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#### RESEARCH

## RETROSPECTIVE ANALYSIS OF ANESTHESIA IN GERIATRIC PATIENTS DURING ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY ABSTRACT

### ABSTRACT

**Introduction:** With the advancement in healthcare, the proportion of elderly population is increasing. We aimed to retrospectively investigate intensive care admission, complications, and mortality rates in elderly patients who underwent Endoscopic Retrograde Cholangiopancreatography.

**Materials and Method:** We retrospectively analyzed 1320 patients aged  $\geq 65$  years who underwent Endoscopic Retrograde Cholangiopancreatography under sedation in our hospital between October 1, 2013 and October 1, 2016. Patients were divided into two groups based on their age: group 1 (65–79 years) and 2 ( $\geq 80$  years). Data on patient gender, American Society of Anesthesiologists (ASA) distribution, early mortality (7 days), postoperative intensive care needs, doses of anesthetic drugs administered, and complications were compared.

**Results:** Comparison of data between groups 1 (926 patients) and 2 (394 patients) revealed that the use of propofol and ketamine was significantly lower in group 2 than in group 1, whereas that of midazolam was similar in both the groups. The number of patients with complications, those requiring intubation, rate of intensive care need, and mortality were significantly higher in group 2 than in group 1; there were no significant differences in the type of complications (cardiac or respiratory) ( $p=0.198$ ).

**Conclusion:** Endoscopic Retrograde Cholangiopancreatography is a painful and stressful procedure that usually requires analgesia or sedation. Geriatric patients account for majority of the patient population undergoing endoscopic retrograde cholangiopancreatography. However, because elderly patients are more sensitive to the negative effects of anesthetic drugs, taking appropriate measures for performing sedation and analgesia during Endoscopic Retrograde Cholangiopancreatography in elderly patients is critical.

**Keywords:** Cholangiopancreatography, Endoscopic Retrograde; Geriatrics; Anesthesia

#### ARAŞTIRMA

## ENDOSKOPIK RETROGRAD KOLANJİOPANKREATOGRAFİ UYGULANAN GERİATRİK HASTALARDA ANESTEZİ DENEYİMLERİMİZİN RETROSPEKTİF İNCELENMESİ Öz

**Giriş:** Gelişen sağlık standartları sayesinde dünya nüfusu giderek yaşlanmaktadır. Bu çalışmanın amacı sedasyon altında Endoskopik Retrograd Kolanjiopankreatografi uygulanan yaşlı hastaların yoğun bakıma giriş, komplikasyonlar ve mortalite açısından retrospektif olarak incelenmesidir.

**Gereç ve Yöntem:** Çalışmamızda 01.10.2013 ve 01.10.2016 arasında hastanemizin Endoskopik Retrograd Kolanjiopankreatografi ünitesinde sedasyon altında uygulama yapılan 65 yaş üzeri hastaların bilgisayar kayıtları retrospektif olarak incelenmiştir. Bu hastalarda kendi içinde 65-79 (Grup 1) yaş arası olanlar ve 80 yaş ve üzeriler (Grup 2) olarak iki gruba ayrılmıştır. Bu hastaların cinsiyetleri, American Society of Anesthesiologists (ASA) dağılımları, erken dönem mortalite (7gün), post operatif yoğun bakım ihtiyacı, kullanılan anestezi ilaç dozları ve komplikasyonlar karşılaştırıldı.

**Bulgular:** Altmış beş yaş ve üzeri 1320 hastanın verilerine ulaşıldı, bunlardan 926'sı 65-80 yaş arasında (Grup 1) iken, 394 tanesi 80 yaş ve üzeriydi (Grup 2). Propofol, ketamin kullanımları Grup 2'de anlamlı olarak düşüken midazolam kullanımı her iki grupta benzerdi. Komplikasyon gelişen, entübasyon gereken hasta sayısı, yoğun bakıma çıkış ve mortalite hızı Grup 2'de anlamlı olarak daha yüksekti. Gelişen komplikasyonların cinsi (kardiyak, solunumsal, diğer) açısından gruplar arasında farklılık gözlenmedi ( $p=0.198$ ).

