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Can red cell distribution width and mean platelet volume be a marker in patients with asymptomatic gallstones?

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ABSTRACT

Introduction: Gallstone disease (cholelithiasis) is one of the most common diseases of the digestive system. In the present study, we aimed to analyze the relationship of coincidentally encountered asymptomatic gallstones with red cell distribution width (RDW) and mean platelet volume (MPV) values investigated as the prognostic indicators for their use in the diagnosis and monitorization of the patients that developed gallstone-associated complications.

Materials and Methods: In the present study, RDW, PLT, and MPV values of 255 asymptomatic patients with coincidentally detected gallstones in their gallbladders were compared with those of 109 healthy patients (control group) that applied to the check-up clinic between the years 2018 and 2020.

Results: Mean RDW values of the patients with asymptomatic gallstones (mean RDW: 15.09, SD: 2.04) were found statistically significantly higher than those of the control group (mean RDW: 14.21, SD: 0.90) ($p<0.001$). In the same manner, also mean MPV values of the patients with asymptomatic gallstones (mean RDW: 7.87, SD: 1.40) were found statistically significantly higher than those of the control group (mean RDW: 7.38, SD: 1.06) ($p<0.001$).

Conclusion: Our results demonstrated as a consequence that RDW and MPV values can be used in prediction of the patients with asymptomatic gallstones.

Keywords: Cholelithiasis; mean platelet volume; red cell distribution width.

Introduction

Gallstone disease (cholelithiasis) is one of the most common diseases of the digestive system and autopsy reports indicated the presence of gallstone in 10–15% in the adults.[1] The prevalence of gallstone is associated with many factors such as diet, age, gender, body mass index, and ethnic origin. The frequency rate of gallstone disease may be increased due to some conditions involving hematological impairments such as pregnancy, non-HDL hyperlipidemia, Crohn's Disease, hereditary spherocytosis, sickle cell disease, and thalassemia.[2] Gallstones that form due to the changes in physical and chemical composition of bile remain mostly asymptomatic. However, the complications such as colic symptoms, cholecystitis, cholangitis, and pancreatitis necessitate to be treated.[3] The gallstones are detected using the imaging techniques

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such as primarily ultrasonography (USG) with high diagnostic value, computed tomography, magnetic resonance imaging, and biliary duct scintigraphy.[4] Surgical treatment is primarily recommended in the symptomatic patients.[5] A strong correlation of complete blood count (CBC) parameters thanks to easy availability and affordable low cost in clinical practice with many acute and chronic diseases was determined, and consequently, use of these parameters was recommended in diagnosis and monitoring clinical course of the associated pathologies.[6]

Red cell distribution width (RDW) is a calculated erythrocyte parameter that indicates anisocytosis and reflects heterogeneity of red blood cell volumes. The RDW value may fall outside the conventional laboratory reference ranges in numerous pathologies such as cardiovascular disease, venous thromboembolism, trauma, cancer, diabetes, infections, severe allergic reactions, impaired renal function, hepatic dysfunction, and thyroid disorders. RDW is potentially not only a diagnostic inflammatory indicator but also has a reliable prognostic value.[7-12]

Thrombocytes play a critical role in regulation of bloodstream and thrombogenic cascades. Mean platelet volume (MPV) is an indicator of the mean size and activation of the thrombocytes and high MPV levels are the inflammatory parameters that reflect the increased production and activation of thrombocytes.[13,14] In the present study, we aimed to analyze the relationship of coincidentally encountered asymptomatic gallstones with RDW and MPV values investigated as the prognostic indicators for their use in the diagnosis and monitorization of the patients that developed gallstone-associated complications.[15,16]

Materials and Methods

In the present study, cholecystectomy operations performed in Denizli Pamukkale University Hospital and Sivas Medicana Hospital, Department of General Surgery between the years 2018 and 2020 were retrospectively analyzed. The patients detected with single or multiple gallstones in the gallbladder and normal gallbladder wall thickness according to the imaging studies and chronic cholecystitis according to the pathology report and those without no previous acute cholecystitis (AC) attack were included in the study. Similarly, the healthy persons that applied to the check-up clinic without a complaint were assigned as the control group. The patients with cancer, systemic and inflammatory diseases, chronic liver and failure, and the patients that received previous blood transfusion and ongoing immunosuppressive treatment were excluded from the study. RDW, PLT, and MPV values of 255 patients with asymptomatic gallstones were compared with those of 109 healthy persons (control group) that applied to the check-up clinic between the years 2018 and 2020.

Statistical Analysis

The statistical analysis of the study data was performed using Statistical Package for the Social Sciences Software Version 25.0. $P<0.05$ was accepted as the statistical significance level. Mann–Whitney U-test was used in comparison between the patient groups in terms of RDW, PLT, and MPV values.

Results

Mean age of the 255 patients with asymptomatic gallstones was 51.67 (min: 19, max: 86, SD: 14.96) years. The study group comprised 92 (36.1%) males and 163 (63.9%) females. Mean age of the control group was 44.83 (min: 22, max: 65, SD: 10.90) years and control group comprised 63 (57.87%) males and 46 (42.2%) females.

