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ORIGINAL ARTICLE

Prospective Study

How to improve patient satisfaction during midazolam sedation for gastrointestinal endoscopy?

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Abstract

AIM

To determine the procedure-related factors that affect sedation satisfaction and to make a suggestion to improve it.

METHODS

We prospectively enrolled a total of 456 patients who underwent outpatient endoscopy procedures with midazolam sedation between March 2014 and August 2014. All patients completed both pre- and post-endoscopy questionnaires about sedation expectations and satisfaction.

RESULTS

The study cohort included 167 (36.6%) patients who

underwent esophagogastroduodenoscopy (EGD), 167 (36.6%) who underwent colonoscopy, and 122 (26.8%) who underwent a combined procedure (EGD and colonoscopy). Over 80% of all patients were satisfied with sedation using midazolam. In univariate and multivariate analyses, total procedure time in the EGD group, younger age (≤ 50 years), and longer colonoscopy withdrawal time in the colonoscopy group were related to decreased satisfaction with sedation. However, in active monitoring and intervention group, there was no decrease in grade of satisfaction despite longer procedure time due to more procedures during colonoscopy. Younger age (≤ 50 years), longer inter-procedure time gap, and colonoscopy withdrawal time were related to decreased satisfaction in the combined EGD and colonoscopy group.

CONCLUSION

Midazolam is still a safe and effective sedative for gastrointestinal endoscopy. Satisfaction with sedation depends on several factors including age (≤ 50 years) and procedure time duration. To improve patient satisfaction with sedation, active monitoring of sedation status by the endoscopist should be considered for patients who require long procedure time.

Key words: Conscious sedation; Patient satisfaction; Endoscopy; Midazolam; Surveys and questionnaires

Core tip: This was a prospective study of 456 patients that evaluated procedure-related factors with midazolam sedation satisfaction. Satisfaction with sedation depends on several factors including age (≤ 50 years) and procedure duration. To improve patient satisfaction with sedation, active monitoring of sedation status by an endoscopist should be considered for patients whose procedures take a long time.

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INTRODUCTION

Esophagogastroduodenoscopy (EGD) and colonoscopy are important examinations for screening, diagnosing, and treating a variety of gastrointestinal diseases. Specifically, endoscopy is one of the best surveillance tools for early detection of several cancers, but some patients refuse endoscopic examinations because of fear and anxiety of discomfort during the procedure[1]. Previous studies have reported that conscious sedation endoscopy improves patient satisfaction, reduces fear and discomfort, and increases compliance with repeat endoscopic procedures[2,3]. Recently, conscious sedation endoscopy has become commonplace in clinical practice[4-6].

As more procedures emerge that are appropriate for sedation endoscopy, sedation quality becomes an important factor because it is directly related to patient satisfaction and could have an effect on performance of endoscopy. Thus, satisfaction with sedation has become an important outcome measure and surveys of satisfaction are critical for quality assurance in many endoscopy centers[7]. In previous studies, young age, high level of anxiety, female sex, and increased gag reflex have been proposed as factors related to decreased patient satisfaction with non-sedation endoscopy[8,9]. However, results varied about factors related to satisfaction with sedation in endoscopy[7,10], and no survey of satisfaction with sedation endoscopy has yet been validated.

Worldwide, midazolam is the most commonly used drug for sedation during endoscopy, followed by fentanyl, propofol, and meperidine[4-6]. Midazolam is a short-acting benzodiazepine with anxiolytic, amnestic, and hypnotic effects. Appropriate sedation level could be adjusted by intravenous titration of midazolam. Because it is possible to evaluate the subject's level of sedation by medical staff during procedure through the Richmond Agitation-Sedation Scale[11] or Observer's Assessment of Alertness/Sedation Scale[12]. Flumazenil, a specific benzodiazepine receptor antagonist, can be used to treat benzodiazepine overdoses in emergency situations and to help reverse anesthesia[13]. In the present study, all patients received midazolam for sedation, and meperidine was added for patients undergoing colonoscopy.

