

Anesthesia-Related Adverse Event Rate and Alteration of Blood Pressure and Heart Rate During and Immediately after Unsedated Esophagogastroduodenoscopy in Elderly Patients

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ABSTRACT

AIMS: Esophagogastroduodenoscopy (EGD) is safely performed by using topical pharyngeal anesthesia in elderly patients. However, it can induce hemodynamic changes and adverse events. The aim of this study was to compare and evaluate the anesthesia-related adverse event rate and the alteration of blood pressure and heart rate in unsedated EGD procedure between elderly patients and younger patients.

METHODS: 1,998 patients underwent unsedated EGD procedures in the study period. All patients who had no history of hypertension, diabetes and cardiovascular diseases were categorized into the two groups. Patients aged <65 years were in group A, and patients aged ≥65 years were in group B. The primary outcome variable was the anesthesia-related adverse event rate during and immediately after the procedure. The secondary outcome variables were the alteration of blood pressure and heart rate.

RESULTS: After matching gender, weight, ASA physical status and indications of procedure, there were 342 patients in group A and 195 patients in group B. All endoscopies were completely successfully. There were no significant differences in gender, weight, ASA physical status, duration of procedure, indication of endoscopy, hemodynamic parameters, and the anesthesia-related adverse events between the two groups. All adverse events were mild degree, transient and did

not require medications.

CONCLUSION: Anesthesia-related adverse event rate and alterations of blood pressure and heart rate during and immediately after unsedated EGD procedure in the elderly patients are relatively high. However, all of these are mild, transient and did not greater than in the younger patients.

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Key words: Esophagogastroduodenoscopy; Unsedated; Topical anesthesia; Adverse event; Hemodynamic; Elderly; Younger

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INTRODUCTION

Esophagogastroduodenoscopy (EGD) is generally safe and can be well tolerated^[1]. The proportion of patients undergoing diagnostic EGD without sedation has been increasing over the past decade, and previous studies suggest that many patients who receive adequate information about the procedure now choose not to have sedation^[2]. In Thailand, most of diagnostic and screening EGD procedures in adult and elderly patients are performed without intravenous sedation^[3]. Topical pharyngeal anesthesia is often used as premedication for EGD procedure. Different form of topical lidocaine exists including viscous solution and spray. Several studies have been demonstrated the efficacy of topical lidocaine as a single agent for pharyngeal anesthesia in unsedated EGD procedure.

In a recent meta-analysis, topical pharyngeal anesthesia before EGD with sedation is shown to improve ease of endoscopy and patient tolerance^[4]. Pharyngeal anesthesia is also often used in

unsedated EGD and is thought to improve patient tolerance^[5]. In contrast, the use of intravenous sedation for endoscopic procedures in elderly patients was associated with higher adverse events although these procedures were sedated by trained anesthetic personnel with appropriate monitoring^[6]. Currently, there have not been any studies directly comparing adverse event rate and alteration of blood pressure and heart rate in patients aged ≥ 65 years and patients aged < 65 years undergoing unsedated EGD. Our study hypothesis was that there would be significant differences in the anesthesia-related adverse event rate and alteration of blood pressure and heart rate between the elderly patients and the younger patients during and immediately after unsedated EGD procedure due to physiologic changes and underlying disease pathophysiology. This present study, therefore, was designed to compare and evaluate the anesthesia-related adverse event rate and alteration of blood pressure and heart rate in unsedated EGD procedure between elderly patients and younger patients.

MATERIAL AND METHODS

Patients

The study was conducted from December 2006 to May 2008 at a large tertiary care referral center, Siriraj Hospital, Bangkok, Thailand. Patients with age at least 18 years of age who presented for diagnostic EGD were eligible for the study. Exclusion criteria included sedated EGD procedures, any clinical evidence of hepatic encephalopathy, patients with hypertension, diabetes and cardiovascular diseases as well as patients with ASA physical status class IV or V. A total of 1,998 unsedated EGD procedures were performed during the study period. The study was approved by the Institutional Review Board of the Faculty of Medicine Siriraj Hospital.

Study design

The study is a retrospective study. All patients were categorized into either healthy adult (aged < 65 years) group (A) or elderly (aged ≥ 65 years) group (B) according to age. Pharyngeal anesthesia with topical viscous lidocaine solution and/or lidocaine spray was performed in the pre-procedure room by anesthetic personnel. The anesthesia-related adverse event rate during and immediately after the procedure was the primary outcome measured. The secondary outcome variables were the alterations of blood pressure and heart rate.

