Gastrointestinal endoskopik girişimlerde uygulanan sedasyon uygulamalarının retrospektif değerlendirilmesi

Comparison of Sedation Types During Monitored Anesthesia Care for Gastrointestinal Endoscopy

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ÖZ

GİRİŞ ve AMAÇ: *Karmaşık gastrointestinal endoskopik girişimlerin ve anestezi altında işlem yapılması taleplerinin giderek artması sedasyon uygulamasını endoskopinin değişmez bir parçası kılmaktadır. Ameliyathane dışında uygulanan anestezinin standartları tümüyle anestezistin sorumluluğundadır. Ameliyathane dışı ortamlarda anestezi uygulamalarında standartın altında bakımın olduğu ve daha iyi bakım ile çok sayıda komplikasyonun önlenebileceği belirtilmektedir. Biz bu çalışmada hastanemiz endoskopi ünitesindeki anestezi uygulamalarını literatür eşliğinde değerlendirmeyi amaçladık.*

YÖNTEM ve GEREÇLER: *Yerel etik kurul onamı alındıktan sonra hastanemiz endoskopi ünitesinde Eylül 2017 ile Nisan 2018 tarihleri arasındaki sedasyon altında endoskopik girişim yapılan hastalara ait kayıtlar tarandı.*

BULGULAR: *Çalışmaya yaşları 18-95 yıl arasında (47.72±12.94 yıl) değişen 717 hasta alındı.10 hastada(%1,5) hipoksi, 38 hastada (%5) aritmi geliştiği saptandı. Hastalar uygulanan sedatif ajanlara göre gruplandırıldığında komplikasyonlar açısından gruplar arasında farklılık saptanmadı.Hastalar ASA derecesine göre gruplandırıldığında ASA III grubunda hipoksi komplikasyonu yüksek gözlendi. Yaş (p=0,044), BMİ (p=0,006) değişkenlerinin solunumsal komplikasyonların,Yaş (p=0,000) değişkeninin kardiyak komplikasyonların ortaya çıkmasına sebep olabileceği saptandı.*

TARTIŞMA ve SONUÇ: *Ameliyathane dışı anestezi yöntemlerinde kullanılan standart bir anestezik ajan veya anestezik ajan kombinasyonu bulunmamaktadır. Buna karşın en çok tercih edilen yöntemin midazolama ilave edilen ikinci bir anestezik ajan olduğu kanaatindeyiz. Ayrıca ameliyathane dışı anestezi uygulamalarında yaş ve BMI ile komplikasyonlar arasında ilişki olduğunu düşünüyoruz.*

Anahtar Kelimeler: *Pulmoner kapak, yetersizlik, diyastolik fonksiyon.*

ABSTRACT

INTRODUCTION: *The number and complexity of the interventions are increasing at endoscopy units thus sedation requirements also increases. However complications may occur under sedation. The aim of the present study is to evaluate the correlation among complications, given anesthetic agents, patient related causes during interventions undersedation.*

METHODS: *A Total of 717 patients undergoing endoscopic interventions under sedation were inclueed the study. Demographic data, ASA Status, mallampati scores, administered anaesthetic agents, co-morbidities, peroperative vital parameters, and developed complications were retrospectively recorded*

RESULTS: *10 (1.5%) patients developed hypoxia and 38 (5%) patients developed arrythmias. There was no statistically significant difference accross the groups in complication rates. When the complications of the patients were analyzed by the ASA groups, the incidence of hypoxia in the ASA 3 group was statistically significantly higher. The incidence of other side effects by the ASA groups was similar. In the model to be created, it was seen that the variables "BMI (p=0.009) and Sedation (p=0.038)" could cause hypoxia complication to arise. In addition "Age (p = 0.000)" could cause heart rhythm problems to arise.*

DISCUSSION AND CONCLUSION: *Adequate monitoring conditions and an expert anesthesia team are required for safe sedation in gastrointestinal endoscopy unit. Moreover, BMI of patients and the type of sedation are independent risk factors for the development of hypoxia and the age of patient is an independent risk factor for the emergence of arrythmias.*

Keywords: *Sedation, Endoscopy, Anesthesia, Hypoxemia, Arrythmia*

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INTRODUCTION

The increased use of invasive and complex procedures in gastrointestinal endoscopic interventions (GEI) necessitate sedation for patients. [1]. In order to administer sedation in GEI, environmental conditions must comply with all required standards for general anesthesia [2, 3]. Check of the standards in anesthesia setting is entirely the responsibility of anaesthesiologist [4]. Sub-standard conditions and care are the most important cause of complications in non-operating room anesthesia practices. It is thought that numerous complications might be prevented by increasing the awareness and care in this respect [5].

