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Retrospective Study

Preoperative blood markers and intra-abdominal infection after colorectal cancer resection

Chang-Qing Liu, Zhong-Bei Yu, Jin-Xian Gan, Tian-Ming Mei

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Abstract

BACKGROUND

Colorectal cancer (CRC) has one of the highest morbidity and mortality rates among digestive tract tumors. Intra-abdominal infection (IAI) is a common postoperative complication that affects the clinical outcomes of patients with CRC and hinders their rehabilitation process. However, the factors influencing abdominal infection after CRC surgery remain unclear; further, prediction models are rarely used to analyze preoperative laboratory indicators and postoperative complications.

AIM

To explore the predictive value of preoperative blood markers for IAI after radical resection of CRC.

METHODS

The data of 80 patients who underwent radical resection of CRC in the Anorectal Surgery Department of Suzhou Hospital affiliated with Anhui Medical University were analyzed. These patients were categorized into IAI (n = 15) and non-IAI groups (n = 65) based on whether IAI occurred. Influencing factors were compared; general data and laboratory indices of both groups were identified. The relationship between the indicators was assessed. Further, a nomogram prediction model was developed and evaluated; its utility and clinical applicability were assessed.

RESULTS

The risk factors for IAI after radical resection of CRC were neutrophil-lymphocyte ratio (NLR), platelet-lymphocyte ratio (PLR), systemic immune-inflammation index (SII), and carcinoembryonic antigen (CEA) levels. NLR was correlated with PLR and SII (r = 0.604, 0.925, and 0.305, respectively), while PLR was correlated with SII (r = 0.787). The nomogram prediction model demonstrated an area under the curve of 0.968 [95% confidence interval (CI): 0.948-0.988] in the training set (n = 60) and 0.926 (95%CI: 0.906-0.980) in the validation set (n = 20). The average absolute errors of the calibration curves for the training and validation sets were 0.032 and 0.048, respectively, indicating a good model fit. The decision curve analysis curves demonstrated high net income above the 5% threshold, indicating the clinical practicality of the model.

CONCLUSION

The nomogram model constructed using NLR, PLR, SII, and CEA levels had good accuracy and reliability in predicting IAI after radical resection of CRC, potentially aiding clinical treatment decision-making.

Key Words: Radical resection of colorectal cancer; Inflammatory factors; Intra-abdominal infection; Predictive model; Blood markers

Core tip: Intra-abdominal infection (IAI) is a common and serious complication following the radical resection of colorectal cancer (CRC) that affects the efficacy of surgery, prolongs hospital stay, and hinders the postoperative rehabilitation process of patients. In this study, the clinical data of 80 patients who underwent radical resection for CRC were retrospectively analyzed. Based on whether IAI occurred, patients were divided into IAI and non-IAI groups. The relationship between IAI and preoperative neutrophil-lymphocyte ratio, platelet-lymphocyte ratio, systemic immune-inflammation index, and carcinoembryonic antigen levels in patients after radical resection of CRC was studied, and a prediction model with good prediction accuracy was developed.

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INTRODUCTION

Colorectal cancer (CRC) is a common pernicious tumor of the alimentary system. In Western countries, such as Europe and the United States, CRC is the second leading cause of death from malignant tumors[1], and its morbidity and mortality rates are the highest among those of digestive tract tumors in China[2]. CRC treatment options include surgery, chemotherapy, teletherapy, and immunotherapy. Radical resection is the only curative treatment available for CRC. With advancements in CRC diagnosis and therapy, early detection rates and the number of radical surgeries are gradually increasing. Consequently, patients' survival time and health-related quality of life have also improved[3]. However, patients may experience complications after radical surgery, including postoperative bleeding, anastomotic leakage, incision infections, and abdominal infections. Among these complications, abdominal infection is the most common and severe postoperative complication of radical CRC resection. Studies have shown that abdominal infections can cause prolonged hospital stays and trigger systemic inflammatory response syndrome in patients with CRC, which can lead to sepsis and death in severe cases[4,5].

