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ORIGINAL ARTICLE

Anesthetic Trainee-Administered Propofol Deep Sedation for Small Bowel Enteroscopy Procedure in Elderly Patients

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ABSTRACT

AIM: To compare and evaluate the clinical efficacy of anesthetic trainee-administered propofol deep sedation (PDS) by using a syringe pump for small bowel enteroscopy (SBE) procedure between patients aged<65 years and patients aged≥65 years in an endoscopic unit outside operating room in Thailand.

METHODS: We undertook a retrospective review of SBE procedures. Patients were classified into two groups: group A (age < 65 years) and group B (age ≥65 years). The primary outcome variable of the study was the successful completion of procedure. Secondary outcome variables were sedation-related complications during and immediately after the procedure.

RESULTS: After matching the patients' characteristics, duration and indications of procedure, there were 45 patients in group A and 28 patients in group B. There were no significant differences in characteristics of patients, duration of procedure and indications of procedure between the two groups. All sedations were used successfully except one patient in group A. There were no significant differences in overall, respiratory and cardiovascular-related complications between the two groups. However, hypotension in group B was significantly higher than in group A.

CONCLUSION: In the setting of endoscopy unit outside operating room, PDS by anesthetic trainee using a syringe pump for SBE procedure in elderly patients with appropriate monitoring was relatively safe and effective. Clinical efficacy of this technique in elderly patients was not different or worse than in younger patients. However, the rate of hypotension was significantly high in the elderly patients than younger patients. Serious complications were rare.

Key words: Anesthetic trainee; Deep sedation; Propofol; Enteroscopy; Elderly

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INTRODUCTION

Small bowel has been a difficult area to examine due to its anatomy, location and relative tortuosity. Endoscopic accessibility to the small bowel has been a challenge to the gastroenterologists. Enteroscopy describes endoscopic examination of the small bowel, extending into jejunum and/or ileum. Many types of enteroscopes are currently available for the small bowel enteroscopy (SBE) procedures[1]. However, the SBE procedure is an invasive and time-consuming procedure, requiring special equipment, training and more staff than for standard endoscopic procedures. Patients undergoing SBE procedures usually receive some forms of anesthesia. In Siriraj GI Endoscopy Center, the authors regularly use the deep sedation technique for this procedure[2]. Continuous propofol infusion by using a syringe pump is commonly used for propofol deep sedation (PDS) technique. Little data is known about the clinical efficacy of PDS by anesthetic trainee using a syringe pump for SBE procedure in elderly patients.

Sedation-related complication rate in elderly patients is generally higher than in younger patients. There are several techniques for administration of propofol. It is believed that the use of syringe pump for PDS leads to a reduced complication rate. However, it may be not true if anesthetic trainee administer it. We conducted a retrospective study to evaluate the clinical efficacy of anesthetic trainee-administered PDS by using a syringe pump for SBE procedures in elderly (age≥65 years) and younger (age<65 years) patients in a tertiary-care teaching hospital in Thailand. Another aim of this study

was to confirm that in an endoscopy unit outside operating room, PDS for SBE procedure in the elderly patients by trained anesthetic personnel was safe and effective and was not different or worse than in the younger patients.

MATERIALS AND METHODS

Patients

Patients who underwent SBE procedure at Siriraj GI Endoscopy Center, Siriraj Hospital between January 2006 and January 2011 were enrolled in the present study. Inclusion criteria were the adult patients (age≥18 years) who underwent SBE procedure by PDS technique. The SBE procedures performed in the operating rooms and the procedures performed without sedation, or procedures performed under monitored anesthesia care and general anesthesia were excluded. This present study was approved by the Institutional Review Board of the Faculty of Medicine, Siriraj Hospital.

Study design

This study was a retrospective descriptive study. Age ranges and means Patients were classified into two groups according to the age. In group A, the patients had age<65 years. In group B, the patients had age≥65 years. The primary outcome of the study was the successful completion of the procedure. Failed procedure is defined as the procedure can not be completed by using the PDS technique in deep sedation level or the sedation-related serious adverse events such as severe hypoxemia (SpO_2 < 85% more than 3 minutes and can not relief by airway management), severe cardiorespiratory instability, are occurred. The secondary outcome variables were sedation-related complications.

