Bispectral index for improving anaesthetic delivery and postoperative recovery

Yodying Punjasawadwong¹, Aram Phongchiewboon¹, Nutchanart Bunchungmongkol¹

¹Department of Anesthesiology, Faculty of Medicine, Chiang Mai University, Chiang Mai, Thailand

Contact address: Yodying Punjasawadwong, Department of Anesthesiology, Faculty of Medicine, Chiang Mai University, Chiang Mai, 50200, Thailand. ypunjas@icloud.com.

Editorial group: Cochrane Anaesthesia Group.

Publication status and date: New search for studies and content updated (conclusions changed), published in Issue 6, 2014.

Review content assessed as up-to-date: 31 January 2013.


Copyright © 2014 The Cochrane Collaboration. Published by John Wiley & Sons, Ltd.

ABSTRACT

Background
The use of clinical signs may not be reliable in measuring the hypnotic component of anaesthesia. The use of bispectral index (BIS) to guide the dose of anaesthetic may have certain advantages over clinical signs. This is the second update of a review originally published in 2007.

Objectives
The primary objective of this review focused on whether the incorporation of BIS into the standard practice for management of anaesthesia can reduce the risk of intraoperative awareness, consumption of anaesthetic agents, recovery time and total cost of anaesthesia in surgical patients undergoing general anaesthesia.

Search methods
In this updated version, we searched the Cochrane Central Register of Controlled Trials (CENTRAL) (The Cochrane Library 2013, Issue 1), MEDLINE (1990 to 31 January 2013), EMBASE (1990 to 31 January 2013) and reference lists of articles. Previously, we searched to May 2009.

Selection criteria
We included randomized controlled trials comparing BIS with standard practice criteria for titration of anaesthetic agents.

Data collection and analysis
Two authors independently assessed trial quality, extracted data and analysed the data. We contacted study authors for further details.

Main results
We included 36 trials. In studies using clinical signs as standard practice, the results demonstrated a significant effect of the BIS-guided anaesthesia in reducing the risk of intraoperative awareness among surgical patients at high risk for awareness (7761 participants; odds ratio (OR) 0.24, 95% confidence interval (CI) 0.12 to 0.48). This effect was not demonstrated in studies using end tidal anaesthetic gas (ETAG) monitoring as standard practice (26,530 participants; OR 1.13, 95% CI 0.56 to 2.26). BIS-guided anaesthesia reduced the requirement for propofol by 1.32 mg/kg/hr (672 participants; 95% CI -1.91 to -0.73) and for volatile anaesthetics (desflurane,
sevoflurane, isoflurane) by 0.65 minimal alveolar concentration equivalents (MAC) (95% CI -1.01 to -0.28) in 985 participants. Irrespective of the anaesthetics used, BIS reduced the following recovery times: time for eye opening (2557 participants; by 1.93 min, 95% CI -2.70 to -1.16), response to verbal command (777 participants; by 2.73 min, 95% CI -3.92 to -1.54), time to extubation (1501 participants; by 2.62 min, 95% CI -3.46 to -1.78), and time to orientation (373 participants; by 3.06 min, 95% CI -3.63 to -2.50). BIS shortened the duration of postanaesthesia care unit stay by 6.75 min (1953 participants; 95% CI -11.20 to -2.31) but did not significantly reduce the time to home readiness (329 participants; -7.01 min, 95% CI -30.11 to 16.09).

**Authors’ conclusions**

BIS-guided anaesthesia can reduce the risk of intraoperative awareness in surgical patients at high risk for awareness in comparison to using clinical signs as a guide for anaesthetic depth. BIS-guided anaesthesia and ETAG-guided anaesthesia may be equivalent in protection against intraoperative awareness but the evidence for this is inconclusive. In addition, anaesthesia guided by BIS kept within the recommended range improves anaesthetic delivery and postoperative recovery from relatively deep anaesthesia.

---

**PLAIN LANGUAGE SUMMARY**

Monitoring the bispectral index (BIS) to improve anaesthetic delivery and patient recovery from anaesthesia

The results from this updated review indicate that BIS can be useful in guiding the anaesthetic dose to avoid the risk of intraoperative awareness in surgical patients at high risk for awareness. Furthermore, anaesthesia guided by BIS improves anaesthetic delivery and recovery from anaesthesia.

General anaesthesia requires multiple agent administration to achieve unconsciousness (hypnotics), muscle relaxation, analgesia and haemodynamic control. Many anaesthesiologists rely on clinical signs alone to guide anaesthetic management. BIS is a scale derived from the measurement of cerebral electrical activity in anaesthetized patients so that the level of anaesthesia and drug delivery can be optimised. We systematically reviewed 36 randomized controlled studies to find out whether BIS could reduce the risk of intraoperative awareness and reduce anaesthetic use and recovery times in adult surgical patients. The risk of intraoperative awareness was determined in selected patients who were at potentially high risk for awareness. Four studies (7761 patients) that used clinical signs as a guide to anaesthetic administration in standard practice, as the control group, demonstrated a significant reduction in the risk of awareness with BIS monitoring. Four studies (26,530 patients) compared BIS monitoring with end tidal anaesthetic gas (ETAG) monitoring as a guide to management of anaesthesia and they did not demonstrate any difference in terms of intraoperative awareness. There was an overall reduction in volatile anaesthetic dose and the dose of propofol in the BIS group. Recovery from anaesthesia was quicker and postanaesthesia recovery care unit stay was shorter. The limitations of some of the clinical trials on BIS are discussed.