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What is the effect of treatment modality on red blood cell distribution width in patients with acute cholecystitis?

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ABSTRACT

Objective: The red blood cell distribution width (RDW) has recently been used as a marker to predict outcome in various patient groups. In this study, we aimed to examine how RDW is influenced during the treatment and follow-up of cases of acute cholecystitis which is a common inflammatory disease.

Material and Methods: Seventy-two patients who were treated for acute cholecystitis, were included into the study. The demographic data, leukocyte count, RDW, C-reactive protein (CRP) values and treatment protocols of these patients were prospectively recorded. The patients who received medical treatment for acute cholecystitis (Group A, n=33) and those who underwent surgery (Group B, n=39) were examined in separate groups.

Results: There were 27 male and 45 female patients with a mean age of 50.1±18 years (min-max: 21-94). In Group B, 33 patients underwent laparoscopic cholecystectomy, whereas 6 patients underwent open cholecystectomy. The RDW values on admission were not significantly different between two groups. However the post-treatment/pre-discharge RDW values were significantly lower in the surgical group (14.4±1.9 to 13.6±1.1, respectively, $p<0.05$). Also, no significant RDW change was identified in the medical treatment group based on an intra-group assessment, whereas a significant decrease was observed in Group B (on admission and following surgical treatment: 14.3±1.3, 13.6±1.1, respectively, $p=0.015$). No significant differences were observed between groups in terms of CRP and leucocyte values.

Conclusion: There was a significant decrease in RDW values in patients who were treated with surgery for acute cholecystitis, while this response could not be observed with medical treatment.

Key Words: Acute cholecystitis, red cell band width, surgical treatment

INTRODUCTION

Red blood cell distribution width (RDW) shows the change in the volume of red blood cell in a standard complete blood count, and it is a routine laboratory parameter that is generally used in assessing blood diseases. It has been reported in recent years that high RDW values could be a new prognostic indicator that may reflect an underlying inflammatory condition (1-5). In addition, it was identified that poor results in morbidity and mortality values could be consistent with RDW in different patient groups, such as elderly patient population, who are monitored due to both cardiac and respiratory problems (4-6).

Acute cholecystitis is an inflammatory event that is often encountered by surgeons. Whether the initial treatment of these patients should be medical or surgical is still controversial. Surgical treatment is recommended after the first attack in patients without surgical risks (7). Some clinics have suggested that surgical management at the time of initial episode does not increase complications, and it furthermore shortens the hospital stay and accelerates the patient's return to daily life.

We aimed to investigate which treatment option influences RDW values in patients with acute cholecystitis.

MATERIAL AND METHODS

Between June 2013 and February 2014, 72 patients who were monitored and treated at our clinic with an initial diagnosis of acute cholecystitis were included in the study. The approval was obtained from the local ethics committee of Şişli Hamidiye Etfal Teaching and Research Hospital (Approval code: 492). The relevant informed consent documents were received from patients who took part in the study. The demographic features, leukocyte, RDW, C-reactive protein (CRP) values and treatment protocols of all patients were recorded. The patients who received medical treatment (Group A) and those who received surgical treatment (Group B) due to attacks of acute cholecystitis were examined in separate groups.

Patient characteristics: Acute cholecystitis was defined as the presence of 2 or more clinical and surgical signs that were previously stated in the literature (8, 9). Clinical factors (4 factors) were determined

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as: body temperature >37.5°C, leukocytosis, right upper abdominal pain with tenderness and a clinical picture persisting for 48 hours in spite of medical treatment. The surgical signs (4 factors) were defined as: gall bladder wall thickness >4 mm, severe adhesion to an adjacent organ, deterioration in the biliary anatomy and inflammation of the gallbladder serosa. The patients in the medical treatment group were assessed according to clinical factors.

Laboratory characteristics: The red blood cell distribution width values were acquired via tests conducted in our hospital's laboratory using a Beckman Coulter LH 780 analyzer. The reference values ranged between 11.5% and 14.5%. Additionally, the white blood cell (WBC) baseline values (normal range: 4.3-10.8 x 10^9/L) and CRP (normal range: 0-5 mg/L) level (admission-discharge) were also recorded. The biochemistry values of patients (liver function tests-transaminase and cholestatic enzymes, bilirubin levels) were not included in the study.

Outcomes

Primary outcomes: Are there any differences between the pre-treatment (initial hospitalization) and post-treatment (discharge from hospital) RDW values? Does regression of inflammation reflect on RDW values? Are RDW differences affected by surgery?

Secondary outcome: Is there any correlation between changes in CRP and RDW values?

Statistical Analysis

The patients were compared in terms of their demographic and laboratory characteristics, treatment modalities and hospital stay. The continuous variables were expressed as mean ± standard deviation, and they were compared via the Student-t test. The categorical variables were expressed in frequencies and percentages, and were compared via Fisher test or chi-square test. A p value less than 0.05 was accepted as statistically significant. Statistical Package for the Social Sciences 20 (SPSS Inc., Chicago, IL, USA) was used for analysis.

RESULTS

In this study, 72 patients (27 men, 45 women) with a mean age of 50.1±18 years (range: 21-94) were managed and treated. In the follow-up period, medical treatment (Group A) was performed for 33 patients and surgical treatment upon the initial hospitalization (Group B) was performed on 39 patients (cholecystectomy: laparoscopic: 33, open: 6).