The interaction between systemic inflammation and the local immune response is considered the seventh marker of cancer and has been confirmed to be related to the emergence and advancement of several malignancies[6]. Several studies have shown that relevant inflammatory indicators, including the neutrophil-lymphocyte ratio (NLR)[7], platelet (PLT)-lymphocyte ratio (PLR)[8], and systemic immune-inflammation index (SII)[9], can be used as prognostic factors for various tumors. Among them, NLR is a clear indicator of the systemic inflammatory response, which can monitor the dynamic balance between pro-tumor and anti-tumor immunity in patients by combining neutrophil and lymphocyte (LY) factors. Previous research has shown that the NLR is significantly associated with the prognosis of various common tumors, such as CRC[10], lung cancer[11], gynecological cancer[12], and esophageal cancer[13]. PLR, an indicator derived from PLT and LY counts, can also help monitor the dynamic balance between pro-tumor and anti-tumor effects in patients with tumors and is related to the pathology and prognosis of various clinical tumors[14,15]. A newer indicator, SII, which incorporates neutrophils, PLTs, and LYs, was proposed to report the immune inflammatory response within the system[16]. Chen *et al*[17] confirmed the predictive value of SII in patients with CRC. Carcinoembryonic antigen (CEA) is a tumor marker. It is an acidic glycoprotein with human embryonic antigen characteristics and assists in tumor cell aggregation, adhesion, invasion, and metastasis[18,19]. Zhai *et al*[20] found that elevated serum CEA levels in patients are correlated with postoperative complications. However, the specific factors influencing abdominal infections after CRC surgery remain unclear, with few studies covering the complete spectrum of these factors. Therefore, it is necessary to identify the markers that can accurately predict the occurrence of abdominal infection in patients with CRC after radical resection of CRC and help select optimal treatment strategies to improve patient outcomes.

Currently, prediction models can be visualized using a column graph and have been widely used as a reliable tool for risk prediction[21] and have a good guiding value in disease prediction. In clinical practice, prediction models are mostly used to predict the prognosis and survival of patients with CRC[21-24]; however, they are rarely used to analyze preoperative laboratory indicators and postoperative complications.

Therefore, this study aimed to explore the correlation between preoperative NLR, PLR, SII, and CEA levels and intra-abdominal infections (IAIs) in patients after radical CRC resection and develop a prediction model to identify risk factors for abdominal infection after radical CRC resection. This study provides insights for clinicians regarding the treatment of complications after CRC surgery.

MATERIALS AND METHODS

Research object

This retrospective study included 80 patients who were admitted to the Anorectal Surgery Department of Suzhou Hospital, affiliated with Anhui Medical University, between January 2021 and March 2023 and underwent radical surgery for CRC. The research process is illustrated in Figure 1. Based on whether they had postoperative IAI, the patients were divided into an IAI group (n = 15) and a non-IAI group (n = 65). The inclusion criteria were as follows: (1) CRC diagnosis confirmed by colonoscopy before operation and pathological examination after operation; (2) complete clinical and pathological data, including NLR, PLR, SII, and CEA test results from peripheral blood taken 1 wk before surgery; (3) ability to communicate properly; (4) no underlying conditions causing malnutrition and severe infectious diseases; and (5) must have received postoperative follow-up. The following categories of patients were excluded: (1) Patients with malignant tumors at other sites; (2) patients who have received chemotherapy or other CRC-related treatments prior to this surgery; (3) patients undergoing emergency surgery; and (4) patients with distant metastasis indicated by preoperative examination.

Research method

Patient data collection: Data on the sex, age, height, weight, medical history, disease course, intraoperative blood loss, and postoperative complications of the selected patients were recorded. Pathological data, including tumor site, size, degree of differentiation, depth of invasion, metastasis, and tumor type, were also documented. The body mass index (BMI) was calculated using patients' height and weight upon hospitalization.

Laboratory examination: Within 1 wk before surgery, routine blood and biochemical tests were performed on peripheral blood samples of patients to determine preoperative hemoglobin, red blood cell, albumin, white blood cell, PLT, neutrophilicgranulocyte (NE), LY, cluster of differentiation 45+ cluster of differentiation 3 (CD45+ CD3-), cluster of differentiation 4/cluster of differentiation 8, CEA, alpha-fetopro-tei, squamous cell carcinoma antigen, carbohydrate Antigen 19-9, carbohydrate antigen 125, carbohydrate antigen 15-3, and heat shock protein 90 α values. The NLR, PLR, and SII values were calculated as follows: NLR = NE/LY, PLR = PLT/LY, SII = (NE × PLT)/LY.

Statistical analyses

Statistical analyses were performed using IBM SPSS Statistics for Windows, version 26.0. The Chi-square test was used for the measurement data, and the t-test was used for the counting data. Counting data following a normal distribution were expressed as mean SD, and categorical variables were presented as percentages of positive cases. Logistic regression analysis was employed to determine whether relevant factors were associated with postoperative IAI in patients with CRC, and receiver operating characteristic (ROC) curves were used to confirm these factors. Spearman's correlation coefficient was used to assess the relationship between the indicators. All tests in the study used a two-tailed approach, and statistical significance was set at P < 0.05.

Based on the results of the multifactor analysis, R software was used to construct a nomogram prediction model. To verify the prediction accuracy, 1000 rounds of bootstrap sampling were used for internal and external validation. Additionally, ROC curves, calibration curves, and decision curve analysis (DCA) were employed to evaluate the prediction efficiency and clinical effectiveness of the nomogram.

