ARAŞTIRMA MAKALESİ / *RESEARCH ARTICLE*

Preoperative Risk Scores in Elderly with Gastrointestinal Malignancies: Their Predictive Value for Postoperative Mortality and Morbidity

Gastrointestinal Maligniteli Yaşlı Hastaların Preoperatif Risk Skorları: Ameliyat Sonrası Mortalite ve Morbidite Yönünden Prediktif Önemi

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ABSTRACT

Aim: *The incidence of gastrointestinal cancers has shifted to older age groups with global population aging. Elderly patients often present with diminished reserves and comorbidities, necessitating individualized risk assessment. This study aimed to evaluate preoperative risk assessment tools, including the Physiological and Operative Severity Score for the Enumeration of Mortality and Morbidity (POSSUM), American Society of Anesthesiologists (ASA) score, and Eastern Cooperative Oncology Group Performance Status (ECOG-PS), in predicting early postoperative outcomes in elderly patients undergoing curative gastrointestinal cancer surgery.*

Material and Methods: *This retrospective study included patients aged ≥75 years (n=65) and 50–65 years (n=60) who underwent curative surgery between 2019 and 2023. Comorbidities, ASA scores, ECOG-PS, POSSUM scores, postoperative complications, and early mortality were analyzed.*

Results: *Elderly patients had significantly higher comorbidity rates, ASA, ECOG-PS, and POSSUM scores. Although early mortality and ICU stays were more frequent in elderly patients, multivariate analysis did not identify age ≥75 as an independent risk factor. The ASA score was significantly associated with postoperative morbidity (OR: 3.2, 95%CI: 1.5–6.7), whereas POSSUM and ECOG-PS scores were not predictive of early mortality.*

Conclusion: *Age alone is not an independent predictor of postoperative outcomes. Higher ASA scores are strongly associated with morbidity, emphasizing the need for comprehensive preoperative assessments.*

Key words: *preoperative risk scores; elderly; gastrointestinal cancer*

ÖZET

Amaç: *Gastrointestinal kanserlerin insidansı, küresel nüfusun yaşlanmasıyla birlikte daha ileri yaş gruplarına kaymıştır. Yaşlı hastalar genellikle azalmış rezervler ve artmış komorbiditelerle başvurduğundan, bireyselleştirilmiş risk değerlendirmesi gerekmektedir. Bu çalışma, küratif amaçlı gastrointestinal kanser cerrahisi geçiren yaşlı hastalarda erken postoperatif sonuçları öngörmede Fizyolojik ve Operatif Şiddet Skoru (POSSUM), Amerikan Anesteziyologlar Derneği (ASA) skoru ve Eastern Cooperative Oncology Group Performance Status (ECOG-PS) gibi preoperatif risk değerlendirme araçlarının kullanımını değerlendirmeyi amaçlamaktadır.*

Materyal ve Metot: *Bu çalışma retrospektif bir çalışma olup 2019–2023 yılları arasında gastrointestinal sistem malignitesi nedeniyle küratif cerrahi geçiren ≥75 yaş (n=65) ve 50–65 yaş (n=60) hastalar çalışmaya dâhil edilmiştir. Hastalara ilişkin komorbiditeler, ASA skorları, ECOG-PS, POSSUM skorları, postoperatif komplikasyonlar ve erken mortalite durumları analiz edilmiştir.*

Bulgular: *Yaşlı hastaların komorbidite oranları; ASA, ECOG-PS ve POSSUM skorları istatistiksel anlamlı olarak daha yüksektir. Erken mortalite ve YBÜ yatışları ileri yaş hastalarda daha sık olsa da multivariant analizlerde yaş ≥75 olması bağımsız bir risk faktörü olarak görülmemiştir. ASA skoru istatistiksel anlamlı olarak postoperatif mortalite ile ilişkili bulunmuştur (OR: 3,2, 95% CI: 1,5–6,7); ancak POSSUM ve ECOG – PS skorları erken mortalite için prediktif görülmemiştir.*