**Sonuç:** Endoskopik Retrograd Kolanjiopankreatografi işlemi ağırlı ve stresli bir prosedür olmasından dolayı çoğunlukla analjezi veya sedasyon ihtiyacı olmaktadır. Geriatrik hasta grupları endoskopik retrograd kolanjiopankreatografi uygulanan hasta popülasyonunda da önemli bir yer tutmaktadır. Ancak bu hastalar anestezi ilaçların olumsuz etkilerine karşı daha duyarlı oldukları için ve bu işlem genellikle ameliyathane günübirlik uygulandığı için yaşlı hastalarda Endoskopik Retrograd Kolanjiopankreatografi sırasında sedasyon ve analjezi uygulaması dikkat ve önem arz etmektedir.

**Anahtar sözcükler:** Endoskopik Retrograd Kolanjiopankreatografi, Geriatri, Anestezi

## INTRODUCTION

The increase in life expectancy has led to an increase in the geriatric population. According to a survey conducted in 2015, 8.5% (617 million) of individuals worldwide were aged >65 years, and this rate is expected to reach 17% by 2050, constituting 1.6 billion individuals in the geriatric age group (1). Physiological and psychological changes as well as delayed healing processes associated with aging require more medical and surgical intervention. Therefore, it is necessary to design a special system for anesthesia applications in the geriatric population.

Endoscopic retrograde cholangiopancreatography (ERCP) is the imaging of the ducts that provide drainage of the pancreas, gall bladder, bile ducts, and liver using a duodenoscope and X-rays with contrast agents. The common channel is cannulated by endoscopically viewing the ampulla Vateri. ERCP is also employed for endoscopic sphincterotomy, choledocholith stone extraction, malignant and biliary stent application, and biopsy. Thus, ERCP plays a very important role in the diagnosis and treatment of pancreaticobiliary pathologies. However, as this procedure is painful and stressful, it is imperative that analgesia and sedation be applied. ERCP also plays an important role in geriatric patient population. However, elderly patients are more sensitive to the adverse effects of anesthesia (2,3).

The present study was a comparative retrospective analysis of geriatric patients aged 65–79 and ≥80 years who underwent ERCP under anesthesia.

## MATERIALS AND METHOD

The hospital records and files of patients aged >65 years (n=1320) who underwent ERCP under sedation by the same surgeon (general surgeon, endoscopy certified) between October 2013 and October 2016 were retrospectively examined. The

data regarding patient's gender, American Society of Anesthesiologists (ASA) physical status, early mortality (7 days), intensive care requirement, anesthetic drug doses administered, and complications were recorded. The development of cardiac (hypotension, rhythm disturbances, and cardiac arrest), respiratory (prolonged sedation and desaturation conditions requiring intubation), and other (pancreatic, emergency surgery requirement, and neurological) conditions were considered as complications. The data were compared between patients belonging to groups 1 (65–80 years) and 2 (≥80 years). The study protocol was approved by the local Ethics Committee of the Afyon Kocatepe University (2011-KAEK-2).

IBM SPSS Statistics version 20 was used for all statistical analysis. Data was expressed as mean and standard deviation. The Mann–Whitney U test and Student's t-test were used to compare the quantitative data. The Chi-square test was used to compare the categorical variables. A p-value of <0.05 was considered statistically significant.

## RESULTS

A total of 2084 patients who undergone ERCP procedure for three years (between October 2013–October 2016) were obtained from hospital data. Of these, 1320 patients aged 65 years or older were included in the study. Then, patients were divided into two groups based on their age: group 1 (65–79 years) and 2 (≥80 years).

Group 1 included 498 female and 428 male patients, while group 2 included 223 female and 171 male patients. There were no gender differences between the two groups (p=0.346) (Table 1). In group 1, 724 patients belonged to ASA class 2, 98 to ASA class 3, and one to ASA class 4. In group 2, 251 patients belonged to ASA class 2, 110 to ASA class 3, and two to ASA class 4 (Table 1).