RESULTS

Comparison of common factors between the patient groups

Patients in the IAI group exhibited a statistically significant higher mean age than those in the non-IAI group (P < 0.05). However, no significant differences were observed in terms of sex distribution, smoking history, medical history, tumor pathology, and tumor surgical classification (P > 0.05) (Table 1).

Comparison of laboratory indices between the patient groups

A comparison of laboratory indicators between the patient groups revealed that the levels of PLT, NE, CD45+ CD3-, NLP, PLR, SII, and CEA in the IAI group were higher than those in the non-IAI group (P < 0.05). Moreover, LY in the group with IAI was lower than that in the group without IAI (P < 0.05). There was no statistical relevance among the other indicators (Table 2).

Table 1 Comparison of general information between the patient groups

	IAI group (%)	Non-IAI group (%)	t/χ^2	*P* value
Sample size	15	65	–	–
Gender				
Male	11 (73.3)	35 (53.8)	1.894	0.169
Female	4 (26.7)	30 (46.2)		
Age	65.63 ± 13.03	57.75 ± 12.86	-2.119	0.046
BMI	24.05 ± 3.47	22.94 ± 2.99	-1.257	0.212
Smoking history				
Yes	6 (40.0)	20 (30.8)	0.473	0.491
No	9 (60.0)	45 (69.2)		
Hypertension				
Yes	10 (66.7)	33 (50.8)	1.239	0.266
No	5 (33.3)	32 (49.2)		
Diabetes				
Yes	8 (53.3)	38 (58.5)	0.131	0.717
No	7 (46.7)	27 (41.5)		
Preoperative anemia				
Yes	12 (80.0)	47 (72.3)	0.373	0.542
No	3 (20.0)	18 (27.7)		
Tumor site				
Left	8 (53.3)	37 (56.9)	0.064	0.801
Right	7 (46.7)	28 (43.1)		
Degree of differentiation				
Medium and above	9 (60.0)	30 (46.2)	0.935	0.334
Low	6 (40.0)	35 (53.8)		
Infiltration depth				
T3 + T4	8 (53.3)	38 (58.5)	0.131	0.717
T1 + T2	7 (46.7)	27 (41.5)		
Tumor diameter (cm)	4.69 ± 1.15	4.79 ± 1.21	0.293	0.770
Lymphatic metastasis				
Yes	6 (40.0)	23 (35.4)	0.112	0.737
No	9 (60.0)	42 (64.6)		
Gross classification of tumor				
Ulcerative	4 (26.7)	13 (20.0)	0.500	0.868
Wettability	7 (46.7)	31 (47.7)		
Uplift type	4 (26.7)	21 (32.3)		
Intraoperative bleeding	388.58 ± 59.27	402.23 ± 57.11	0.810	0.428

IAI: Intra-abdominal infection, BMI: Body mass index.

Table 2 Comparison of laboratory indexes between the patient groups

Project	IAI group	Non-IAI group	*t*	*P* value
HGB (g/L)	126.74 ± 19.58	130.29 ± 21.13	0.595	0.554
RBC (10^{12}/L)	4.09 ± 0.32	4.06 ± 0.28	-0.267	0.790
ALB (g/L)	38.19 ± 2.13	38.11 ± 2.31	-0.131	0.896
WBC (10^9/L)	5.63 ± 1.03	5.46 ± 0.87	-0.657	0.513
PLT (10^9/L)	359.33 ± 30.33	291.41 ± 63.94	-3.997	0.000
NE (10^9/L)	4.84 ± 0.70	3.44 ± 1.11	-4.684	0.000
LY (10^9/L)	1.44 ± 0.18	1.73 ± 0.34	3.174	0.002
CD45+ CD3-	13.41 ± 0.87	14.46 ± 1.55	2.518	0.014
CD4/CD8	1.49 ± 0.092	1.49 ± 0.11	0.137	0.891
NLR	3.43 ± 0.65	2.08 ± 0.84	-5.770	0.000
PLR	253.87 ± 40.95	177.65 ± 62.28	-4.508	0.000
SII	1226.48 ± 245.55	611.52 ± 285.96	-7.691	0.000
CEA (μg/L)	4.32 ± 0.65	3.65 ± 0.84	-2.913	0.005
AFP (μg/L)	3.63 ± 0.94	3.57 ± 0.91	-0.218	0.829
SCC (μg/L)	1.40 ± 0.086	1.40 ± 0.097	0.038	0.970
CA19-9 (Ku/L)	18.78 ± 0.75	18.84 ± 1.24	0.169	0.866
CA-125 (Ku/L)	10.64 ± 1.04	11.13 ± 1.09	1.576	0.119
CA15-3 (Ku/L)	8.26 ± 1.06	7.87 ± 0.96	-1.378	0.172
Hsp90α (ng/mL)	38.21 ± 2.82	38.49 ± 2.69	0.344	0.734