Sonuç: *Yaş, postoperatif takip ve sonuçlar açısından tek başına bağımsız bir risk faktörü değildir. Yüksek ASA skorları morbidite ile güçlü ilişkilidir. Bu durum, kapsamlı bir preoperatif değerlendirmenin ve bu değerlendirme doğrultusunda cerrahiye hazırlık için gerekli olan nütrisyonel destek, hastanın genel kondisyonunun optimize edilmesi vb. müdahalelerin yapılmasının (prehabilitasyon) önemini gösterir.*

Anahtar kelimeler: *preoperatif risk skorları; yaşlılık; gastrointestinal kanser*

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Introduction

The global population's aging has contributed to a rise in the average age of patients diagnosed with gastrointestinal (GI) cancers[1,2]. The peak incidence of GI cancers has shifted to the 6th and 7th decades in men and the 8th and 9th decades in women[1]. Age is recognized as a significant risk factor for many solid tumors. Aging results in a gradual decline in functional reserves across multiple organ systems, though at varying rates[3]. This decline leads to an increased prevalence of comorbidities, a higher incidence of complications, and a worsened prognosis[4]. Due to the variability in functional reserves among elderly individuals, this patient population exhibits high heterogeneity in terms of frailty[3]. As a result, individualized evaluation is crucial, particularly in the treatment of cancer. For instance, up to 70% of elderly patients are unable to receive neoadjuvant or adjuvant chemotherapy due to poor tolerance. The curative treatment for GI cancers remains surgical intervention[5]. However, similar to chemotherapy, surgery in elderly patients is associated with higher morbidity and complication rates[4,5].

This study aims to investigate the prognostic utility of widely used preoperative risk assessment tools (POSSUM, ASA, and ECOG-P scores) in predicting early postoperative outcomes, specifically 30-day morbidity and mortality, in elderly patients (≥75 years) undergoing curative gastrointestinal cancer surgery. The secondary objective is to compare these outcomes with those of middle-aged patients (50–65 years) to evaluate the impact of age-related physiological decline on surgical prognosis.

Material and Methods

Following approval from the local ethics committee, this retrospective observational study commenced with informed consent obtained from all participants. Patients undergoing elective curative-intent surgeries for gastric, colorectal, or pancreatic cancer at Kafkas University Hospital from 01.01.2019 to 01.11.2023 were included in the study. The study excluded patients with synchronous tumors, gastrointestinal stromal tumors, surgeries performed at external centers, or incomplete data. Data collected included patients' preoperative sociodemographic characteristics, comorbidities, Eastern Cooperative Oncology Group Performance Status (ECOG-PS), American Society of Anesthesiologists (ASA) scores, and Physiological and Operative Severity Score for the enumeration of Mortality and Morbidity (POSSUM) scores, as well as postoperative intensive care unit length of stay, morbidity, and early mortality outcomes. Postoperative morbidity was defined as the presence of complications classified as Grade 2, 3, or 4 according to the Clavien-Dindo classification. All patients' pathology results were staged according to the American Joint Committee on Cancer (AJCC) Tumor-Node-Metastasis (TNM) staging system. Patients were categorized into two groups for outcome analysis: Group 1 (≥75 years) and Group 2 (50–65 years) This grouping allowed for a comparative analysis of surgical outcomes between elderly and middle-aged patients with gastrointestinal cancers.