The procedure was performed by either gastroenterology fellow supervised by staff attending physician or by the staff endoscopist. Olympus video esophagogastroduodenoscope (GIF-Q 180, Olympus Corporation, Tokyo, Japan) was used for all EGD procedures. Each patient was monitored with noninvasive blood pressure, heart rate, electrocardiogram, and oxygen saturation with pulse oximetry. No other premedication drugs were administered before the procedure.

Pharyngeal anesthesia technique

Pharyngeal anesthesia was administered by the anesthetic nurse or anesthesiology resident supervised by the staff anesthesiologist in the pre-procedural room. Topical lidocaine viscous (Xylocaine[®] 2%, Astra Zeneca) and/or lidocaine spray (Xylocaine[®] 10% Spray, Astra Zeneca) was used for pharyngeal anesthesia. The maximum dose of lidocaine used was not to be higher than 5 mg/kg. Once adequate pharyngeal anesthesia was achieved, the patient was moved into the procedural room for the start of the procedure.

Anesthesia-related adverse events

All anesthesia-related adverse events were recorded. The adverse events were defined as follow: 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, SpO₂ $< 90\%$); airway obstruction. A significant adverse event was defined as prolonged desaturation or apnea with duration more than 30 sec.

Statistical analysis

Results were expressed as mean \pm SD or percentage (%), when appropriate. Comparisons between the patients aged < 65 years and the patients aged ≥ 65 years 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

After matching gender, weight, ASA physical status and indications of procedure, there were 342 patients in group A and 195 patients in group B. Table 1 summarizes the patients' characteristics of the two groups. The mean age in group A was 50.9 \pm 11.5 years and the mean age in group B was 73.3 \pm 5.9 years. There were no significant differences in gender, weight, ASA physical status, duration of procedure and indication of endoscopy between the two groups.

All EGD procedures were successfully completed. Table 2 shows systolic and diastolic blood pressure, heart rate and oxygen saturation in both groups. There were no significant differences in systolic and diastolic blood pressure, heart rate and oxygen saturation at baseline, scope insertion, 5 min, 10 min and 15 min after scope insertion between the elderly and the younger groups. These hemodynamic parameters returned to the baseline about 15 min after endoscope insertion.

The adverse events during and immediately after endoscopy are shown in Table 3. The overall adverse event rate occurred in 102 patients (29.8%) in group A and 57 patients (29.2%) in group B ($p=0.885$). Most of these adverse events are hemodynamic alterations including tachycardia, 14.9% in group A and 13.3% in group B; hypertension, 9.1% in group A and 7.2% in group B; and tachycardia

Table 1 Characteristics of patients, duration of procedure and indication of endoscopy (mean, SD and percentage).

	Group A (n=342)	Group B (n=195)	P value
Age (yr) (mean, SD)	50.9 (11.5)	73.3 (5.9)	
Gender (%):			0.573
Male	191 (55.8)	104 (53.3)	
Female	151 (44.2)	91 (46.7)	
Weight (kg) (mean, SD)	60.4 (13.9)	55.6 (11.9)	0.083
ASA physical status (%):			0.444
I	14 (4.1)	5 (2.6)	
II	257 (75.1)	155 (79.5)	
III	71 (20.8)	35 (17.9)	
Duration of procedure (min) (mean, SD)	12.9 (8.8)	13.3 (7.2)	0.175
Indication of endoscopy (%)			0.086
Dyspepsia	103 (30.1)	49 (25.1)	
Variceal screening	82 (24.0)	39 (20.0)	
Upper gastrointestinal hemorrhage	59 (17.2)	50 (25.7)	
Gastroesophageal reflux disease	37 (10.8)	15 (7.7)	
Gastritis	19 (5.6)	9 (4.6)	
Others	42 (12.3)	33 (16.9)	

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

Table 2 Hemodynamic parameters: systolic and diastolic blood pressure (mmHg), heart rate (beat/minute) and oxygen saturation (SpO₂, %) (mean, SD).