It seems that there is no comprehensive data or investigation regarding the attitudes, behaviors and practices of anesthesiology and reanimation specialists on anesthesia practices in the literature. [1,4, 6, 7, 8].

The aim of the current study was to evaluate the sedation practices in the gastrointestinal endoscopy unit in our hospital in the light of the literature.

MATERIALS AND METHODS

After the approval of the local ethics committee is obtained for the study (University of Kocaeli Ethical Committee of Non-invasive Clinical Research: 2018/13), the records of patients who underwent intervention under sedation in the gastrointestinal endoscopy unit of our hospital between September 2017 and April 2018 were retrospectively reviewed. The study included patients who received sedation. Patients who did not receive sedation were excluded from the study.

Sedation was administered by anesthesiologist and anesthesia technician. The patients' age, gender, weight, height, ASA risk score, mallampati score, BMI, smoking and alcohol consumption status were recorded. In addition, sedative agents administered to the patient, peroperative vital parameters and nausea and vomiting were recorded. The patient's peripheral oxygen saturation below 90% was recorded as hypoxia, and changes in heart rhythm (ventricular extrasystole, atrial extrasystole and 30% increase/decrease in basal peak heart rate) were recorded as heart rhythm problems (arrhythmias). In the patients who developed hypoxia, the procedure was paused and oral aspiration was performed using the jaw-thrust maneuver. The patients whose peripheral oxygen saturation did not increase were intubated. In the patients whose peripheral oxygen saturation increased to 95% and spontaneous respiration was adequate, the procedure was carried on.

The patients were divided into 6 groups based on the anesthetic agents administrated for sedation. Those given only ketamine for sedation were assigned to Group 1, those given only propofol were assigned to Group 2, those given dormicum + ketamine were assigned to Group 3, those given dormicum + propofol were assigned to Group 4, those given ketamine + propofol were assigned to Group 5 and those given dormicom + ketamine + propofol were assigned to Group 6.

Statistical Analyses

While evaluating the results obtained in the study the Kruskal-Wallis H test and One-Way ANOVA were used for non-normally distributed numerical data in the comparison of multiple groups, and the Chi-Square test was used for the analysis of discrete variables. The results were evaluated at a significance level of $p < 0.05$ and at a confidence interval of 95% .

RESULTS

The study included 717 patients aged between 18-95 years (47.72±12.94 years). Of the patients participated in our study, 417 (58.2%) were female and 300 (41.8%) were male. The distribution of the patients in the groups is as follows: 8 patients in the Group 1 and 2, 88 patients in the Group 3, 351 patients in the Group 4, 6 patients in the Group 5 and 256 patients in the Group 6. The gender distribution, BMI, mallampati and ASA risk scores of the groups were statistically similar. When the groups were compared in terms of age, it was found that Group 5 (ketamine + propofol) had a statistically significantly greater age (p =0.000).

In addition, when the groups were compared in terms of procedure duration, it was found that Group 6 (dormicum+ketamine+propofol) had a statistically significantly prolonged duration (p<0.000) (Table1).

Table 1. Demographic data, ASA Mallampati classifications and Durations of interventions for each group

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	p
Gender (F/M)	5/3	6/2	57/31	209/142	4/2	136/120	0,346^k
Age(yrs)	41,50±15	42±17	45±16	45±19	60±12	52±17	0,000*^{m}
BMI	24,5±7	26,5±7	25±3	25±4	23,5±2	25±4	0,643^m
ASA	1±1	1±1	1,5±1	2±1	1±1	2±1	0,798^m
Mallampati	2±2	1,5±1	2±1	2±1	2,5±1	2±1	0,085^m
Duration(min)	11±2	8±9	8±2	10±4	7,5±15	16±16	0,000*^{m}

^{k} *MC Fisher's Exact Chi-square test: values are given as frequency (percentage)*
^{m} *Kruskal-Wallis H test: values are given as mean ± standard deviation (median+Iqr)*
* P <0.05: statistically significant difference

In our study, hypoxia occurred 10 (1.5%) of the patients and arrytmia occurred 38 (5%) of the patients as complication. When the complication rates of the groups were compared, results showed no difference across the groups (Table 2).

Table 2. The distribution of complications of the groups

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	p
Hypoxemia	%0 (0/8)	%0 (0/8)	%0 (0/88)	%1.44 (5/346)	%0 (0/6)	%1.99 (5/251)	0,645^k
Arrythmia	%0 (0/8)	%0 (0/8)	%1.14 (1/87)	%7.66 (25/326)	%0 (0/6)	%4.91 (12/244)	0,282^k

^{k} *MC Fisher's Exact Chi-square test: values are given as frequency (percentage) * P <0.05: statistically significant difference*

When the complications were analyzed by the ASA groups, the incidence of hypoxia in the ASA 3 group was statistically significantly higher compared to the other groups. The incidence of other side effects by the ASA groups were similar. (Table 3).

