

# Frequency of complications due to sedation in patients undergoing gastrointestinal endoscopy

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## Abstract

**Aim:** Non-operating room anesthesia is frequently used in all areas. Gastrointestinal endoscopy is one of the procedures requiring sedation outside the operating room. This study aimed to investigate the drugs used for sedation and the complications during gastrointestinal procedures in our hospital.

**Materials and Methods:** The files of the patients who underwent anesthesia for gastrointestinal endoscopy between 01.01.2018-31.12.2018 in our hospital were retrospectively reviewed. ASA score, age, gender, vital signs, drugs, doses, complications, and need for intensive care were evaluated.

**Results:** A total of 508 patients were sedated. The 187 cases (36.3%) were male, and 321 (63.2%) were female. The mean age was  $54.9 \pm 15.6$  years. Two hundred fifty-two cases (49.6%) were found to be ASA II. Colonoscopy was performed in 134 cases (26.4%), gastroscopy in 270 cases (53.1%), both colonoscopy and gastroscopy in 99 cases (19.5%), and PEG in 5 cases (1%). The most frequently used anesthetic drug in sedated patients was observed to be propofol. Complications occurred in 28 patients (5.5%).

**Conclusions:** Drug selection becomes crucial in non-operating room anesthesia applications in terms of early recovery and patient safety. In this study, it was seen that the most used drug was propofol, and accordingly, it was concluded that mortal complications were not observed.

**Keywords:** Complication; gastrointestinal endoscopy; non-operating room anesthesia; sedation

## INTRODUCTION

Developing technology and surgery have increased the number and types of invasive procedures performed outside the operating room. This situation increased the need for anesthesia of these procedures. In many countries, endoscopic interventions are in the first place in non-operating anesthesia applications (1). Drugs used to provide sedation may lead to a continuous process from anxiolysis to general anesthesia outside the sedation's targeted level (2). Moderate sedation is aimed at endoscopic procedures (3). However, patients may develop unexpectedly deep sedation and general anesthesia and may require cardiopulmonary system support. Failure to do so may result in death. Besides, preoperative evaluation is absolutely necessary before the endoscopic intervention in order to minimize such risks (3,4).

The distance to the operating room and lack of technical equipment make anesthesia applications insecure. In non-operating environments, basic standards are required to

perform procedures without disregarding patient safety. It is entirely the responsibility of the anesthesiologist to perform anesthesia under applicable standards (2).

There is still no consensus regarding the most appropriate sedation to be performed during gastrointestinal interventions, and researches are currently in progress for sedation medications.

In this study, we aimed to investigate the drugs used for sedation and the complications during gastrointestinal procedures in our hospital in 2018.

## MATERIALS and METHODS

After the approval of the ethics committee of the Medical Faculty of Namik Kemal University (29.11.19-109), the files of the patients who underwent anesthesia for gastrointestinal endoscopy between 01.01.2018-31.12.2018 were reviewed retrospectively. The information was obtained from the forms in the anesthesia archive; therefore, it was not needed to get informed consent. The forms consisted of preoperative evaluation and

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anesthesia follow-up schedules. An anesthesiologist evaluated the patients before endoscopy. The American Society of Anesthesiologists (ASA) risk score, age, gender, procedure information, vital signs (blood pressure, pulse, pulse oximeter), drugs used and doses, and complications of patients, who were monitored during the procedure, were noted in the anesthesia record form. Anesthesia for endoscopy was performed by an anesthesiologist and nurse anesthetist. A monitor capable of measuring heart rate, blood pressure and oxygen saturation, aspirator, oxygen supply, laryngoscope, an emergency bag, and a defibrillator were included in the endoscopy unit. Following the procedure, the patients were discharged after being followed in the recovery section of the unit.