Endoscopy procedure

All SBE procedures were done using a video endoscope compatible with the type of endoscopy. The success rate in both groups was recorded. The successful completion of the procedure defined as completion of the procedure as intended without additional general anesthesia once the procedure had started. After completion of the procedure, admission into the inpatient hospital service was arranged to rule out post-SBE complications.

Sedation-related procedure

The patients were monitored with non-invasive blood pressure, ECG and pulse oximetry. End-tidal carbon dioxide ($ETCO_2$) monitoring with capnography was not used during sedation. No pre-medications were used before the procedure. All patients in both groups were oxygenated with 100% O_2 via nasal cannula (3 liters/minute). All procedures were done by using the PDS technique and all patients were sedated in deep sedation level, according to guidelines of the American Society of Anesthesiologists[3]. The dose of sedative and analgesic agents was assessed. When, the procedure was failure, general anesthesia was carried out. All PDS was given by the anesthetic trainee including residents in the anesthesiology residency program and anesthetic nurse students. The use of PDS is described in the standard learning course. Additionally, the trainee learned to practice the real situation during they worked in the endoscopy room supervised by a staff anesthesiologist.

Sedation-related complications

All sedation-related complications were recorded. Sedation-related complications were defined as follows: hypertension or hypotension (increase or decrease in blood pressure by 25% from baseline); tachycardia or bradycardia (increase or decrease in heart rate by 25% from baseline); any cardiac arrhythmias; hypoxia (oxygen desaturation, SpO_2 < 90%); airway obstruction.

Statistical analysis

Results were expressed as mean±SD or percentage (%), when appropriate. Comparisons between group A and B were compared by using with Chi-square tests (for categorical variables), Chi-square tests for trend (for ordinal variables), and two-sample independent t-test (for continuous variables). The statistical software package SPSS for Window Version 11 (SPSS Inc., Chicago, IL) was used to analyze the data. All statistical comparisons were made at the two-sided 5% level of significance.

RESULTS

One hundred and sixty-two patients who underwent SBE procedures during the study period were enrolled in the study. After matching age, gender, indication of procedure as well as the type of anesthetic technique and type of sedative agent, 45 patients were in Group A, and 28 patients were in Group B. Mean age in Group A was 45.1±13.1 years (range 18-63 years) and mean age in Group B was 73.9±7.5 years (range 65-92 years). Sixteen patients (57.1%) in Group B were aged >70 years old. There were no statistically significant differences in gender, weight, height, ASA physical status as well as duration and indications of the procedure between the two groups (Table 1).

Table 1 Characteristics of patients, duration and indications of procedure.

	Group A (*n*=45)	Group B (*n*=28)	*P* value
Age (year) (mean, SD)	45.1 (13.1)	73.9 (7.5)	
Gender (%):			
Male	15 (33.3)	15 (53.6)	0.087
Female	30 (66.7)	13 (46.4)	
Weight (kg) (mean, SD)	55.9 (10.7)	58.5 (12.6)	0.107
Height (cm) (mean, SD)	158.8 (8.2)	159.0 (7.8)	0.205
ASA physical status (%):			0.061
I	8 (17.8)	0	
II	21 (46.7)	16 (57.2)	
III	16 (35.6)	12 (42.9)	
Duration of procedure (min) (mean, SD)	71.6 (35.3)	85.2 (44.1)	0.587
Indications (%)			0.203
Gastrointestinal bleeding	20 (44.4)	16 (57.1)	
Chronic diarrhea	12 (26.7)	2 (7.2)	
Others	13 (28.9)	10 (35.7)	

Group A: Age < 65 years; Group B: Age ≥65 years.