IAI: Intra-abdominal infection; HGB: Hemoglobin; RBC: Red Blood Cell; ALB: Albumin; WBC: White blood cell; PLT: Platelet; NE: Neutrophilic-granulocyte; LY: Lymphocyte; CD45+ CD3-: Cluster of differentiation 45+ cluster of differentiation 3-; CD4/CD8: Cluster of differentiation 4/cluster of differentiation 8; NLR: Neutrophil-lymphocyte ratio; PLR: Platelet-lymphocyte ratio; SII: Systemic immune-inflammation index; CEA: Carcinoembryonic antigen; AFP: Alpha-fetopro-tei; SCC: Squamous cell carcinoma antigen; CA19-9: Carbohydrate Antigen 19-9; CA-125: Carbohydrate Antigen 125; CA15-3: Carbohydrate Antigen 15-3; Hsp90α: Heat Shock Protein 90 α.

Multifactor analysis of IAI in patients with radical resection of CRC

The above indicators with notable differences were included in the logistic regression analysis, with the presence of IAI (yes = 1, no = 0) serving as the dependent variable and age, CD45+ CD3-, NLR, PLR, SII, and CEA as the independent variables. The results indicated that NLR, PLR, SII, and CEA were risk factors for IAI in patients with CRC after radical resection of CRC (odds ratio > 1, P < 0.05) (Table 3). The ROC curve was used to evaluate the diagnostic value of each indicator. The highest area under the curve (AUC) of the SII was 0.937 (Table 4 and Figure 2).

Relationship between preoperative NLR, PLR, systemic immune inflammation index, and CEA in patients

A Spearman correlation analysis was performed to assess the relevance of the NLR, PLR, SII, and CEA. The results revealed that NLR was significantly correlated with PLR and SII (r = 0.604, 0.925, and 0.305, respectively). PLR was significantly correlated with the SII (r = 0.787). The relationships between other variables are shown in Figure 3.

Construction and verification of the nomogram model

All patients who underwent radical resection of CRC were stochastically divided into training (n = 60) and test (n = 20) sets. A nomogram model was built based on the results of the multifactor analysis, and the scores corresponding to each index were added to obtain the aggregate points. These points were converted into the predicted probability of abdominal infection in patients undergoing radical resection of CRC (Figure 4).

For internal verification, bootstrap was used to sample 1000 times, and the areas under the ROC, DCA, and calibration curves were used to estimate the efficiency of the nomogram. An AUC of 0.968 [95% confidence interval (CI): 0.948-0.988] indicated that the model had a certain estimation efficiency, as shown in Figure 5A. The calibration curve further revealed that the estimated value was consistent with the measured value, and the average absolute error (0.032) was small, indicating that the nomogram model had a good predictive effect (Figure 5B). In addition, the DCA curve indicated that the net benefit of this model was better when the threshold value was > 5%, indicating the clinical practicality of the model (Figure 5C).

Table 3 Multivariate analysis of intra-abdominal infection in patients that underwent radical resection of colorectal cancer

Independent variable	B	S.E.	Wald	*P* value	OR	95%CI
Age	0.001	0.055	0.000	0.990	1.001	0.899-1.114
CD45+ CD3-	0.355	1.185	0.090	0.765	1.426	0.140-14.542
NLR	-1.615	0.677	5.69	0.017	1.199	0.053-1.750
PLR	-0.022	0.010	5.13	0.024	1.978	0.960-1.997
SII	0.010	0.004	7.194	0.007	1.010	1.003-1.018
CEA (μg/L)	3.131	1.414	4.903	0.027	22.905	1.433-366.157
Constant	-20.789	18.767	1.227	0.268	0.000	–

CD45+ CD3-: Cluster of differentiation 45+ cluster of differentiation 3-; NLR: Neutrophil-lymphocyte ratio; PLR: Platelet-lymphocyte ratio; SII: Systemic immune-inflammation index; CEA: Carcinoembryonic antigen; CI: Confidence interval; OR: Odds ratio.

Table 4 Diagnostic value of receiver operating characteristic curve evaluation index

Independent variable	Cutoff	AUC	Sensitivity	Specificity	Youden index	*P* value	95%CI
NLR	2.67	0.890	0.867	0.800	0.667	0.000	0.811-0.969
PLR	213.18	0.842	0.933	0.723	0.656	0.000	0.757-0.927
SII	826.24	0.937	0.215	0.785	0.785	0.000	0.886-0.989
CEA (μg/L)	4.03	0.728	0.667	0.708	0.375	0.006	0.595-0.861

NLR: Neutrophil-lymphocyte ratio; PLR: Platelet-lymphocyte ratio; SII: Systemic immune-inflammation index; CEA: Carcinoembryonic antigen; AUC: Area under the curve.

