Factors affecting the postoperative morbidity in patients who underwent gastric or colorectal resection due to cancer: Does preoperative nutritional status affect postoperative morbidity?

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ABSTRACT

Objective: The aim of the present study is to detect the factors affecting the postoperative morbidity of gastric or colorectal resection due to cancer and to evaluate the predictive value of the preoperative Nutritional Risk Screening 2002 (NRS-2002) score on postoperative morbidity.

Methods: Patients who underwent gastric and colorectal resection due to malignancy were included in the study. The effects of age, gender, the malignancy origin, preoperative NRS-2002 score, blood transfusion size during operation, stage of the disease, length of the operation, body mass index (BMI), and preoperative blood albumin levels on morbidity were statistically evaluated.

Results: A total of 418 patients between January 2012 and December 2014 were included in the study. Ninety-nine of them (23.6%) showed postoperative morbidity. Postoperative morbidity developed in 50 (19.3%) patients with a good nutritional score. The morbidity rate was 30.8% (n=49) in patients with a poor nutritional score (p<0.05).

Conclusion: The preoperative evaluation of the nutritional status with NRS-2002 in surgery clinics can be used as a method to predict postoperative morbidity in patients who underwent resection due to gastric or colorectal cancer.

Keywords: Colon cancer, gastric cancer, NRS-2002, nutrition

Introduction

Malnutrition is common in patients with cancer. This is an important factor affecting postoperative morbidity and mortality (1). The incidence of malnutrition is 40%-80% in patients with cancer (2). The rate of malnutrition depends on the tumor type, location, stage of disease, treatment received, and nutritional assessment method (3). A poor nutritional status is correlated with a poor quality of life, high postoperative morbidity and mortality, and low tolerance to chemotherapy for gastrointestinal cancer (4, 5). In addition, Cause of death in as many as 20% of patients with cancer is associated with malnutrition (6).

Operations for gastric cancer and colorectal cancer are common in general surgery clinics. Preoperative nutritional status must be evaluated in patients with gastrointestinal cancer. There are several methods to evaluate preoperative nutritional status in patients. Anthropometric measurements such as the weight change, arm muscle circumference, triceps skin-fold thickness, and biochemical parameters are commonly used methods (7). Other methods are the Subjective Global Assessment (SGA), Patient-Generated SGA (8), and Nutritional Risk Screening (NRS-2002). The NRS-2002, which has demonstrated a high sensitivity and specificity at hospital admission, has been recommended by the European Society for Clinical Nutrition and Metabolism (ESPEN). The NRS-2002 was developed by Kondrup in 2003 (9). This is a useful and easy method for general surgeons in patients with colorectal and gastric cancer.

In this retrospective study, we aimed to determine the effect of preoperative nutrition on the postoperative morbidity and mortality of patients with gastrointestinal cancer.

Methods

The approval for non-invasive investigations was obtained from the Ethics Committee of Katip Çelebi University (No: 53,24.03.2016). The patients who underwent gastric and colorectal resection due to malignancy between January 2012 and December 2014 were included in the study. The patients with rectal cancer, Stage 4 (metastatic disease) tumors and non-adenocarcinoma tumors were excluded from the study. Patient file charts were recorded. A decision about the operation type was made by consensus in the clinic. The operations were performed by four surgical teams. Age, gender, the origin of the cancer, stage of the disease, preoperative albumin level (g/dL), preoperative BMI (kg/m^2), operation time (hours), the number of blood transfusion, preoperative nutritional status according to NRS-2002 (Table 1), the length of hospital stay (days), and the morbidity rates were recorded. The nutritional status is accepted as poor if the NRS-2002 score was ≥3 points. The effect of parameters on morbidity were statistically evaluated.

