EDITORIAL

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Clinical and economic value of bispectral index monitoring for adequate endoscopic sedation

Se Woo Park

Division of Gastroenterology, Department of Internal Medicine, Hallym University Dongtan Sacred Heart Hospital, Hallym University College of Medicine, Hwaseong, Korea

See "Bispectral index-guided propofol sedation during endoscopic ultrasonography" by Ayana Okamoto, Ken Kamata, and Takeshi Miyata, et al., on page 558–563.

I read the paper by Okamoto et al.,[1] titled "Bispectral index-guided propofol sedation during endoscopic ultrasonography" published in this issue of *Clinical Endoscopy*, with great interest. The authors concluded that bispectral index (BIS) monitoring provides maintenance of a constant and optimal level of sedation depth, and titration for sedatives. However, they could not provide additional clinical benefits, including a reduction in cardiopulmonary adverse events derived from over-sedation.

The major components of safe and effective sedation monitoring include direct visual monitoring and physiological monitoring of hemodynamics and the depth of sedation of the patient. Direct visual monitoring may include close observation of respiratory patterns, movement of the chest wall, changes in skin color, and involuntary motion or facial expressions as a reflection of painful stimuli.[2] In all cases of endoscopic sedation, direct visual monitoring should begin immediately before the administration of sedatives and continue throughout the procedure until full recovery by an endoscopist or a well-trained assistant. Physiological monitoring may be classified as the monitoring of hemodynamics (e.g., heart rate, blood pressure, and electrocardiography), oxygenation (e.g., pulse oximetry), ventilation (e.g., pulse oximetry, capnography, transcutaneous carbon dioxide monitoring, and respiratory volume monitors), and the depth of sedation (e.g., direct clinical assessment, BIS monitoring, and auditory evoked potentials).

BIS monitoring is a non-invasive, objective method for determining the level of consciousness based on a series of continuous electroencephalogram parameters. In clinical practice, BIS monitoring appears to be a safe and effective method for avoiding excessive consumption of sedatives and providing adequate sedation during endoscopic procedures.[3] However, the results regarding the accuracy and clinical efficacy of BIS monitoring are conflicting. First, there is no optimal cut-off value for the BIS level for achieving appropriate sedation. Therefore, it can lead to difficulties in the correlation between BIS levels and formal sedation scales (e.g., modified observer assessments of alertness/sedation scores).[4] Second, several concerns regarding the clinical role of BIS monitoring during endoscopic sedation remain. Many studies[5-8] have reported a significant reduction in sedative consumption and recovery time, as well as sedation-related adverse events when the BIS score is used as the primary target for sedation in procedures. However, contrary to this, our group identified that BIS monitoring did not result in clinical

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Correspondence: Se Woo Park
Division of Gastroenterology, Department of Internal Medicine, Hallym University Dongtan Sacred Heart Hospital, Hallym University College of Medicine, 7 Keunjaebong-gil, Hwaseong 18450, Korea
E-mail: mdsewoopark@gmail.com

benefits, including improvement of oxygenation and reduction of cardiopulmonary adverse events. Therefore, the clinical benefits in daily practice may be limited.[3] Overall, the results from the study by Okamoto et al.[1] are in concordance with ours. We performed a meta-analysis of 1,039 patients (526 in the BIS group and 513 in the non-BIS group) through 11 randomized controlled trials. A significant reduction in the total propofol consumption was found in the BIS group, although the mean consumption of propofol was not different. Furthermore, recovery time, procedure time, sedation-related adverse events, and even satisfactory outcomes were not significantly superior in the BIS group than in the non-BIS group. This phenomenon may be mainly attributed to the substantial and potential time lag between the initiation of a decline in the BIS score below a specific level and the respective clinical signs, which is indicative of an unstable hemodynamic status derived from excessive sedation.[9]

Consequently, recommendations for optimal sedation monitoring should be designed to prevent sedation-related adverse events by minimizing sedative consumption and early detection of over-sedation. Although the supporting evidence to date is limited, close patient monitoring through visual assessment (e.g., coughing, cyanosis, and limb movement) and physiological parameters (e.g., vital signs and oxygen saturation measured by pulse oximetry) are the most important and reliable methods for the prevention of sedation-related adverse events. Medical instruments can serve as a foundation for effective monitoring, but they can never entirely replace the skilled medical staff, who can immediately recognize early indications of adverse events and initiate an adequate response.[10]

Conflicts of Interest

The author has no potential conflicts of interest.

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ORCID

Se Woo Park https://orcid.org/0000-0003-1603-7468

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