Bootstrap was used to sample 1000 times in the test set, and the AUC was 0.926 (95%CI: 0.906-0.980), indicating that the nomogram model had fine prediction efficiency (Figure 5D). The average absolute error of the calibration curve of the test set was 0.048, indicating good agreement between the estimated value of the model and the predicted value of the correction (Figure 5E). The DCA curve indicated that the model was effective (Figure 5F).

DISCUSSION

IAI is a common complication after radical resection of CRC and is a critical cause of prolonged hospital stay and decreased quality of life in patients with CRC. This study retrospectively analyzed the data of 80 patients who underwent radical resection of CRC and established a nomogram model with good prediction accuracy to confirm that preoperative NLR, PLR, SII, and CEA levels can be used as tools to predict IAI after radical resection of CRC.

Continuous research on malignant tumors has shown that inflammation is a sign of tumor occurrence and development and is linked to disease forecasting in patients. The immune process between inflammation and tumors is highly complex and is affected by many factors[25]. Studies have shown that various inflammation-related indicators are linked to disease forecasting for patients with CRC, and their combined use can further improve the prognosis of these patients[26,27]. Among them, NLR can reflect the degree of neutrophil activation, PLR can reflect the balance between PLTs and LYs, CEA can induce the abnormal division of tumor nuclear DNA in response, and SII can comprehensively reflect immune function and inflammatory response. In this study, the levels of NLR, PLR, SII, and CEA before radical resection of CRC in patients with CRC were markedly higher in the IAI group than in the non-IAI group, demonstrating that inflammatory indicators were positively correlated with postoperative IAI. This finding is consistent with those of previous studies. Guthrie *et al*[28] retrospectively analyzed 126 patients who underwent radical resection of CRC and found that a high preoperative NLR was associated with decreased survival rates in patients with cancer. Emir *et al*[29] retrospectively analyzed 113 patients with CRC and found that higher preoperative PLR levels are associated with reduced survival in patients with CRC. In addition, Ma *et al*[30] found that the SII was a risk factor for postoperative complications in stages II–III CRC and could be used to predict the risk of postoperative complications in these patients. Baqar *et al*[31] revealed that preoperative CEA levels are related to age, BMI, American Society of Anesthesiologists score, and tumor stage. CEA levels can be used as a reliable predictor of postoperative complications in patients with CRC. Similarly, several investigators have probed the prognostic value of inflammatory indicators in patients with CRC, including the NLR, MLR, PLR, SIS, and SII, to determine the optimum predictor and aid clinical decision-making[17,32-35]. Based on previous studies, the ROC curve method was used in this study to compute the diagnostic value of each