Table 1. Nutritional risk screening 2002			
Step 1. Initial screening		**Yes**	**No**
1. Is BMI <20.5 kg/m^2?			
2. Has the patient lost weight within the last 3 months?			
3. Has the patient had a reduced dietary intake in the last week?			
4. Is the patient severely ill? (e.g., in intensive therapy)			
Yes: If the answer is yes to any question, the screening in Step 2 is performed.			
No: If the answers is no to all questions, the patient is re-screened at weekly intervals. If the patient, for example, is scheduled for a major operation, a preventive nutritional care plan is considered to avoid the associated risk status.			
Step 2. Final screening			
Impaired Nutritional Status		Severity of Disease (≈ increase in requirements)	
Absent, Score 0	Normal nutritional status	Absent, Score 0	Normal nutritional requirements
Mild, Score 1	Weight loss >5% in 3 months or food intake below 50%-75% of normal requirements in proceeding week	Mild, Score 1	Hip fracture, chronic pulmonary disease, oncology, chronic hemodialysis, diabetes
Moderate, Score 2	Weight loss >5% in 2 months or BMI 18.5-20.5 + impaired general condition or food intake below 25%-60% of normal requirements in the proceeding week.	Moderate, Score 2	Major abdominal surgery, stroke, severe pneumonia, hematologic malignancy
Severe, Score 3	Weight loss >5% in 1 month (15% in 3 months) or BMI <18.5 + impaired general condition or food intake below 0%-25% of normal requirements in proceeding week	Severe, Score 3	Head injury, bone marrow transplantation, intensive care patients (APACHE>10)
score	+	score	= total score
Age	If >70 years, add 1 to total score		= age-adjusted total score
Score ≥3: The patient is nutritionally at risk, and a nutritional care plan is initiated. Score <3: Weekly rescreening of the patient. If the patient, for example, is scheduled for a major operation, a preventive nutritional care plan is considered to avoid the associated risk status. APACHE: Acute Physiology and Chronic Health Evaluation			

Statistical analysis

The Mann-Whitney U test and one-way analysis of variance were used for numeric parameters. A chi-squared test and Fisher's exacts test were used for other parameters. A p-value <0.05 was accepted as statistically significant. The Statistical Package for the Social Sciences (SPSS Inc.; Chicago, IL, USA) version 16.0 was used for the statistical analysis.

Results

A total of 418 patients who met the study criteria were included in the study. Gastric resection was performed in 196 (46.8%) patients, and colon resection was performed in 222 (53.2%) patients. The nutritional status was poor in 61.2% (120) of patients with gastric cancer and 17.5% (39) of patients with colorectal cancer. There were 170 patients (76.5%) with left-side and sigmoid colon cancer, 42 patients with right-side colon cancer (18.9%), and 10

Table 2. Patient characteristics				
	n (%)	Morbidity	%	p
Gender				
Male	268 (64.1)	71	26.5	NS
Female	150 (35.9)	28	18.7	
Origin of the cancer				
Gastric	196 (46.9)	42	21.4	NS
Colorectal	222 (53.1)	57	25.7	
Stage of cancer				
1	47 (11.2)	24	51.1	0.001
2	335 (80.1)	54	16.1	
3	36 (8.7)	21	58.3	
NRS-2002 score				
1	99 (23.7)			
2	160 (38.2)			
3	17 (4.1)			
4	139 (33.3)			
5	2 (0.5)			
6	1 (0.2)			
Nutritional status				
Poor	159 (38.0)	49	30.8	0.001
Good	259 (62.0)	50	19.3	

transverse colon cancer cases (4.6%). Totally gastrectomy and D2 lymphatic dissection were performed in 108 patients (55.1%), and subtotally gastrectomy with D2 lymphatic dissection were performed in 88 patients (44.9%). The 64.1% (268 patients) of the patients were male, and the overall age was 61.1±12.3 (24-88) years. The characteristics of the patients were shown in Table 2.

