

Predictive value of Neutrophil Lymphocyte Ratio (NLR) and Glasgow Prognostic Index (GPI) for complications and length of hospital stay after bowel resection in Crohn's Disease

Nötrofil-Lenfosit Oranı(NLR) ve Glasgow Prognostic Index (GPI)'in, Crohn Hastalığında Postoperatif Komplikasyon ve Hastanede Kalış Süresi Üzerine Etkisi

Abstract

Aim:Crohn Disease (CD) is a chronic and often progressive disease that affects the quality of life of the patient. Although the primary treatment is considered to be medical, approximately 70% of patients need surgical intervention(s) during their lifetime. There are limited numbers of studies evaluating the factors affecting postoperative morbidity and length of hospital stay (LOS) and evaluating correlation between postoperative septic complications and Glasgow Prognostic Index (GPI) in CD patients. In this study, we aimed to evaluate the impact of simple blood tests and GPI on morbidity and LOS in CD patients who underwent surgery.

Method: A total of 43 patients who underwent elective bowel resection due to CD in our clinic between 2012 and 2017 were included in the study. Postoperative complications and LOS were recorded. The effecting parameters on the LOS and postoperative complications were evaluated statistically.

Results: The postoperative morbidity rate was 32.5% (n=14) and there was no mortality. The blood parameters and GPI score were found not to have statistical significance on the complication rates. The mean LOS was 8.1 (3-30) days. The lymphocyte count and NLR value were significantly predictive markers for the LOS (p<0.05). The LOS and neutrophil-lymphocyte ratio (NLR) were found to be statistically longer and higher, respectively, in complicated patients (p<0.05).

Conclusion: NLR and lymphocyte are good predictors to evaluate postoperative LOS. Additionally, NLR is a good parameter to predict morbidity in complicated CD including intraabdominal abscess, enterocutaneous or enteroenteric fistula.

Keywords: Crohn Disease, Neutrophil-lymphocyte ratio (NLR), Glasgow Prognostic Index

Öz

Amaç: Crohn Hastalığı (CH), hastanın yaşam kalitesini etkileyen kronik ve genellikle progresyonlarla seyreden bir hastalıktır. Hastalığın öncelikle tedavisi tıbbi olmakla birlikte, hastaların yaklaşık% 70'i yaşamları boyunca cerrahi girişime ihtiyaç duyar. Crohn hastalarında postoperatif morbidite ve hastanede kalış süresini etkileyen faktörleri ve postoperatif septik komplikasyonlar ile Glasgow Prognostik İndeksi (GPI) arasındaki ilişkiyi değerlendiren sınırlı sayıda çalışma vardır. Bizde çalışmamızda, basit kan testlerinin ve GPI'nin cerrahi uygulanan Crohn hastalarında morbidite ve hastanede kalış süresi üzerindeki etkisini değerlendirmeyi amaçladık.

Materyal ve Metod: Çalışmamıza kliniğimizde 2012-2017 yılları arasında CH nedeniyle elektif barsak rezeksiyonu yapılan toplam 43 hasta alındı. Postoperatif komplikasyonlar ve hastanede kalış süresi kaydedildi. Hastanede kalış süresi ve postoperatif komplikasyonlar üzerine etki eden demografik özellikleri, basit kan testleri ve hastalık lokalizasyonu istatistiksel olarak değerlendirildi.

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Bulgular: Postoperatif morbidite oranı% 32,5 (n = 14) idi ve mortalite görülmüdü. Kan parametreleri ve GPI skoru komplikasyon oranları üzerinde istatistiksel olarak anlamlı bulunmadı. Hastanede yatış süresi ortalama 8.1 (3-30) gündü. Lenfosit ve NLR değerlerinin hastanede kalış süresi konusunda anlamlı prediktif parametreler olduğu görüldü (p<0.05). Komplikasyon görülen hastalarda hastanede kalış süresi ve nötrofil- lenfosit oranı (NLR) sırasıyla istatistiksel olarak daha uzun ve yüksek bulundu (p <0,05).

Sonuç: NLR ve lenfosit hastanede kalış süresini öngörmeye iyi bir belirleyicidir. Aynı zamanda, NLR intraabdominal apse, enterokutanöz veya enteroenterik fistül içeren komplike CH'da morbiditeyi öngörmeye iyi bir parametredir.

