

The role of frailty score in early surgical treatment of elderly cholecystitis patients

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ABSTRACT

Objectives: The average life expectancy is increasing all over the world, and as a result, the number of elderly patients is increasing. Acute cholecystitis is one of the most common diseases requiring emergency surgical treatment in the elderly. In the literature, it has been reported that in the treatment of elderly patients with acute cholecystitis, physicians do not fully comply with the current literature recommendations due to some concerns and do not apply surgical treatment in the early period. The concept of frailty, which has come to the fore in geriatric assessment today, provides objective information about the general health status of the patient. In our study, the role of frailty assessment in the decision made regarding the early surgery in elderly patients with acute cholecystitis treated in our hospital was investigated.

Methods: In our study, the clinical features, comorbidities, American Society of Anesthesiologists (ASA) scores, Canadian Study of Health and Aging (CSHA) frailty scale, treatment modalities and prognosis of patients over the age of 65 who were treated with the diagnosis of acute cholecystitis between January 2018 and January 2021 were evaluated retrospectively.

Results: Of the 182 patients included in the study, 24 (13.2%) were found to be frail. It was observed that the mean age and multi-morbidity were higher in the frail group ($p < 0.001$). It was observed that the mean C-reactive protein and leukocyte values, which are inflammatory mediators, increased in both groups, both fragile and non-fragile, and complicated cholecystitis accompanied by cholangitis or pancreatitis was observed in a total of 64 (35.16%) patients. There were 57 (31.3%) patients using anticoagulant or antiaggregant agents. The patients were most frequently treated with medical treatment ($n = 108$; 59.3%), the other treatment methods were early surgery ($n = 46$; 25.3%), endoscopic retrograde cholangiopancreatography ($n = 22$; 12.1%) and percutaneous cholecystostomy ($n = 11$; 6.0%). Surgical treatment was more common in ASA I and II patients, and percutaneous cholecystostomy was more common in frail patients ($p < 0.001$). There were 20 (14.70%) patients who were re-admitted to the hospital and 6 (3.29%) patients ended up with mortality. No statistical relationship could be demonstrated between these conditions and frailty ($p > 0.05$).

Conclusions: In the treatment of the elderly cholecystitis patients, early surgical treatment is the most favorable treatment method in order to reduce re-admission and prevent possible complications. However, we think that a detailed geriatric evaluation should be made in a multidisciplinary manner for the decision making regarding the of surgical treatment of elderly patients, and frailty evaluation should also be made in this context.

Keywords: Acute cholecystitis, early surgical treatment, frailty, elderly

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The risk of developing gallstones increases with age, and its prevalence increases to around 20% over the age of 65 [1]. Acute cholecystitis due to cholelithiasis is one of the most common surgical emergencies in the elderly population. As in young patients, the recommended treatment for acute cholecystitis in the elderly patients is laparoscopic cholecystectomy in the early period [1, 2]. However, in clinical practice, it has been observed that the decision to operate on elderly patients is more conservative than younger patients [3]. In the surgical decision regarding elderly patients with acute cholecystitis, presence of comorbidities, anticoagulants drug usage and a high American Society of Anesthesiologists (ASA) score bring up alternative treatment options [4].

The chronological age limit of 65 used for the evaluation of elderly patients does not reflect the biological status of each patient. One of the commonly used variables to evaluate the general health status of the geriatric patient group is frailty [5]. Frailty refers to a state in which the person is generally vulnerable, accompanied by a decrease in the general health status, physical activity energy and cognitive skill reserves [6].

In our study, the usability of the Canadian Study of Health and Aging (CSHA) frailty scale was investigated in the surgical treatment of elderly patients with acute calculous cholecystitis who were hospitalized in our hospital.

METHODS

In our study, patients over the age of 65 who were hos-

pitalized in the general surgery service for acute calculous cholecystitis between January 2018 and January 2021 were evaluated. The diagnosis of acute cholecystitis was made according to the ultrasound and computed tomography imaging results of the patients, as well as the laboratory and physical examination findings. Patients with acalculous cholecystitis and chronic cholecystitis were not included in the study.

Patients' age, gender, presence of comorbid disease, use of anticoagulants, C-reactive protein (CRP) and leukocyte values, ASA classification value, frailty score value, concurrent cholangitis or pancreatitis, type of cholecystitis treatment, presence of re-admission to the hospital within 30 days with similar complaints and mortality were evaluated retrospectively by accessing the patients' file data.