Statistical Analysis

All statistical analyses were performed using IBM Statistical Package for Social Sciences (SPSS) version 27.0 software. The distribution of continuous variables was assessed using the Kolmogorov-Smirnov test. Normally distributed variables were expressed as mean ± standard deviation (SD), while non-normally distributed variables were presented as median with interquartile range (IQR). For comparisons between two independent groups, the Student's t-test was used for parametric data, and the Mann–Whitney U test was employed for non-parametric data. Categorical variables were compared using the Chi-square test or Fisher's exact test, where appropriate. To identify variables independently associated with early postoperative mortality and morbidity, a binary logistic regression model was constructed, including variables with a p-value <0.10 in univariate analysis. The strength of associations was reported as odds ratios (OR) with 95% confidence intervals (CI). Receiver Operating Characteristic (ROC) curve analysis was used to evaluate the predictive value of the POSSUM score for early postoperative outcomes. The optimal cut-off value was determined using the Youden Index to maximize sensitivity and specificity. A cut-off point of 20.5 yielded the highest diagnostic performance for both morbidity and mortality (sensitivity for mortality: 87.5%, specificity: 53.0%; sensitivity for morbidity: 56.8%, specificity: 53.1%). A two-tailed p-value of less than 0.05 was considered statistically significant in all analyses.

Results

Present study included 125 patients, comprising 44 female and 81 male participants. The age ≥75 group had significantly higher comorbidities than the 50–65 age group (p=0.001). Of the 11 patients with

Table 1. *Comparison of preoperative demographic data, cancer stages according to TNM classification and risk scores according to age groups*

Parameters		Total (n=125)	Age ≥75 (n=66)(52.8%)	Age 50–65 (n=59) (47.2%)	p-value
Age median (IQR)		75.00(21.00)	80.00 (6.00)	59.00(8.00)	
Male sex n (%)		81 (64. 8%)	44 (66.7%)	37 (62.7%)	0.644
Obesity (BMI >30) n (%)		39 (31.2%)	25 (37.9%)	14 (23.5%)	0.088
Comorbidities n (%)		81 (64.8%)	58 (87.87%)	23 (38.98%)	**<0.001**
Diabetes mellitus n (%)		21 (16.8%)	11 (20.0%)	10 (16.9%)	0.966
Hypertension n (%)		46 (36.8%)	36 (54.54%)	10 (16.9%)	**<0.001**
Coroner artery disease n (%)		25 (20%)	20 (30.30%)	5 (8.47%)	**0.002**
ASA n (%)	1	2 (1.6%)	1 (1.52%)	1 (1.69%)	**<0.001**
	2	57 (45.6%)	18 (27.27%)	39 (66.10%)	
	3	65 (52.0%)	46 (69.69%)	19 (32.20%)	
	4	1 (0.8%)	1 (1.52%)	0(0.0%)	
ECOG-PS n (%)	0	49 (39.2%)	17 (25.75%)	32 (54.25%)	**<0.001**
	1	39 (31.2%)	14 (21.22%)	25 (42.37%)	
	2	22 (17.6%)	21 (31.82%)	1 (1.69%)	
	3	14 (11.2%)	13 (19.69%)	1 (1.69%)	
	4	1 (0.8%)	1 (1.52%)	0	
POSSUM median (IQR)		21.00 (8.00)	23.00 (5.00)	16.00 (5.00)	**0.001**
AJCC Stage 1 n (%)		20 (16%)	6 (9.09%)	14 (23.73%)	
Stage 2 n (%)		47 (37.6%)	20 (30.31%)	27 (45.76%)	**0.003**
Stage 3 n (%)		49 (39.2%)	32 (48.48%)	17 (28.81%)	
Stage 4 n (%)		9 (7.2%)	8 (12.12%)	1 (1.69%)	
Neoadjuvant treatment	No n, %	97 (77.6%)	55 (83.3%)	42 (71.2%)	0.104
	Yes n, %	28 (22.4%)	11 (16.7%)	17 (28.8%)	

ASA: American Society of Anesthesiologists, ECOG-PS: Eastern Cooperative Oncology Group performance status, POSSUM: physiological and operative severity score for the enumeration of mortality and morbidity, IQR: interquartile range, BMI: body mass index.