	Group A	Group B	P value
Baseline			
SBP, DBP	127.4 (16.5), 79.2 (13.9)	142.5 (19.9), 76.2 (14.8)	0.072, 0.193
HR, SpO ₂	79.8 (14.1), 98.9 (1.3)	79.8 (15.4), 98.8 (1.3)	0.084, 0.939
Scope insertion			
SBP, DBP	145.4 (24.9), 83.7 (17.4)	144.1 (21.4), 81.2 (17.9)	0.085, 0.693
HR, SpO ₂	91.4 (18.9), 98.9 (1.4)	85.7 (17.8), 98.9 (1.6)	0.320, 0.345
5 min			
SBP, DBP	144.9 (24.8), 80.2 (16.7)	158.0 (23.7), 75.7 (14.8)	0.068, 0.645
HR, SpO ₂	90.5 (19.1), 99.0 (1.3)	85.8 (18.1), 98.9 (1.5)	0.440, 0.749
10 min			
SBP, DBP	139.6 (23.9), 79.4 (15.7)	152.1 (23.9), 74.5 (14.3)	0.174, 0.197
HR, SpO ₂	87.7 (17.8), 99.0 (1.3)	85.0 (17.8), 99.0 (1.5)	0.736, 0.505
15 min			
SBP, DBP	139.3 (23.0), 79.0 (16.2)	144.2 (25.2), 72.6 (17.5)	0.609, 0.631
HR, SpO ₂	89.3 (18.1), 99.0 (1.4)	84.7 (19.2), 99.2 (1.3)	0.229, 0.437

Group A: Age <65 years; Group B: Age ≥65 years; SBP: Systolic blood pressure; DBP: Diastolic blood pressure; HR: Heart rate; SpO₂: Oxygen saturation

Table 3 Anesthesia-related adverse events during and immediately after endoscopy (n, %).

	Group A (n=342)	Group B (n=195)	P value
Overall	102 (29.8)	57 (29.2)	0.885
Tachycardia	51 (14.9)	26 (13.3)	0.616
Hypertension	31 (9.1)	14 (7.2)	0.502
Tachycardia and Hypertension	20 (5.8)	17 (8.7)	0.448

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

and hypertension, 5.8% in group A and 8.7% in group B. All of these alterations were transient and did not require any specific interventions. No signs and symptoms of pulmonary aspiration and local anesthetic toxicity were noted. Consequently, there were no procedure-related complications

DISCUSSION

EGD is considered to be safe, feasible, quick and well tolerated procedure. However, it does take some risk for all patients. The adverse event rate after EGD procedure varies between 0.02% and 1.1% with a mortality rate of 0%-0.12%. Most adverse events are cardiorespiratory-related events. Elderly patients and the patients with cardiorespiratory diseases are at increase risks^[7]. In our previous study, the use of lidocaine spray for topical pharyngeal anesthesia in unsedated EGD was shown to result in a higher procedural completion rate, greater ease of intubation, and higher patient and endoscopist satisfaction. Moreover, the changes of hemodynamic parameters were also transient^[8].

There are a number of advantages associated with performing EGD without sedation. These include a decreased incidence of cardiorespiratory complications, a shorter procedural time, decreased hospital costs as well as the ability to work and drive immediately following the procedure. Several factors associated with successful completion of unsedated EGD have been reported. These included older age, lower level of pre-endoscopic apprehension, smaller endoscope diameter, male gender, and having undergone prior unsedated endoscopy^[9]. Moreover, young age, male gender and duration of procedure are significant factors for unwillingness to undergo repeat unsedated EGD^[10].

The objectives of the present study were to measure the anesthesia-related adverse event rate and the alteration of blood pressure and

heart rate during and immediately after the unsedated EGD procedure. Our result showed that unsedated EGD for elderly patients was safe and effective. The anesthesia-related adverse event rate and alteration of blood pressure and heart rate after unsedated EGD in elderly patients did not higher than in the younger patients. In addition, all adverse events were mild degree, transient and did not require medications. The non-different outcome variables of the study might be due to two factors. First, all unsedated EGD procedures in both groups were successfully completed. Because of adequate pharyngeal anesthesia, the reflex responses and the mechanical irritation would be mild or none. Second, all EGD procedures were diagnostic cases. This study excluded inadequate anesthesia cases and complicated endoscopic procedures.