CSHA frailty scale was used to assess the frailty of the patients. In this scoring system, patients are classified from 1 to 7. Patients with CSHA class 1 are very fit, class 2 are well, class 3 are well, with treated comorbid disease, class 4 are apparently vulnerable, class 5 are mildly frail, class 6 are moderately frail, and class 7 are severely frail (Table 1). In our study, patients were evaluated in two groups; patients in CSHA category 1-4 as non-fragile and those in category 5-7 as fragile based on the guidelines.

Anesthesia preoperative evaluation forms are used for ASA classification. Patient anamnesis form and nutritional risk screening (NRS) form, patient fall risk assesment form, decubitus wound screening form file data records were evaluated for CSHA score evaluation.

Consent was obtained with the decision numbered

Table 1. Frailty scale

1	Very Fit	Robust, active, energetic, well-motivated and fit; these people commonly exercise regularly and are in the most fit group for their age
2	Well	Without active disease, but less fit than people in category 1
3	Well, with treated comorbid disease	Disease symptoms are well controlled compared with those in category 4
4	Apparently vulnerable	Although not frankly dependent, these people commonly complain of being “slowed up” or have disease symptoms.
5	Mildly frail	With limited dependence on others for instrumental activities of daily living
6	Moderately frail	Help is needed with both instrumental and non-instrumental activities of daily living.
7	Severely frail	Completely dependent on other for the activities of daily living, or terminally ill.

2021/72 of the scientific research ethics committee of Sancaktepe Şehit Prof. Dr. İlhan Varank Training and Research Hospital.

Statistical Analysis

Study data were analyzed with SPSS 21.0. Skewness and Kurtosis (normal distribution of data) values, normal distribution curve and Levene (equality of variances) test results were examined whether the data met the prerequisites of parametric tests. T-test and deviation of data from normal distribution in independent groups based on comparison of mean and variance between low and high-risk groups according to ASA scores and surgical treatment, percutaneous transluminal coronary angioplasty (PTCA), medical treatment variables, and also frail and non-frail groups according to frailty scale results and surgical treatment, PTCA, medical treatment variables. In case the data deviated from the normal distribution, comparisons were made with non-parametric Mann Whitney U and Kruskal Wallis tests. $P < 0.05$ was accepted for statistical significance.

RESULTS

A total of 182 patients over 65 with acute calculous cholecystitis, whose file data could be accessed retrospectively within the specified period of time, were included in the study. The number of female patients was 110 (60.4%) and the number of male patients was 72 (39.6%). The mean age of female and male patients was similar (74.53 ± 7.08 years and 74.93 ± 6.21

Table 2. The Canadian Study of Health and Aging (CSHA) frailty scale frequencies of patients

Frailty	Number of patient/percent
1	33/18.1%
2	65/35.7%
3	37/20.3%
4	23/12.6%
5	16/8.8%
6	6/3.3%
7	2/1.1%

years, respectively).

When the distribution of the patients according to the CSHA frailty scores was evaluated, it was seen that the patients were most frequently ($n = 135, 74.17\%$) in CSHA classes 1, 2 and 3, which were not considered as frail, and a total of 24 (13.2%) patients were in the frail group (Table 2).

When patients were sub-grouped as frail and non-frail, the mean age was 84.71 ± 5.09 years in the group considered frail, while this value was 73.16 ± 5.55 years in the non-fragile group ($p < 0.001$). The number of patients with more than two additional diseases in the frail group was 9 (4.9%) and 12 (6.6%) in the non-frail group. Similar to the mean age distribution, multimorbidity was statistically higher in the frail patient group ($p < 0.001$) (Table 3).

The mean CRP value was 16.18 ± 7.53 mg/dL in the frail group, and 12.10 ± 10.96 mg/dL in the non-

Table 3. The comparison of means in independent groups according to frailty

	Non-frail (CSHA 1, 2, 3, 4)	Frail (CSHA 5, 6, 7)	Total	p value
Age (years) (mean \pm SD)	73.16 ± 5.55	84.71 ± 5.09		< 0.001
Male/Female, n (%)	63/95 (34.6/52.2)	9/15 (4.9/8.2)	72/110 (39.6/60.4)	0.825
Multimorbidity > 2, n (%)	12 (6.6)	9 (4.9)	21(11.5)	< 0.001
Use of anticoagulant agent, n (%)	45 (24.7)	12(6.6)	57(31.3)	0.034
CRP (mg/dL)	12.10 ± 10.96	16.18 ± 7.53		0.081
Leucocyte (cells/mm ³) (mean \pm SD)	11465.11 ± 5227.04	14054.58 ± 6523.78		0.030