cerebrovascular events, 10 were in the age ≥75 group (p=0.008). Chronic obstructive pulmonary disease (COPD) was found in 24 patients, including 16 from the age ≥75 group, though not statistically significant (p=0.120). Atrial fibrillation (AF) was observed in 10 patients in total, 9 of whom were in the age ≥75 group (p=0.014) (Table 1). The number of patients with an ASA score of 3 or 4 was 66 (52.8%), of whom 47 (71.2%) were in the age ≥75 group (p<0.001). Among the patients with an ECOG performance score of 0 or 1, 88 (70.4%) were identified, and 57 (64.8%) of these were in the 50–65 age group (p<0.001). The total number of patients with stage 3 or 4 cancer was 58 (46.4%), with 40 (69.0%) belonging to the age ≥75 group (p<0.001). The proportion of patients receiving neoadjuvant therapy showed no significant difference between age groups (p=0.104) (Table 1). Postoperative morbidity did not differ significantly between the age groups (p=0.773). The age ≥75 group had significantly higher ASA, ECOG performance, and POSSUM scores (p=0.001 for all). Cancer-affected organ distribution was similar across both groups (p=0.174). Although early mortality rates and intensive care unit (ICU) stay durations were higher in the age ≥75 group in univariate analysis, multivariate analysis did not identify age as a significant risk factor for ICU stay or early mortality (respectively; p=0.640, p=0.683) (Table 2). Age ≥75 is an independent risk factor for the presence of comorbidities (Odds ratio: 5.001, p=0.047). Similarly, age ≥75 is a risk factor associated with an increase in ASA score, deterioration in performance status, and elevation in POSSUM score (Table 3). Patients were grouped by POSSUM scores (<20.5 and >20.5) for comparison of morbidity and mortality. POSSUM score did not significantly predict morbidity or early mortality (p=0.290 and p=0.062, respectively). Nevertheless, 7 out of 8 patients who developed early mortality had a POSSUM score >20.5 (Table 4). The relationship between risk scores and early mortality and postoperative morbidity was also evaluated specifically in patients over 75 years of age. In this subgroup, an ASA score of 3–4 was found to be associated with postoperative morbidity but not with early mortality in univariate analysis (respectively, p=0.027, p=0.127). However, this association did not reach statistical significance in multivariate analysis (p=0.122).

Table 2. *Comparison of malignancy site and postoperative data of the patients according to age groups*

Parameters		Total (n=125)	Age ≥75 (n=66; 52%.8)	Age 50–65 (n=59; 47%.2)	p-value
Site of malignancy n, %	Stomach	34 (27.2%)	22 (33.3%)	12 (20.3%)	0.174
	Colon	58 (46.4%)	31 (47.0%	27 (45.8%)	
	Rectum	23 (18.4%)	8 (12.1%)	15 (25.4%)	
	Pancreas	10 (8.0%)	5 (7.6%)	5 (8.5%)	
ICU length of stay median (IQR)		1.00(2.00–0.00)	1.00(2.00)	0.00(1.00)	**<0.001**
Postoperative morbidity n (%)		44 (35%.2)	24 (36%.36)	20 (33%.89)	0.773
Early Mortality n (%)		8 (6%.4)	7 (10%.60)	1 (1%.69)	0.065
Type of morbidity		81 (64.8%)	42 (63.6%)	39 (66.1%)	0.924
		11 (8.8%)	6 (9.1%)	5 (8.5%)	
		10 (8.0%)	6 (9.1%)	4 (6.8%)	
		9 (7.2%)	5 (7.6%)	4 (6.8%)	
		1 (0.8%)	1 (1.5%)	0 (0.0%)	
		13 (10.4%)	6 (9.1%)	7 (11.9%)	

ICU: intensive care unit, IQR: interquartile range.