### Statistical Analysis

In summarizing the study's data, descriptive statistics were presented as numbers and percentages for categorical variables. Depending on the distribution for continuous variables, mean  $\pm$  standard deviation, and median to quartile width were determined. The Kolmogorov Smirnov test analyzed the normality of numerical variables. Mann Whitney U test was used to analyze the differences between numerical variables according to complications. Fisher's Exact Test compared the differences between categorical variables according to complications. All calculations were made with R-3.5.2 (for Windows. The R-project for statistical computing), Jamovi project (2018), Jamovi (Version 0.9.5.12) [Computer Software] (Retrieved from <https://www.jamovi.org>) and JASP Team (2018) JASP (Version 0.9) [Computer software] software. Additionally Comm R Commander 'and' RcmdrPlugin.KMggplot2' packages were used in the creation of the graphics.

## RESULTS

In our study, a total of 508 patients underwent gastrointestinal procedures under anesthesia in 2018. The 187 cases (36.3%) were male, and 321 (63.2%) were female. The mean age of the patients was  $54.9 \pm 15.6$  years. When ASA classifications were examined, 227 cases were classified as ASA I, 252 as ASA II, 28 as ASA III, and one as ASA IV (Table 1). Colonoscopy was performed in 134 cases (26.4%), gastroscopy in 270 cases (53.1%), colonoscopy and gastroscopy in 99 cases (19.5%) and PEG (Percutaneous endoscopic gastrostomy) in 5 cases (1%). Mean endoscopy time was  $10.9 \pm 5.6$  minutes, and mean anesthesia time was  $14.3 \pm 5.9$  minutes. It was observed that the most used anesthetic drug in sedated patients was propofol. The mean propofol dose was  $138.5 \pm 50.6$  mg, and the midazolam dose was  $1.4 \pm 0.5$  mg. Complications occurred in 28 patients (5.5%). Desaturation was observed in 11 cases (2.2%), bradycardia in 12 cases (2.4%), and hypotension in 5 cases (1%) (Table 1).

In Table 1, gender, age, ASA classification, procedure type, duration of endoscopy, duration of anesthesia, and drug dosages were compared in terms of complications.

The difference between the median propofol dosage in patients with desaturation was statistically significant ( $p = 0.016$ ). The median propofol dosage was significantly higher in patients with desaturation. When the other comparisons were examined, no statistically significant difference was observed ( $p > 0.05$  for each, see Table 1). While 3 of the desaturated patients were male and 8 were female, there were 5 cases in ASA I classification and 6 cases in ASA II classification. When the types of procedures were evaluated in desaturated cases, colonoscopy alone was performed in 2 patients, gastroscopy alone in 5 patients and gastroscopy and colonoscopy in 4 patients.

There was a significant difference between the procedure type and bradycardia ( $p = 0.008$ ). Bradycardia was significantly more common in patients undergoing PEG and both gastroscopy and colonoscopy, whereas the bradycardia rate was lower in gastroscopy patients. There was no statistically significant difference between bradycardia and other comparisons ( $p > 0.05$  for each, see Table 1). While 5 of the cases with bradycardia were male and 7 were female, 4 were ASA I, 6 were ASA II, and 2 were ASA III.

The rate of hypotension according to procedure type was statistically significant ( $p = 0.027$ ). The rate of hypotension was significantly higher in the PEG procedure. While 3 of the patients with hypotension were male and 2 were female, 1 was ASA I and 3 were ASA II.

## DISCUSSION

In addition to non-invasive procedures for diagnosis and treatment in non-operating environments, more invasive and complex interventions have begun to be performed in patients. In the first place, gastrointestinal interventions are the most common type of procedures that require sedation outside the operating room. With these procedures, the need to provide appropriate and safe sedation to patients has become a current issue.

The Turkish Anesthesiology and Reanimation Society's guidelines for non-operating room anesthesia applications in 2015 and the American Society of Anesthesiology guidelines formed a basis for establishing standards for non-operation room anesthesia applications. Drugs, equipment, and environmental conditions to be provided in the units are specified. Besides, the recovery unit after anesthesia is insufficient or absent in most hospitals for non-operating room applications. This condition increased the need for anesthetic drugs to provide safer and faster recovery (2,5).