CSH = Canadian Study of Health and Aging, CRP = C-reactive protein, SD = standard deviation

Table 4. The concomitant cholangitis or pancreatitis prevalence according to age groups

	65-80 years	> 80 years	Total	p value
Patients with concomitant cholangitis or pancreatitis, n (%)	44 (24.2)	20 (11.0)	64 (35.2)	0.017
Total, n (%)	143 (78.6)	39 (21.4)	182 (100)	

Table 5. Treatment modalities according to ASA scores

	ASA I, II	ASA III, IV	Total	p value
Surgery, n (%)	36 (19.8)	10 (5.5)	46 (25.3)	< 0.001
Percutaneous cholecystostomy, n (%)	1 (0.5)	10 (5.5)	11 (6.0)	0.004
Medical treatment, n (%)	47 (25.8)	61 (33.5)	108 (59.3)	0.008
ERCP, n (%)	12 (6.6)	10 (5.5)	22 (12.1)	0.772

ASA = American Society of Anesthesiologists, ERCP = endoscopic retrograde cholangiopancreatography

frail group. The mean leukocyte value was $14054.58 \pm 6523.78 \times \text{cells/mm}^3$ in the frail group, and $11465.11 \pm 5227.04 \times \text{cells/mm}^3$ in the non-frail group. There was no significant difference between the groups in terms of mean CRP and leukocyte values ($p = 0.081$ and $p = 0.030$, respectively) (Table 3).

In total, 57 (31.3%) patients were using anticoagulant or antiaggregant agents. There was no significant difference between the frail and non-frail groups in terms of gender distribution and use of anticoagulants ($p = 0.825$ and $p = 0.034$, respectively) (Table 3).

It was observed that there were 39 patients in the octogenarian (over the age of 80) group. 20 patients had concomitant cholangitis or pancreatitis diagnoses and regarded as complicated cholecystitis. There were 44 patients with complicated cholecystitis in the 65-80 age group ($p = 0.017$) (Table 4).

It was observed that medical treatment was the most common ($n = 108$; 59.3%) treatment option and surgery was planned in elective conditions for this group. The number of patients who underwent emergency surgical treatment in the early period was 46

Table 6. Treatment modalities according to The Canadian Study of Health and Aging (CSHA) frailty scale

	Non Frail	Frail	Total	p value
Surgery, n (%)	46 (25.3)	0	46 (25.3)	0.002
Percutaneous cholecystostomy, n (%)	3 (1.6)	8 (4.4)	11 (6.0)	< 0.001
Medical treatment, n (%)	94 (51.6)	14 (7.7)	108 (59.3)	0.914
ERCP, n (%)	19 (10.4)	3 (1.6)	22 (12.1)	0.957

ERCP = endoscopic retrograde cholangiopancreatography

Table 7. The readmission and mortality frequencies according to ASA scores

	ASA I, II	ASA III, IV	Total	p value
Readmission, n (%)	10 (5.5)	10 (5.5)	20 (11)	0.876
Mortality, n (%)	2 (1.1)	4 (2.2)	6 (3.3)	0.361

ASA = American Society of Anesthesiologists

Table 8. The readmission and mortality frequencies according to The Canadian Study of Health and Aging (CSHA) frailty scale

	Non Frail	Frail	Total	<i>p</i> value
Readmission, n (%)	19 (10.4)	1 (0.5)	20 (11)	0.251
Mortality, n (%)	4 (2.2)	2 (1.1)	6 (3.3)	0.180

(25.3%). The number of patients who underwent percutaneous cholecystostomy was 11 (6.0%) and the number of patients who underwent endoscopic retrograde cholangiopancreatography (ERCP) was 22 (12.1%) (Tables 5 and 6).

When the treatment modalities applied to the patients were divided into subgroups according to their ASA scores and state of frailty, emergency surgical treatment was applied more frequently for patients with ASA I-II compared to ASA III-IV patients ($p < 0.001$) and percutaneous cholecystostomy was performed more frequently for frail patients compared to non-frail patients ($p < 0.001$) (Tables 5 and 6).

