Annals of Medical Research
DOI: 10.5455/annalsmedres.2018.09.198 2019;26(2):135-8

Original Article

Diagnostic utility of neutrophil lymphocyte ratio in acute complicated cholecystitis

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Abstract

Aim: To investigate whether the neutrophil lymphocyte ratio is a determining factor in the detection of complicated acute calculous cholecystitis.

Material and Methods: The study was planned as retrospective and multi-centered. One hundred and twenty patients were divided into 3 groups equally. Group1; patients with symptomatic gall stones having undergone elective cholecystectomy. Group 2; patients having undergone cholecystectomy with acute cholecystitis.Group 3: patients having undergone cholecystectomy with acute complicated cholecystitis. Blood glucose, C-reactive protein, leukocyte, neutrophil, and lymphocyte ratio were recorded from the hospital records in the final laboratory parameters of patients before surgery. ROC nalysis, sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), cut-off and AUC values for NLR were calculated.

Results: There was a significant difference between the gangrenous cholecystitis group and other groups in terms of white blood cell count values (p = 0.002 and p <0.001).There was a significant difference between the gangrenous cholecystitis group and other groups in terms of CRP values (p <0.001).There was a difference between gangrenous cholecystitis group and normal cholecystectomy group according to the mean glucose values (p = 0.006)According to ROC analysis, sensitivity, specificity, cut-off and AUC values for NLR in terms of gangrenous cholecystitis and acute cholecystitis were,77.50%,67.5%,80.9%,73.8%,6.56 and 0.736, respectively. For gangrenous cholecystitis group and normal cholecystectomy group; these values were 85%, 77.5%, 94%, 87.9%, 4.43% and 0.878%, respectively.

Conclusion: The increase in the acute cholecystitis N / L ratio appears to be a simple inflammatory marker that indicates that the condition has become complicated, that is easily detectable and does not add additional cost.

Keywords: Acute Cholecystitis; C-Reactive Protein; Neutrophil-To-Lymphocyte Ratio.

INTRODUCTION

The frequency of gallstones differs by ethnicity. The prevalence rate (10-15%) in developed countries is quite high. Around 1% to 4% of these patients become symptomatic. Approximately 20% of patients with untreated gall stones present with acute cholecystitis (1,2,3). Acute calculous cholecystitis is a clinical condition that requires early surgical intervention frequently seen in surgical clinics. Some patients may complain of complicated cholecystitis (gangrenous cholecystitis, perforation of the gallbladder, empyema of the gallbladder). This is associated with increased morbidity and mortality. However, there is no specific diagnostic criteria with imaging showing that acute calculous cholecystitis has become complicated. In acute calculous complicated cholecystitis, morbidity and mortality can be reduced with early surgical intervention in case of clinical suspicion (4,5).

An increase in the leukocyte count develops as an inflammatory response to the infection. Lymphopenia due to changes in the immune system after acute stress (due to stress-related cortisol release) is seen. Numerous studies have recently been conducted suggesting that neutrophil lymphocyte ratio (N / L) is a good indicator of inflammation (6-9).

In this study, it was aimed to investigate whether the neutrophil lymphocyte ratio is a determining factor in the detection of complicated acute calculous cholecystitis.

MATERIAL and METHODS

The study was planned as retrospective and multi-

Received: 21.09.2018 **Accepted:** 27.10.2018 **Available online:** 05.11.2018
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centered. Permission was obtained from the local ethics committee for the study. Power analysis was performed to determine the sample size. There is very few study for the acute cholecystitis N/L ratio in the literature. . Acute appendicitis is an intra-abdominal clinical inflammatory condition similar to acute cholecystitis. Therefore, power analysis was performed using data from a study on acute appendicitis N / L ratio in literature. The analysis was based on 95% reliability, 80% power. Expected values for N / L ratio; difference between groups; 3.5 and standard deviations of the groups were 4.5 and 5.5. Power analysis was performed and it was determined that the minimum number of patients to be taken should be 34. Therefore, it was considered appropriate to take 40 patients in each group. We have included all the patients underwent cholecystectomy surgery with a gallstone presence at two tertiary hospital between the years of 2016 and 2017.

Patients were divided into 3 groups. Group1; Patients with symptomatic gall stones having undergone elective cholecystectomy. Group 2; Patients having undergone cholecystectomy with acute cholecystitis. Group 3: Patients having undergone cholecystectomy with acute complicated cholecystitis. The groups of all patients were determined according to the pathology report. (Group 1: Chronic calculous cholecystitis, Group 2, Acute cholecystitis, Group 3: Gangrenous cholecystitis, Empyema)

Patients with known malignancies, intubated patients, and patients with hematologic disease, patients with coronary and / or cerebrovascular disease, and patients with additional inflammatory disease other than gallbladder were excluded from the study.

