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FRAILTY INDEX AND ITS ROLE IN EMERGENCY SURGERY OF ACUTE ABDOMINAL DISEASES IN ELDERLY PATIENTS

Frailty is an important predictor of adverse outcomes in elderly patients with acute abdominal diseases requiring surgery. Preoperative assessment of frailty can significantly improve the prognosis of surgical outcomes and postoperative recovery.

Objective: To study the influence of frailty on the immediate and long-term results of surgical treatment in elderly patients with acute diseases of the abdominal cavity.

Materials and methods: The study involved 154 patients over the age of 62 with acute diseases of the abdominal organs who underwent surgical treatment. Patients were divided into two groups based on the Edmonton Frail Scale (EFS). Complications were classified according to the Clavien-Dindo system. The short- and long-term results of surgical treatment were assessed.

Results: The postoperative period was more complicated in patients with high frailty index. The ICU days were more for patients with the frailty score more than 7. They demonstrated delayed initiation of active movement and food intake, as well as a higher incidence of postoperative complications. 2nd and 3rd Grade ccomplications according Clavien-Dindo classification were significantly higher in patients with a high frailty index in the postoperative short-term. However, 1st Grade complications were more common in patients without frailty. In the group with a high frailty index, unsatisfactory long-term results were observed, including an increased risk of rehospitalisation (readmission) and a decreased functional status.

Conclusion: Frailty assessment plays a key-role in improving postoperative outcomes in elderly patients with acute abdominal diseases. Further research is necessary to develop methods that can mitigate the negative impact of frailty on surgical outcomes.

Keywords: elderly, frailty assessment, emergency surgery, abdominal diseases, outcomes/results.

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Introduction. Understanding the role of frailty is of utmost importance in emergency surgery, particularly in elderly patients with acute diseases of the abdominal cavity. Acute abdominal diseases such as appendicitis or intestinal obstruction pose a significant health threat to the elderly population due to age-related physiological changes and comorbidities. Treatment of such conditions often requires urgent surgical intervention, and the presence of frailty may complicate treatment tactics and may affect outcomes in patients [1–3].

Frailty often characterised by reduced physiological reserve and increased vulnerability to stressors is a major challenge in surgical treatment.

Elderly patients with increasing frailty may experience decreased functional status, delayed wound healing, and increased susceptibility to postoperative complications such as infections and delirium. In addition, preoperative frailty assessment is critical for risk stratification and informed decision-making regarding the feasibility of surgical intervention and approaches to perioperative care [4–7].

This article presents a comparative study of two groups of elderly patients with acute abdominal diseases and an examination of the impact of frailty on surgical outcomes. By assessing frailty degrees using validated tools such as the Edmonton Frail Scale, we aim to elucidate the association between frailty and the surgical complication rate, mortality and healthcare utilization.

Materials and methods. The research is based on the examination of patients over the age of 62 with acute surgical diseases of the abdominal organs. Along with routine examinations, all patients were assessed for their "frailty index" according to the Edmonton scale. In 68 patients, the frailty index was calculated to be below 7, indicating no signs of frailty according to the Edmonton scale. Among patients who applied in 2021, 86 people had a frailty index greater than 7, indicating the presence of senile frailty. The comparison of patients without frailty with patients whose frailty index was higher than 7 were performed. The results of surgical treatment of acute surgical diseases of abdominal organs in elderly patients with and without frailty were compared.

The anthropometric indicators of patients without frailty were as follows: the average age of patients was 69.3±0.8, ranging from 62 to 87. Among patients without frailty, men predominated (n=48; 70.6%).

The number of women was approximately three times less (n=20; 29.4%).

The average age of patients with a frailty index of more than 7, i.e., with signs of frailty, was 69.7 ± 0.71, ranging from 62 to 87. Among patients with frailty, men accounted for n=54; 62.8%, while women n=32; 37.2%.