Table 2 shows the success rate, type of enteroscopy, route of intubation and sedative/analgesic agents used in the two groups. All patients in both groups were concluded with the successful completion of the procedure except one patient in group A (p=0.427). Failed procedure was successfully completed by using general anesthesia with endotracheal tube. Combination of fentanyl, propofol and midazolam was used for PDS technique. There were no significant differences in the type of enteroscopy, route of intubation, and mean dose of fentanyl, propofol and midazolam between the two groups.

Table 3 demonstrated sedation-related complications during and immediately after the procedure. Overall, 11 patients (24.4%) in group A and 13 patients (46.4%) in group B, experienced sedation-related complications. There were no significant differences in overall, respiratory and cardiovascular related-complications between the two groups. Any difference in the rate of complication in elderly patients between anesthetic trainee and well-trained anesthesiologists

administered PDS was not observed. However, hypotension in group B was significantly higher than in group A. Procedure-related complications were none in both groups. All sedation-related complications were under the care of an anesthesiologist. No serious complications were occurred.

Table 2 Success rate, type of enteroscopy, route of intubation and sedative/analgesic agents used.

	Group A (*n*=45)	Group B (*n*=28)	*P* value
Success rate (*n*, %)	44 (97.8)	28 (100.0)	0.427
Type of enteroscopy (*n*, %)			0.086
Single balloon	23 (51.1)	20 (71.4)	
Push	22 (48.9)	8 (28.6)	
Route of intubation (*n*, %)			0.748
Antegrade (Oral)	29 (64.4)	17 (60.7)	
Retrograde (Anal)	16 (35.6)	11 (39.3)	
Sedative/analgesic agents (mean, SD)			
Fentanyl			
Dose/Body weight (mg/kg)	0.001 (0.001)	0.001 (0.001)	0.120
Propofol			
Dose/Body weight (mg/kg)	3.24 (1.19)	2.25 (1.05)	0.200
Midazolam			
Dose/Body weight (mg/kg)	0.06 (0.05)	0.05 (0.04)	0.258

Group A: Age < 65 years; Group B: Age ⩾65 years.

Table 3 Sedation-related complications during and immediately after the procedure (*n*, %).

Complications	Group A (*n*=45)	Group B (*n*=28)	*P* value
Overall	11 (24.4)	13 (46.4)	0.052
Respiratory	1 (2.2)	1 (3.6)	0.731
Hypoxia (SpO_2 < 90%)	1 (2.2)	1 (3.6)	0.731
Cardiovascular	10 (22.2)	12 (42.9)	0.062
Hypotension	9 (20.0)	12 (42.9)	0.036[1]
Bradycardia	1 (2.2)	0	0.427

Group A: Age < 65 years; Group B: Age ⩾65 years. [1] considered statistically significant.

DISCUSSION

The present study shows that PDS using a syringe pump for SBE procedure in elderly patients by anesthetic trainee with appropriate monitoring is relatively safe and effective, even in an endoscopy unit outside the operating room in Thailand. Our observations confirm when we compare the results to the younger patients investigated within the same time period and extend the previous studies[2,4]. All SBE procedures were able to be completed. Our report of PDS practice in elderly patients demonstrated that it can be conducted safely in various sedative combinations, with proper monitoring and anesthesiology service supervision. Our study also shows that clinical education in routine practice is effective and easy. The rate of complication in elderly patients was not significantly different between anesthetic trainee and well-trained anesthesiologists.

SBE is a diagnostic and therapeutic procedure among small bowel abnormality, even in our institution, where we observe an increase in number of these procedures every year. Therefore, it is mandatory to standardize a safe, easy, well tolerated anesthetic procedure, which is feasible in the endoscopy unit outside operating room. In our previous experiences, we have noted that topical anesthesia or minimal to moderate sedation is not sufficient for pain-free procedures[2]. In contrast, deep sedation or general anesthesia technique, which may be of benefit for the patient and endoscopist comforts, may be difficult to administer, especially in elderly patients with co-morbidity diseases. Additionally, the lack of experience in anesthesia care among endoscopy personnel might increase the risk of complications.

