J Korean Med Sci. 2021 Sep 6;36(35):e254
https://doi.org/10.3346/jkms.2021.36.e254
eISSN 1598-6357·pISSN 1011-8934

JKMS

Correspondence

Letter to the Editor: Optimal Method for Sedation of Pediatric Upper Gastrointestinal Endoscopy

Soon Chul Kim

Department of Pediatrics, Jeonbuk National University Medical School and Hospital, Research Institute of Clinical Medicine of Jeonbuk National University - Biomedical Research Institute of Jeonbuk National University Hospital, Jeonju, Korea

▸ See the article "Procedural Sedation for Pediatric Upper Gastrointestinal Endoscopy in Korea" in volume 36, number 20, e136.

Received: Jul 21, 2021
Accepted: Aug 31, 2021

Address for Correspondence:
Soon Chul Kim, MD, PhD
Department of Pediatrics, Jeonbuk National University Children's Hospital, 20 Geonji-ro, Deokjin-gu, Jeonju 54907, Republic of Korea.
E-mail: kimsc@jbnu.ac.kr

ORCID iD
Soon Chul Kim
https://orcid.org/0000-0002-5947-4599

Disclosure
The author reports no conflicts of interest.

As with the author's study,[1] most previous studies used the Ramsay score to evaluate procedural sedation. Although there are other scores (e.g., Richmond Agitation/Sedation Scale, Modified Ramsay Sedation Scale, Modified Observer's Assessment of Alertness and Sedation), they have similar scoring systems.[2,3] These scores are general and applicable to various procedures as they have a uniform standard and clarity. However, using a sedation score specialized for pediatric sedative upper gastrointestinal endoscopy is more suitable for determining the optimal dose of sedative drugs. The Ramsay score examines a patient's stimulation response using six levels. Depending on the sedation depth, the level of stimulation response is considered appropriate.[2] However, we aimed to identify the optimal dose of drugs that induces sedation enough to comfortably complete pediatric endoscopy. Unfortunately, the Ramsay score is insufficient to be regarded as a standard because it would be different at different time points. Even if the Ramsay score of a specific time point is uniformly used, it would be unsatisfactory. If irritability at the 5 minutes time point or desaturation without recovery occurs while the procedure is not yet finished, the dose would not be optimal. Therefore, using a procedure-specialized score that comprehensively and objectively examines conditions during the procedure is desirable. Since this is a novel index, it will be referred to as the "Soon score" (**Table 1**). This score can be evaluated objectively and indicates whether the procedure is successful. A score of 1 indicates irritability, meaning that conducting a procedure is impossible, which also applies to cases of drug-induced paradoxical responses. Furthermore, young children may naturally exhibit irritability in the awake state. Score 2 indicates a non-sedative response capable of allowing patient cooperation. Patients show a normal stimulation response at this level; despite being awake, conducting endoscopy may be possible. Score 3 is when a procedure is performed for the desired time, and patients remain in deep sedation (the most appropriate level to conduct endoscopic procedures comfortably). Score 4 refers to when desaturation occurs due to deep sedation, but spontaneously recovers if oxygen is administered or the endoscopy is briefly

Table 1. The Soon score according to the situation after sedation

Score	Situation during procedure
1	Irritability (very young age or paradoxical response)
2	Awake (non-sedative response)
3	Asleep (in deep sedation)
4	Desaturation (recovery without mask-ambu bagging or intubation)
5	Desaturation (need mask-ambu bagging or intubation)

suspended and the endoscopy tube is removed. A score of 5 requires mask-ambu bagging or intubation (**Table 1**). Since the author uses midazolam as a base, at a score of 5, flumazenil is always used for recovery.