Distribution of anesthetic agents that were used during the operation were shown in Table 2. 2.1% of the patients used only midazolam, whereas the use of propofol + midazolam was 17.4%, the use of ketamine + midazolam was 25.7%, and the use of propofol + midazolam + ketamine was 54.8% (Table 2). The amount of midazolam used was similar between the two groups, whereas propofol and ketamine amounts were significantly lower in group 2 than in group 1 (Table 2). The number of patients requiring intubation, number of intensive care unit (ICU) discharge, and mortality rate were significantly higher in group 2 than in group 1

(Table 3). After the procedure, 96.4% of patients in group 1 were transferred to surgery ward and 3.1% to the ICU, whereas 78.4% of patients in group 2 were transferred to surgery ward and 21.6% to the ICU; these differences between the groups were statistically significant ( $p=0.002$ ) (Table 3). Complications occurred perioperatively with a rate of 2.1% in group 1 and 19.8% in group 2; the differences were statistically significant ( $p=0.000$ ) (Table 4). There were no significant differences in the types of complications (cardiac, respiratory, and other) between the groups ( $p=0.198$ ) (Table 4).

**Table 1.** Patients' gender and ASA status.

	<b>Group 1 (n=926)</b>	<b>Group 2 (n=394)</b>	<b>Total (n=1320)</b>	<b>p</b>
Gender (female / male, n)	498 / 428	223 / 171	721 / 594	0.346
ASA I, n	103	31	134	0.000
ASA II, n	724	251	975	
ASA III, n	98	110	208	
ASA IV, n	1	2	3	

Group 1; ages between 65 and 79, Group 2; age of  $\geq 80$ , ASA; American Society of Anesthesiologists.

**Table 2.** Drug distribution and doses used between groups.

<b>Drugs</b>	<b>Group 1 (n=926)</b>	<b>Group 2 (n=394)</b>	<b>Total (n=1320)</b>	<b>P</b>
Only M, n (%)	1 (0.1)	27 (6.9)	28 (2.1)	0.000
P+M, n (%)	124 (13.4)	106 (26.9)	230 (17.4)	
K+M, n (%)	209 (22.6)	130 (33.0)	339 (25.7)	
P+M+K, n (%)	592 (63.9)	131 (33.2)	723 (54.8)	
Propofol, mg	40 (0-200)	20 (0-200)		0.000
Ketamin, mg	60 (0-180)	30 (0-160)		0.000
Midazolam, mg	3.04 $\pm$ 1.53	3.04 $\pm$ 1.95		0.170

Group 1; ages between 65 and 79, Group 2; age of  $\geq 80$ , Patients' data are expressed as mean $\pm$ SD (standard deviation) and median (minimum –maximum).

M: midazolam, P: propofol, K: Ketamine

**Table 3.** Comparison of patients according to the necessity of intubation, mortality and postoperative discharge.

Characteristics	Group 1 (n=926)	Group 2 (n=394)	p
Intubation necessity,			
Yes, n (%)	10 (1.1)	57 (14.5)	0.000
No, n (%)	916 (98.9)	337 (85.5)	
Mortality, n (%)	14 (1.5)	35 (8.9)	0.000
Postoperative discharge			
Surgery ward, n (%)	897 (96.9)	309 (78.4)	0.000
ICU, n (%)	29 (3.1)	85 (21.6)	
Hospital stay, day, median (min-max)	2 (1-52)	1 (1-32)	0.002

Group 1; ages between 65 and 79, Group 2; age of  $\geq 80$ , ICU; intensive care unit

**Table 4.** Distribution of complications according to groups.

Complication	Group 1 (n=926)	Group 2 (n=394)	Total (n=1320)	p
Developed, n (%)	19 (2.1)	78 (19.8)	97 (7.3)	0.000
Not developed, n (%)	907 (97.9)	316 (80.2)	1223 (92.7)	
Cardiac, n (%)	6 (31.6)	25 (32.1)	31 (32)	0.198
Respiratory, n (%)	9 (47.4)	22 (28.2)	31 (32)	
Others, n (%)	4 (21.1)	31 (39.7)	35 (36.1)	