In our hospital, the authors normally use deep sedation for various endoscopic procedures because of the given reasons in conjunction with the preference of anesthesiologists[5-7]. In our GI Endoscopy Center, it has few end-tidal carbon dioxide ($ETCO_2$) monitors. So, the end-tidal carbon dioxide monitoring was not routinely used during deep sedation for gastrointestinal endoscopy procedure. Consequently, there are no special anesthetic techniques needed for this kind of anesthesia. Cardiopulmonary and other diseases that are more frequent in elderly patients have been regarded as the major risk factors for complications associated with endoscopy or sedation[8,9]. In the present study, the elderly patients developed hypotension more frequently than in the younger patients. However, old age and high ASA physical status did not represent as an indication for providing general anesthesia more frequently for SBE at our institution. In our experience, we recommend that general anesthesia with endotracheal tube should be performed for patients underwent SBE by using antegrade (oral) intubation route.

The authors usually use propofol, combined with short acting benzodiazepine, with or without fentanyl, for deep sedation in several gastrointestinal endoscopic procedures. Propofol is widely employed for sedation outside the operating room because it is easy to use, has a good safety and efficacy profile due to its quick onset of action, rapid metabolism, significantly shorter recovery time and it has some anti-emetic effects[10]. It also has been shown to be safe when used in elderly patients[11,12]. PDS allows a significant increase in the rate of successful completion of the procedures as well as patient and endoscopist satisfaction. Midazolam and fentanyl have a short half-life and rapid onset of actions, may have an advantage in geriatric patients. In this study, we have shown that PDS with low dose midazolam and fentanyl, and low dose propofol, is safe and well tolerated by the patient. Furthermore, it is well accepted by endoscopists.

The present study used only standard monitoring, including an assessment of blood pressure, pulse rate, respiratory rate and pulse oximetry, as well as electrocardiogram. We detected a relatively high overall rate of adverse events in both groups. This rate is higher than that commonly reported, and there may be several explanations. We used these criteria in defining complications: hypo/hypertension and brady/tachycardia measured as the changes of blood pressure and heart rate of more than 25% of base line values. Hypoxia was defined as oxygen saturation < 90%. Hypercapnia ($ETCO_2$ >50 mmHg) could not be detected directly in this study.

Data from our previous study showed that both patient and endoscopist satisfaction about sedated patients was higher than in non-sedated patients. The use of sedation was the major determinant of patient satisfaction and willingness to repeat the procedure[13]. However, deep sedation contributed to an increased recovery room time. We believe that appropriate selection of patients for sedation is very important for everyday practice and will most likely reduce the rate of adverse events. Finally, the use of pulse oximetry to monitor hypoxemia is important, especially in cases when supplemental oxygen is administered.

Limitations of this study exist. First, there is the wide range in age of the patients in our study. Drug requirements and side effects can be related to patient's age. Second, inaccurate and incomplete documentation of certain measures, as occurs with many chart reviews, also occurred in this study. Third, the limitation of monitoring such as of end-tidal carbon dioxide, could result in an outcome of the study. Fourth, different anesthesiologists define complications differently. Overall, despite these limitations, we are, however, confident that these findings are generalizable to the

practice of SBE procedure using PDS technique. Finally, because the sample population in our study is small, further studies in larger prospective groups of patients are therefore needed.

SUMMARY

The authors report the performance of the clinical efficacy of PDS regimen utilizing anesthetic trainee with appropriate basic monitoring for SBE procedure in elderly patients in an endoscopy unit outside the operating room from a tertiary-care teaching hospital in a developing country. The findings of the present study also showed that the SBE procedure done by PDS technique for elderly patients was relatively safe and effective. The rate of hypotension in the elderly patients is significantly higher than in the younger patients. However, this adverse event is transient and easily treated with no adverse sequelae. The combination of low dose fentanyl, midazolam and propofol may be beneficial.

CONFLICT OF INTERESTS

There are no conflicts of interest with regard to the present study.

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