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- Süheyla ABİTAĞAOĞLU[1]
- Ceren KÖKSAL[1]
- Hüseyin ÇİYİLTEPE[2]
- Tamer BAYRAM[3]
- Güldem TURAN[1]
- Dilek ERDOĞAN ARI[1]

CORRESPONDANCE

Süheyla ABİTAĞAOĞLU
University of Health Sciences, Fatih Sultan Mehmet Health Application and Research Center, Anesthesiology and Reanimation , İstanbul, Turkey.

Phone: +905325267656
e-mail: suheylaatay81@gmail.com

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[1] University of Health Sciences, Fatih Sultan Mehmet Health Application and Research Center, Anesthesiology and Reanimation , İstanbul, Turkey.

[2] University of Health Sciences, Fatih Sultan Mehmet Health Application and Research Center, General Surgery, İstanbul, Turkey.

[3] University of Health Sciences, Fatih Sultan Mehmet Health Application and Research Center, Intensive Care, İstanbul, Turkey.

RESEARCH

FACTORS AFFECTING INTENSIVE CARE UNIT ADMISSION AND MORTALITY RATES OF GERIATRIC PATIENTS WHO UNDERGO EMERGENCY ABDOMINAL SURGERY

Abstract

Introduction: The number of geriatric patients undergoing emergency surgery is increasing worldwide. The objective of our study was to retrospectively review the intensive care unit (ICU) admission rates, mortality rates and the mortality risk factors in geriatric patients undergoing emergency abdominal surgery.

Materials and Method: The data of patients who underwent emergency abdominal surgery between January 2014 and August 2018 were retrospectively reviewed. Patients were classified into Group-I (≥75 years) and Group-II (65–74 years). American Society of Anesthesiologists (ASA) physical status, haemoglobin values, whether preoperative cardiac examinations were conducted, ICU admission and mortality rates were recorded. The two groups were compared in terms of ICU admission rates, ICU and in-hospital mortality rates and the factors affecting these parameters.

Results: A total of 109 patients were included in the study with 71 (65.1%) being in Group-I and 38 (34.9%) in Group-II. ICU admission rate and in-hospital mortality rates were higher in Group-I than those in Group-II. High ASA score in Group I and high ASA score and low haemoglobin value in Group-II affected ICU admission rate. It was observed that the absence of preoperative cardiac examination increased ICU mortality in Group-I. High ASA scores in both the groups increased in-hospital mortality. In addition, postoperative ICU admission rate increased in-hospital mortality in Group-II.

Conclusion: ASA score was found to be the most important factor affecting mortality rates in geriatric patients after emergency surgery. It was concluded that ICU mortality rates can be decreased by utilising necessary treatment protocols by performing preoperative cardiologic examinations geriatric patients aged >75 years.

Keywords: Geriatrics; Morbidity; Mortality; General Surgery.

ARAŞTIRMA

ACİL ABDOMİNAL CERRAHİ GEÇİREN YAŞLI HASTALARDA YOĞUN BAKIMA YATIŞ VE MORTALİTE ORANINI ETKİLEYEN FAKTÖRLER

Öz

Giriş: Günümüzde acil cerrahi geçiren yaşlı hasta sayısı artmaktadır. Çalışmamızın amacı acil abdominal cerrahi geçiren geriatrik hastaların yoğun bakıma yatış oranlarının, mortalite oranlarının ve mortalite risk faktörlerinin retrospektif olarak incelenmesidir.

Gereç ve Yöntem: Ocak 2014-Ağustos 2018 tarihleri arasında acil abdominal cerrahi geçiren hastaların bilgileri retrospektif olarak tarandı. Hastalar yaş gruplarına göre Grup-I (75 yaş ve üstü), Grup-II (65-74 yaş) olarak ayrıldı. American Society of Anesthesiologists (ASA) fiziksel durum skorları, hemoglobin değerleri, preoperatif kardiyak muayene yapılıp yapılmadığı, yoğun bakım ünitesine giriş durumları, mortalite değerleri kaydedildi. İki grup yoğun bakım yatışları, yoğun bakım ve hastane içi mortalite değerleri ve bu durumları etkileyen faktörler açısından karşılaştırıldı.