The author is the only pediatric endoscopist who conducts pediatric endoscopy in the current hospital. The number of pediatric sedative upper gastrointestinal endoscopies performed by the author reaches up to 150 cases/year, except for foreign body removal or percutaneous endoscopic gastrostomy for therapy. Analyzing the past 8 years' data, the author made various attempts to find optimal drugs and doses of drugs and strived to seek answers based on the Soon score. Consequently, no flumazenil was used last year (no score of 5 was registered). The author always uses midazolam as a base. Administering midazolam combined with other drugs has outstanding advantages because it has drug properties, synergic effects, and an antagonist called flumazenil.[1] The author used to administer midazolam combined with ketamine or propofol; however, in recent times, only the midazolam and ketamine combination has been used. When the number of patients with Soon scores of 1 and 5 increased, the drug dose was titrated for these patients to determine the optimal dose. Moreover, sedation responses should be considered according to age, underlying diseases, and various other factors for children.[1] Recommending a single method of administering drugs for children would be difficult. Nevertheless, there is an urgent need to establish guidelines for pediatric procedural sedation, and data collection is ongoing. Meanwhile, the author's drug dose titration method will be explained in this letter.

Understanding dose per body weight (mg/kg) and maximum dose is necessary when administering drugs to children. In the past, the author used midazolam (0.2 mg/kg; maximum 5 mg) and ketamine (1 mg/kg; maximum 50 mg), leading to frequent Soon scores of 1 or 5. Although the sedative effect was good, many incidences with midazolam-induced paradoxical irritability and desaturation caused by deep sedation occurred.[1] Thus, midazolam was reduced to 0.1 mg/kg (maximum 4 mg), resulting in a decreased number of cases of score 1. When using 1 mg/kg of ketamine (maximum 50 mg), a score of 5 often occurred. Hence, 0.1 mg/kg of midazolam (maximum 4 mg) and 2 mg/kg of propofol (maximum 100 mg) were used, leading to frequent incidences with a Soon score of 5. Although propofol was titrated to 0.5–1.5 mg/kg (maximum 80 mg), no optimal dose was found. The use of 2 mg/kg of propofol induced deep sedation. However, when 0.5–1.5 mg/kg of the same drug was administered, despite using it with midazolam, a score of 1 or 2 was noted occasionally. Furthermore, Soon scores of 2 and 5 were noted when the same method was used for the same patients between the 2- and 3-month follow-ups, respectively. Since finding the optimal dose of propofol was difficult, the author switched back to using combined midazolam and ketamine. Lately, the dose has been further titrated so that 0.1 mg/kg of midazolam (maximum 3 mg) and 0.5–1 mg/kg of ketamine (maximum 30–40 mg) are used. First, midazolam was used and observed for 3 minutes without supplying oxygen. Depending on the response, a slightly reduced amount of ketamine and 1 L/min of oxygen was administered. After implementing this method, no Soon scores of 5 or 1 were noted. When a procedure is prolonged, the patient recovers within a short period. In some cases, administering 1 mg/kg of pethidine (maximum 50 mg) and 1 mg/kg of propofol (maximum 80 mg) together or separately would extend the “comfortable” procedure time. Although the current method is quite satisfactory, sedation methods are very diverse.[1] The author has not examined every combination and dose of drugs and is on the way to discovering an optimal method. Additionally, the author considers that other optimal methods exist. Further research on optimal sedation methods is expected to further develop the field of pediatric gastrointestinal endoscopy.

https://doi.org/10.3346/jkms.2021.36.e254

REFERENCES

1. Lee YM, Kang B, Kim YB, Kim HJ, Lee KJ, Lee Y, et al. Procedural sedation for pediatric upper gastrointestinal endoscopy in Korea. *J Korean Med Sci* 2021;36(20):e136.
PUBMED | CROSSREF
2. Sessler CN, Grap MJ, Ramsay MAE. Evaluating and monitoring analgesia and sedation in the intensive care unit. *Crit Care* 2008;12(Suppl 3):S2.
PUBMED | CROSSREF
3. Lee TH, Lee CK. Endoscopic sedation: from training to performance. *Clin Endosc* 2014;47(2):141-50.
PUBMED | CROSSREF