There were 99 patients with morbidity (23.6%). A total of 89 patients had minor complications, such as minor pulmonary infection and wound infection, and the remaining 10 patients had major complications. Anastomotic leakage was observed in 8 patients (6 in total gastrectomy and 2 in right hemicolectomy). One patient had pulmonary emboli, and 1 patient had postoperative gastrointestinal bleeding. While total morbidity rates were found to be 21.4% and 25.7% in patients who underwent gastrectomy and colectomy, respectively, 8 of 10 patients who were developed major complications were gastrectomy patients. Postoperative morbidity developed in 50 (19.3 %) of patients with a good nutritional score. The morbidity rate was 30.8% (n=49) in patients with poor nutritional performance. The statistical analysis showed that a poor nutritional status is a factor affecting morbidity (p<0.05). In addition, an increasing number of blood transfusions, duration of the operation, and an advanced stage of the disease were morbidity-increasing factors (p<0.05). Results of the statistical analysis are shown in Table 3.

Mortality was observed in only 3 patients from the study group, and all of them underwent gastrectomy. Therefore, mortality was not statistically evaluated. Two of the 3 patients died for cardiac reasons, and 1 died due to the anastomosis leak and septicemia.

Discussion

Approximately 30%-40% of patients with cancer suffer from weight loss and malnutrition (10, 11), which is particularly high in patients with gastrointestinal or head and neck cancer (12).

The Joint Commission International recommended a nutritional assessment within 24 hours to diagnose malnutrition and to treat nutritional problems as early as possible. Nutritional screening tools vary according to the risk parameters used and the ability to determine nutritional risk. The Nutrition Risk Index, Malnutrition Universal Scan Tool, NRS-2002, and Mini Nutritional Assessment are the most commonly used nutritional screening tools that have proven reliability (13). Poulia et al. (14) and Kyle et al. (15) reported differences in the prevalence of malnutrition in nutrition screening tools when the tools were applied to the same patients. A good nutritional screening tool should

be simple, fast, non-invasive, standard, and cost-effective. In our study, we used the NRS-2002 screening tool recommended by ESPEN (16). The NRS-2002 is based on anthropometrics measurements, intakes of the patient, age, and metabolic stress, applying it to the identification of nutrition risk groups for all hospitalized patients (17).

We found that 38.0% of patients had a poor nutritional status after the NRS-2002 assessment in our study. Not surprisingly, the nutritional status was poorer in patients with gastric cancer than patients with colorectal cancer.

The morbidity rate was higher in the malnourished patients than in well-nourished patients in the present study.

The postoperative morbidity did not only depend on the nutritional status, but also the tumor stage, the operation duration, and the number of blood transfusions were also important factors in the present study. Age, gender, and the origin of the cancer did not affect the morbidity.

Ryu et al. (18) studied several parameters that can be linked with the postoperative morbidity in patients with gastric

Table 3. Factors affecting morbidity						
	N	Mean	Standard Deviation	Minimum	Maximum	p
Age (year)						
Group 1	319	60.77	12.304	24	88	
Group 2	99	62.48	12.449	36	87	NS
Total	418	61.17	12.345	24	88	
Length of hospital stay (day)						
Group 1	319	7.01	0.647	3	14	
Group 2	99	11.75	3.234	8	35	0.0001[†]
Total	418	8.13	2.616	3	35	
Duration of the operation (minutes)						
Group 1	319	159.92	34.353	120	478	
Group 2	99	167.86	22.689	123	218	0.032[†]
Total	418	161.80	32.131	120	478	
BMI (kg/m²)						
Group 1	319	23.79	3.648	17	36	
Group 2	99	23.62	3.036	18	34	NS
Total	418	23.75	3.510	17	36	
Albumin (g/dL)						
Group 1	319	2.8	0.5	2.0	4.0	
Group 2	99	2.8	0.6	2.0	4.0	NS
Total	418	2.8	0.58	2.0	4.0	
Blood transfusion (unit)						
Group 1	319	0.18	0.5	0	3	
Group 2	99	0.56	1.0	0	3	0.0001[†]
Total	418	0.27	0.7	0	3	
Group 1, patients without morbidity, Group 2, patients with morbidity, [†]Statistically significant. NS: nonsignificant; BMI: body mass index						