Blood glucose, CRP, leukocyte, neutrophil lymphocyte ratio were recorded from the hospital records in the final laboratory parameters of patients before surgery.

Statistical Package for the Social Sciences version 17.0 (SPSS Inc, Chicago, IL, USA) used for the data analysis. Sahapiro-Wilk test was used for the continuous variables normal or not. Data was shown as median (min-max) or mean±standard deviation, where applicable. Student's t or Mann-Whitney U-test were used to compare the differences between the groups, where appropriate. Pearson's chi-square test were used for the categorical data. The receiver operating characteristic (ROC) analysis was used to find out the cut-off values of parameters for discrimination of the groups. At each value, the sensitivity and specificity for each outcome under study were plotted, thus generating an ROC curve. A p value less than 0.05 was considered statistically significant.

RESULTS

The mean age of the patients was 54.80 ± 17.10 and the M/F ratio was 2/3. In gangrenous cholecystitis group male patients were significantly much more according to other groups. The ages of patients at the gangrenous cholecystitis group were elder according to other groups and the difference is statistically significant. There was a significant difference between the gangrenous cholecystitis group and other groups in terms of white blood cell count (WBC) values (p = 0.002 and p <0.001). There was a significant difference between the gangrenous cholecystitis group and other groups in terms of C-reactive protein (CRP) values and N/L ratios (p <0.001). There was a difference between gangrenous cholecystitis group and normal cholecystectomy group according to the mean glucose values (p = 0.006) (Table 1). According to ROC analysis, sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), cut-off and AUC values for NLR in terms of gangrenous cholecystitis and acute cholecystitis were, 77.50%, 67.5%, 80.9%, 73.8%, 6.56, and 0.736, respectively (Figure 1). For gangrenous cholecystitis group and normal cholecystectomy group, these values were 85%, 77.5%, 94%, 87.9%, 4.43 %, and 0.878%, respectively (Figure 2).

Table 1. Characteristics and laboratory parameters of the patients

	Gangrenous cholecystitis	Acute cholecystitis	Normal cholecystectomy
Age (year)	64.90±14.79[a]	51.90±16.04	53.20±14.02
Sex (F/M)*	16/24	25/15	26/14
WBC (x109/L)	12.60±4.84[x,y]	9.32±4.37	7.22±1.71
CRP (mg/dL)	15.36±10.24[α]	2.85±3.66[β]	0.44±0.65
Glukoz (mg/dL)	138.85±70.50[b]	119.72±35.75	107.77±29.63
NLR	10.72±8.62[a]	5.29±3.22	2.98±1.95

*p=0.046 (According to Chi-Square test)
[a]p<0.001 According to other groups, [x]p=0.002 According to acute cholecystitis, [y]p<0.001 According to normal cholecystectomy, [α]p<0.001 According to other groups, [β]p<0.001 According to normal cholecystectomy, [b]p=0.006 According to normal cholecystectomy

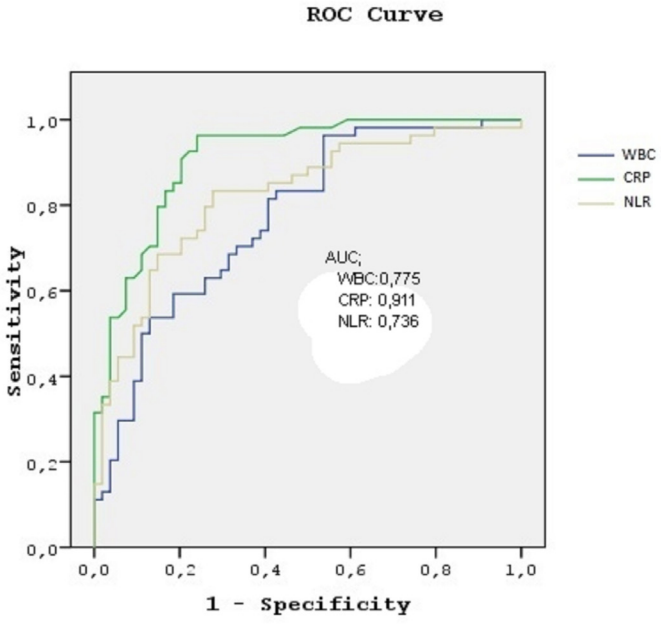

Figure 1. Receiver operating characteristic (ROC) curve for gangrenous cholecystitis group and acute cholecystitis group