Table 3. The distribution of complications by the ASA classification

	ASA 1	ASA 2	ASA 3	p
Hypoxemia	%0.58 (2/342)	%1.1 (4/338)	%16 (4/25)	0,000*^{k}
Arrythmia	%3.61(12/332)	%6.21 (20/322)	%16(4/25)	0,060^k

^{k}MC Fisher's Exact Chi-square test: values are given as frequency (percentage)
 * P <0.05: statistically significant difference

When the variables in the study are considered together, they have a significant effect on the development of hypoxia and have an ability to substantially explain hypoxia complication (F (6.710) = 3.030, * p <0.05). In the model to be created, it was seen that the variables "BMI (p=0.009) and Sedation (p=0.038)" could cause hypoxia complication to arise. Other independent variables had no effect on the development of hypoxia complication (Table 4,5).

Table 4. Regression analyses of hypoxemia

ANOVA[a]

Model		df	F	Sig.
1	Regression	6	3,030	,006[b]
	Residual	710		
	Total	716		

a. Dependent Variable: Hypoxemia, b. Predictors: (Constant), sedation type, BMI, ASA, gender, age, duration

Table 5. The effect of variables on hypoxemia

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-,350	,155		-2,251	,025
	Gender	,007	,031	,008	,211	,833
	Age	,002	,001	,055	1,420	,156
	BMI	**,014**	**,005**	**,097**	**2,604**	**,009**
	ASA	-,013	,027	-,019	-,499	,618
	Duration	,001	,002	,024	,597	,550
	Sedation type	**,029**	**,014**	**,085**	**2,078**	**,038**

a. Dependent Variable: Hypoxemia

When the variables in the study are considered together, they have a significant effect on heart rhythm problems and have an ability to substantially explain heart rhythm problems (F (6.710) = 4.210, * p <0.05). In the model to be created, it was seen that the variable "Age (p = 0.000)" could cause heart rhythm problems to arise. Other independent variables had no effect on the development of heart rhythm problems (Table 6,7).

Table 6. Regression analyses of heart rhtyhm problems

ANOVA[a]

Model		df	F	Sig.
1	Regression	6	4,210	,000[b]
	Residual	710		
	Total	716		

a. Dependent Variable: Heart Rhythm Problems, b. Predictors: (Constant), sedation type, BMI, ASA, gender, age, duration

Table 7. The effect of variables on heart rhythm problems

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-,003	,173		-,017	,986
	Gender	-,022	,035	-,024	-,639	,523
	Age	**,006**	**,001**	**,180**	**4,672**	**,000**
	BMI	,000	,006	,002	,062	,951
	ASA	,014	,030	,017	,456	,648
	Duration	,001	,003	,013	,324	,746
	Sedation type	-,006	,016	-,017	-,407	,684

Coefficients[a]

a. Dependent Variable: Arrythmia

DISCUSSION

Our study showed that the BMI of patient and the choice of drug used for sedation play a role in hypoxia developing in gastrointestinal endoscopy procedures under sedation. Moreover, the age of patient is effective in the development of heart rhythm problems.

There is a limited data on the mortality and morbidity in non-operating room anesthesia practices [9]. In a study by Robbertze et al., it was indicated that the problems arising due to anesthesia in non-operating room settings were mostly associated with anesthesia practices and marginal ages (newborn and advanced age)[5]. Likewise, in our study, age was found as an effective factor for the emergence of heart rhythm problems. We are of the opinion that this is associated with the increase in cardiovascular diseases as age progresses.

In the literature, sedation, regional anesthesia and general anesthesia are emphasized as anesthetic techniques used in non-operating room anesthesia practices[8]. The study by Iyilikci et al. That evaluates anesthesia management outside of the operating room, sedation was administered to 1526

patients (94%), regional anesthesia was performed to 60 patients (4%) and general anesthesia was administered to 36 patients (2%)[8] .The rate of preferring regional anesthesia increases up to 25% in non-operating room endovascular interventions [10].

A study by Froehlich et al. (EPAGE Study Group) including 6004 patients undergone colonoscopy, it was reported that sedation was administered to 83% of the patients and no sedation was administered to 17% of the patients [11]. In gastrointestinal endoscopy units, sedation comes to the fore as the basic anesthetic technique. Similarly, since our study included gastrointestinal endoscopy patients, sedation was sufficient for the procedures in all patients and no additional anesthetic technique required.