Anahtar Kelimeler: Crohn hastalığı, Glasgow Prognostic Index, Nötrofil- lenfosit oranı

Background

Inflammatory bowel disease (IBD) includes two major forms which are Crohn disease (CD) and ulcerative colitis and it is a worldwide serious healthcare problem (1).CD is a nonspecific chronic inflammation of gastrointestinal tract that can cause symptoms such as abdominal pain, diarrhea and bloody stool (2).

CD is a recurrent and often progressive disease that affects the quality of life of the patient. Although the primary treatment of CD is medical, approximately 70% of all CD patients undergo surgical intervention during their lifetime (3). Bowel resection is indicated in patients with complications such as obstruction, abdominal abscess, fistulation, and also in the presence of resistance to medical treatment. Surgery has been shown to be effective in improving the quality of life of these patients (4).

Postoperative complications in CD surgery are not uncommon due to fragility of the inflamed bowel, inflamed masses, adhesions, malnutrition, preoperative steroids use, presence of abscess at the time of surgery and immunosuppression (3, 5, 6). Postoperative morbidities, especially postoperative septic complications, increase the length of hospital stay (LOS) and increase the cost of treatment. More importantly, they increase the rate of postoperative relapse and decrease the quality of life of the patients (3,7). Postoperative complication rates reach up to 30%, with devastating intra-abdominal septic complications (8). Therefore, it is important to estimate the risk of surgical complications in patients with CD.

Biomarkers such as C reactive protein (CRP), erythrocyte sedimentation rate and neutrophil-lymphocyte ratio (NLR) are present in the diagnosis and follow-up of CD in determining the activity of the disease. Complete blood count is frequently ordered before surgery in CD patients.

Neutrophil, lymphocyte, platelet, monocyte count, NLR, neutrophil-monocyte ratio (NMR), lymphocyte-monocyte ratio (LMR) and platelet-lymphocyte ratio (PLR) also easily determined by a single complete blood count test(9).

Glasgow prognostic index (GPI), an inflammation-based prognostic index is a good tool to predict the postoperative morbidity of the gastrointestinal cancers. GPI calculation is easy and requires only two parameters including blood albumin (Alb) level and CRP (10).

In this study, we aimed to evaluate the effect of simple blood tests such as NLR, NMR, LMR, PNR, white blood cell (WBC), lymphocyte, platelet, CRP and GPI on morbidity and LOS in CD patients who underwent surgery.

Material and Methods

Patients who under went elective bowel resection due to CD in our clinic between 2012 and 2017 were included in the study. All operations were completed by the same surgical team, and CD diagnosis was confirmed by postoperative pathologic analysis.

The study was approved by the ethics committee of our hospital(2018/33).

Patients who underwent stoma opening without bowel resection and patients who underwent emergent surgery were excluded from the study. CD patients with abdominal abscess, bowel stenosis, enterocutaneous or enteroenteric fistula and also patients with resistance to medical treatment were administered the surgical treatment as bowel resection.

Treatments such as steroids and Tumor Necrosis Factor-alpha (TNF α)inhibitors were discontinued 2-4 weeks before the operation and preoperative enteral and / or parenteral nutrition support was provided in all patients.

The patients' age, gender, WBC, lymphocyte, Platelet, CRP, Neutrophil (N), Alb, morbidity, mortality and LOS are reviewed from the file charts. Complete blood tests were performed within one week preoperatively. NLR values were calculated by dividing absolute neutrophil count by absolute lymphocyte count, PNR values were calculated by dividing absolute platelet count by absolute neutrophil count, LMR values were calculated by dividing absolute lymphocyte count by absolute monocyte count. We used preoperative CRP and Alb levels to calculate GPI. Patients with an elevated CRP level (≥ 10 mg/L) and concomitant hypoalbuminemia (< 3.5 g/dl) were assigned a score of 2 and included in the high GPI group. Patients with only one or none of these abnormalities were assigned scores of 1 or 0, respectively, and assigned to the low GPI group.

Postoperative complications and LOS were recorded. The effecting parameters on the LOS and postoperative complications were evaluated statistically.

SPSS Statistics for Windows, Version 21.0. (Armonk, NY: IBM Corp.) was used for statistical analysis. Independent samples t-test was used for countable parameters and Chi-square test was used for GPI. The parameters which were effective on LOS were evaluated by the means. p<0.05 was accepted as statistically significant.