The purpose of this study was to evaluate patient satisfaction with conscious sedation endoscopy, to determine procedure-related factors that affect satisfaction with sedation during endoscopic examinations, and to make a suggestion to improve it.

MATERIALS AND METHODS

Patient selection

We prospectively enrolled 466 patients who underwent outpatient endoscopy procedures between March 2014 and August 2014 at Seoul National University Hospital (SNUH), which is a tertiary referral center in Korea. Ten (2.1%) patients were excluded because they did not complete the satisfaction questionnaire. A total of 456 patients were eligible for this study.

All participants provided written informed consent before completing study interviews and undergoing endoscopy. The procedure for our review of clinical records for this study was approved by the Institutional Review Board of SNUH (IRB No. 1402-083-558).

Pre-endoscopy interview

Each patient completed an interview before the endoscopic procedure. An investigator administered a questionnaire in the waiting room after the patient had received explanations of the endoscopic procedure and sedation. The following patient information was recorded: age, sex, body mass index, previous sedation endoscopy, anxiety about procedure, cause of anxiety, and patient expectations of sedation depth according to the Richmond Agitation-Sedation Scale (drowsy, light, or deep sedation)[11]. Before the procedure started, nurses checked and recorded vital signs including oxygen saturation and blood pressure.

Endoscopy procedure

After completing the pre-endoscopy questionnaire, all patients were moved from the waiting room to the endoscopy procedure room. Before EGD, patients received topical anesthesia by pharyngeal spray with lidocaine. All patients underwent examinations with sedation by intravenous midazolam; meperidine at a dose of 25 mg was added for all patients undergoing colonoscopy. The examinations were performed by 14 board-certified endoscopists using an esophagogastroduodenoscope (GIF-260; Olympus, Tokyo, Japan) and/or a colonoscope (CF H260AL; Olympus, Tokyo, Japan). A nurse and an assistant monitored the patient during the procedure by periodically assessing pulse, blood pressure, ventilator status, and neurologic status. Nurses also completed records that included adverse effects of midazolam, the doses and frequency of midazolam injections, and the durations of the procedure and sedation. Three stages of sedation have been described: minimal, moderate, and deep[14]. In our study, most patients underwent endoscopy with moderate sedation referred to as "conscious sedation".

Post-endoscopy questionnaire

After the endoscopy procedure, patients were allowed sufficient time to recover from sedation, and then they completed a post-procedure questionnaire before discharge. Patients subjectively evaluated the depth of sedation and memory loss during the procedure. The questionnaire was self-administered and collected information regarding patient satisfaction with sedation (very satisfied, satisfied, neutral, dissatisfied, or very dissatisfied) and the cause of dissatisfaction, if patients answered "dissatisfied" or "very dissatisfied".

Definitions

Paradoxical response was defined as unexpected movement after midazolam injection. Decreased respiration was defined as oxygen saturation below 88% despite stimulation. In the case of decreased respiration, oxygen was administered *via* nasal prong. Procedure time was subdivided into the following periods: midazolam injection to procedure start, procedure duration, and procedure finish to antidote injection. For colonoscopy procedures, we further divided the procedure time into two periods: insertion time (anal verge to cecum) and withdrawal time (cecum to anal verge). For patients in the combined EGD and colonoscopy group, the inter-procedure time gap was defined as the waiting time from the end of the first endoscopy procedure to the beginning of the second endoscopy procedure.

Statistical analysis

Results are expressed as frequencies and percentages for categorical variables and means for continuous variables. We compared the three procedure groups using the χ^2-test for ordinal variables and analysis of variance for quantitative variables.

Patient satisfaction outcomes were grouped according to satisfaction: very satisfied, satisfied, neutral, dissatisfied, and very dissatisfied. We constructed univariate and multivariate proportional odds logistic models to determine which factors were related to satisfaction in each procedure group. Results with *P* values less than 0.05 were considered statistically significant. Data were analyzed with statistical software R, version 3.2.2.