Group 1; ages between 65 and 79, Group 2; age of  $\geq 80$

## DISCUSSION

Owing to the tremendous advancement in healthcare practices, the average longevity in humans has significantly increased. As a result, the current world population has a significant proportion of elderly individuals. Generally, age is not a contraindication to anesthesia and surgery; however, greater perioperative morbidity and mortality have been reported in the elderly than in younger patients undergoing surgery. The current

study revealed that complications, intubation necessity, and intensive care need were significantly greater in elderly patients than in middle-aged patients. In addition, the mortality rate was 8.9% in elderly patients and 1.5% in middle-aged patients. Furthermore, the use of propofol and ketamine was significantly lower in the elderly, whereas that of midazolam was similar between the two groups. Outpatient anesthesia applications are becoming increasingly important due to increasing number of patients and medical techniques (MR, endoscopy,



ECT, ERCP, EBUS, angiography). Elderly patients who undergo ERCP form the most vulnerable group of patients, similar to newborns, in MR. Moreover, the risk of complications increases for procedures that are performed outside the operation theater; therefore, such procedures require specialized teams (4).

Generally, with advancing age, systemic diseases tend to increase. In our study, most patients belonged to ASA class 2 in both the groups. However, a past study reported that the complication rate increases with increasing ASA scores (3). Moreover, it has been suggested that the ASA score does not adequately reflect the risk ratio in nonoperating anesthesia applications (5).

A retrospective study of 16,045 patients revealed that the mean age of patients who developed complications in anesthesia applications performed outside the operation theater was 73.35 years. This finding suggested that patients in the geriatric age group are more sensitive to the risk of anesthesia complications. In our study, patients aged >80 years developed significantly more complications than those aged 65–80 years (6).

Mortality, morbidity, and length of hospital stay were greater in patients suffering from post-surgery complications. Iyilikçi et al. (6) reported that the complication rate was 6.2% in their entire outpatient anesthesia practice. We found a complication rate of 7.3% in patients aged >65 years, 2.1% in patients aged 65–80 years, and 19.8% in patients aged >80 years. In addition, ICU exits were also higher in elderly patients due to the necessity of intubation. Increased stay in ICU also increases the mortality rate.

Studies in geriatric patients advocate the use of short-acting agents to reduce the complication rates. Our results suggested that short-acting drugs, such as midazolam and propofol, are more frequently used in geriatric patients. Although propofol may be an ideal induction agent in elderly patients due to its rapid elimination, it is more likely

to cause apnea and hypotension in such patients than in younger patients. Thus, the use of propofol is limited in elderly patients (7,8). The use of propofol and ketamine were lower in the elderly patients in the present study, which was insufficient in reducing reduce complications in these patients.

Previous studies have shown that the use of propofol with ketamine provides enhanced hemodynamic stability (9). In our study, ketamine was used in both the groups, but its use was reduced in the elderly, similar to that of propofol. This reduced use may be attributed to the low anesthetic needs of elderly patients and their unstable hemodynamics (7). In addition, the fact that geriatric patients are mostly hypertensive before anesthesia induction reduces the use of ketamines (10). However, as a limitation of our study, information about patients' secondary illnesses, such as hypertension, diabetes, and COPD, could not be obtained due to incomplete data entry.

With age, the distributional volume of benzodiazepines increases, thus extending its half-life. The need for midazolam has been reduced by 50% in geriatric patients (7). In our study, the use of midazolam was similar in both the age groups. Although the use of propofol and ketamine were reduced in the elderly group, midazolam was used without dose reduction according to the availability of its recycler. However, there is insufficient information regarding the routine use of benzodiazepine-group medications with their reverse agents. There is a concern that geriatric patients may have an increased risk of postoperative complications considering that reverse drugs have a shorter effect than that of midazolam. There is a huge scope of research on the use of fewer cardioprotective drugs with the subsequent antagonism of their effects.

Our results indicated that geriatric patients aged >80 years, defined as the elderly, are at a greater risk of complications than other patient groups. The anesthetic evaluation of geriatric patients

should therefore be performed more carefully, with perioperative observation under the guidance of skillful and experienced team of anesthesiologists. Guidelines have been published to standardize the outpatient anesthesia practice (11,12). We believe that geriatric patients should be considered while formulating such guidelines.

In conclusion, we believe that the physiological and psychological changes as well as delayed

healing processes associated with aging require more medical and surgical intervention in elderly patients than in younger patients, warranting the need to devise a special system for the use of anesthesia in geriatric patient groups.

#### **Conflict of interest**

None. The authors declare no conflicts of interests.

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