Results

Forty three patients were included in the study. The mean age was 41.5 (19-66) years and 28 of the patients (65.1%) were male. The mean LOS was 8.1 (3-30) days. The mean values of the parameters were: Alb= 3.3 g/dl, CRP=4.7mg/dl, WBC: 9.2/dl, L: 1.78/dl, Platelet= 379000/dl, N=6.5/dl, Hemoglobin=11.7 g/dl, PNR=67.5, NLR=5.2.

The GPI was 0, 1, and 2 in the 11, 12, and 20 patients, respectively. The lymphocyte count and NLR value were significantly predictive markers for the LOS (p<0.05). The other parameters did not predict the LOS in this study (p>0.05). The parameters which were evaluated for LOS were shown in Table 1-2.

The localization of the CD was ileocecal region in 24 patients (55.8%), small intestine in 9 patients (20.9%) and colon in 10 patients (23.2%). The most common reason for the surgical treatment was ileocecal stricture accompanied by enterocutaneous or enteroenteric fistula (n=27). Twenty patients had abdominal abscesses. Preoperative percutaneous drainage was performed to abscess for suitable patients (7 patients). Adenocarcinoma was detected in the pathological examination of one patient who underwent ileal resection for CD.

The postoperative morbidity rate was 32.5% (n=14) and there was no mortality in our series. The most common complication was wound infection (n=9) and the anastomotic leak was seen in one patient (2.3%). An intraabdominal abscess was detected in 2 patients (4.6%). Reoperation was performed in one patient due to anastomotic leak. Drainage of the abscess by interventional radiology technique was performed in 2 patients. The blood parameters and GPI score were found not to have statistical significance on the complication rates. The LOS and NLR were found to be statistically longer and higher, respectively, in complicated patients (p<0.05) (Table 3).

Table 1: The effecting parameters on length of hospital stay

Parameter	Mean	Std.Dev.	p	Significance
Age	41.5	1.06	0.43	
Albumin (g/dl)	3.3 (1.8-4.9)	0.74	0.31	NS
WBC (cell/L)	9.2 (5.3-15)	2.79	0.19	NS
Lymphocyte (cell/L)	1.78 (0.29-4.69)	0.75	0.001	Sig
Platelet(cell/ L)	379000 (87000-791000)	13466	0.063	NS
Neutrophil (cell/ L)	6.5 (1.9-13.51)	2.78	0.088	NS
Hemoglobin (g/ dl)	11.7 (7.97-15.8)	1.79	0.81	NS
Protein (g/dl)	6.2 (3.9-8.1)	1.15	0.85	NS
CRP (mg/dl)	4.7 (0.24-20.04)	5.22	0.77	NS
Monocytes (cell/L)	0.58 (0.12-1.48)	0.26	0.96	NS
LMR	3.75 (0.7-12.2)	2.5	0.80	NS
PNR	67.5 (21.4-161.8)	3.36	0.72	NS
NLR	5.2 (0.6-46.6)	7.07	0.04	Sig

CRP: C reactive protein, WBC: white blood cell, LMR: lymphocyte/monocyte ratio, PNR: platelet/neutrophil ratio, NLR: neutrophil/lymphocyte ratio

Table 2: LOS and uncountable parameters.

Parameter	LOS (Day)	p
Gender		0.21
Male (28)	7.8±4.2	
Female (15)	8.7±6.4	
Localization		0.84
Small intestine (9)	7.8	
Colon (10)	7	
Combined (24)	7.7	
GPI		0.1
Low (23)	8.4±6.4	
High (20)	7.7±2.9	

GPI: Glasgow Prognostic Index

Table 3: The parameters which were evaluated for morbidity

	Morbidity (n=14)	No morbidity (n=29)	p
Age	38.51±8.9	43±11.2	0.19
Gender			0.31
Male	11	17	
female	4	11	
LOS (day)	10.6±7.7	6.9±2.3	0.001
Disease duration (year)	9.2±4.1	8.4±3.3	0.7
Localization			0.45
Small intestine	4	5	
Colon	3	7	
Combined	7	17	
Protein (g/dl)	6.4±1	6.1±1.1	0.53
Albumin (g/dl)	3.2±0.6	3.3±0.7	0.42
CRP (mg/dl)	6.3±6.4	4.08±4.7	0.09
Leucocyte(cell/L)	11±2.8	8±2.2	0.08
Lymphocyte(cell/L)	1.7±1	1.7±0.5	0.26
Platelet(cell/L)	425570±140155	371620±130766	0.76
Monocyte(cell/L)	0.7±0.29	0.52±0.23	0.41
Neutrophil(cell/L)	8.4±2.8	5.6±2.2	0.19
Hemoglobin (g/dl)	11.8±1.8	11.6±1.7	0.86
NLR	8±11.3	3.8±3	0.03
PNR	55.1±25.3	73.5±35.8	0.12
LMR	2.8±1.8	4.1±2.6	0.34
GPI			0.49
Low (23)	8	15	
High (20)	6	14	