RESULTS

A total of 456 patients were eligible for this study and completed the post-endoscopy questionnaire. The patient group comprised 224 men and 232 women and the mean age of the group was 57.2 years. The study cohort included 167 (36.6%) patients who underwent EGD, 167 (36.6%) who underwent colonoscopy, and 122 (26.8%) who underwent a combined procedure (EGD and colonoscopy together). The characteristics of the three groups are shown in Table 1. Compared with the other procedure groups, the combined group had slightly higher first and total midazolam doses; the combined group was also more likely to receive more frequent injections and have longer procedure time. The EGD group was the most satisfied with conscious sedation (Figure 1).

In all, 280 (61.4%) patients reported no anxiety before endoscopy; only 149 (32.7%) patients had mild anxiety and 19 (4.2%) patients had moderate anxiety. The most common cause of anxiety was fear of endoscopy procedure (n = 69, 41.1%), followed by fear of abdominal pain during endoscopy (n = 34, 20.2%), fear of insufficient sedation (n = 19, 11.3%), and fear of paradoxical response (n = 9, 5.4%). Most patients (50.2%) expected moderate sedation with movement or eye-opening to voice, followed by light sedation (41.9%) with brief awakenings to voice (Table 2).

In the EGD group, 81 (48.5%) patients were very satisfied, 74 (44.3%) were satisfied, 7 (4.2%) were neutral, and 5 (3.0%) were dissatisfied with sedation

Table 1 Baseline characteristics of patients according to procedure group *n* (%)

	EGD (*n* = 167)	Colonoscopy (*n* = 167)	Combined group[1] (*n* = 122)	*P* value
Sex				0.099
Male	71 (42.5)	89 (53.3)	64 (52.5)	
Female	96 (57.5)	78 (46.7)	58 (47.5)	
Age (yr)				0.878
≤ 50	43 (25.7)	44 (26.3)	29 (76.2)	
> 50	124 (74.3)	123 (73.7)	93 (76.2)	
Body mass index (kg/m^2)	22.6	22.9	23.3 (76.2)	0.245
Previous sedation endoscopy				0.310
Yes	137 (82.5)	135 (80.8)	92 (75.4)	
No	29 (17.5)	32 (19.2)	30 (24.6)	
Midazolam (mg)				
First dose	4.1	4.3	4.4	0.014
Second dose	1.5	1.6	1.7	0.055
Third dose	1.0	1.6	1.5	0.269
Fourth dose	1.5	1.5	1.9	0.881
Total midazolam dose (mg)	4.4	5.0	6.4	< 0.005
No. of midazolam injections	1.2	1.4	2.2	< 0.005
Time (min)				
Midazolam injection to procedure start	5.1	4.5	4.7	0.327
Total procedure time	3.5	23.7	42.4	< 0.005
Inter-procedure gap			19.5	
Procedure finish to antidote injection	12.8	13.1	12.1	0.482
Satisfaction with sedation during endoscopy				0.016
Very satisfied	81 (48.5)	51 (30.5)	46 (37.7)	
Satisfied	74 (44.3)	86 (51.5)	58 (47.5)	
Neutral	7 (4.2)	19 (11.4)	11 (9.0)	
Dissatisfied	5 (3)	11 (6.6)	7 (5.7)	
Very dissatisfied	-	-	-	

[1]Combined group: Esophagogastroduodenoscopy and colonoscopy together. EGD: Esophagogastroduodenoscopy.

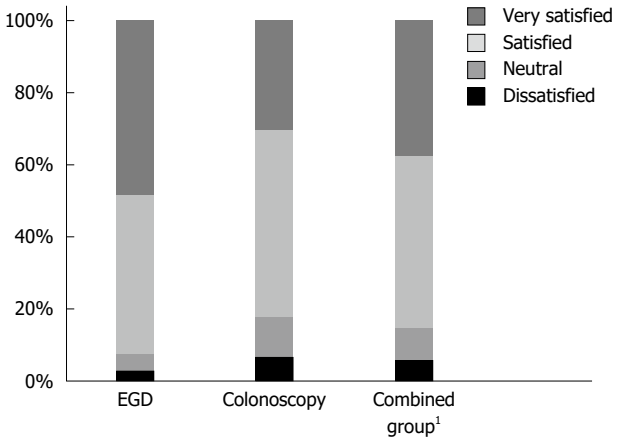

Figure 1 Patient sedation satisfaction according to endoscopy procedure. [1]Combined group: Esophagogastroduodenoscopy and colonoscopy together. EGD: Esophagogastroduodenoscopy.

