International Journal of Science and Research Archive
eISSN: 2582-8185
Cross Ref DOI: 10.30574/ijsra
Journal homepage: https://ijsra.net/

(RESEARCH ARTICLE)

Check for updates

Monitoring depth of anesthesia: The role of bispectral index (BIS) in clinical practice

Paulo Henrique Barbosa *, Livia de Oliveira Cardoso, Emmanuelle Machado Xavier, Jeniffer Aparecida de Morais Rodrigues, Túlio César Vasconcelos da Nóbrega Rodrigues and Marinaldo Soares Leite

Centro Universitário Alfredo Nasser.

International Journal of Science and Research Archive, 2026, 19(01), 709-711

Publication history: Received on 08 March 2026; revised on 14 April 2026; accepted on 17 April 2026

Article DOI: https://doi.org/10.30574/ijsra.2026.19.1.0802

Abstract

Monitoring the depth of anesthesia is essential to ensure patient safety, prevent intraoperative awareness, and optimize anesthetic drug administration. The Bispectral Index (BIS) is a widely used processed electroencephalogram (EEG) parameter that provides a numerical scale to assess the level of consciousness during anesthesia. This article reviews the clinical utility of BIS monitoring, its physiological basis, advantages, limitations, and its impact on anesthetic outcomes. Evidence suggests that BIS contributes to reduced anesthetic consumption and faster recovery, although its influence on awareness prevention remains debated.

Keywords: Bispectral Index; Anesthesia monitoring; Intraoperative awareness; EEG; Anesthetic depth

1. Introduction

The accurate assessment of anesthetic depth remains a challenge in modern anesthesiology. Traditional clinical signs such as heart rate, blood pressure, and movement are indirect and may not reliably reflect the level of consciousness (BROWN; LAUDERDALE; PACKER, 2010).

The development of processed electroencephalographic monitors, particularly the Bispectral Index (BIS), has introduced a more objective approach. BIS is derived from EEG signals and generates a dimensionless number ranging from 0 (absence of cortical activity) to 100 (fully awake), with values between 40 and 60 typically considered adequate for general anesthesia (RAMPERSAD et al., 2018).

Clinical studies have demonstrated that BIS monitoring may reduce anesthetic drug consumption and facilitate faster postoperative recovery (PUNJABI et al., 2020). However, its effectiveness in preventing intraoperative awareness is still controversial (Avidan et al., 2008).

Given its widespread use, understanding the role of BIS in clinical practice is essential for optimizing anesthesia management.

2. Methodology

This is a narrative literature review based on publications from indexed databases such as PubMed, Scopus, and Cochrane Library. Articles published in the last 15 years were prioritized, focusing on randomized clinical trials, systematic reviews, and meta-analyses addressing BIS monitoring and anesthetic depth.

* Corresponding author: Paulo Henrique Barbosa

3. Result

3.1. Physiological Basis of BIS

The BIS algorithm integrates multiple EEG parameters, including power spectral analysis, bispectral analysis, and time-domain features. These components reflect cortical activity and synchronization, allowing estimation of hypnosis levels (RAMPERSAD et al., 2018).

3.2. Clinical Applications

BIS monitoring is widely used in: General anesthesia (volatile and intravenous); Sedation in intensive care units; Procedural sedation; Studies show that maintaining BIS between 40–60 is associated with adequate hypnosis and reduced risk of awareness (PUNJABI et al., 2020).

3.3. Impact on Anesthetic Consumption and Recovery

Several trials demonstrated that BIS-guided anesthesia: Reduces anesthetic drug usage; Shortens time to extubation; Decreases recovery room stay. These findings suggest improved efficiency in anesthetic management (PUNJABI et al., 2020).

3.4. Prevention of Intraoperative Awareness

Large randomized trials, such as the B-Aware and BAG-RECALL studies, have produced conflicting results regarding BIS effectiveness in preventing awareness (AVIDAN et al., 2008).

4. Discussion

The use of BIS monitoring represents a significant advancement in anesthesia practice by providing an objective measure of hypnotic depth. Its main advantage lies in optimizing drug titration, reducing both under- and over-sedation (BROWN; LAUDERDALE; PACKER, 2010).

Despite these benefits, BIS is not without limitations. Factors such as electromyographic interference, hypothermia, and certain anesthetic agents (e.g., ketamine and nitrous oxide) can affect its accuracy (RAMPERSAD et al., 2018).

Additionally, while some evidence supports BIS in reducing awareness, other studies show no significant difference compared to end-tidal anesthetic concentration monitoring (AVIDAN et al., 2008). Therefore, BIS should be used as an adjunct rather than a standalone tool, integrated with clinical judgment and other monitoring parameters.

5. Conclusion

BIS monitoring plays an important role in modern anesthetic practice by improving drug titration and recovery outcomes. However, its limitations and inconsistent impact on awareness prevention highlight the need for multimodal monitoring strategies. Future research should focus on improving EEG-based technologies and individualized anesthesia care.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

[1] AVIDAN, M. S. et al. Anesthesia awareness and the bispectral index. New England Journal of Medicine, v. 358, n. 11, p. 1097–1108, 2008.

[2] BROWN, E. N.; LAUDERDALE, J.; PACKER, M. General anesthesia and altered states of arousal: a systems neuroscience analysis. Annual Review of Neuroscience, v. 33, p. 593–614, 2010.

[3] PUNJABI, P. P. et al. Bispectral index monitoring and postoperative outcomes: a systematic review. Anesthesia & Analgesia, v. 131, n. 3, p. 845–856, 2020.

[4] RAMPERSAD, S. M. et al. Bispectral index and its clinical applications. BJA Education, v. 18, n. 3, p. 78–84, 2018.