WBC values were observed to be in normal range in 43% (n=31) and CRP values in 34.7% (n=25) of patients. According to the assessment of treatment efficacy, no significant changes were observed in either group with respect to CRP values. The initial leukocyte values of patients were higher in the surgically treated group (mean values: 12.952 to 10.971, respectively; p=0.114); however, no significant differences were observed between groups. When the pre-treatment and post-treatment values were evaluated, a significant decrease in the intra-group assessment was observed for both groups (p<0.01). According to the assessment between groups (to evaluate the treatment efficacy), no significant differences in WBC values were identified (Table 1).

Table 1. Patient demographics and inter-group comparative laboratory findings

	Group A (Medical treatment)	Group B (Surgical treatment)	p
Number of patients	33	39	
Gender (F/M)	21/12	24/15	1.0
Age (years)	48.24±20	51.74±16	0.42
WBC count* 10^3/uL			
Admission	10.971±3647	12.352±3653	0.11
Discharge	8.505±2953	8.697±3050	0.79
CRP, mg/L			
Admission	68.8±15.5	71.3±11.3	0.44
Discharge	71.1±89.8	94.4±116	0.34
RDW** %			
Admission	14.3±1.3	14.3±1.3	0.97
Discharge	14.4±1.9	13.6±1.1	**0.04**
LOS (days)	4.7±2.2	3.7±2	**0.03**

F: female; M: male; SD: standard deviation; WBC: white blood cell; RDW: redblood cell distribution width; LOS: length of hospital stay.
*There was significant decrease in WBC count in both groups when inter-group pre-treatment-post-treatment values were compared (p<0.01).
**There was no difference in Group A (p=0.891) while a significant difference was observed in Group B (p=0.015) when inter-group pre-treatment-post-treatment values were compared. (Continuous variables were presented as mean±SD)

While there was no statistically significant difference between RDW values of two groups upon initial hospitalization, it was observed that the post-treatment/pre-discharge RDW values were significantly lower in the surgical group (14.4±1.9 vs. 13.6±1.1, respectively; p<0.05). In addition, according to the inter-group assessment, no significant RDW changes were identified in Group A, whereas a significant decrease was observed in Group B (after hospitalization and surgical treatment: 14.3±1.3; 13.6±1.1, respectively; p=0,015). In terms of surgical procedure, no differences in RDW values were observed between patients receiving laparoscopic and open cholecystectomy (p=0.395). No significant correlations between the post-treatment serum CRP and RDW values were observed (p>0.05, r=-0.05).

The length of hospital stay was found significantly lower in Group B (3.7±2 days) as compared to Group A (4.7±2.2 days) (p=0.03).

DISCUSSION

Although it is a frequent inflammatory event, there are no specific blood tests available in the diagnosis of acute cholecystitis. The consistency of clinical and radiological findings has a significant role in its diagnosis. On the other hand, leukocyte count and CRP values are used for diagnosis and follow-up

the inflammatory process. In a study conducted by Singer et al. (10), leukocytosis was not identified in 40% of patients with acute cholecystitis. This finding is consistent with our study results (43%). Other values that are used to assess disease severity include thrombocytosis, blood urea nitrogen, creatinine and prothrombin levels.

The red blood cell distribution width has been reported as a significant prognostic parameter for both patients with cardiac problems and those with history of cancer in recent studies (10-12). Additionally, it has been reported to be related to outcome in cases of infection, especially sepsis (13).

In this study, we investigated the changes in RDW values with respect to treatment protocols in patients with acute cholecystitis, which is a common inflammatory condition. In surgically treated group, RDW values showed significant decrease proportionally with leucocyte count; however, there was no correlations with CRP levels. This may be related to the relatively slow response of CRP to treatment. It was considered that the increase in CRP especially in patients in the surgical group could be associated with the reaction provoked by surgery. As a matter of fact, CRP values increase at 2-6 postoperative hours and start to decrease on post-operative day 3. However, the mean length of hospital stay in our series was found to be 3.7 days. We believe that a significant decrease in these values could be achieved if the hospital stay is longer. RDW may be considered as a useful parameter because it shows a parallel change with leukocyte count, and is a quick indicator for the assessment of inflammatory conditions. Wider patient series with longer follow-up periods are needed to increase the reliability of RDW results. In recent studies, it was reported that there was a positive correlation between age and RDW (14, 15). Although age was not taken into account in our study, no significant differences were identified between groups in terms of age.

One of the limitations of this study is that certain values that could affect the RDW value (such as iron, vitamin B12, folic acid) were not analysed in these patients. Nevertheless, a significant difference was identified between pre-treatment and post-treatment values within the same group of patients (i.e., in the inter-group examinations of surgically treated patients). Another limiting factor is that difference in age was not included in the evaluation.

CONCLUSION

The facts that the red blood cell distribution width values showed a significant decrease in the surgical group of patients that received a more radical treatment. However, it remained higher levels in the medically-treated patients. This result provides that RDW value is related to inflammatory process. Further studies with longer follow-up periods and a larger series of patients are needed in order to determine its role in the evaluation of treatment efficacy.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Şişli Hamidiye Etfal Training and Research Hospital.

Informed Consent: Written informed consent was obtained from the patients who participated in this study.

Peer-review: Externally peer-reviewed.

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