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Anesthesia Innovation: Mini-Review of an Intravenous Sedation for Gastrointestinal Endoscopy

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Abstract

Gastrointestinal endoscopy (GIE) is a procedure for diagnosis and treatment of gastrointestinal tract abnormalities. To date, intravenous sedation is commonly used for this procedure. The new sedative drugs and equipment for safety and efficacy are available. This mini-review focuses on innovation in intravenous sedation (IVS) for GIE procedures.

Keywords: Innovation; Intravenous Sedation; Gastrointestinal Endoscopy

Abbreviations: IVS: Intravenous Sedation; GIE: Gastrointestinal Endoscopy; TCI: Target-Controlled Infusion; PCS: Patient-Controlled Sedation; CAPS: Computer-Assisted Personalized Sedation

Introduction

Intravenous Sedation (IVS) is one of the important components of gastrointestinal endoscopic (GIE) procedures. The aim of sedation for these procedures is to improve patient's comfort and endoscopic practice as well as patient and endoscopist satisfaction. The depth of sedation level is dependent on the type and duration of endoscopy, experience of endoscopist, and patient's physical status. The sedation regimens for GIE procedures are quite different. To date, several sedation techniques are utilized. The new sedative drugs and equipment for safety and efficacy are available [1-4].

Target-Controlled Infusion

Target-controlled infusion (TCI) is a sophisticated tool for providing optimal sedation regimen avoiding under or over sedation in GIE procedures. This technique uses a pharmacokinetic model to predictthe patient plasma and effect site concentrations from the infusion design and allows the anesthesiologist to target a selected concentration. The device computes the appropriate infusion system to achieve this concentration [5]. The TCI rapidly accomplishes and maintains a predefined plasma or effect site concentration of the anesthetic drug. Presently, TCI devices for propofol administration are approved in several countries. A previous study determined the quality and plausibility of TCI as a sedation mechanism for upper and lower GIE procedures. This study confirmed that TCI sedation for GIE provided safe and effective sedation and was associated with a better sedation quality [6]. Wang and colleagues evaluated whether TCI of propofol could offer a better sedation quality than manually controlled infusion in training inexperienced anesthesiology residents. The authors concluded that TCI was a more effective and safer technique for anesthesiology residents in sedation for colonoscopy [7].

Patient-Controlled Sedation

Patient-controlled sedation (PCS) usually involves a target-controlled method. There are two types of PCS. In open-loop system, the sedation is adjusted according to a target drug concentration. In closed-loop system, the patient directs the infusion system to release medication up to a set point. A systematic review and meta-analysis assessed the advantages and disadvantages between PCS and traditional IVS. The review demonstrated that PCS was as feasible and effective as traditional IVS for colonoscopy. PCS relatively shows its superiority in recovery time, incidence for oxygen saturation and hypotension [8]. Recently, PCS is readily implemented in clinical practice. It is suitable for IVS in younger and low-risk patients and is associated with less cardio respiratory adverse effects [9]. Adding propofol to remifentanil or alfentanil increases sedation, and potentiates analgesia, with no increase

in respiratory depression. The combination regimen is a safe and feasible method for PCS [10].

A prospective, randomized, controlled study compared the use of PCS with propofol and remifentanil and the anesthesiologist-administered propofol sedation for 80 elective endoscopic patients. All patients were completely successful except two patients in the PCS group. Mean level of sedation and total propofol requirement in the PCS group were significantly lower than in the anesthesiologist-administered propofol group. The study confirmed that PCS with propofol and remifentanilwas a safe and well-accepted sedation technique for endoscopic patients [11]. Moreover, time to sedation and the recovery time in the PCS with the propofol and remifentanil group were significantly shorter than in the PCS with the fentanyl and midazolam group. However, the perceptions of patients, nurses and endoscopists were comparable between the two groups [12].

Computer-Assisted Personalized Sedation

Computer-assisted personalized sedation (CAPS) is a sedation delivery system to administer propofol. It is based on thepatient response to stimulation and physiologic profiles. It presents an attractive means ofdelivering safe and effective doses of propofol. The closed-loop target-controlled system orcontinuous electroencephalographic recordings are used to assess the depth of sedation. Patient-controlledplatforms may also be used. These devices may help physicians titrating propofol administrationand controlling the physiological functions. The American Society for Gastrointestinal Endoscopy Technology Committee provides reviews of this system that have the potential to have an impact on the practice of GIE [13]. Several previous studies demonstrated the feasibility of CAPS for facilitating the accurate administration of propofol by endoscopist or nurse teams, achieving minimal to moderate sedation in patients undergoing routine GIE procedures. Mean propofol dosage was low and post-procedure recovery time was rapid [14].

The SEDASYS System is a CAPS device that delivers the drug propofol for minimal-to-moderate sedation. The device provides comprehensive patient monitoring and limits the depth of sedation by adjusting drug delivery accordingly. The efficacy and safety of this system for sedation during GIE procedures was evaluated and compared with the combination of benzodiazepineand opioid in adult patients with ASA physical status class I-III. All patients were sedated in mild to moderate depth of sedation level. The study confirmed that SEDASYS system was safe and effective for sedation during GIE procedures. Patient and physician satisfaction as well as recovery time in the SEDASYS group were significantly better than in the combination of benzodiazepine and opioid group [15]. The use of CAPS system by non-anesthetic personnel for mild or moderate sedation in GIE patients was also safe and effective [14].

Conclusion

GIE procedure requires some forms of anesthesia. IVS is commonly used for this procedure. Sedation could be effectively and safely performed by anesthesiologist or non-anesthetic personnel with appropriate patient selection and monitoring. The new sedative drugs and equipment are available. However, pre-anesthetic assessment and preparation, anesthetic drugs used, monitoring practices and post-anesthesia management are still essential for the anesthesia innovation in GIE procedures.

Conflict of Interest

No financial support was received for the preparation of this study. The author declares that no conflict of interest exists.

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