cancer. They showed that the nutritional status is an important factor to predict postoperative morbidity. They used the NRS-2002 and SGA to evaluate preoperative nutritional status. Although the preoperative anthropometric parameters of patients with gastric cancer were found to be within the normal range of mean BMI, malnutrition scores were significantly correlated with the weight loss according to SGA and NRS-2002 (18). Aydin et al. (19) reported that even patients with a normal BMI may be malnourished and that the SGA may detect malnutrition before BMI falls below 20 kg/m². For this reason, it is very important to combine several methods to evaluate a patient's nutritional status. In the present study, we did not compare the nutritional status with BMI, but we detected that BMI was not a factor affecting morbidity. Data show that BMI is not sufficient when evaluating a preoperative nutritional status.

Albumin and prealbumin are common biochemical parameters in the nutritional status assessment. Prealbumin has a plasma half-life of 2 days, much shorter than albumin and more sensitive to changes in the protein-energy state than albumin. The prealbumin test is not routinely studied in our hospital, and therefore, it was not used in our study. Ryu et al. (18) also examined the preoperative albumin levels in patients. They found that the albumin level was not affecting the preoperative morbidity in patients with gastric cancer, as in our study.

The ESPEN guidelines define that preoperative parenteral nutrition is indicated in severely undernourished patients in whom enteral nutrition cannot be adequately administered either orally or enterally (20). On the contrary, its use in well-nourished patients has no benefit. Therefore, preoperative detecting of the nutritional status in patients with cancer is a tool to plan postoperative nutritional support.

The preoperative nutritional status of the patients who underwent elective colorectal resection induced the postoperative morbidity, length of hospital stay, and back to the normal gastrointestinal functions in a recent study (21). Chen et al. (22) reported that malnutrition occurs in more than 25% of the colorectal cancer patients, and morbidity is frequent in these patients. Because of that, the preoperative NRS-2002 score can be used to predict postoperative morbidity in patients with colorectal cancer. In compliance with the literature, in our study, the morbidity increased after colon resection in malnourished patients.

There are several studies that evaluated the factors affecting the postoperative morbidity or fatigue rates following gastrointestinal surgery. Old age, the NRS-2002 score ≥3, and gastrectomy were risk factors for postoperative fatigue (23). The original study in 2014 showed that there were nutritional risks in patients with gastrointestinal cancer. The study also detected that old age is a risk factor for nutritional risk (24).

Lohsiriwat assessed the effect of preoperative nutritional status on postoperative morbidity after colorectal surgery. The author found that malnourished patients were at risk of increased postoperative morbidity, delayed recovery of gastrointestinal function, and prolonged hospital stay (21). The results of our study were similar with the literature. Malnourished patients showed a higher risk of postoperative morbidity and prolonged hospital stay.

In our study, blood transfusion was found to be a factor affecting the morbidity. In the literature, it is observed that blood transfusion increases morbidity and mortality in patients undergoing gastrointestinal surgery. Blood transfusion was performed in 27% of our patients in accordance with the literature (25).

The factors that could affect mortality were not studied in our research because there was only 1 patient with postoperative early mortality in our study.

In conclusion, the NRS-2002 is an easy, rapid, and noninvasive tool to detect preoperative nutritional status in patients with gastrointestinal cancer. Postoperative morbidity in patients undergoing gastrectomy and colectomy is more frequent in malnourished patients according to the NRS-2002 score. BMI and blood albumin levels are important parameters, but they are not correlated with the nutritional status and postoperative morbidity. Patients with advanced-stage gastrointestinal cancer and a poor nutritional status should receive nutritional support.

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