Table 2 Patient anxiety and expected sedation depth before endoscopy *n* (%)

Anxiety before endoscopy	
No anxiety	280 (61.4)
Mild anxiety	149 (32.7)
Moderate anxiety	19 (4.2)
No answer	8 (1.8)
Cause of anxiety	
Fear of endoscopy procedure	69 (41.1)
Fear of abdominal pain during endoscopy	34 (20.2)
Fear of insufficient sedation	19 (11.3)
Fear of paradoxical response	9 (5.4)
None of the above	36 (21.4)
Expected sedation depth[1]	
Drowsy	19 (4.2)
Light sedation	191 (41.9)
Moderate sedation	229 (50.2)
No answer	9 (2)

[1]Drowsy: Not fully alert, but experiences sustained wakening to voice; Light sedation: Briefly awakens to voice; Moderate sedation: Movement or eye-opening to voice.

according to the post-procedure questionnaire. Total procedure time was only the factor associated with decreased satisfaction (OR = 0.97, *P* = 0.041) in the EGD group (Table 3).

In the colonoscopy group, 51 (30.5%) patients were very satisfied, 86 (51.5%) were satisfied, 19 (11.4%) were neutral, and 11 (6.6%) were dissatisfied with sedation. In our univariate analysis, younger age (≤ 50 years), total midazolam dose, and colonoscopy withdrawal time were associated with decreased patient satisfaction in this group. Age (> 50 years) (OR = 0.38, *P* = 0.005) and colonoscopy withdrawal time (OR = 1.03, *P* = 0.036) were significantly associated with sedation satisfaction in the multivariate analysis (Table 4). In colonoscopy cases, an endoscopist directly commanded nurse to inject additional doses of midazolam under active monitoring of sedation status.

Table 3 Factors associated with sedation satisfaction in the esophagogastroduodenoscopy group

	Univariate analysis				Multivariate analysis			
	Beta	SE (β)	*P* value	OR (95%CI)	Beta	SE (β)	*P* value	OR (95%CI)
Sex (Female)	0.063	0.302	0.834	1.07 (0.59-1.92)				
Body mass index (kg/m^2)	0.001	0.005	0.798	1.00 (0.99-1.01)				
Previous sedation endoscopy	0.642	0.395	0.104	1.90 (0.88-4.12)				
Midazolam, first dose (mg)	-0.094	0.143	0.509	0.91 (0.69-1.20)				
Midazolam, total dose (mg)	-0.022	0.116	0.852	0.98 (0.78-1.23)				
Time (min)								
Midazolam injection to procedure start	-0.033	0.052	0.525	0.98 (0.78-1.23)				
Total procedure time	0.127	0.062	0.041	0.97 (0.87-1.07)	0.127	0.062	0.041	0.97 (0.87-1.07)
Procedure finish to antidote injection	-0.036	0.024	0.127	1.14 (1.01-1.28)				

Table 4 Factors associated with sedation satisfaction in the colonoscopy group

	Univariate analysis				Multivariate analysis			
	Beta	SE (β)	*P* value	OR (95%CI)	Beta	SE (β)	*P* value	OR (95%CI)
Sex (female)	0.197	0.294	0.503	1.22 (0.68-2.17)				
Age (> 50 yr)	-0.937	0.339	0.006	0.39 (0.20-0.76)	-0.956	0.341	0.005	0.38 (0.20-0.75)
Midazolam, first dose (mg)	0.253	0.165	0.127	1.29 (0.93-1.78)				
Midazolam, total dose (mg)	0.223	0.108	0.039	1.25 (1.01-1.54)				
No. of midazolam injections	0.441	0.244	0.070	1.55 (0.96-2.51)				
Time (min)								
Midazolam injection to procedure start	0.009	0.051	0.863	1.01 (0.91-1.12)				
Procedure time								
Colonoscopy insertion time	0.015	0.036	0.670	1.02 (0.95-1.09)				
Colonoscopy withdrawal time	0.030	0.014	0.035	1.03 (1.00-1.06)	0.030	0.014	0.036	1.03 (1.00-1.06)
Procedure finish to antidote injection	0.016	0.020	0.447	1.02 (0.98-1.06)				

These patients were similarly satisfied with sedation despite longer procedure time due to more procedures (28.8 ± 12.2 min *vs* 22.3 ± 12.2 min, *P* = 0.005) (Table 5).