Table 3. *Multivariate analysis of parameters according to age group*

Parameters	Odds ratio	95% CI	P value
Comorbidities	5.001	1.020–24.506	**0.047**
ICU length of stay	1.064	0.821–1.379	0.640
Cancer Stage 3, 4	3.827	1.689–8.671	**0.001**
ASA Scores 3, 4	5.585	2.478–12.586	**<0.001**
ECOG-PS 2, 3, 4	32.177	7.248–142.856	**<0.001**
POSSUM score	1.358	1.170–1.577	**<0.001**
Early mortality	3.024	0.015–617.089	0.683

ICU: intensive care unit, ASA: American Society of Anesthesiologists, ECOG-PS: Eastern Cooperative Oncology Group performance status, POSSUM: physiological and operative severity score for the enumeration of mortality and morbidity.

Discussion

In the present study, age ≥75 was not identified as an independent risk factor for intensive care unit length of stay, early mortality, or morbidity in patients who underwent curative surgery for gastrointestinal malignancies. However, age ≥75 was determined to be an independent risk factor for higher ASA scores, impaired ECOG performance status, and elevated POSSUM scores. In the evaluation of all patients, the ASA score was statistically significant in predicting early mortality and postoperative morbidity, whereas the ECOG-PS and POSSUM scores were not found to be significant.

Table 4. *Comparison of preoperative risk scores in terms of early mortality and morbidity*

Variables		Early mortality (n=8)	Univariate analysis P value	Postoperative morbidity (n=44)	Univariate analysis P value
ECOG-PS age ≥75	0, 1 (n=31)	3 (9.7%)	1.000	8 (25.8%)	0.093 (0.060*)
	2, 3, 4 (n=37)	4 (11.4%)		16 (45.7%)	
ECOG-PS all patients	0, 1 (n=88)	4 (4.5%)	0.222	27 (61.4%)	0.103
	2, 3, 4 (n=37)	4 (10.8%)		17 (38.6%)	
ASA score age ≥75	1, 2 (n=19)	0(0.0%)	0.179	3 (15.8%)	**0.027** (0.122*)
	3, 4 (n=47)	7(14.9%)		21 (44.7%)	
ASA score all patients	1, 2 (n=59)	0 (0.0%)	0.007 (0.997*)	14 (31.8%)	**0.011** (0.029*)
	3, 4 (n=66)	8 (100.0%)		30 (68.2%)	
POSSUM score age ≥75	<20.5 (n=62)	0 (0.0%)	0.334	1 (8.3%)	**0.043** (0.097*)
	>20.5 (n=63)	7 (13.0%)		23 (42.6%)	
POSSUM score all patients	<20.5 (n=62)	1 (12.5%)	0.062 (0.341*)	19 (43.2%9	0.290
	>20.5 (n=63)	7 (87.5%)		25 (56.8%)	

ASA: American Society of Anesthesiologists, ECOG-PS: Eastern Cooperative Oncology Group performance status, POSSUM: physiological and operative severity score for the enumeration of mortality and morbidity. *: p-value obtained from multivariate analysis.

Age is a recognized risk factor for malignancies[6]. As the global population continues to age, decision-making in cancer treatment for the geriatric population has become increasingly significant[6,7]. It has been reported that more than half of cancer diagnoses in Europe each year occur in individuals over 70 years of age[6,8]. Advances in perioperative assessment, intraoperative monitoring, and postoperative intensive care management have led to a dramatic reduction in perioperative mortality rates among elderly patients[8–10]. In 1948, Welch et al. reported a perioperative mortality rate of 20.7% in patients over 70 years of age undergoing abdominal surgery[9]. However, with advancements in surgical techniques and perioperative care, this rate has decreased to approximately 5% in recent years[11]. In this study, mortality was observed in 7 (10.6%) patients in the age ≥75 group. However, multivariate analysis revealed no statistically significant difference when compared to the younger patient group, which is consistent with the existing literature. A population-based study on esophageal, gastric, and colorectal cancers reported that curative surgical treatment was significantly less frequently performed in patients over 75 years of age; however, the outcomes of those who underwent surgery were similar to those of other age groups[1]. Although comorbidities increase with chronological age, age alone is insufficient to predict mortality and morbidity following elective curative surgery for gastrointestinal malignancies[7]. In our study, comorbidities increased significantly with age; however, multivariate analysis revealed no association between age and ICU length of stay, early mortality, or postoperative morbidity. Similar to other studies in the literature, the rate of neoadjuvant therapy administration was lower in elderly patients, although this difference was not statistically significant[12].