Bulgular: Çalışmaya Grup-I'de 71 (%65,1) ve Grup-II'de 38 (%34,9) üzere toplam 109 hasta dahil edildi. Grup-I'de yoğun bakıma yatış ve hastane içi mortalite değerleri daha yüksekti. Grup-I'de yüksek ASA skoru, Grup-II'de ise ASA skoru ve hemoglobin düşüklüğü yoğun bakıma yatışta etkiliydi. Grup-I'de preoperatif kardiyak muayene yapılmamasının yoğun bakım mortalitesini arttırdığı görüldü. Her iki grupta yüksek ASA skorunun hastane içi mortaliteyi artırdığı, ayrıca Grup-II'de postoperatif yoğun bakıma çıkışın da hastane içi mortaliteye etkisi olduğu bulundu.

Sonuç: Yaşlı hastalarda acil cerrahi sonrası yoğun bakım yatışı ve mortaliteyi etkileyen en önemli faktör ASA skoru olarak bulundu. Yetmiş beş yaş üstü hastalarda preoperatif kardiyolojik muayene yapılarak gerekli tedavi protokollerinin uygulanmasının yoğun bakım mortalite değerini azaltabileceği sonucuna varıldı.

Anahtar Sözcükler: Cerrahi; Morbidite; Mortalite; Yaşlılık.

INTRODUCTION

Life expectancy has increased owing to advances in the diagnosis and treatment of chronic diseases. More than half of the surgical procedures requiring hospitalisation are performed on patients aged ≥65 years (1). The number of geriatric patients undergoing emergency abdominal surgery has increased because of increased lifespan, and more patients in this age group undergo emergency abdominal operations than patients in younger age groups (1, 2). In geriatric patients, a decrease in physical reserves and an increase in the incidence of comorbidities are observed. Moreover, patients undergoing emergency abdominal surgery are often operated without adequate preoperative preparation and thus have a high risk of anaesthesia. Emergency surgery is associated with higher mortality and morbidity rates than elective surgery. Reportedly, the risk of mortality related to surgery increases by two times in geriatric patients who undergo emergency abdominal surgery (3).

The objective of our study was to retrospectively review intensive care unit (ICU) admission rates, ICU and in-hospital mortality rates and the risk factors of mortality in patients aged 65-74 years and those aged ≥75 years who underwent emergency abdominal surgery at our hospital.

MATERIALS AND METHOD

After obtaining the approval of the hospital Scientific Studies Board (FSM SSB 2018/9-17958), the data of patients who presented to our hospital and subsequently underwent emergency abdominal surgery between January 2014 and August 2018 were retrospectively reviewed using a computer system. Age, sex, chronic diseases, ASA status, pre- and postoperative haemoglobin (Hb) and sodium values, aetiology and surgery types, time when surgery was conducted (08:00–16:00, 16:00–24:00 and 24:00–08:00), whether preoperative cardiac examination was performed, ICU admission status, the length of ICU stay, hospitalisation duration, postoperative complications (sepsis, anastomotic leakage, acute kidney failure, pneumonia, delirium and wound site infection), ICU and in-hospital mortality rates and mortality days were recorded.

The patients were categorised into two groups according to their age: Group I (≥75 years) and Group II (65–74 years); the two groups were compared in terms of ICU stay, ICU and in-hospital mortalities and the factors affecting these situations. Four patients in Group I were transferred to ICUs in external facilities after operation, and thus, the ICU follow-up data of these patients could not be analysed.

Statistical analyses

Data were statistically analysed using the IBM SPSS Statistics 22 (IBM SPSS, Turkey) software. The Shapiro–Wilk test was used to assess whether the parameters were normally distributed. Along with descriptive statistics (mean, standard deviation and frequency) of the study data, the Kruskal–Wallis test was used for inter-group comparison of qualitative data without normal distribution. The student's t-test was used for the comparison of parameters with normal distribution between the two groups, and the Mann–Whitney U test was used for the comparison of parameters without normal distribution between the two groups. For the comparison of quantitative data, the Chi-square test, Fisher's exact test, Fisher–Freeman–Halton test and Yates's correction for continuity were used. Pearson's correlation coefficient was used to evaluate the relationship between the parameters that followed normal distribution, and Spearman's rank correlation coefficient was used for analysing the relationship between parameters that did not follow normal distribution. The level of statistical significance was set at $p < 0.05$.

RESULTS

A total of 109 patients were included in the study, with 71 (65.1%) in Group I and 38 (34.9%) in Group

II. The mean age of the patients was 78±7.3 years. Demographic characteristics and chronic diseases of the patients in the two groups are summarised in Table 1. Thirty-five patients (%49,2) in Group I and 13 patients (%34,2) in Group II underwent pre-operative cardiac examination (p=0,131). There was no difference between the groups in terms of the aetiology of acute abdomen and surgery types (Table 2).