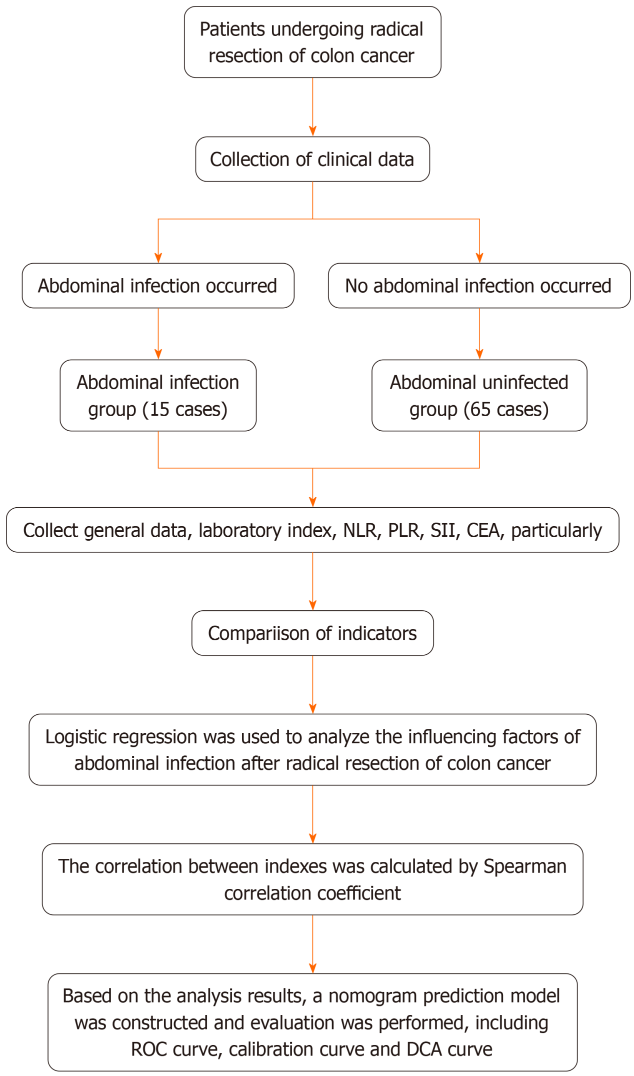

Figure 1 Flowchart of the research study process. NLR: Neutrophil-lymphocyte ratio; PLR: Platelet-lymphocyte ratio; SII: Systemic immune-inflammation index; CEA: Carcinoembryonic antigen; ROC: Receiver operating characteristic; DCA: Decision curve analysis.

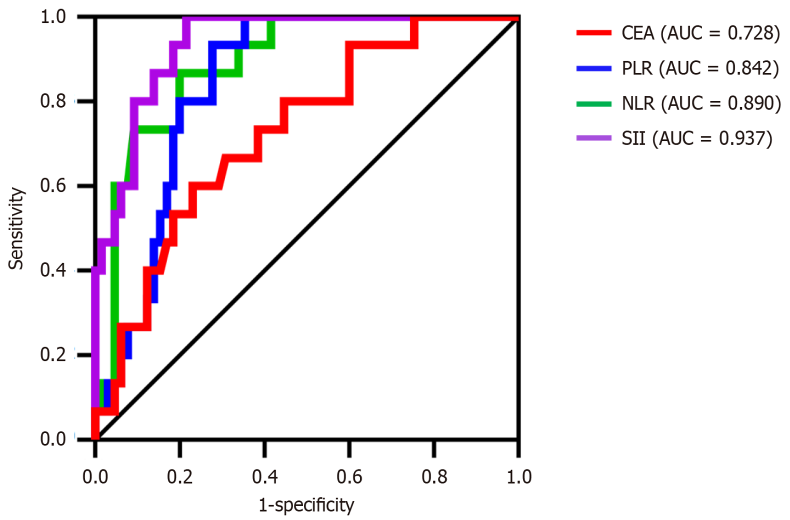

Figure 2 Diagnostic value of receiver operating characteristic curve evaluation index. CEA: Carcinoembryonic antigen; PLR: Platelet-lymphocyte ratio; NLR: Neutrophil-lymphocyte ratio; SII: Systemic immune-inflammation index.

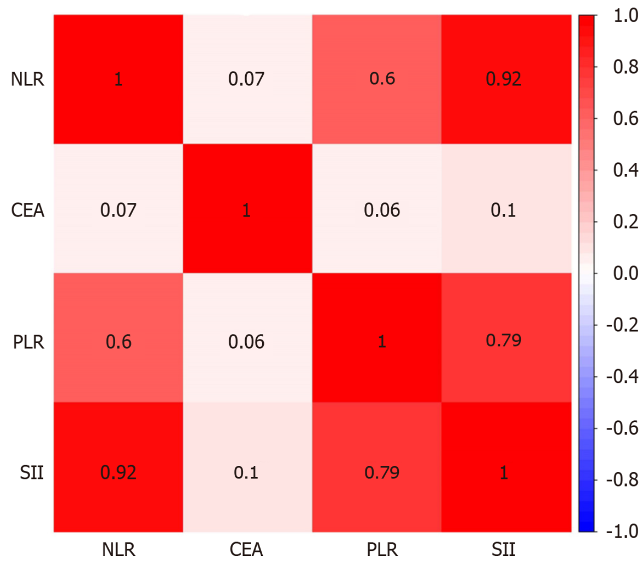

Figure 3 Spearman correlation heat map. The darker the color, the stronger the correlation between the two indicators. NLR: Neutrophil-lymphocyte ratio; CEA: Carcinoembryonic antigen; PLR: Platelet-lymphocyte ratio; SII: Systemic immune-inflammation index.