In the combined EGD and colonoscopy group, 46 (37.7%) patients were very satisfied, 58 (47.5%) were satisfied, 11 (9.0%) were neutral, and 7 (5.7%) were dissatisfied with sedation. In our univariate analysis, female sex, younger age (≤ 50 years), total midazolam dose, number of midazolam injections, procedure time, and number of endoscopic mucosal resections were associated with decreased patient satisfaction in the combined group. In the multivariate analysis, age (> 50 years) (OR = 0.38, *P* = 0.022), inter-procedure time gap (OR = 1.02, *P* = 0.027), and colonoscopy withdrawal time (OR = 1.08, *P* = 0.002) were associated with dissatisfaction with sedation (Table 6).

Five (1.1%) patients experienced a paradoxical response, 10 (2.2%) patients complained of pain during the procedure, and 7 patients complained of decreased respiration during the endoscopy procedure. Among these patients, 3 patients with paradoxical response and 2 patients with decreased respiration were given an antidote to the sedative. Of 23 dissatisfied patients, 16 complained of insufficient sedation.

DISCUSSION

Using a multivariate analysis in this prospective study, we found that longer procedure time in EGD, younger age, and longer colonoscopy withdrawal time were procedure-related factors that influenced patient satisfaction with conscious midazolam sedation. Young age, long inter-procedure time, and long colonoscopy withdrawal time were associated with decreased satisfaction in the combined EGD and colonoscopy group, as determined by the multivariate analysis. If a procedure is prolonged, the concerned endoscopist and other health care personnel should pay attention to the sedation status, especially for younger patients.

Few studies have assessed procedure-related factors that affect satisfaction with sedation. In previous studies, endoscopy-associated sedation satisfaction was related to organizational factors such as waiting time, personal considerations, and comfort of the hospital environment[7,10]. Patient factors such as nervousness and chronic use of psychotropic drugs have also been associated with sedation satisfaction[15]. The satisfaction survey mGHAA-9 has been used to evaluate the general satisfaction with hospital systems and subjective aspects of endoscopy centers; however, mGHAA-9 is insufficient to evaluate satisfaction with the sedation itself[3,7].

Previous studies found that female and young patients experienced more discomfort during endoscopy and received more sedatives than male and older patients for achieving similar comfort levels[4,16]. Our findings support the fact that female and younger patients (≤ 50 years) were less satisfied with seda-

Table 5 Patients' satisfaction through active monitoring and intervention by endoscopist during colonoscopy

	Active monitoring (n = 39)	Non-active monitoring (n = 128)	P value
Sex (Male, %)	19 (48.7)	70 (54.7)	0.584
Age (mean ± SD)	56.1 ± 13.0	57.7 ± 13.5	0.514
Proportion of EMR, n (%)	32 (82.1)	51 (39.8)	< 0.001
Satisfaction, n (%)			0.968
Very satisfied	12 (30.8)	39 (30.5)	
Satisfied	20 (51.3)	66 (51.6)	
Fair	5 (12.8)	14 (10.9)	
Unsatisfied	2 (5.1)	9 (7.0%)	
Midazolam, first dose (mg, mean ± SD)	4.5 ± 1.0	4.2 ± 0.9	0.159
Midazolam, total dose (mg, mean ± SD)	5.8 ± 1.2	4.8 ± 1.5	0.002
Midazolam, No. of injections (mean ± SD)	1.6 ± 0.5	1.4 ± 0.7	0.025
Procedure time (min, mean ± SD)	28.8 ± 12.2	22.3 ± 12.2	0.005

