

# Preoperative MELD-Na Score Predicts 30-day Post-operative Complications After Colorectal Resection for Malignancy

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## ABSTRACT

**Introduction:** Predicting possible complications in colon surgery is important in terms of reducing postoperative mortality and morbidity rates. Various scoring methods have been used to predict these complications. The MELD score was developed to predict mortality following Transjugular Intrahepatic Portosystemic Shunt (TIPS) placement in cirrhotic patients. This model was revised by adding Na data and used to predict complications in non-cirrhotic patients. We investigated the value of the MELD-Na score in predicting postoperative 30-day complications in patients undergoing colorectal resection for malignancy.

**Methods:** Patients who underwent colorectal resection for malignant diseases were included in the study. Demographics and clinical outcomes were recorded. The MELD-Na scores of the patients were calculated within 48 h before the surgery. Patients were divided into 2 groups according to the status of development of any complication.

**Results:** Age, gender, operative time, and length of stay was not statistically significant for developing complications. The MELD-Na score was significantly higher in patients with any complications. Also, MELD-Na score, stoma creation, and postoperative erythrocyte suspension replacement were found to be independent risk factors for developing complications in patients undergoing surgery for colon cancer.

**Conclusion:** The MELD-Na score may predict the complications that may develop in the first 30 days postoperatively in patients undergoing colorectal resection for malignant diseases.

**Keywords:** Colorectal cancer, complication, MELD-Na

## Introduction

Following colon resection, perioperative morbidity and mortality are largely dependent on the elective or emergencies of the procedure (e.g. occlusive lesion, bowel perforation) and the patient's associated comorbidities (e.g. cardiopulmonary disease, multiple traumas, etc.). Colon cancer patients tend to have more comorbidities because of the higher mean age and as a result, postoperative morbidity and mortality are also higher (1).

The MELD score is a validated chronic liver disease severity scoring system to estimate three-month survival (2). The formula was updated in 2016 by adding serum sodium (3).

Various studies have reported that the addition of serum sodium concentration improves the predictive accuracy of the MELD score in hyponatremic patients who have low MELD scores and awaiting liver transplantation (4-11).

The primary use of the MELD and MELD-Na scores is to prioritize patients on the waiting list for cadaver donor liver transplantation based on liver disease severity and short-term risk of mortality. However, the MELD score also predicts mortality following placement of a Transjugular Intrahepatic Portosystemic Shunt (TIPS). It was shown to have a predictive value for outcomes in patients who have cirrhosis undergoing non-transplant surgical procedures (12).

In this study, the purpose was to investigate the value of the MELD-Na score in predicting early mortality and morbidity in the first postoperative 30 days in patients with colorectal cancer.

## Methods

The patients who applied to Haseki Training and Research Hospital and İstanbul Training and Research Hospital between 01.07.2020 and 01.07.2022 and underwent colorectal resection were included in the study. Ethical approval for this study was obtained from a University of



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Health Sciences Turkey, Haseki Training and Research Hospital Local Ethical Committee (approval number: 134-2022). Informed consent was received from the patients. Those who were diagnosed with cirrhosis, whose laboratory did not require the necessary parameters for MELD Na score measurement, and diagnosed with a different cancer were excluded. The MELD-Na scores of the patients were calculated by evaluating the blood results obtained within 48 h before the surgery. The patients were followed up for 30 days postoperatively for complications. The relationship between complications and MELD-Na score was investigated.

**Statistical Analysis**

The Statistical Package for Social Sciences (SPSS®) version 17.0 software package for Windows, was used for statistical analysis. Comparisons of numerical variables in two independent groups were made with Student’s t-test for normally distributed variable and Mann-Whitney U test for non-normally distributed variables. The ratios in the groups were analyzed using the chi-square test. Multivariate regression analysis was performed with the statistically significant data. The statistical alpha significance level was accepted as  $p < 0.05$