The anesthesia-related adverse event rate in either healthy adult (aged <65 years) group or elderly (aged ≥65 years) group in this study is relatively high. This may be due to the definition of adverse event. The adverse events were defined as follow: 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, SpO₂ <90%); airway obstruction. We used this definition from the report of an ASGE (American Society for Gastrointestinal Endoscopy) workshop for endoscopic adverse events^[11].

The autonomic nervous system plays an elaborate function in maintaining adequate hemodynamics and coronary blood flow. The cardiovascular effects associated with EGD procedure can lead to an increase in sympathetic tone and a decrease in parasympathetic tone causing tachycardia, hypertension and cardiac arrhythmias. In addition, the mechanical irritation of esophagus during the procedure can cause a vagal reflex, which in turn can increase sympathetic tone^[12]. The previous studies showed endocrine stress responses after EGD procedure. Consequently, anxiety or fear also influences hemodynamic parameters.

The data regarding the safety of unsedated EGD are limited, and there are no large prospective studies that address safety. Limited studies have reported no serious complications in patients who underwent unsedated EGD procedures. The observed hemodynamic alterations were transient and did not require any specific interventions. These hemodynamic changes are likely a result of stress of the procedure. Consequently, mild to moderate hypoxia is common during therapeutic EGD procedures and of no serious consequence. However, severe hypoxia is less common. Previous studies recommended the non-invasive monitoring including pulse oximetry in patients with age greater than 45 years^[13] or 50 years^[14] and procedure longer than 8 min^[13] or 27 min^[14]. In our present study, patients with hypertension or other cardiovascular co-morbid conditions were excluded from the study. However, a higher complication rate of the study might be due to the definition of complications.

Generally, the elderly patients might have several co-morbid diseases. Many physicians concern the safety of unsedated EGD in elderly patients. However, Balagopal and coworkers found out that EGD was well tolerated, safe and did not produce a higher incidence of complications even in elderly patients with co-morbidities. They also suggested that age alone should not influence the physician's judgment regarding tolerability of EGD procedure^[15]. Additionally, the study of Lee and Kim demonstrated that the incidence of arterial oxygen desaturation was not related to age, sex, preprocedure pulmonary function tests, smoking and duration of EGD. They also suggested that oxygen supplement might not be needed during EGD even in patients with moderately impaired pulmonary function tests^[16].

The patient's age, gender and stage of the procedure in relation

to the cardiorespiratory changes during EGD procedures were evaluated by Badiger and colleagues^[7]. Their study showed that cardiorespiratory changes during EGD procedures were more frequent in the age groups of 51-60 years, with the same incidence in both sexes. Oxygen saturation decreased about 4% during insertion of an endoscope. However, severe hypoxia was found in 5% of the patients, mostly in those patients who are above 50 years of age. Tachycardia was observed in 88% of the patients, and hypertension was noted in 15.7% which returned to baseline within few minutes after the procedure. Additionally, the recovery was faster in the younger age groups and in the female patients^[7].

The study of Lee and colleagues confirmed that acute cardiovascular complications of endoscopy were infrequent and usually self-limited. Serious complications commonly occurred in the patients with heart disease^[17]. Although, the complication rate of endoscopy is low, EGD may provoke cardiac stress. A previous study showed heart rate increased significantly when the endoscope was placed in the esophagus compared with the rate before insertion. In addition, serum concentration of norepinephrine increased significantly after the procedure. However, the changes of cardiac output, cardiac index and left ventricular work index were not significant during EGD procedure^[18].

There are several limitations in this study. First, our study is a retrospective study. Some limitations may be occurred. Second, the endoscopic procedures were performed by variety of endoscopists including fellows in training. Therefore, the varied experience may have biased the result including the anesthesia-related adverse event rate and the alteration of blood pressure and heart rate. Stress-related hemodynamic changes need further exploration especially in patients with cardiovascular co-morbid conditions. Overall, despite these limitations, we are confident, however, that these findings are generalizable to the practice of unsedated EGD procedure that used topical pharyngeal anesthesia in the elderly patients.

SUMMARY

In conclusion, the anesthesia-related adverse event rate and the alterations of blood pressure and heart rate during and immediately after unsedated EGD procedure in the elderly (aged ≥ 65 years) patients did not higher than in the younger (aged < 65 years) patients. Additionally, the use of topical pharyngeal anesthesia for this procedure in elderly patients is safe with rare serious adverse events.

CONFLICT OF INTERESTS

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

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