesia is more controversial.

An association between relatively deep anaesthesia and increased post-operative mortality has been demonstrated in a number of observational studies.[2-11] The majority of these studies have been *post hoc* analyses of studies undertaken for other purposes, for example determining whether the use of processed EEG monitors reduces the incidence of awareness. All have used the BIS monitor to measure anaesthetic depth and most report statistically significant associations between BIS values <45 and death.

All the randomized trials to date have used the BIS monitor to measure anaesthetic depth. One reported increased mortality in a BIS=50 group than in a BIS >80 group[12] and two reported no difference between BIS = 35 and BIS = 50-55 groups.[13,14]

The ANZCA Clinical Trials Network (http://www.anzca.edu.au/fellows/Research/clinical-trials-network.html) is leading an international randomized controlled trial of deep (BIS = 35) and light (BIS = 50) volatile-based general anaesthesia (the Balanced Anesthesia Study) (Australian New Zealand Clinical Trials Registry No: 12612000632897). In total 6500 patients will be required to explore our hypothesis of a 20% relative risk reduction for 1-year mortality in the BIS = 50 group. The choice of BIS targets for light and deep anaesthesia was based on previous studies where BIS has been blinded, and the manufacturer's recommendations.[15] Anaesthetists will also be asked to maintain MAP between patient-specific limits that they identify before randomization.

What should you do as you read the literature on this subject and wait for definitive evidence? Our recommendation is that you strive for the optimal anaesthetic depth: deep enough to avoid intraoperative responsiveness and postoperative recall but light enough to avoid intraoperative hypotension and postoperative side effects. Titration of anaesthetic depth using a processed EEG monitor, in addition to clinical signs, haemodynamic responses and anaesthetic delivery indices, will allow identification of patients with anaesthetic sensitivity.

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