**Results**

A total of 206 patients were included in the study. Among these, 86 (41.7%) were female and 120 (58.3%) were male. Complications were observed in 66 (32%) patients. The mean age of patients who developed complications was  $63.70 \pm 14.08$  years, and those who did not develop complications were  $66.47 \pm 10.82$  years. Age was not statistically significant for developing complications ( $p = 0.124$ ). Although the mean surgery duration was  $190.42 \pm 56.65$  in the group with complications, the mean surgery duration was  $205.88 \pm 67.45$  in the group without complications. The mean Meld-Na score was

found to be  $11.65 \pm 4.71$  in patients with complications,  $9.72 \pm 2.41$  in patients without complications, and the Meld-Na score was significantly higher in the group with complications ( $p < 0.001$ ). Although the mean hospital stay was  $13.85 \pm 11.21$  days in the group with complications, it was  $5.78 \pm 1.87$  days in the group without complications, and the difference was statistically significant ( $p < 0.001$ ). The mean number of erythrocyte suspension (ES) replacements was  $2.16 \pm 2.44$  in the group with complications and  $0.67 \pm 1.20$  in the group without complications and difference was statistically significant ( $p < 0.001$ ). The mean number of harvested lymph nodes was  $21.40 \pm 13.63$  in the group with complications and  $16.70 \pm 5.77$  in the group without complications, and more lymph nodes were removed in the group with complications at statistically significant levels ( $p < 0.001$ ). The mean number of metastatic lymph nodes was  $1.14 \pm 2.03$  in the group with complications, it was  $2.46 \pm 3.80$  in the group without complications ( $p < 0.001$ ). The general characteristics of the patients who developed complications are given in Table 1.

Among the patients who developed complications, 23 (34.8%) were female, 43 (65.2%) were male, and gender was not a risk factor for developing complications ( $p = 0.168$ ). The complication rate was higher in patients with comorbidity at a significant level ( $p = 0.002$ ). Complications were present in 34 of 72 patients with a stoma, and stoma creation was considered a risk factor for developing complications ( $p = 0.001$ ). Complications were observed in 27 of 54 patients who underwent emergency surgery, and it was observed that it increased the development of complications at a significant level ( $p = 0.001$ ). It was found that preoperative liver metastasis and the type of surgery were not significant in increasing the development of complications. However, 14 patients died and the MELD-Na scores of 11 of the patients who died were found to be above 10.75. The data on postoperative complication analysis are given in Table 2.

**Table 1. Comparison of the features of the patients**

	Complications (yes), (n=66)	Complications (no), (n=140)	p
MELD-Na	11.65±4.72	9.72±2.41	<0.001
Age	63.7±14.09	66.47±10.83	0.124
Operative time (minutes)	190.42	205.88	0.539
Postoperative ES	2.16±2.44	0.67±1.20	<0.001
Length of stay	13.85±11.21	5.79±1.87	<0.001
Metastatic lymph nodes	1.14	2.46	<0.001
Total harvested lymph nodes	21.40	16.70	<0.001

ES: Erythrocyte suspension

**Table 2. Comparison of the features of the patients**

	Complications (yes), (n=66)	Complications (no), (n=140)	p
Gender (female)	23 (26.7)	63 (73.3)	0.168
Comorbidity	26 (49.1)	27 (50.9)	0.002
Stoma creation	34 (47.2)	38 (52.8)	0.001
Liver metastasis	5 (27.8)	13 (72.2)	0.685
Surgical approach	Open	41 (29.9)	0.360
	Laparoscopic	25 (36.2)	
Emergency	27 (50.0)	27 (50.0)	0.001
Mortality	3 (21.4)	11 (78.6)	0.001

Complications were followed up in 2 groups of patients based on MELD-Na score  $\leq 10.75$  and  $> 10.75$ . The rate of wound infection, anastomotic leakage, internal complications, and any complication development were found to be significantly higher in patients with a score of  $> 10.75$  than in patients with a score of  $\leq 10.75$ . No positive correlations were detected between the intra-abdominal abscess, evisceration, and ileus and the MELD-Na scores of the patients. Complication analysis results according to the MELD-Na score are given in Table 3.

Because of the multivariate analysis, MELD-Na score, stoma creation, and postoperative ES replacement were found to be independent risk factors for developing complications in patients undergoing surgery for colon cancer. The results of the analysis are given in Table 4.

## Discussion

In this study, patients who were operated on for colon cancer were examined, and a significant correlation was found between early postoperative complications and mortality and elevated MELD-Na score. We think that the elevated MELD-Na score to be checked preoperatively will contribute to the prediction of complications.