Table 1. Demographic characteristics and chronic diseases of the enrolled patients.

Variable		Group I	Group II	p
		Mean±sd	Mean±sd	
Age (years)		82.62±4.4	69.61±2.47	10,000*
ASA score (median) 1 2 3 4 5		 2 3 21 42 3	 1 6 17 12 2	20,014*
Gender n (%)	Male	35 (49.3 %)	25 (65.8 %)	30.148
	Female	36 (50.7 %)	13 (34.2 %)	
HT n (%)		56 (78.9 %)	23 (60.6 %)	30.103
DM n (%)		15 (21.2 %)	9 (23.7 %)	30.922
CHF n (%)		19 (26.8 %)	3 (7.9 %)	30.039*
CAD n(%)		13 (18.3 %)	6 (15.8 %)	30.970
ARF n (%)		3 (4.3 %)	5 (13.2 %)	40.122
CRF n (%)		10 (14.1 %)	1 (2.6 %)	40.093
COPD n (%)		11 (15.5 %)	9 (23.7 %)	30.409
Asthma n (%)		3 (4.2 %)	1 (2.7 %)	41.000
Alzheimer's disease n (%)		9 (12.7 %)	0 (0 %)	40.026*
Parkinson's disease n (%)		2 (2.8 %)	2 (5.3 %)	40.608
CVA n (%)		6 (8.6 %)	1 (2.6 %)	40.418

[1]Student's t-test; [2]Mann–Whitney U test; [3]Yates's correction for continuity; [4]Fisher's exact test; *p<0.05

HT: Hypertension, DM: Diabetes Mellitus, CHF: Congestive heart failure, CAD: Coronary artery disease, ARF: Acute kidney failure, CRF: Chronic kidney failure, COPD: Chronic obstructive pulmonary disease, CVA: Cerebrovascular accident.

Table 2. Aetiologies of acute abdomen and surgery types of patients.

Variable		Group I	Group II	p
		n (%)	n (%)	
Aetiology	Incarcerated hernia	9 (12.7 %)	4 (10.5 %)	0.164
	Colon perforation	9 (12.7 %)	4 (10.5 %)	
	Mesenteric ischaemia	6 (8.5 %)	1 (2.6 %)	
	Obstructive colon/ rectum tumour	24 (33.8 %)	10 (26.3 %)	
	Volvulus	6 (8.5 %)	2 (5.3 %)	
	Peptic ulcer perforation	6 (8.5 %)	10 (26.3 %)	
	Ileus	7 (9.9 %)	5 (13.2 %)	
	Ischaemic colitis perforation	1 (1.4 %)	0 (0 %)	
	Abdominal pain of unknown origin	3 (4.2 %)	0 (0 %)	
	GIT bleeding	0 (0 %)	2 (5.3 %)	
Surgery type	Small intestine resection	19 (26.8 %)	6 (15.8 %)	0.077
	Colon resection	30 (42.3 %)	15 (39.5 %)	
	Primary repair	10 (14.1 %)	10 (26.3 %)	
	Bridectomy	0 (0 %)	2 (5.3 %)	
	Diagnostic laparotomy	3 (4.2 %)	0 (0 %)	
	Stomal opening	7 (9.9 %)	2 (5.3 %)	
	Colopexy	1 (1.4 %)	0 (0 %)	
	Gastrectomy	0 (0 %)	2 (5.3 %)	
	Enterostomy	1 (1.4 %)	1 (2.6 %)	

Fisher–Freeman–Halton test; *$p < 0.05$, GIT: Gastrointestinal tract

Older geriatric patients (≥75 years; 48.6%) most frequently underwent surgery between 16:00 and 00:00 h, whereas younger geriatric patients (65-74 years) most frequently (43.2%) underwent surgery between 08:00 and 16:00 h, but the time when surgery was conducted was statistically similar between the groups (p=0.646). Intraoperative death was not observed. While Hb values were similar in the preoperative period (12.1±2.4 g/dl vs 13.1±2.7 g/dl, p=0.05), postoperative Hb values were lower in Group I than those in Group II (10.7±1.7 g/dl vs 11.8±1.9 g/dl, p=0.004), respectively. Pre- and postoperative sodium values of the two groups were similar.