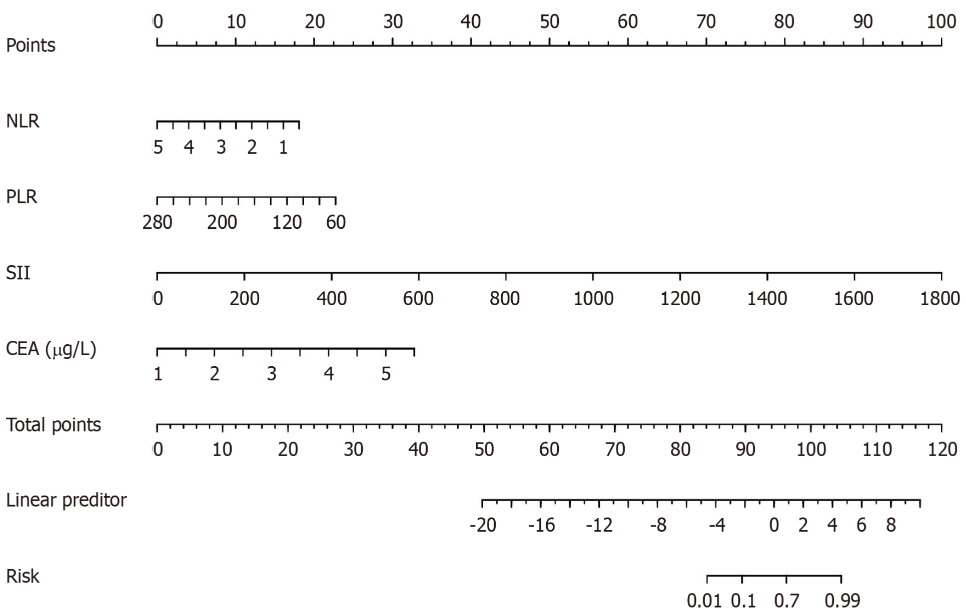

Figure 4 Nomogram for predicting intra-abdominal infection in patients after radical colorectal cancer resection. For an individual patient, each variable corresponds to a single point at the top of nomogram (points). The total points were summed up by all single points and are indicated in the second line from the bottom (total points), and each total point corresponds to a probability of abdominal infection. NLR: Neutrophil-lymphocyte ratio; PLR: Platelet-lymphocyte ratio; SII: Systemic immune-inflammation index; CEA: Carcinoembryonic antigen.

indicator; the results suggest that preoperative NLR, PLR, SII, and CEA levels had high diagnostic values, indicating that NLR, PLR, SII, and CEA are effective indicators of postoperative abdominal infection in patients with CRC. However, the prognostic effect of a single factor in predicting the disease has certain limitations. To circumvent this issue, this study used the NLR, PLR, SII, and CEA as predictors to build a risk prediction model and evaluated it to determine the risk value of IAI in patients after radical resection of CRC.

The AUC of the model for predicting abdominal infection after radical CRC surgery was 0.968 (95%CI: 0.948-0.988) in the training set and 0.926 (95%CI: 0.906-0.980) in the validation set, demonstrating the high accuracy of the model. The calibration curves of the training and validation sets indicate that the predicted values of the model closely align with the observed values. The DCA curves also indicate that the model has a good net benefit when the threshold value is above 5%, indicating that the model has high clinical functionality. These results indicate that the model has a certain value in predicting the incidence of abdominal infection after radical resection of CRC. According to previous studies, NLR, PLR, SII, and CEA, as predictive indicators, have good forecasting practicability in different models. Yan *et al*[36] built a nomogram model for forecasting the survival rate after radical CRC surgery based on NLR, CEA, CA125, and clinical

