The Narcotrend ‘depth of anaesthesia’ monitor cannot reliably detect consciousness during general anaesthesia: an investigation using the isolated forearm technique

Editor—In the discussion of his paper comparing the Narcotrend monitor to the isolated forearm technique (IFT), Russell1 states that ‘to be clinically useful, not only must an anaesthesia brain monitor be 100% accurate but it must also be reliable’. This is an expectation of depth of anaesthesia monitoring that I often hear expressed by colleagues, despite the general lack of 100% accuracy in predictive tests used in clinical practice. Certainly neither the measurement of end-tidal concentrations of volatile anaesthetic agents, a commonly used surrogate of depth of anaesthesia, nor the use of target-controlled infusions of propofol predict consciousness or explicit recall with complete accuracy. Myles and colleagues2 showed that another depth of anaesthesia monitor produces false negatives, reporting a patient who recalled sternal sawing despite bispectral index (BIS) values of 55–59 at that time. However, they also showed that BIS can reduce the incidence of awareness in high-risk patients by 82% within the setting of a randomized, controlled trial, despite its failings. This is a benefit that has not been demonstrated for the IFT.

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Editor—I agree that neither minimum alveolar concentration (MAC) nor target-controlled infusions of propofol can predict consciousness, and as a result it is usual to err on the side of safety and give additional anaesthesia. However, if a brain monitor is used as a guide to monitor the depth of anaesthesia, we do quite the opposite: we reduce the administration of anaesthetic drugs to ‘sail closer to the wind’. It is in this context that the monitor needs to be 100% accurate; otherwise, as shown by my results, there is a risk that by reducing anaesthetic administration to follow some number on a monitor many more patients could well be conscious. The ‘reliability’ refers not so much to the accuracy of the monitor, but to how dependable it is: end-tidal monitors, ECGs, non-invasive blood pressure (NIBP) machines, etc. do not suddenly go blank for up to 9 or 10 min at a time. But even if they did, they are generally ‘non-critical’ as we are not relying on them to ensure unconsciousness.

In his reference to the study by Myles and colleagues,2 Dr Bould, similar to the authors, seems to misunderstand the term ‘awareness’. The title of that study refers to the prevention of awareness ‘during anaesthesia’ but the authors define ‘awareness’ as ‘the patient’s recollection of intraoperative events’. Thus, what that study2 demonstrated, when using the BIS monitor, was a reduced incidence of ‘recall of intraoperative events’. This is not the same as ‘awareness during anaesthesia’. ‘Awareness’ is the state of being ‘aware’ or ‘conscious’, it does not imply anything about ‘memory’ or ‘recall’ assessed at some later time. As Ghoneim and Block3 state, the term ‘awareness’ is ‘ambiguous and confusing’ ‘anaesthetic jargon’. Myles and colleagues2 do not know how many of their patients were ‘aware’ (i.e. conscious) during surgery (with or without the experience of pain at the time), they only know the number of patients who, in the postoperative period, had recall for intraoperative events. Also of note is the fact that BIS was allowed to increase to 70 during the last 15 min to facilitate rapid awakening. In my limited experience of using the BIS in conjunction with the IFT in paralysed patients, it is not uncommon for patients to regain consciousness with a BIS value between 60 and 70; before reversing the neuromuscular blocking agent. Without the IFT, this fact would be unknown to investigators and, after reversal, rapid ‘awakening’ would be reported. In reality, it is likely that many of these patients were already conscious before this point—reversal of muscle relaxation merely allows the patient to communicate this fact. This is the strength of the IFT—the anaesthetist knows when a patient is conscious and responsive, irrespective of what number is output on the screen of an anaesthesia brain monitor. With my experience of the IFT and several brain monitors over the past few years, I would hesitate to titrate anaesthesia according to brain monitor output alone (with or without the usually monitored physiological parameters), but I have no such reservations when the brain monitor is backed up by the IFT, these together form a consciousness/awareness monitoring duo par excellence: with both in use, you can ‘sail close to the wind’ with confidence rather than rely on chance!

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3 Ghoneim MM, Block RI. The word ‘awareness’: its ambiguous and confusing use in anesthesia literature on memory. Anesthesiology 1990; 73: 193

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