



Original Article

Age correlates with hypotension during propofol-based anesthesia for endoscopic retrograde cholangiopancreatography

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ABSTRACT

Objective: Endoscopic retrograde cholangiopancreatography (ERCP) is a procedure used for diagnostic and therapeutic purposes. Most of the patients may feel pain, anxiety, and discomfort during this procedure, so conscious sedation is usually used during ERCP. General anesthesia would be considered if conscious sedation fails to achieve the requirement of the endoscopists. Several studies showed that propofol-based sedation could provide a better recovery profile. However, propofol has a narrow therapeutic window and complications may occur beyond this window. The present study aimed to find out the complications and the associated risk factors during ERCP procedure under propofol-based deep sedation.

Methods: We retrospectively reviewed data from anesthetic and procedure records of the patients who underwent ERCP under propofol-based deep sedation from January 2006 to July 2010 at Far Eastern Memorial Hospital, Taipei, Taiwan. All propofol-based deep sedations were conducted by anesthesiologists. The incidence of complications was determined and the independent risk factors identified by the multivariable logistic regression model.

Result: Propofol-based deep sedation was provided for 552 patients who received ERCP procedure. The majority of the patients were male, the mean age was 60 ± 16 years and American Society of Anesthesiologists physical status II–III. Almost 30% of patients experienced hypotension during the procedure, although no mortality or morbidity was associated with this complication. Sex, age, anesthetic time, American Society of Anesthesiologists status, hypertension, and arrhythmia were significantly different ($p < 0.05$) between patients with hypotension and without hypotension during the procedure. Multivariable logistic regression identified sex and age to be the independent predictors of hypotension. **Conclusion:** Hypotension was the most frequent anesthetic complication during procedure under propofol-based deep sedation, but this method was safe and effective under appropriate monitoring. Age is the strongest predictor of hypotension and therefore propofol-based deep sedation should be conducted with caution in the elderly.

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1. Introduction

Endoscopic retrograde cholangiopancreatography (ERCP) is a procedure used for diagnostic and therapeutic purposes such as sphincterotomy.¹ Because it is a relatively uncomfortable and prolonged procedure, adequate sedation is usually beneficial for its

successful completion. Sometimes, general anesthesia even may be indicated when sedation fails.²

Various sedatives, hypnotics, and narcotics have been used for ERCP.¹ Several studies have shown that propofol-based sedation could provide a better recovery profile including a shorter recovery time and a higher recovery score during ERCP.^{3–5}

Even for sedation in high-risk octogenarians, propofol has been shown to be superior to midazolam or meperidine.⁶ However, propofol has a narrow therapeutic window, and a small increase in dosage may cause a patient to progress from deep sedation to general anesthesia, during which hypoxemia and hypotension may

Conflicts of interest: All authors have no conflicts of interest to declare.

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occur.⁷ Considering these possible complications, the aim of this study was to investigate the possible predictors related to the complications of propofol-based deep sedation for ERCP.

2. Methods

After obtaining the approval from the Institutional Review Board of the Far Eastern Memorial Hospital, Taipei, Taiwan we retrospectively reviewed the anesthetic records, history charts, and procedure records of the patients who underwent ERCP under propofol-based deep sedation from January 2006 to July 2010 at the Far Eastern Memorial Hospital. The inclusion criteria included patients who received ERCP procedure under propofol-based deep sedation. In those containing multiple ERCP procedure, data were analyzed from the first time of anesthetic record. The procedure was performed with patients in the prone position. Appropriate monitoring was used for all patients including electrocardiography, pulse oximetry, noninvasive blood pressure measurements, and continuous respiratory rate measurements. Supplemental oxygen at 4 L/min was offered via nasal cannula throughout the procedure. All patients received an initial dose of 1–2.5 mg midazolam and 20–50 mg propofol. Deep sedation was further maintained with titration of continuous propofol infusion according to the guidelines of American Society of Anesthesiologists (ASA) and the depth of anesthesia was monitored by clinical observation with the modified observer's assessment of alertness/sedation score. A level of deep sedation was targeted by the anesthesiologists to adjust the rate of propofol infusion manually and boluses of propofol might be given. After the procedure, patients were sent to postanesthesia care units for observation at least 60 minutes.