In non-operating room anesthesia practices, monitoring of vital functions, early detection and effective treatment of complications are of vital importance. In the study by Froehlich et al. on patients undergone colonoscopy, it was reported that pulse oximetry, blood pressure monitoring and electrocardiography monitoring were used in 77%, 34%, and 24% of the patients, respectively [11]. In

the study by Yildiz et al. investigating anesthesia management of the anaesthesiologists in Turkey outside the operating room, it was reported that the use of non-invasive blood pressure (87.5%), pulse oximetry (98.5%), capnography (24.4%) and electrocardiography (85.4%) were respectively the most common techniques [10]. In the study by Deitch et al. investigating the effect of capnography use on reducing the incidence of hypoxic events during sedation, it was indicated that 17 (25%) of 68 patients on whom capnography was used developed hypoxia, while 27 (42%) of 64 patients on whom capnography was not used developed hypoxia[12]. In our study, capnography monitoring was not used as standard protocol on patients in the endoscopy unit. We are of the opinion that the lower rate of hypoxia in our study compared to the literature (1%) is due to the fact that all required monitorings were completely performed.

Propofol, midazolam, ketamine, thiopental, opioids, and chloral hydrate are commonly used in non-operating room sedation practices [4]. In the survey study by Riphaus et al. investigating the sedation practices for gastrointestinal endoscopy, midazolam was preferred in 82% and propofol was preferred in 74% of the cases [7]. Likewise, in the study by Yildiz et al. investigating the non-operating room sedation techniques, it was indicated that midazolam (89.6%) and propofol (91.1%) were the most commonly preferred hypnotic agents [10].

Amorytin et al. state that midazolam (67.8%), fentanyl (87.0%) and propofol (94.0%), are the most commonly preferred anesthetic agents, and that these agents are often used in combination [13] In the study by Agostoni et al., the most commonly used sedative agent was propofol (94%) and the rate of fentanyl use was only 5.6%; however, the complication rates were lower than that of the studies using sedative agents in combination and the author attributed this to the more effective practicability of propofol with TCI and to monitoring of patients, unlike other studies [14,15].

The sedative agents used in our study were dormicum, propofol and ketamine. In 2% of the patients, the agents were used alone. However, in 98% of the patients, the sedative agents were used in combination. We are of the opinion that the anesthetic agents could be used at lower doses by means of this combined use, and that this contributed to the lower complication rates compared to the literature.

It is also stated that non-operating room sedation/analgesia practices are performed by non-anesthesiologist physicians (gastroenterologist, general surgeon) and nurses in the world and in our country [1,4,16]. In our study, sedation was administered by a team of anesthesiologist and anesthesia technician. We believe that this is one of the reasons for the lower complication rate.

In all anesthesia practices, the ASA classification is important for peroperative risk assessment. In the study by Iyilikci et al. analyzing the records of 1622 patients received non-operating room anesthesia, it was found that of the patients, 92.4% were in ASA 1, 5.6% were in ASA 2 and 4% were in ASA 3 risk groups, considering the ASA classifications, and no ASA 4 patients were included [8]. A study by Amorythini et al. conducted on pediatric population, there was no significant difference across the groups with different ASA scores in terms of complications [13]. In our study, of the patients, 48.2% were in ASA I, 47.8% were in ASA II and 4% were in ASA III risk groups.

In our study, the incidence rate of hypoxia was significantly higher in the ASA III risk group. However, we are of the opinion that this is a result of the small number of ASA III patients. We believe that studies on ASA III patients with a larger sample size are needed.

When the etiology of the complications arising in non-operating room anesthesia practices is evaluated, different etiological factors have been found in different studies. In the study by Goudra et al., mallampati score, body mass index, sedative agent type were studied in regression model, and the type of anesthesia was found to be the most important cause for the development of complication [16]. In the study by Vargo et al. included 1,380,000 patients, it was found that

advanced age (> 75 years) and ASA III-IV were associated with complications [17]. In the study by Leslie et al., age and ASA III-V similarly led to an increase in the risk of unexpected and undesirable events, and unlike our study, low BMI was associated with undesirable events[18]. In the regression analysis performed in our study, high BMI and type of sedation were reported as independent risk factors for the development of hypoxia. Whereas, age was reported as an independent risk factor for heart rhythm problems.

Limitations of the study

The limitations of the study were retrospective collection of the data and the small number of patients included in the study.

CONCLUSION

In conclusion, we are of the opinion that adequate monitoring conditions and an expert anesthesia team are required for safe sedation in gastrointestinal endoscopy unit. Moreover, we think that the BMI of patient and the type of sedation are independent risk factors for the evolution of hypoxia and the age is an independent risk factor for the emergence of heart rhythm problems in gastrointestinal endoscopy procedures under sedation.

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