Association between frailty and readmission within one year after gastrectomy in older patients with gastric cancer

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ABSTRACT

Objective: The incidence of gastric cancer in older people is increasing. Because older patients are at increased risk of postoperative complications and mortality, preoperative risk assessment in this population is important. This study explored whether preoperative assessment of frailty could be useful for predicting the postoperative outcome in patients with gastric cancer.

Materials and Methods: We investigated 223 patients (136 men and 87 women) over 65 years of age who underwent gastric cancer surgery from April 2012 to March 2015 at a single institution in Korea. Frailty was assessed using the Study of Osteoporotic Fractures (SOF) frailty index. Logistic regression was used to identify factors predicting readmission within one year of discharge following gastrectomy.

Results: Twenty six (11.7%) patients were readmitted within one year after gastrectomy. Patients in the "robust" and "pre-frail and frail" group had a readmission rate of 4.4% and 19.1%, respectively. After adjusting age, gender, Eastern Cooperative Oncology Group performance status (ECOG PS) (score ≥ 1), histological type and stage (III, IV), frailty (pre-frail and frail) was a predictive factor for readmission within one year of discharge after gastrectomy (Odds Ratio, 5.74, 95%; Confidence Interval, 1.78–18.48; p = 0.003).

Conclusions: Preoperative risk assessment including frailty evaluation can predict the readmission within one year of discharge after gastrectomy. Frailty assessment can help physicians to identify the risk and inform patients and their families of the risk, which should improve decision making in gastric cancer treatment.

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1. Introduction

South Korea is an aging society, with the proportion of citizens 65 years and over increasing from 7.2% of the total population in 2000 to 11% in 2010. The prevalence is predicted to be 20.8% by 2026 [1,2] and the incidence of gastric cancer in this population is also expected to increase [3].

The gold standard treatment of gastric cancer is surgical resection [4] and gastric cancer surgery is associated with postoperative morbidity and mortality. Because older patients have more comorbidities and reduced functional reserve than younger adults, they are at increased risk of postoperative complications and mortality [5–7]. Thus, preoperative risk assessment for predicting postoperative outcomes in older patients is important.

In geriatric practice, evaluation of frailty for preoperative risk assessment has emerged. Frailty develops as a consequence of age-related decline in multiple physiological systems, which results in increased vulnerability to external and internal stressor events [8,9]. Several recent studies have established that frailty is a strong predictor of postoperative morbidity (postoperative complications, length of hospital stay, discharge to nursing home or long-term care facilities, readmission) and mortality in older patients [10–12]. In most previous studies that evaluated the association between frailty and postoperative outcomes, frailty was assessed by relatively complex procedures that include the Groningen Frailty Indicator (GFI), Cardiovascular Health Study (CHS) frailty index, and Comprehensive Geriatric Assessment (CGA) [10–13].

The purpose of this study was to determine if preoperative assessment of frailty using the Study of Osteoporotic Fractures (SOF) frailty index – a simple and easy tool to predict elderly adverse outcomes (fall, disability, fracture and mortality) [14] – could be useful for predicting the postoperative outcomes in patients with gastric cancer.

2. Materials and Methods

2.1. Study Population

We investigated 223 patients over 65 years of age who underwent gastric cancer surgery and who received staging work-up and

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preoperative evaluation in Chonnam National University Hwasun Hospital from April 2012 to March 2015. Patient information was obtained retrospectively through review of the hospital's electronic medical record (EMR) system. Before the study was initiated, the protocol was approved by the Chonnam National Hwasun Hospital institutional review board (CNUHH-2014-112).

2.2. Assessment of Frailty – Study of Osteoporotic Fractures Frailty Index

We assessed frailty using the SOF frailty index validated in large two studies [15,16]. The index is simple and easy to use, but can predict elderly adverse outcomes as well as the CHS frailty index [14–16]. The SOF frailty index was constructed with three components. First was an involuntary weight loss of 5% or more during the past year. Second was the inability to rise from a chair five times without using arms. Third was reduced energy level identified by "no" response to the question "Do you feel full of energy?" on the Korean version of the Geriatric Depression Scale (GDS-K) [17]. Frailty status was defined as robust (0 component), pre-frail (1 component), and frail (2–3 components) (Table 1). We assessed SOF frailty index for each patient at their first hospital visit for staging work-up.

2.3. Outcome Variables

The primary outcome for this study was the rate of readmission within one year of discharge after gastrectomy. Readmission was defined as hospitalization at Chonnam National University Hwasun Hospital due to postoperative complications or progression of gastric cancer within one year of discharge after gastrectomy. Readmission data were also obtained retrospectively through the EMR system of Chonnam National University Hwasun Hospital.