In total, 73.2% and 36.8% of the patients in Group I and II, respectively, were admitted to ICU after operation (p=0.001). The length of ICU stay, hospitalisation duration, mortality status and mortality days of the patients are summarised in Table 3. The overall mortality rate was 30.2%.

In intra-group analysis, ASA score in Group I (p=0.007) and ASA score and pre- and postoperative Hb values (p=0.008, p=0.003 and p=0.005, respectively) in Group II were significant factors affecting ICU admission.

Among the older geriatric patients, ICU mortality rate was not affected by ASA score, preoperative congestive heart failure, Alzheimer's disease, aetiology of acute abdomen, operation time and pre- and postoperative Hb and sodium values. Moreover, not having undergone preoperative cardiac examination increased ICU mortality rate (p=0.016), whereas in Group II, none of these factors affected ICU mortality rate. When the same parameters were analysed, it was observed that high ASA scores increased in-hospital mortality rate in both the groups (p=0.007 and p=0.0038, respectively); moreover in Group II, postoperative ICU admission affected in-hospital mortality rate (p=0.001).

Table 3. Postoperative ICU admission, length of ICU stay, hospitalisation duration, mortality status and mortality days of patients.

Variable		Group I	Group II	p
		Mean±sd (median)	Mean±sd (median)	
ICU admission n (%)		52 (73.2 %)	14 (36.8 %)	[1]0.001*
ICU stay (days)		9.4±19.35 (3)	3.83±3.27 (3)	[2]0.955
ICU mortality n (%)	Yes	15 (31.3 %)	5 (35.7 %)	[3]0.755
ICU mortality days		10.33±15.65 (2)	4.8±4.97 (2)	[2]0.855
Hospitalisation duration		16.1±17.21 (11)	16.54±31.79 (9)	[2]0.259
In-hospital mortality n (%)		27 (40.3 %)	6 (15.8 %)	[4]0.009*
Mortality day		15.18±19.22 (10)	6.17±5.19 (5.5)	[2]0.324

[1]Yates's correction of continuity; [2]Mann–Whitney U test; [3]Fisher's exact test; [4]Chi-square *p < 0.05

ICU: Intensive care unit

The rate of postoperative complications among the patients without mortality was found to be 25% in older geriatric patients and 18,7% in younger geriatric patients with no statistically significant difference between the groups (Table 4).

Table 4. Postoperative complications among the patients without mortality.

Variable		Group I	Group II	p
		n (%)	n (%)	
Complications	None	30 (75 %)	26 (81.3 %)	0.592
	Anastomotic leakage	1 (2.5 %)	3 (9.4 %)	
	Pneumonia	4 (10 %)	1 (3.1 %)	
	Delirium	1 (2.5 %)	0 (0 %)	
	Evisceration	1 (2.5 %)	0 (0 %)	
	Wound site infection	2 (5 %)	2 (6.2 %)	
	Respiratory distress	1 (2.5 %)	0 (0 %)	

Fisher's exact test

DISCUSSION

In our study comparing younger geriatric (65–74 years) and older geriatric (≥75 years) patients undergoing emergency abdominal surgery, it was observed that ASA score, ICU admission rate and in-hospital mortality rate were higher among older geriatric patients. It was observed that high ASA score increased ICU admission and in-hospital mortality rates in older geriatric patients. Low pre- and postoperative Hb values, along with high ASA scores, increased ICU admission rate; high ASA scores and admission to the ICU affected in-hospital mortality rate in younger geriatric patients.

Geriatric patients comprise a significant portion of patients undergoing emergency abdominal surgery. Emergency abdominal surgery in this patient group is associated with increased morbidity and mortality rates owing to decreased physiological reserves and the presence of comorbidities. Arenal et al. reported a mortality rate of 22% in a study involving patients aged ≥70 years who underwent emergency abdominal surgery, and this rate was as high as 58% among patients who underwent non-therapeutic laparotomy (4). In the present study, the overall mortality rate was found to be 30.2%. It is well known that advanced age is the sole, independent risk factor of mortality in patients who undergo abdominal surgery (5). In a previous study, patients aged >65 years were categorised into three groups: those aged 65–74, 75–84 and ≥85 years; it was shown that mortality rate increases for all surgery types with increasing age (6). Moreover, in the present study, in-hospital mortality rate was higher in older geriatric patients than that in younger geriatric patients.