The incidence of main diseases as an indication for surgery, was compared in patients with a frailty index above 7 and without fragility. The analysis showed that patients with hernias prevailed in the group without frailty. The incidence of hernias in the group without frailty was 69.1%, but in patients with a fragility index above 7 this figure was 50%. The difference in the incidence of hernias between the groups was statistically significant ($p<0.05$). However, when analysing the incidence of gallstone disease, the opposite trend was observed. The incidence of gallstone disease in the group without frailty was only 11.8%, while in the group of patients with a high frailty index this figure was 26.7%. The incidence

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of gallstone disease in patients with a frailty index above 7 was statistically significantly higher than in the group without frailty (p<0.05). The results of the frequency of occurrence of other major disease groups in patients without frailty and with a frailty index above 7 were as follows: perforated ulcer (4.4% and 9.3%), gastrointestinal bleeding (0 and 3.5%), acute intestinal obstruction (7.4% and 7%), acute appendicitis (7.4% and 3.5%). The differences in the frequency of occurrence of these major diseases between the groups were statistically insignificant (p>0.05).

The incidence of acute diseases of the abdominal cavity among the comparable groups is presented in Table 1.

The Edmonton Frail Scale (EFS), a widely used instrument to measure alterations related to frailty, was used to assess the frailty degree in elderly people [8]. The scale consists of 10 items, each rated on a scale of 0 to 1 or 0 to 2, depending on the specific question. Questions include assessment of cognitive status, functional independence, functional performance, continence, social support, and medication use. The total score ranges from 0 to 17, with higher values indicating greater frailty [9].

Both groups of patients were treated by the same hospital team, ensuring consistency in the surgical approach and postoperative care. All patients underwent surgery for medical reasons. The types of surgical procedures performed in patients with and without frailty were shown in the Table 2.

The statistical analysis using the Chi-Square test showed the following results: Pearson Chi-Square test value = 11.679; p-value = 0.020. Since p < 0.05, it can be stated that there is a statistically significant difference in the number of operations between the groups. Likelihood ratio value = 12.155; p-value = 0.016. This result also confirms the significance of the differences (p < 0.05). Linear by linear relationship = 1.064; p-value = 0.302. This result shows that the linear relationship is not significant. Thus, the differences are due to the distribution by categories.

Postoperative results were compared between groups. The main criterion for assessment was the frequency of postoperative complications. The Clavien-Dindo classification was used to rank the severity of surgical complications. This system, developed by Dr. Pierre Clavien and Dr. Daniel Dindo in 2004, has become a standard tool for reporting and comparing surgical outcomes across studies and institutions. The classification divides complications based on their clinical severity and the necessary interventions for treatment. According to this classification, complications are divided into the following grades:

Grade I–any deviation from the normal postoperative course without the need for pharmacological or surgical treatment and interventions.

Grade II – requiring pharmacological treatment with drugs other than such allowed for Grade I complications. Blood transfusions and total parenteral nutrition (TPN) are also included.

Grade III – requiring surgical or endoscopic intervention:

IIIa–intervention not under general anaesthesia, i.e. local anaesthesia.

IIIb–intervention under general anaesthesia.

Grade IV – life-threatening complications (including those affecting the brain) requiring intensive care management:

IVa – single organ dysfunction (including dialysis);

IVb –multi-organ dysfunction.

Fatal outcomes are classified as Grade V.

The Clavien-Dindo classification provides a standardised and objective way of assessing the severity of postoperative complications. This facilitates comparisons between different studies and helps clinicians and researchers better understand the impact of surgical interventions on patient outcomes [10].

Secondary assessment criteria included the duration of stay in the intensive care unit, hemodynamic parameters, respiratory rate, time to the onset of independent feeding, and time to the first bowel movement.