A study investigating the outcomes of patients over 80 years of age who underwent curative gastrectomy for gastric cancer identified an ASA score of 3/4, involvement of the cardia during gastrectomy, and a pathological stage of 2–4 as independent risk factors for poor prognosis. The same study demonstrated that patients who underwent D0 lymphadenectomy had worse survival compared to those who underwent D2 lymphadenectomy, while POSSUM scores and ECOG performance status were not associated with postoperative mortality[13]. In a study evaluating patients over the age of 85 with gastric cancer, it was found that while the ECOG score was not associated with overall survival, a POSSUM score above 30 significantly increased the risk of mortality[14]. POSSUM score is a surgical risk assessment system which combines both the physiological and surgical status of patients. Qiang Li and Yingjun Lu[15,16] concluded that the POSSUM scoring system can effectively predict postoperative complication rates. However, they suggested that it may overestimate the mortality rate, particularly in elderly patients with colorectal cancer. Matsubara et al. reported that in patients over 80 years of age who underwent surgery for colorectal cancer, there were no difference in mortality or postoperative complications between groups with high (ASA 3–4) and low (ASA 1–2) ASA scores. However, they observed a lower rate of complications in the high ASA score group when laparoscopic surgery was performed compared to open surgery[17]. Rosa F et al. in their study investigated the impact of the preoperative ASA on short term and long term outcomes in patients with gastric cancer. They found that 22.8% of patients, classified as ASA 3–4 preoperatively, had a mean age of 77.5 years. This group showed no significant difference in terms of postoperative surgical and medical complications or mortality rates when compared to patients classified as ASA 1 and 2, whose mean ages were 44.7 and 64.5 years, respectively[18]. In a study evaluating the data of 1.012 patients, ASA score and intraoperative blood transfusion were identified as independent risk factors for postoperative mortality and morbidity in patients over 70 years of age who underwent hepatectomy or pancreaticoduodenectomy. While age itself was not found to be a risk factor for postoperative mortality and morbidity, it was reported that sepsis occurred more frequently in elderly patients[19]. In our study, having an ASA score of 3–4 was also identified as an independent risk factor for postoperative morbidity. In our study, all 7 patients over the age of 75 who experienced mortality were preoperatively classified as ASA 3/4. The lack of statistical significance in the relationship between early mortality and ASA score may be attributed to the small sample size.

Study limitations include its retrospective design and the small sample size of elderly patients. Due to the small number of cancer patients aged over 75 years, patients with inherently different characteristics, such as those with gastric, colorectal, and pancreatic cancers, were analyzed as a single group to enhance statistical power. This approach constrained data harmonization and represented the primary limitation of the study.

Conclusion

This study highlights that while age ≥75 was associated with increased comorbidities, higher ASA scores, impaired ECOG performance status, and elevated POSSUM scores, it was not an independent risk factor for ICU length of stay, early mortality, or postoperative morbidity in patients undergoing curative surgery for gastrointestinal malignancies. Notably, the ASA score emerged as a significant predictor of postoperative morbidity, whereas ECOG-PS and POSSUM scores did not demonstrate predictive value. These findings underscore the importance of comprehensive preoperative evaluation that goes beyond chronological age when determining surgical risk in elderly patients. An interdisciplinary approach, involving a geriatric specialist prior to surgery, may contribute to improved clinical outcomes. As advancements in perioperative care continue to improve outcomes, this study reinforces the viability of curative surgical treatment in appropriately selected geriatric patients, emphasizing that age alone should not preclude surgical intervention for gastrointestinal cancers.

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