2.4. Other Covariates

Demographic variables included age and gender. Preoperative assessment included body mass index (BMI), preoperative anemia (<12 g/dl) [18,19], preoperative hypoalbuminemia (<3.5 g/dl), [19,20] Eastern Cooperative Oncology Group performance status (ECOG PS), American Society of Anesthesiologists (ASA) physical status [21,22], number of comorbidities and Charlson Comorbidity Index (CCI) [23]. BMI was classified as under/normal weight (BMI < 23 kg/m^2), overweight (23 ≤ BMI ≤ 24.9 kg/m^2) and obese (≥25 kg/m^2) [24,25]. ECOG PS was categorized as 0 and ≥1, and ASA physical status was classified as <2 and ≥2. Clinical variables included histological type [26], stage of gastric cancer [27], type of gastric resection, and neo-adjuvant and/or adjuvant chemotherapy [4].

2.5. Statistical Analyses

We divided all participants into "robust" and "pre-frail and frail" frailty groups. To compare the two groups, we conducted independent samples t-tests for continuous variables and chi-square tests for categorical variables. To identify predicting factors for readmission within one year of discharge after gastrectomy, a logistic regression model was used for univariate and multivariate analyses. In multivariate analysis, we included the main demographic variables of age and gender, as well as ECOG PS, histological type, stage, and frailty, which in the univariate analysis were associated with a greater than 10% probability for readmission within one year. All statistical analyses were performed with SPSS 22.0.0.1 (IBM Co., Armonk, NY, USA), and p-value < 0.05 was considered statistically significant.

3. Results

3.1. Baseline Characteristics

A total of 223 patients were included in this study (136 men and 87 women). Their mean age was 72.1 ± 4.6 years. Data concerning preoperative assessment (BMI, preoperative anemia, preoperative hypoalbuminemia, ECOG PS, ASA physical status, number of comorbidities and CCI) and clinical variables (histological type, stage, type of resection, and neo-adjuvant and/or adjuvant chemotherapy) are summarized in Table 2. In the preoperative assessment, 112 (50.2%) patients were under/normal weight by BMI. 44 (19.7%) and ten (4.5%) patients were diagnosed with anemia and hypoalbuminemia, respectively. 113 (50.7%) patients had an ECOG PS ≥1 and 99 (44.4%) had an ASA physical status ≥2. CCI ≥ 1 was present in 91 (40.8%) patients. According to the seventh edition of the Union for International Cancer Control (UICC) Tumor-Node-Metastasis (TNM) classification, 144 (64.6%) patients were stage I, 38 (17.0%) were stage II, 36 (16.1%) were stage III, and five (2.2%) were stage IV. Three out of five patients with stage IV gastric cancer underwent surgery for palliative treatment and two patients were candidates for a clinical trial. 153 (68.6%) patients underwent distal gastrectomy, and 55 (24.7%) patients received neo-adjuvant and/or adjuvant chemotherapy.

The "robust" and "pre-fail" and "fail" groups according to the SOF index comprised 134 (60.1%), 56 (25.1%), and 33 (14.8%) patients, respectively (Table 1). For analysis, participants were allocated into two groups: "robust" (n = 134, 60.1%) and "pre-frail and frail" (n = 89, 39.9%) groups. The "pre-frail and frail" group was older (73.0 ± 4.4 years) than the "robust" group (71.5 ± 4.7 years) and had more women (50, 56.2% vs. 37, 27.6%). ECOG PS score was higher in the "pre-frail and frail" group than in the "robust" group (p < 0.001; Table 2).

3.2. Readmission within One Year of Discharge after Gastrectomy

Readmission within one year was defined as hospitalization due to postoperative complications or progression of gastric cancer within one year of discharge after gastrectomy. 26 (11.7%) patients were readmitted within one year after gastrectomy. The proportion of readmitted patients according to frailty status is presented in Fig. 1. Nine (7.2%) patients of the "robust" group and seventeen (19.1%) patients of the "pre-frail and frail" group were readmitted.

The reasons for readmission of the 26 patients are summarized in Table 3. The most common causes were abdominal pain (5, 2.2%) and paralytic ileus (5, 2.2%). These patients were treated with conservative and supportive care. Three (1.3%) patients had an anastomosis site stricture and were treated using Through the Scope (TTS) balloon dilation. One (0.4%) patient diagnosed as stage I at staging work-up was readmitted due to paraplegia from gastric cancer metastasis of tenth thoracic vertebra (T10).

3.3. Predictive Factors for Readmission within One Year of Discharge after Gastrectomy

In univariate analysis, stage (III, IV) and frailty (pre-frail and frail) were significantly associated with readmission within one year after

Table 1
Study of Osteoporotic Fractures (SOF) index (N = 223).

	Number (%)
Parameters	
Involuntary weight loss of 5% or more during the past year	23 (10.3)
Inability to rise from a chair five times without using arms	50 (22.4)
A "no" response to the question "Do you feel full of energy?"	52 (23.3)
Classifications	
Robust	134 (60.1)
Pre-frail	56 (25.1)
Frail	33 (14.8)

Define 'robust' as none of the three components; 'pre-frail' as the presence of one of three components; 'frail' as the presence of at least two of three components.