Although ICU admission rate was higher among older geriatric patients, ICU mortality rates were similar between older and younger geriatric patients. The evaluation of the ASA status prior to administering anaesthesia is very crucial. Reportedly, ASA score is an independent risk factor of mortality after emergency abdominal surgery in geriatric patients (4, 7). A study involving patients aged >80 years demonstrated that ASA score is inadequate in evaluating the risk of colorectal surgery, while a similar study reported that P-POSSUM score combined with frailty scales can better evaluate the risk factors of mortality after emergency laparotomy (8, 9). In our study, it was observed that high ASA score increased in-hospital mortality rate in both the groups. Another factor affecting mortality in younger geriatric patients was ICU admission rate. This finding is linked to high ASA score, which increases ICU admission rate and ICU complications, such as infections, possibly occurring during ICU stay. The difference between the two groups was attributed to high ICU admission rates among the older geriatric patients with high ASA scores and ICU admission of younger geriatric patients with a higher risk than the general population of younger geriatric group.

Cardiopulmonary functions decline with increasing age; thus, comprehensive preoperative evaluation becomes more important. The evaluation of preoperative cardiac risks is important for the estimation of possible perioperative cardiac complications and for the adoption of a suitable treatment approach (10). Despite the improvements in perioperative care, significant morbidity and mortality are observed among the patients with congestive heart failure (11). In our study, history of congestive heart failure rate was higher among older geriatric patients than that among younger geriatric patients; however, there was no relationship between heart failure and ICU and in-hospital mortality rates. Providing necessary medical consultation in the preoperative period to patients who are undergoing emergency surgery is not always possible. In our routine clinical practice, cardiac evaluations of the patients are done according to ''ESC/ESA Guidelines on non-cardiac surgery: cardiovascular assessment and management" (12). In the present study, it was observed that not undergoing preoperative cardiac examination increased ICU mortality rate. While an increase in mortality was not observed with suitable monitoring and medical and fluid therapies in patients with known congestive heart failure, it was concluded that among patients who did not undergo preoperative cardiac examination, ICU mortality increased due to the inability to detect hidden heart failure and thus the inability to perform cardiac optimisation.

Anaemia is commonly observed in geriatric patients, and its prevalence increases with age after 65 years of age (13). In our study, while there was no significant difference in preoperative Hb values between the two groups (p=0.05), postoperative Hb values were lower in older geriatric patients than those in younger geriatric patients. However, low Hb value in older geriatric patients did not affect ICU admission, ICU mortality and in-hospital mortality rates. In a study of patients with a median age of 66 years undergoing hiatal hernia repair, it was shown that ICU admission rate increases if Hb value is <12 g/dl in females and <13 g/dl in males (14). In our study, low pre- and postoperative Hb values increased ICU admission rates among younger geriatric patients. It is considered that the detection of the treatable causes of anaemia and the use of available medical therapy protocols may be effective in decreasing ICU admission rates in younger geriatric patients who undergo elective surgery, although such an approach may not be practical in patients who undergo emergency surgery.

In the present study, no significant difference was observed between the two groups in terms of complications. In a study of patients aged >80 years, pneumonia (12.8%) was reported as one the most common complications occurring after

undergoing emergency abdominal surgery (15). Another study reported that the rate of postoperative pneumonia development was 11.4% among patients aged >70 years who underwent emergency abdominal surgery (4). In our study, the most common postoperative complication among older geriatric patients was pneumonia with the incidence (10%) being similar to that reported in previous studies. Reportedly, advancing age is associated with the deterioration of deglutition functions and the slowing of gastric emptying (16). The high prevalence of pneumonia in the postoperative period in older geriatric patients is attributed to the aforementioned physiological changes and an increased risk of aspiration due to acute gastrointestinal events.

The limitations of the study include its retrospective design, which is associated with the uneven distribution of patients in terms of number, and the inability to use scoring systems other than ASA in preoperative evaluation.

In conclusion the most important factor affecting ICU admission and postoperative mortality rates among patients aged >65 years was found to be ASA status. Moreover, anaemia appeared as a risk factor affecting ICU admission in patients aged 65–74 years. Treatment of anaemia prior to elective surgery in this age group can be beneficial in decreasing ICU admission rate and thus decreasing in-hospital mortality. As an absence of preoperative cardiac examination increases ICU mortality in older geriatric patients (≥75 years), it was concluded that preoperative cardiac examination and intra- and postoperative cardiac optimisations among patients aged ≥75 years can decrease ICU mortality rates.

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