Table 1

The Incidence of Acute Diseases of the Abdominal Cavity

	Frailty index <7	Frailty index >7	Significance
Complex hernia	47 (69.1)	43 (50)	p<0.05
Calculous cholecystitis	8 (11.8)	23 (26.7)	p<0.05
Perforated ulcer	3 (4.4)	8 (9.3)	p>0.05
GI (gastrointestinal bleeding)	0	3 (3.5)	p>0.05
Obstructive ileus/Intestinal obstruction	5 (7.4)	6 (7)	p>0.05
Acute appendicitis	5 (7.4)	3 (3.5)	p>0.05

Table 2

The types of surgical procedures

Surgical Procedure	Patients without frailty: number (%)	Patients with frailty index >7: number (%)	Significance
Hernioplasty	46 (67.6)	41 (47.7)	p<0.05
Cholecystectomy	9 (13.2)	23 (26.7)	p<0.05
Stomach surgery	2 (2.9)	9 (10.5)	p<0.05
Ileus surgery	6 (8.8)	11 (12.8)	p<0.05
Appendectomy	5 (7.4)	2 (2.3)	p<0.05

Statistical analysis. All numerical indicators obtained during the study were arranged in order of variation, and the mean value and standard error (M±m) were calculated for each row. A non-parametric method, i.e., the Wilcoxon (Mann-Whitney) criterion (U) was used to determine differences between group indicators. All statistical procedures were performed using the IBM SPSS 22 program.

Research results and their discussion. Immediate postoperative results: Comparative analysis in the immediate postoperative period revealed significant differences between the two groups. The average duration of stay in the intensive care unit after surgery in patients without frailty was 2.52 ± 0.22 days. Patients with a high frailty index spent an average of 4.16±0.32 days in the intensive care unit (minimum 1 and maximum 16 days), which indicates a more severe course of the postoperative period. The difference in the duration of stay in the intensive care unit was statistically significant (p<0.001).

The groups were compared in terms of the time it took to start active movements, independent food intake, and ability to communicate during treatment in the surgical hospital. Patients with a frailty index of less than 7 required an average of 1.59±0.11 days to start active movements after surgery. In patients with a frailty index greater than 7 this period increased to 2.7±0.25 days (p<0.001). In addition, patients without frailty received oral nutrition on average 1.8±0.13 days after surgery. In patients with a high frailty index, 2.9 ± 0.24 days were required to initiate oral nutrition.

It took a significantly longer time for weakened patients to begin food intake (p<0.001). Another important observation was the comparison of time to the first bowel movement. In the group of patients with a high frailty index, this occurred after 2.98±0.26 days, while in the other group – after 1.87±0.14 days. Patients with a high frailty index had a higher rate of complications in the short-term postoperative period. These complications ranged from surgical site infections to postoperative delirium, suggesting an increased vulnerability of frail patients to surgical stressors. Table 2 shows the complication rates in both groups according to the Clavien-Dindo classification.

In addition, clinical indicators of patients with a high frailty index was significantly suboptimal, highlighting the challenges in managing this cohort during the acute phase of recovery. It was found that cases of shortness of breath occurred more often in patients with a high frailty index. The respiratory rate in patients with frailty was significantly higher (20.2±0.29 per minute, p<0.05) compared to patients without frailty (14.8±0.13 per minute). Pain intensity in patients without frailty was lower compared with the other group. The time of the surgical wound healing was shorter in the group of patients without frailty.

The average duration of hospital stays for patients without frailty came to 3.7±0.25 days, which was statistically significantly less (p<0.001) than for patients with a high frailty index, which came to 5.3±0.32 days.

Long-term postoperative results:

In addition to the immediate postoperative period, the influence of frailty also affected the long-term results of surgical interventions. All patients were invited to the clinic 30 days after surgery for examination. Patients with a high frailty index faced persistent challenges including longer hospital stays, increased risk of rehospitalisation (readmission), and deterioration of functional status compared with their healthy counterparts. These results highlight the complex relationships between frailty and surgical outcomes, which indicates the need for individual strategies for managing patients in the preoperative period.

As can be seen from Table 3, the incidence of complications of grades 1, 2 and 3a during the first 30 days after discharge was statistically significantly higher in the group with a high frailty index.

