

Bispectral index in psychiatric patients: Is there a need for a separate monitor?

The bispectral index (BIS) was conceptualised to provide a substitute for the complex electroencephalograph (EEG) analysis with an easy to understand ‘magic’ number, to measure hypnotic effect of anaesthetics and sedative drugs.^[1] BIS monitoring helps in maintenance of adequate levels of hypnosis and prevents awakening and formation of implicit and explicit memory during general anaesthesia.^[2] Intraoperative BIS monitoring has also been found to be useful in fast tracking day-care patients,^[3] prevention of postoperative emergence delirium,^[4] nausea and vomiting. Since its FDA approval in 1996, BIS monitor usage is extending outside the operating room. Quantitative BIS values correlation has been observed in many neurological conditions like cerebral ischaemia,^[5] vasospasm,^[6] syncope,^[7] seizures,^[8] cerebral palsy^[9] and dementia.^[10] It is also found to be useful in predicting efficacy of cardiopulmonary resuscitation,^[11] outcome after hypoxic ischaemic injury,^[12] and hypoglycaemia,^[13] determining effect of hypothermia on the hypnotic state,^[14] assessing brain death and level of consciousness in case of brain injury.^[15]

Although BIS monitoring is being widely used in psychiatric patients during electroconvulsive therapy, its aberrance has still not been evaluated. The present issue of the journal carries an article, in which Ramesh *et al.*,^[16] recorded BIS values of patients suffering from psychiatric conditions viz., psychosis, depression, organic and bipolar disorder and compared it with control group patients, who were not suffering from any psychiatric illness. In their study, they observed that BIS values in psychiatric patients are significantly lower compared to the control patients. Patients with psychosis and bipolar disorder were found to have lower BIS values than patients with depression. BIS being an empirical value derived from EEG pattern of approximately 2000 healthy volunteers/patients receiving a variety of commonly used general anaesthetics, sedative-hypnotics and opioids.^[1] The question arises whether these values are applicable for psychiatric patients also? Do we need a separate monitor say, BIS_{psy} derived from

EEG recordings of these patients or a different range of BIS values for them? In an observational study on 18 patients undergoing electroconvulsive therapy (ECT), Gunawardane *et al.* found that a low BIS value does not correspond to a deep hypnotic level in patients after ECT.^[17]

Technological advancements in anaesthesia have brought in monitors which provide continuous display of important variables in a non-invasive manner. These monitors are found to be cost effective, improve safety in perioperative period and have become essential components of our clinical practice. It includes the use of non-invasive blood pressure, pulse oximeter, end-tidal carbon dioxide and BIS. Each one of these monitors provides us with a ‘magic number’ which guides our intervention(s). However, one must appreciate that these monitors have their own limitations. New devices are known to introduce new informations (and errors!). BIS is no exception. It is known that pulse oximeter, (a reliable monitor displaying oxygen saturation in patients with normal haemoglobin) gives spurious 88% saturation despite high arterial oxygen saturation in patients with methaemoglobinaemia. On a similar analogy, BIS values (which are derived from normal individuals) might show spuriously low BIS values in psychiatric patients. The study by Ramesh *et al.* in psychiatric patients observed low BIS values and patients’ remain awake with no manifestation of sedation. The key question is whether this BIS value is a true reflection of sedation? Is this low BIS value because of the disease process, because of the psychiatric medications or a combination of these two is a matter which needs further investigation. The study by Ramesh *et al.* is only the beginning, and there are many more related issues to be studied. Simultaneous correlation of BIS with EEG monitoring, brain imaging and various clinical stages and manifestations of the particular psychiatric illness; choosing similar age group (to remove effect of age related cerebral changes) and numbers in each group, converting into a randomised, controlled trial are some of the ways the quality of such studies can be improved upon. There is a possibility that we might soon have an ideal non- invasive monitor, which can reflect the regression or progression of such illness and help the physicians titrate pharmacotherapy or other modalities of treatment in them. Association of poor outcomes of the patients with low BIS values, in presence or absence of anaesthetic drugs is another area, waiting to be explored.^[18]

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Till all these questions are answered, let us only accept that BIS values are low in psychiatric patients and also caution that it might not be a true indicator of the depth of anaesthesia in psychiatric patients.

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