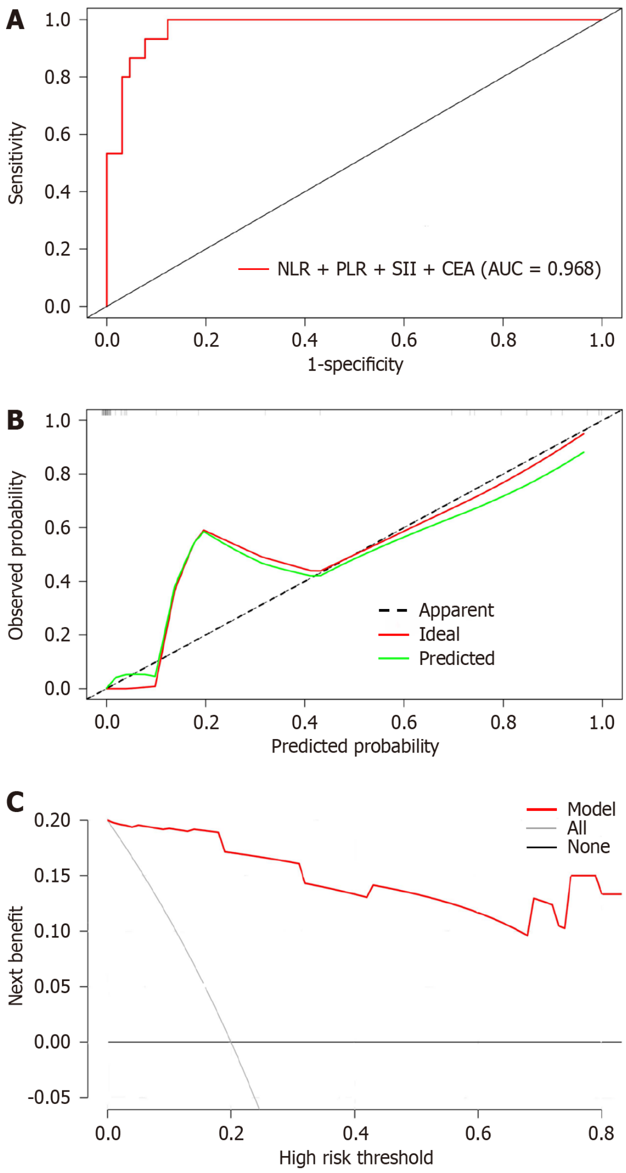

Figure 5 Nomogram of intra-abdominal infection in training and validation sets. A: Receiver operating characteristic (ROC) curve of the nomogram in the training set; B: Calibration curve of the nomogram in the training set; C: Decision curve analysis (DCA) curve of the nomogram in the training set; D: ROC curve of the nomogram in the validation set; E: Calibration curve of the nomogram in validation set; F: DCA curve of the nomogram in the validation set. NLR: Neutrophil-lymphocyte ratio; PLR: Platelet-lymphocyte ratio; SII: Systemic immune-inflammation index; CEA: Carcinoembryonic antigen; AUC: Area under the curve.

staging. The C-index of the model was 0.918 (95%CI: 0.885-0.952), indicating the fine correctness of the model. Ma *et al*[30] established a nomogram prediction model that unites inflammatory factors and conducted internal verification. The AUC of the model was 0.825 (95%CI: 0.764-0.886), indicating an advantage in predicting postoperative complications in patients with stage II–III CRC. Liu *et al*[37] identified a series of factors related to the survival of patients with distant metastatic CRC and constructed a prognostic histogram for patients with stage IV CRC. The C-index of the model was 0.742 (95%CI: 0.726-0.758), which proved that the model had good calibration and discriminating power.

This study has some limitations. First, the data were limited, and the selected case samples were from a single center with a small number of cases, which may have introduced bias to the results. The sample size should be broadened to ensure the accuracy of the results. Second, because this was a retrospective study, selected patients could not represent the overall population, which is prone to selection bias and recall bias, and we could not calculate the incidence rate or directly analyze the relative risk. The scope of research objects should be expanded.

CONCLUSION

This study found that NLR, PLR, SII, and CEA levels may be risk factors for IAI in patients with CRC after radical resection. The nomogram model built based on the above indices can be used as a prediction tool for abdominal infection after radical resection of CRC, aiding individualized treatment decisions. Simultaneously, it holds clinical significance in improving patient prognosis.

ARTICLE HIGHLIGHTS

Research background

Postoperative complications are important clinical outcomes in patients with colorectal cancer (CRC). Abdominal infection is a serious complication of radical resection of CRC. Currently, the risk factors for abdominal infections after CRC surgery are unclear.

Research motivation

To explore the correlation between inflammatory indicators and abdominal infection in patients after radical resection of CRC and construct a risk prediction model to provide a theoretical basis for prevention and intervention.

Research objectives

To explore the predictive value of preoperative neutrophil-lymphocyte ratio (NLR), platelet-lymphocyte ratio (PLR), systemic immune-inflammation index (SII), and carcinoembryonic antigen (CEA) levels for intra-abdominal infection (IAI) in patients after radical resection of CRC and provide an evaluation tool for individualized treatment of patients.

Research methods

This study was based on a retrospective analysis of the preoperative NLR, PLR, SII, and CEA levels in 80 patients who were admitted and underwent radical resection of CRC. A risk prediction model was constructed and verified.

Research result

Studies have shown that the NLR, PLR, SII, and CEA are risk factors for IAI in patients with CRC after radical surgery. The area under the curve of the training set (n = 60) for the nomogram prediction model was 0.968 [95% confidence interval (CI): 0.948-0.988], and that of the validation set (n = 20) was 0.926 (95%CI: 0.906-0.980). Calibration curves of the training and validation sets showed that the predicted results corresponded with the observed results. decision curve analysis curve analysis showed that patients with CRC could benefit from the prediction model.

Research conclusions

A nomogram combining the NLR, PLR, SII, and CEA levels was established. It has good accuracy and reliability in predicting abdominal infections in patients after radical resection of CRC, which is helpful in clinical treatment decision-making and has clinical significance in improving the prognosis of patients.

Research perspectives

Based on the general data and laboratory indicators of patients undergoing radical resection of CRC, we observed whether IAI occurred and focused on the analysis of preoperative NLR, PLR, SII, and CEA levels and the construction of relevant prediction models.

FOOTNOTES

Author contributions: Liu CQ designed and performed the study and wrote the paper; Mei TM designed the study and supervised the report; Gan JX collected the data and contributed to the analysis; Yu ZB provided clinical advice.

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