Discussion. This study examines the impact of frailty on surgical outcomes in elderly patients with acute abdominal diseases. One of the strongest aspects of our study is the comprehensive assessment of frailty using the Edmonton Frail Scale (EFS), a validated instrument that covers multiple aspects of frailty such as cognitive status, functional independence, and social support. We managed to establish a relationship between frailty and surgical outcomes by dividing patients into groups based on their preoperative frailty index.

However, our study has several limitations. First, the sample size of 154 elderly patients may limit the generalisation of our findings to broader populations. Additionally, the single-centre study design may introduce biases related to institutional practices and patient demographics. Even though we used the Clavien-Dindo classification to categorise postoperative complications, the subjective nature of some criteria may cause variability in the assessment.

Our results highlight the significant impact of frailty on surgical outcomes in elderly patients with acute diseases of the abdominal cavity. Patients with frailty experienced longer intensive care unit stays, delayed postoperative recovery, and higher rates of postoperative complications compared to the group without frailty.

Complications of the first degree of severity according to the Clavien-Dindo

Table 3

Rate of surgical complications within 7 days after surgery

CDC Grades	Frailty index <7		Frailty index >7		p
	n	%	N	%	
Grade 1	29	42.6	4	4.7	<0.001*
Grade 2	24	35.3	48	55.8	<0.05*
Grade 3a	12	17.6	28	32.6	<0.05*
Grade 4b	3	4.4	6	7.0	>0.05

Note: *<0.05 difference is reliable.

Table 4

Shows the surgical complication rate 30 days after surgery

Clavien-Dindo complications	Frailty index <7		Frailty index >7		p
	n	%	n	%	
Grade 1	21	30.9	47	54.7	<0.001*
Grade 2	4	5.9	16	18.6	<0.05*
Grade 3a	3	4.4	17	19.8	<0.001*
Grade 4b	2	2.9	2	2.3	>0.05

Note: *<0.05 difference is reliable.

classification were more often recorded in the group of patients without frailty, without requiring drug treatment and intervention. A statistically significant difference ($p<0.05$) was found when comparing the incidence of grade 1 complications between the groups. Severity complications of Grades 2 and 3 were predominant in patients with a high frailty index. Severity complications of Grade 2 were recorded in 48 patients (55.8%), and Grade 3 in 28 patients (32.6%). Only the difference in severity complications of Grade 4B was not statistically relevant between the groups.

However, in the high frailty index group, the rate of Grade 4b complications came to 7%, which was higher than in relation to the other group (4.4%).

These results emphasize the importance of preoperative frailty assessment for risk stratification and decision-making regarding surgical strategy and perioperative care.

Furthermore, our study provides valuable information on the long-term consequences of frailty in the context of surgical repair. Patients with a high frailty index experienced persistent problems: rehospitalisation, and decreased functional status, highlighting the need for individual strategies in the preoperative and postoperative periods. Despite the assistance provided, 6 patients died, and the 30-day mortality rate came to 3.9%.

Our results are consistent with previous studies demonstrating the negative impact of frailty on surgical outcomes in elderly patients. A study by Makarii et al. (2010) found that frailty was associated with increased postoperative complications and mortality in elderly patients who underwent surgery [11]. Similarly, Robinson et al. (2019) reported that frailty was a major predictor of adverse outcomes after emergency abdominal surgery in elderly patients [12].

However, some studies have shown contradictory results regarding the association between frailty and surgical outcomes [13–16]. For example, Amini et al. (2018) found no substantial differences in the rate of postoperative complications between frail and healthy elderly patients who underwent planned surgical procedures [17].

These discrepancies may be related to differences in study populations, frailty assessment tools, and types of surgical interventions.

Conclusion. Our study stresses the critical role of frailty assessment in optimization of surgical outcomes in elderly patients with acute abdominal diseases. Despite some limitations, our results provide valuable insights into the complex interactions between frailty, surgical stressors, and postoperative recovery. Additional research is needed to confirm our findings in larger multicentre samples and explore potential interventions to mitigate the impact of frailty on surgical outcomes.

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