LOS: Length of Hospital Stay,CRP: C reactive protein, WBC: white blood cell, LMR: lymphocyte/monocyte ratio, PNR: platelet/neutrophil ratio, NLR: neutrophil/lymphocyte ratio, GPI: Glasgow Prognostic Index

Discussion

The complicated CD is a challenging problem for gastroenterologists and surgeons. Most of the patients are expected to have postoperative complications.

We aimed to evaluate the value of blood tests to predict the postoperative hospital stay in complicated CD. NLR has been investigated in several diseases such as acute pancreatitis, ulcerative colitis, colorectal cancer, and metastatic malignancies (11,12). NLR is a simple and inexpensive indicator of severity of systemic inflammation. NLR also was used in several studies to evaluate the severity of the CD. Acarturk et al. (13) reported that NLR was strongly associated with severe IBD. The other study which was published in 2017 demonstrated that NLR and platelet/lymphocyte ratio were good indicators for severe CD (9). On the other hand, NLR was found not to have a predictive value to detect the severity of CD in another study (12).

There are many studies showing the activity of CD with simple blood tests such as NLR, PLR, and LMR. However, only one study showed its effect on postoperative complications. In the study of Kang W et al., (14) It was stated that Onodera prognostic nutrition index (OPNI) and NLR were predictive factors for postoperative complications and did not bring economic burden to the patient.

The present study showed that NLR and lymphocyte were good predictors to guess the LOS in complicated CD, and NLR was found to be a good predictor for postoperative morbidity.

CRP is a useful marker to determine the severity of inflammatory diseases, and some studies have reported the importance of CRP in CD. Solem et al. (15) reported that elevated CRP level was associated with disease activity and endoscopic inflammation. Some studies have reported that CRP elevation was effective in predicting postoperative septic complications (16,17). Zhou et al. (3) found that preoperative CRP level higher than 10mg /L was an independent factor for postoperative septic complications. In our study, postoperative intraabdominal septic complications were seen only in 3 patients and there was no significant correlation between CRP level and morbidity development.

GPI is a simple test that uses CRP and blood Alb level (18). It has three values as 0, 1, and 2. GPI is a good prognostic index to evaluate the postoperative prognosis and general prognosis in the several malignancies (19,20). The retrospective studies showed that GPI could be used to predict postoperative prognosis in gastric or colon cancer. Previous studies reported that CRP and hypoalbuminemia were independent risk factors for postoperative complications on CD (16,21). The mechanism of GPI in predicting postoperative results is still unclear. GPI was studied in only one study about IBD (22). In that study, statistical significance was found between high GPI (GPI =2) and postoperative septic complications, LOS and stoma requirement.

Our study evaluated the predictive value of GPI in the complicated CD. In this study, morbidity was not seen in most patients with GPI 0, but we did not find any statistical correlation between GPI and LOS and morbidity development.

The absolute number of lymphocyte was not studied to evaluate the postoperative complication on CD, but in 1986, Heimann et al. (23) divided the patients into two groups as lymphocyte count higher than 1000 cells / mm³ or lower, and reported that lymphocyte count did not affect the complication rate and LOS in CD. In our study, we evaluated the effect of lymphocyte count as a countable parameter. We found that it was an effective parameter on LOS in CD patients but not on the postoperative complications.

Limitations of this study are its retrospective nature, the inclusion of a limited number of patients and based on observational data on file. There may also be other factors affecting postoperative morbidities such as corticosteroid use and smoking. Prospective researches are needed to overcome such potential limitations. However, there are few studies evaluating the factors that affect postoperative morbidity and LOS on CD. There is only one study in the literature evaluating postoperative septic complications and GPI in CD patients.

In conclusion, NLR and lymphocyte are good predictors to evaluate postoperative LOS. Additionally, NLR is a good parameter to predict morbidity in complicated CD including intraabdominal abscess, enterocutaneous or enteroenteric fistula. GPI does not predict the postoperative morbidity in complicated CD.

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