Table 6 Factors associated with sedation satisfaction in the combined esophagogastroduodenoscopy and colonoscopy group

	Univariate analysis				Multivariate analysis			
	β	SE (β)	P value	OR (95% CI)	β	SE (β)	P value	OR (95%CI)
Sex (Female)	0.689	0.349	0.049	1.99 (1.00-3.95)				
Age (> 50 yr)	-0.868	0.407	0.033	0.42 (0.19-0.93)	-0.978	0.427	0.022	0.38 (0.16-0.87)
Body mass index (kg/m^2)	-0.001	0.006	0.878	1.00 (0.99-1.01)				
Previous sedation endoscopy	-0.013	0.395	0.974	0.99 (0.46-2.14)				
Midazolam, first dose (mg)	0.105	0.210	0.619	1.11 (0.74-1.68)				
Midazolam, total dose (mg)	0.278	0.113	0.014	1.32 (1.06-1.65)				
No. of midazolam injections	0.690	0.284	0.015	1.99 (1.14-3.48)				
Time (min)								
Midazolam injection to procedure start	0.041	0.033	0.215	1.04 (0.98-1.11)				
Procedure time								
Inter-procedure time gap	0.021	0.010	0.043	1.02 (1.00-1.04)	0.024	0.011	0.027	1.02 (1.00-1.05)
Colonoscopy insertion time	0.084	0.038	0.027	1.09 (1.01-1.17)				
Colonoscopy withdrawal time	0.069	0.025	0.006	1.07 (1.02-1.13)	0.081	0.027	0.002	1.08 (1.03-1.14)
Procedure finish to antidote injection	0.014	0.029	0.637	1.01 (0.96-1.07)				

tion in the combined EGD and colonoscopy group. However, female sex was not a significant factor for dissatisfaction with sedation during endoscopy in our multivariate analysis.

Longer procedure time was strongly associated with dissatisfaction in our analysis. When we divided procedure time for colonoscopy procedures, colonoscopy withdrawal time was associated with sedation satisfaction. When additional procedures such as biopsies and endoscopic mucosal resections were performed, withdrawal time was longer. In colonoscopy cases, an endoscopist directed a nurse to inject additional doses of midazolam while actively monitoring sedation status. Interestingly, over 80% of these patients were satisfied with sedation and there was no decrease in the degree of satisfaction despite longer procedure time due to the additional procedures being carried out (Table 5). However, the endoscopist, as a single variable, was not statistically significant in initial univariate analysis and was not included in multivariate analyses because only one endoscopist was involved in active monitoring of patient groups. Active monitoring and intervention by an endoscopist could be an important way to improve a patient's sedation satisfaction. For active monitoring, endoscopists have to pay close attention to sedation status by observing spontaneous eye opening, verbal arousal, and complaints of pain. As a result of active monitoring, timely dose titrations of midazolam might help maintain the desired conscious sedation during the procedure.

Same-day EGD and colonoscopy are commonly used in clinical practice[17], and carried out in clinical settings when digestive disease is suspected. Performing both EGD and colonoscopy as a combined procedure is convenient for patients, efficient for providers, and saves costs for the health care system[18]. Although the combined procedure group had a longer procedure time than the single-colonoscopy group in our data, patients in the combined group were more satisfied with conscious sedation than those in the colonoscopy group. Patients in the combined group tended to have higher midazolam doses and more midazolam injections than those in the colonoscopy group. This finding is likely because the endoscopist verified the sedation status of the patient and administered additional midazolam before performing the second procedure. In the combined EGD and colonoscopy group, the inter-procedure time gap (the waiting time from the end of the first endoscopy procedure to the start of the second procedure) was related to sedation satisfaction. Therefore, this waiting time should be reduced as much as possible in clinical

practice.