As is already known, the MELD score was first used to predict mortality following TIPS placement. The model was then validated in an independent cohort of patients with TIPS placement (13). Later, this model was revised by adding Na data. Although this scoring system was primarily used to identify patients who would undergo liver transplantation, it was later used to predict complications in patients who were scheduled for non-transplant surgery (14).

In Khachfe et al.'s (15) study, in which 1,096 cases of elective gastrectomy were examined, patients with a MELD-Na score of  $> 11$  and  $< 11$  were compared, and the rates of mortality, any complications, and major

complications were found to be significantly higher in the group with elevated MELD-Na scores. In this study, it was concluded that the rates of wound infection, anastomotic leakage, internal complications, and any complication development increased significantly.

Al Abbas et al. (16) reported a positive correlation between an MELD score of  $> 11$  and mortality in patients who underwent Whipple. It was found that most patients with a mortal course had a MELD-Na score above 10.75.

Causey et al. (17) conducted a study in which 10,842 patients who were operated on for colon cancer were examined and reported that a MELD-Na score above 9 increased the risk of postoperative complications 1.3 times, and, the mortality risk increased 2.7 times in patients who had a score above 8. The increase in mortality and complications in this study is in parallel with this article.

Coakley et al. (18) conducted a study in which 44,540 elective colorectal cases were examined, MELD-Na score was found to be an independent risk factor for developing complications.

In a study that was conducted by Schlosser et al. (19) in which 48,955 patients who underwent elective hernia repair were examined, it was reported that the risk of postoperative complications, hospital stay, reoperation, and mortality increased in patients with a MELD-Na score above 10.

This study supports many studies on this subject. In this study, positive correlations were detected between the length of hospital stay, wound infection, anastomotic leakage, internal problems, and the development of any complications, and a high MELD-Na score.

Some studies report positive correlations between age and postoperative complications (20); however, the age factor was not found to be significant in terms of complication development in this study.

**Table 3. Complication analysis according to the MELD-Na score**

	MELD-Na score		p
	$< 10.75$ n, (%)	$> 10.75$ n, (%)	
SSI	22 (84.6)	4 (15.4)	<b>0.036</b>
Intra-abdominal abscess	13 (81.3)	3 (18.7)	0.193
Evisceration	11 (68.8)	5 (31.2)	0.843
Ileus	18 (78.3)	5 (21.7)	0.205
Anastomotic leakage	21 (87.5)	3 (12.5)	<b>0.020</b>
Internal complications	15 (34.1)	29 (65.9)	<b>&lt; 0.001</b>
Any complications	37 (56.1)	29 (43.9)	<b>0.029</b>

SSI: Surgical site infection

**Table 4. Multivariate analysis**

	Complications (yes)	Complications (no)	p	OR
Comorbidity n, (%)	35 (63.6)	20 (36.4)	0.759	0.810
Elective surgery	58 (36.7)	100 (73.3)	0.147	0.461
Stoma creation	58 (38.9)	91 (61.1)	<b>&lt; 0.001</b>	9.784
Gender (female) n, (%)	65 (51.6)	61 (48.4)	0.186	0.488
MELD-Na score (mean $\pm$ SD)	11.65 $\pm$ 4.72	9.72 $\pm$ 2.41	<b>0.017</b>	0.843
Postoperative ES replacement	2.16 $\pm$ 2.44	0.67 $\pm$ 1.20	<b>&lt; 0.001</b>	0.532
Neoadjuvant therapy n, (%)	7 (15.2)	39 (84.8)	0.537	1.389

### Study Limitations

The most important limitations of this article were the small number of patients and the retrospective nature of the study. Also, the fact that the surgery teams were different and their experience was not standardized was another limitation, and we think that this may affect the development of complications. Urgent colon resections were also added to the study data, increasing the risk of complications.

### Conclusion

Our study concluded that the elevated MELD-Na scores calculated in the preoperative period of the patients who are scheduled for surgery for colorectal cancer can predict the complications that may develop in the first 30-days postoperatively.

**Ethics Committee Approval:** Ethical approval for this study was obtained from a University of Health Sciences Turkey, Haseki Training and Research Hospital Local Ethical Committee (approval number: 134-2022).

**Informed Consent:** Informed consent was received from the patients.

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