We found that the most commonly used anesthetic drugs were propofol and midazolam when we retrospectively analyzed the anesthetic drugs used for sedation in our hospital's gastrointestinal endoscopy unit. The number of patients who received propofol and midazolam combined was 82 (16.14%), and the number of patients who received propofol alone was 426 (83.86%). We believe that fast induction and rapid recovery of propofol are essential for its frequent use in non-operating room anesthesia.

Table 1. Comparison of gender, age, ASA classification, procedure type, duration of endoscopy, duration of anesthesia, dosages of propofol and midazolam and sedation by anesthesiologist in terms of complications of patients

	Desaturation			Bradycardia			Hypotension		
	No, (n=497)	Yes, (n=11)	P	No, (n=496)	Yes, (n=12)	P	No, (n=503)	Yes, (n=5)	P
<b>Gender (%)</b>									
Male	184 (37.0)	3 (27.3)	0.754*	182 (36.7)	5 (41.7)	0.766*	184 (36.6)	3 (60.0)	0.363*
Female	313 (63.0)	8 (72.7)		314 (63.3)	7 (58.3)		319 (63.4)	2 (40.0)	
<b>Age (median [IQR])</b>	55.0 (44.0 - 67.0)	57.0 (39.0 - 70.5)	0.978**	55.0 (43.0 - 67.0)	57.5 (52.2 - 64.5)	0.539**	55.0 (43.5 - 67.0)	67.0 (65.0 - 81.0)	0.140**
<b>ASA Classification (%)</b>									
ASA I	222 (44.7)	5 (45.5)		223 (45.0)	4 (33.3)		226 (44.9)	1 (20.0)	
ASA II	246 (49.5)	6 (54.5)	0.999*	246 (49.6)	6 (50.0)		249 (49.5)	3 (60.0)	0.220*
ASA III	28 (5.6)	0 (0.0)		26 (5.2)	2 (16.7)		27 (5.4)	1 (20.0)	
ASA IV	1 (0.2)	0 (0.0)		1 (0.2)	0 (0.0)		1 (0.2)	0 (0.0)	
<b>Procedure Type (%)</b>									
Colonoscopy	132 (26.6)	2 (18.2)		130 (26.2)	4 (33.3)		132 (26.2)	2 (40.0)	
Gastroscopy	265 (53.3)	5 (45.5)	0.454*	268 (54.0)	2 (16.7)		269 (53.5)	1 (20.0)	<b>0.007*</b>
Gastro+Colonoscopy	95 (19.1)	4 (36.4)		94 (19.0)	5 (41.7)		98 (19.5)	1 (20.0)	
PEG	5 (1.0)	0 (0.0)		4 (0.8)	1 (8.3)		4 (0.8)	1 (20.0)	
<b>Dur. of Endoscopy,min. (median [IQR])</b>	10.0 (6.0 - 15.0)	12.0 (10.0 - 15.0)	0.077**	10.0 (6.0 - 15.0)	13.5 (10.0 - 15.0)	0.054**	10.0 (6.0 - 15.0)	12.0 (8.0 - 17.0)	0.328**
<b>Dur. of Anesthesia,min. (median [IQR])</b>	12.0 (10.0 - 18.0)	15.0 (13.5 - 18.0)	0.107**	12.0 (10.0 - 18.0)	15.5 (12.0 - 20.0)	0.100**	12.0 (10.0 - 18.0)	17.0 (10.0 - 20.0)	0.343**
<b>Propofol, Mg (median [IQR])</b>	100.0 (100.0 - 200.0)	150.0 (150.0 - 200.0)	<b>0.016**</b>	100.0 (100.0 - 200.0)	150.0 (100.0 - 200.0)	0.417**	100.0 (100.0 - 200.0)	200.0 (100.0 - 200.0)	0.588**
<b>Midazolam, Mg (median [IQR])</b>	1.0 (1.0 - 2.0)	2.0 (1.0 - 2.0)	0.253**	1.0 (1.0 - 2.0)	1.0 (1.0 - 1.4)	0.685**	1.0 (1.0 - 2.0)	1.0 (1.0 - 1.0)	0.309**

\*\* : Mann Whitney U test is used. Descriptive statistics were given as median (IQR). IQR: Interquartile range

Although there are differences within sedation drugs, conscious sedation, or analgesia drugs are generally administered during the endoscopic procedure (6). It was found that sedating the patient before the procedure was much more reliable for the patient and the doctor (7). The most commonly used sedative and analgesic drugs in gastroenterology practice are midazolam, propofol, and opioids alone or as in combination. However, the search for an optimal method and combination continues.