In recent years, the sedative propofol use has increased in community medical practice compared to academic medical practice[19,20]. In a previous study, propofol increased sedation satisfaction by reducing fear and pain compared to other types of sedation[19]. Because propofol provided more rapid recovery than midazolam[21], it has the merit of post-procedure neuropsychologic function over midazolam[22]. Moreover, a previous study showed that propofol was cost-effective in critical illness and emergency situations[23]. However, its cost-effectiveness in outpatient endoscopy is yet unknown. It is important to select sedative medication not only for economic reasons but also for its safe use. The narrow therapeutic window of propofol necessitates close patient monitoring because of the risk of adverse cardiopulmonary events[14]. Therefore, midazolam was still the best option as a sedative during endoscopy in terms of both safety and cost-effectiveness. Administration of another sedative flumazenil results in a safe and cost-effective shortening of the recovery time[24].

This study has some limitations that must be considered. First, we collected the post-procedure survey from patients on site, usually in the recovery room. Patients may have been hesitant to provide responses indicating dissatisfaction in the presence of clinical staff. For this reason, our study showed higher satisfaction scores in on-site surveys than in mail-back surveys[25]. In addition, patients in the recovery room may still have been under the influence of midazolam and, as such, unable to answer all questions accurately. While the patients in this study answered our surveys on the day of the endoscopy examination, previous studies collected such data a few days after the examination *via* telephone surveys or using a mail-back system[7,16]. However, the response rate to telephone or mail back surveys could be lower than that to the on-site survey[25]. Even though the on-site survey has weaknesses, the magnitude of the differences is small, and the on-site method is simple and associated with a higher response rate than mail-back surveys.

Second, the surveys were not anonymous: each survey had the name of the patient and the date of the procedure printed at the top of the questionnaire. This unblinded format could also have led patients to overestimate satisfaction because most patients anticipated a return visit to the hospital to discuss the results of the endoscopy. However, anonymous questionnaires were impossible for this study because we analyzed clinical procedure data such as procedure time and midazolam doses. Third, we used a satisfaction survey that has not been formally validated. A few validated surveys exist for evaluating the general satisfaction of endoscopy, but currently no validated survey specifically evaluates sedation satisfaction.

In conclusion, midazolam is still a safe and effective sedative for gastrointestinal endoscopy. Satisfaction with sedation depends on total procedure time in EGD; younger age and colonoscopy withdrawal time in colonoscopy; and younger age, inter-procedure time gap, and colonoscopy withdrawal time in combined procedures. To improve patient satisfaction with midazolam sedation, active monitoring and intervention by the endoscopist should be considered for patients who require long procedure time.

COMMENTS

Background

The use of endoscopy is important for the early detection of gastrointestinal cancers, but some patients refuse endoscopic examinations owing to fear and anxiety over expected discomfort during the procedure. Conscious sedation endoscopy is the best option to relieve patient discomfort. Therefore, satisfaction with sedation endoscopy is critical for quality assurance in many endoscopy centers. This study was designed to evaluate patient satisfaction with conscious sedation endoscopy, to determine which procedure-related factors affect satisfaction with sedation, and to offer suggestions for improvement.

Research frontiers

In this study, the authors determined which procedure-related factors affect patient satisfaction with sedation during endoscopic examinations. Those factors varied in significance depending on the type of procedure (*e.g.*, esophagogastroduodenoscopy, colonoscopy, and combined group). This outcome suggests that the endoscopist should closely monitor sedation status and pay attention to procedure-related factors, such as procedure time or patient factor (*e.g.*, age), depending on procedure type.

Innovations and breakthroughs

An interesting finding of this study was that active monitoring and intervention by an endoscopist could be an important way to improve patient sedation satisfaction. In addition, midazolam was still found to be a safe and effective medication for conscious sedation.

Applications

The results of this study could help an endoscopist make decisions concerning midazolam titration and when to administer additional doses of midazolam.

Terminology

Midazolam is a short-acting benzodiazepine with anxiolytic, amnestic, and hypnotic effects. Propofol is an intravenous sedative-hypnotic agent used in the induction and maintenance of anesthesia.

Peer-review

A pleasure to read about this interesting topic regarding the patient/customer's perception of adequate sedation that corresponds to the use of drug. A discussion regarding cost comparison of the drugs may add another dimension to drug selection by the Endoscopist/Medical center.

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