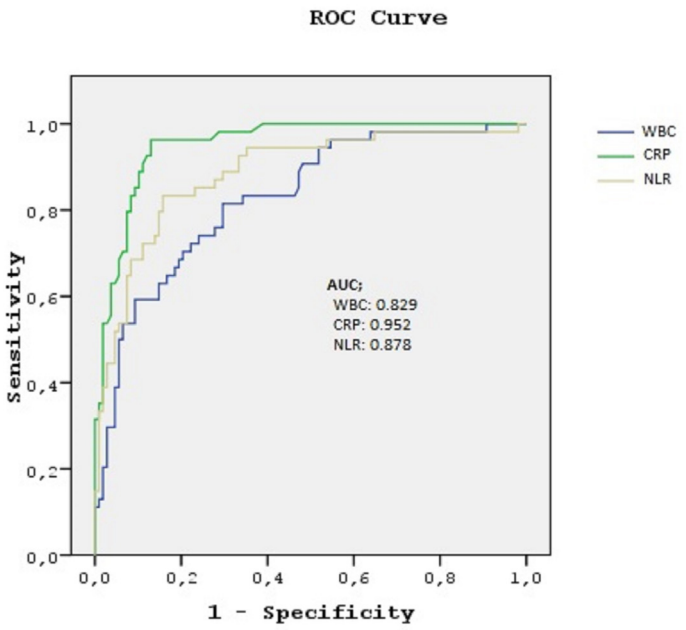

Figure 2. Receiver operating characteristic (ROC) curve for gangrenous cholecystitis group and normal cholecystectomy group

DISCUSSION

Acute calculous cholecystitis refers to a heterogeneous group frequently seen in surgical clinics. (acute cholecystitis, gangrenous cholecystitis, gallbladder empyema, etc.) The diagnosis of acute calculous cholecystitis can be made with high diagnostic accuracy by combining the clinical history, examination findings and imaging methods, in particular ultrasonography. Biomarkers such as CRP also contribute to the diagnosis by increasing diagnostic accuracy (10-12).

In gangrenous cholecystitis group male patients were significantly much more according to other groups. We thought that the male patients were diagnosed so lately or complications occur quickly.

Acute calculous cholecystitis is associated with increased morbidity and mortality, in cases where it is complicated as gangrenous cholecystitis, perforation, etc., and early diagnosis is important in these cases (13). However, there is no specific diagnostic criteria with imaging showing that acute calculous cholecystitis has become complicated. In complicated acute cholecystitis, morbidity and mortality can be reduced with early surgical intervention in case of clinical suspicion (8,9).

N / L ratio is an easy to measure marker and is a good indicator of inflammation. Among studies carried out, there are numerous studies suggesting that elevated N / L ratio is indicative of poor prognosis in cancer, cardiovascular disease, and intensive care patients. In addition, increased N / L ratio was found to be a marker of disease severity, cancer stage, morbidity and mortality in these studies (14-19).

A number of studies have shown that N / L ratio in acute appendicitis, similar acute cholecystitis, is effective both in the diagnosis and in determining the severity of the disease. Complications such as acute appendicitis perforation, peritonitis, and gangrene development have been correlated with an increase in N/L ratio (20-23).

In literature, N / L ratio in acute cholecystitis has been studied in a small number of studies. In a study by Lee SK et al., an N / L ratio > 3.0 was associated with the severity of cholecystitis and the duration of hospital stay (24). A study by Beliaev AM et al., found that N / L ratio was found to be correlated with the severity of acute cholecystitis. Furthermore, in this study, the N / L ratio was found to be superior to leukocyte and CRP values when determining the severity of cholecystitis (25). In our study glucose, CRP and leukocyte values were higher in the gangrenous cholecystitis group comparing to the other groups. This results were similar with literature (25,26).

In some studies, N / L ratio was found to be a better predictor than C-reactive protein, leukocyte, and neutrophil (25,27), but this was not the case in our study.

CONCLUSION

The increase in the acute cholecystitis N / L ratio appears to be a simple inflammatory marker that indicates that the condition has become complicated, that is easily detectable and does not add additional cost.

Competing interests: The authors declare that they have no competing interest.
Financial Disclosure: There are no financial supports
Ethical approval: Permission was obtained from the local ethics committee for the study

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