An anesthesiologist performed the sedation, and it was reported that adequate sedation was provided in our study. The mean dose of propofol given to patients in anesthesia applications in our clinic's endoscopy unit was  $138.5 \pm 50.6$  mg, while the midazolam dose was observed as  $1.4 \pm 0.5$  mg on average. Although the initial and additional doses of the anesthesia were made according to the procedure's length, the drug doses administered to patients could not be determined from the records. Accordingly, only the total dose was examined from the records since our study was retrospective. We think that this is the limiting aspect of our study. Anesthetic agents in different doses and combinations have been used in various sources and studies for sedation (8). Sporea et al. (9) used propofol-based sedation in their retrospective review of 974 adults' lower gastrointestinal endoscopy. They used propofol-midazolam-fentanyl in most patients (52.1%) and propofol-diazepam-fentanyl in some (26.5%).

We encountered a total of 28 (5.5%) complications in 508 patients. We did not see any mortality and morbidity that required hospitalization in the patients included in our study. Desaturation was observed in 11 cases (2.2%), bradycardia in 12 (2.4%), and hypotension in 5 cases (1%). In our study, a significant increase in desaturation frequency was found in the use of propofol depending on the dose administered. No significant relationship was found between propofol dose and the incidence of bradycardia and hypotension. Besides, while saturation is a parameter that instantly changes, blood pressure may have been measured intermittently and may not have been recorded. This condition may also be a limiting aspect of our study. In all cases with desaturation, invasive/non-invasive respiratory support was not required. The problem was resolved with a simple intervention. There are no studies with a large number of patients in the literature on morbidity and mortality rates in non-operating room anesthesia applications. In a study conducted in 1622 patients who underwent non-operating anesthesia, Iyilikci et al. (10) encountered 6 major and 40 minor complications. A meta-analysis was published comparing propofol to other anesthetics for gastrointestinal endoscopy in the adult population (11). Based on the 27 studies' meta-analysis, the authors concluded that there was no significant difference in cardiopulmonary side effects between propofol and other anesthetic agents (12). A different study has shown that propofol provides shorter recovery time and better sedation than other sedative agents without increasing cardiopulmonary complications (13).

In our study, there was a statistically significant difference between bradycardia and the type of procedure ( $p = 0.008$ ). While bradycardia rates were significantly higher in PEG and gastroscopy and colonoscopy procedures, the bradycardia rate was lower in gastroscopy. The rate of hypotension according to the type of procedure was statistically significant ( $p = 0.027$ ). The rate of PEG procedure was significantly higher in patients with hypotension. However, in our study, the number of patients who underwent PEG was 5, and only 1 patient had hypotension. Patients undergoing PEG procedures were geriatric and had a mean age of 85 years. In patients, bradycardia was treated with atropine, while hypotension was probably transient and did not require any pharmacological treatment.

In our study, it was observed that 134 cases (26.4%) underwent colonoscopy, 270 (53.1%) cases gastroscopy, 99 (19.5%) cases both colonoscopy and gastroscopy, and 5 cases PEG (1%). In other studies, in which propofol and other anesthetic agents were compared in patients undergoing advanced endoscopic procedures such as endoscopic retrograde cholangiopancreatography and endoscopic submucosal dissection, similar conclusions were determined (11,14).

## CONCLUSION

Gastrointestinal endoscopic procedures performed outside of the operating room in 508 patients were practiced with sedation in 2018. In our cases, low-dose propofol-based intravenous sedation was the most commonly used, and anesthesia complications were observed in 5.5% of cases. It can be concluded that the low-dose propofol regime for intravenous sedation applied by the anesthesiologist in the endoscopy unit outside the operating room is safe.

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