It was observed that 20 (14.70%) patients who were not operated, were admitted to the hospital again within 30 days due to similar complaints. It was observed that re-admissions to 125 the hospital were not associated with the ASA scores and frailty score ($p = 0.876$ and $p = 0.251$, respectively) (Tables 7 and 8). A total of 6 (3.29%) patients included in the study ended up with mortality. When the relationships between mortality and ASA and frailty scores were evaluated, no significant difference was found ($p = 0.361$ and $p = 0.180$, respectively) (Tables 7 and 8).

DISCUSSION

Cholelithiasis is a very common disease in the society. As the prevalence of cholelithiasis increases with age, gallbladder stones are detected in 20% of men and 35% of women by the seventh decade [7]. In our patient group, acute cholecystitis was more common in female patients. Complications related to cholelithiasis are the most common cause in the elderly patient group referring to the emergency services due to acute abdomen [8].

It has been reported that the risk of morbidity and mortality is higher in the elderly patients compared to the young adult patients. The incidence of patients

with complicated cholecystitis accompanied by gangrenous cholecystitis, cholangitis or pancreatitis is higher the in elderly [9-11].

In our study, when evaluated numerically, complicated cholecystitis was frequently encountered in the elderly patients. It has been observed that this risk may be higher in older ages. Today, early surgical treatment is recommended for both young and elderly patients who are admitted to the hospital due to biliary pancreatitis and cholecystitis attacks [1]. It has been shown that there is an increase in the frequency of re-admissions to the hospital with similar complaints and morbidity in patients who did not undergo surgical treatment [12, 13]. Laparoscopic cholecystectomy usually does not cause severe endocrine, metabolic, and inflammatory responses in patients because it is a minimally invasive surgery. However, studies have shown that there is a significant increase in inflammatory markers in the postoperative period in the elderly patients after cholecystectomy [9]. When the cholecystitis patients in our study group are evaluated, it is seen that the mean CRP and leukocyte values, which help to show the inflammation in the body, are higher at the time of admission, more higher in frail patients. Due to comorbidities and general health problems in the elderly patients, the patients in this group become more sensitive to acute stresses and traumas [14, 15]. It has been reported that the risk of mortality increases significantly in the perioperative period in the elderly patients, even in low-risk surgical procedures, when compared with the younger patient group. It has been reported that the risk of mortality increases dramatically in every decade over the age of 50, and can reach values as high as 40-50%, although it varies according to the diagnosis and surgical procedure for those over 80 [14].

When the literature data is evaluated, it is seen that the recommendations specified in the Tokyo guideline are not followed in the surgical treatment of the elderly cholecystitis patients even in the developed countries

[3]. It is thought that cholecystectomy rates are low in the elderly patients due to difficulties in diagnosis, comorbidities, and increased perioperative morbidity and mortality risks in the elderly patients. In a study conducted even in the developed European countries such as the United Kingdom, Scotland and Sweden, the rates of patients who underwent surgical treatment in the early period ranged from 20% to 62% [3].

In the study of Mclsaac *et al.* [16], it was reported that 15% of the 65-69 age group patients who underwent cholecystectomy in emergency conditions and up to 40% of the patients over the age of 80 had a decrease in their ability to do their daily activities and an increased risk of being dependent on other people in the postoperative period.

In the study of Lupinacci *et al.* [13] on 81 cholecystitis patients over 80, they compared the surgical treatment on emergency conditions with semi-elective conditions. As a result, they reported that need for intensive care, days of hospitalization and complication rates were higher in the group that underwent emergency surgery. They showed that length of hospital stay of the patients was prolonged, and the mortality risk increased up to 32% in the emergency surgery group. At the end of the study, they recommended that more studies should be conducted for the decision making and timing of surgery in patients with acute cholecystitis [13].

In our study, medical treatment in acute phase and surgery in elective conditions was the most frequently preferred treatment method in the elderly patients with cholecystitis.

Trust *et al.* [3] suggested to apply non-surgical treatment methods in the acute period for patients who use anticoagulant or antiaggregants such as aspirin and clopidogrel, or who have uncontrolled comorbidities and later on surgical treatment in elective conditions [3]. Similarly, Elixhauser *et al.* [17] reported in their study that profit and loss should be evaluated for patients who use anticoagulant or antiaggregant agents and have comorbidities when making a surgical decision.

The high number of patients using anticoagulants in our study was one of the factors that distracted us from the decision to apply surgical treatment in the early period.