Hypotension was defined by blood pressure dropping significantly to < 20% of baseline blood pressure, which was measured before sedation. Hypertension was defined by blood pressure significantly > 20% of baseline blood pressure before sedation. Desaturation was defined by oxygen saturation dropped to < 90%. If the patient developed desaturation under supplemental oxygen, the airway was opened by head-tilt/chin-lift and jaw-thrust maneuvers. Nasal airway was inserted if the above maneuvers failed. If desaturation persisted, the procedure was terminated and mask ventilation with 100% oxygen was adopted.

2.1. Statistical analysis

Statistical analysis was performed using SPSS 17.0 (SPSS Inc., Chicago, IL, USA). Interval data were expressed as mean \pm standard deviation, and compared with Student *t* test. Categorical data were coded and compared with Pearson Chi-square test or Fisher's exact test where appropriate. A *p* value of < 0.05 was regarded as significant. A multivariate logistic regression model was used to identify the independent predictors with the hypotension during propofol-based deep sedation.

3. Results

During the study period, a total of 552 patients were recruited. Baseline characteristics are shown in Table 1. The majority of the patients were male; the mean age was 60 \pm 16 years (range, 14–96 years) and ASA physical status II–III. More than 200 of patients had hypertension or biliary tract infection. The number of patients with hypotension, hypertension, and desaturation during anesthesia are shown in Table 2. Almost 30% of patients experienced hypotension during the procedure.

Sex, age, anesthetic time, ASA status, hypertension, and arrhythmia were significantly different (*p* < 0.05) between patients with hypotension and without hypotension during the procedure.

Table 1
Patient characteristics.

Characteristics	
Sex (male/female)	283/269
Age (y)	60 \pm 16
Body mass index (kg/m ²)	24.5 \pm 3.9
ASA classification (%)	
1	8.7
2	68.8
3	22.3
4	0.2
Anesthetic time (min)	53.8 \pm 23.1
Comorbidities	
Hypertension	200
Diabetes mellitus	136
Congestive heart failure	9
Arrhythmia	15
Old CVA	21
CAD	37
HBV/HCV carrier	41/14
Hepatic tumor	4
Chronic renal insufficiency	21
COPD	10
Asthma	4
Biliary tract infection	210
Biliary pancreatitis	78
Acute pancreatitis	29
Anemia	7

Data are presented as *n* or mean \pm standard deviation, unless otherwise indicated.

ASA = American Society of Anesthesiologists; CAD = coronary artery disease; CVA = cerebrovascular accident; COPD = chronic obstructive pulmonary disease; HBV = hepatitis B virus; HCV = hepatitis C virus.

Body mass index and other comorbidities such as diabetes mellitus and biliary tract infection showed no statistical difference between the two groups (Table 3). Multivariate logistic regression identified sex and age as significantly associated with hypotension (*p* < 0.05; Table 4). However, when age was excluded from analysis, hypertension and anesthetic time were identified as a significant predictor (*p* = 0.002 and *p* = 0.03, respectively), while sex remained a significant independent predictor (*p* = 0.038).

4. Discussion

Propofol-based deep sedation can cause some complications during ERCP procedures. Results of this retrospective study showed that hypotension was the most frequent anesthetic complication during propofol-based deep sedation for ERCP, the incidence of which was 29.9%. Our rate was higher than the series reported by Amornyotin et al⁸ (8.8%), Kongkam et al³ (19.4%), and Vargo et al⁵ (15.8%), which might be due to the older age of patients and the longer anesthetic time in our study. Indeed, in this study, the incidence of hypotension in the elderly is relatively high (33.3%).⁹ Although hypotension was found during this procedure, there was no sequela after the procedure.

Multivariable logistic regression identified sex and age were independent predictor. In our study, we found that age is positively correlated with hypertension and anesthetic time (Table 5). In addition, clinical studies imply that increasing in blood pressure is

Table 2
Complications during anesthesia.

Complication	No. of patients (%)
Hypotension	165 (29.9)
Hypertension	13 (2.35)
Desaturation	1 (0.18)

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