In the WSES and SICG 2017 guidelines, in which many studies have been reviewed, it has been reported

that it is more difficult to decide between surgery, medical treatment or percutaneous cholecystostomy for the treatment of elderly patients with acute cholecystitis compared to younger patients. In elderly patients with acute cholecystitis, it has been recommended to use scores that determine surgical risk and frailty in making the decision for laparoscopic cholecystectomy in the early period [1].

The effect of the ASA score, which determines the surgical risk of the patient, was evaluated for the surgical treatment method and timing of surgery in elderly cholecystitis patients. Accordingly, it has been shown that there is an increased risk of complications and mortality after cholecystectomy in patients with a high number of additional diseases and a high ASA score. It was emphasized that the post-operative intensive care unit need of these patients were increased [18, 19].

It has been reported that percutaneous cholecystostomy is an effective temporary treatment that can be applied before the final surgical treatment for cholecystitis patients with ASA 3 and above [20]. However, percutaneous cholecystostomy was not recommended as the gold standard treatment due to high mortality rates, prolonged hospitalization, and high rate of re-admissions to the hospital [21].

Frailty refers to the clinical sensitivity of the person as a result of the loss of physiological systems with aging [6]. Geriatric studies have shown that frailty is superior to chronological age in assessing the patient. In fact, it has been reported that frailty of the patient is more effective in predicting perioperative morbidity and mortality than the assessment made with the ASA score alone [22]. Some scoring systems have been developed to objectively define frailty. However, some of the defined scoring systems are difficult to use in daily clinical practice. CSHA scoring system is a widely used method due to its ease of use and high accuracy in determining mortality risk [6].

Goeteyn *et al.* [23], reported that mortality risks of frail patients after emergency surgery were significantly increased compared to the non-frail patient group. For the frail patient group, mortality rates increase up to one third within 1 year after the emergency surgical procedure. The fact that most of the deaths occur in the early postoperative period draws attention to the stress factor that surgery creates on the patient [23]. Similarly, Khan *et al.* [5], in their study

on 326 elderly surgical patients, reported that frailty has an effect on the prognosis of patients and that frailty should be taken into consideration when making an emergency surgical procedure. Studies have shown that frailty score is an independent marker for postoperative complications, length of hospital stay, and mortality risk in the elderly patients after surgical procedures [24, 25].

In our patient group, it is seen that the ASA score and CSHA frailty score are effective in planning the treatment choice of the elderly cholecystitis patients. In our study, it has been shown that these evaluation methods are especially effective in making the decision on performing surgery and percutaneous cholecystostomy in the early period.

When all patients are evaluated, our mortality rate is not high. However, the high rate of re-admission of patients to the hospital within 30 days is high. It can be attributed to the low rate of patients who underwent surgery in the early period.

Limitations

One of the limiting factors of our study is that, the time interval of our study coincides with Covid 19 pandemic. The increase in the occupancy rate of intensive care beds due to Covid disease has been one of the factors that distracted us from the decision on early surgical treatment of the elderly patients who may need intensive care after surgery. When the treatment option applied to our patients is evaluated, our early surgical treatment rate is less than the literature recommendations. As another limitation of our study, we can say that the number of our patients is low in the frail and octogenarian patient groups. Therefore, we could not show statistically significant difference when evaluating the distribution of patients with comorbid diseases and complicated cholecystitis. We think that a prospective multicenter study conducted on more patients under favorable conditions after the pandemic, will yield clearer results.

CONCLUSION

Today, with the increase in the number of elderly patients, the number of emergency surgical treatment is also increasing for elderly patients. In the treatment of acute cholecystitis, early surgical treatment is much

recommended for elderly patients as young patients. However, conditions such as additional diseases, use of anticoagulant agents, poor general condition and the need for intensive care unit in the elderly patients affect the surgical decision of surgeons. We think that multidisciplinary geriatric evaluation is necessary when deciding surgical intervention in the elderly patients and it is beneficial to include frailty in the evaluation.

Authors' Contribution

Study Conception: NT, CD, DE; Study Design: NT, CD, DE; Supervision: NT, CD, DE; Funding: NT, CD, DE; Materials: NT, CD, DE; Data Collection and/or Processing: NT, CD, DE, ÜBB; Statistical Analysis and/or Data Interpretation: NT, CD, DE, ÜBB; Literature Review: NT, CD, DE, ÜBB; Manuscript Preparation: NT, CD, DE, ÜBB and Critical Review: NT, CD, DE, ÜBB.

Conflict of interest

The authors disclosed no conflict of interest during the preparation or publication of this manuscript.

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