Table 1 reveals the comparison between the patient groups in terms of RDW, PLT, and MPV values. RDW values of the coincidental patients were found statistically significantly higher than the healthy subjects ($p<0.001$).

Table 1. The comparison between the patient groups in terms of RDW, PLT and MPV values

CBC parameters	Groups	N	Mean	SD	p
RDW	Healthy subject	109	14.21	0.90	<0.001
	Coincidental	255	15.09	2.04	
PLT	Healthy subject	109	244.43	57.75	0.011
	Coincidental	255	264.79	76.50	
MPV	Healthy subject	109	7.38	1.06	<0.001
	Coincidental	255	7.87	1.40	

PLT values of the coincidental patients were also detected to be statistically significantly higher than the healthy subjects ($p<0.001$). In the same manner, also MPV values of the coincidental patients were determined to be higher statistically significantly higher than the healthy subjects ($p<0.001$).

Discussion

Symptomatic gallstone disease is one of the most important causes of acute abdominal pain in adults and USG is accepted as the diagnostic gold standard.[1,17]

Gallstone disease becomes progressive in one-third of the patients and AC develops, gallstone may be detected in more than 90% of the patients with AC. On the other hand, gallbladder may be determined to be normal in one-third of the patients that were considered to have AC due to the complaint of right upper quadrant pain.[18,19]

Approximately two-third of the patients with gallstones remain asymptomatic and gastrointestinal symptoms of these patients present similar features with those without gallstones.[20,21] Nevertheless, some studies have highlighted the correlation of gallstones with cardiovascular diseases and the increase in the total mortality rate.[22] It is also known that approximately 90% of the patients that developed gallbladder cancer had gallstones.[23] The role of inflammatory markers in the pathogenesis of gallbladder stones and cancer has been demonstrated and also the effect of the increase in these markers (IL-6, IL-10, IL-12, IL-13, etc.) has been emphasized.[23,24] Likewise, it is well documented that formation of gallstones causes systemic inflammation before leading to histopathological changes.[24]

The identification of the relationship between RDW as a CBC parameter and the various pathologies such as anemia, oxidative stress, inflammation, malignancy, and cardiovascular disease[7,12,24] has created a basis for the present study that analyzed the relationship between gallstone disease and RDW.[7,12,24]

We have found in our study that RDW values were statistically significantly higher in the group with asymptomatic gallstones than the control group. It is obvious that many phenomena such as metabolic syndrome, obesity, and cardiovascular disease are the risk factors for formation of the gallstones.[7,25] The cytokines that enter circulation due to the inflammatory entities cause red blood cell membrane disorders and cause entry of the immature red blood cells into the circulation and increased RDW values.[7] Perl et al. have stated in their study that RDW >14 values are significantly associated with metabolic syndrome and long-term increased mortality.[26] Peter et al. have reported that CBC values are the key indicators for the gallstone disease and indicate higher values than normal limits.[27] These outcomes were found compatible with our results.

Thrombocytes (PLT) are primarily responsible for fibrosis and hemostasis. Increased levels of inflammatory cytokines lead to increased release of thrombopoietin and affect megakaryocytes. High thrombocyte counts may be tested due to inflammation as a consequence of that condition. MPV is a calculated measure of mean PLT size (7.5–12.0 fl), however, it indicates activation and functionality of the PLTs.[13] Many studies have demonstrated that MPV is associated with inflammation and increases in the chronic diseases such as cardiovascular disease and metabolic syndrome.[6,13,28] Under physiological conditions, MPV is inversely proportional with thrombocyte count associated with preservation of hemostasis and constant thrombocyte mass.[29] Some studies have suggested that MPV >11.6 fl levels accompany with increased risk for coronary heart diseases.[30] In our study, MPV and PLT levels of the symptomatic patients with gallstones were found statistically significantly higher than the control group.

Free oxygen radicals accompanied with inflammation cause changes in the biliary composition and formation of the gallstones. However, numerous variables including genetic factors, gender, dietary habits, and race are effective in the formation of the gallstone.[1,2] The patients with gallstones mostly remain asymptomatic throughout lifetime, however, protective medicine and public health services play an important role in management of the well-documented risk factors. Taking the risks accompanied with gallstones and associated chronic entities into consideration; gallstones, that remain asymptomatic and undetected in most patients, should be taken into serious before it appears symptomatic.[20] Because of these reasons, we conclude that the changes in RDW and MPV values may orientate us in controlling risks that increase formation of gallstones. The CBC parameters may be helpful in prediction of diagnosis and follow-up the risky patients in the population that receive particularly basic healthcare services.

The retrospective design and small sampling size of our study limit us to present definite outcomes. Even though,

we did not include the patients with known chronic diseases in the study, it is obviously necessary to carry out further and larger studies to estimate whether RDW and MPV values increase due to the presence of gallstones or intercorrelated risk factors. We also consider that existing chronic diseases of the patient should be meticulously questioned. However, the detection of the gallstone disease that should be taken into serious also in the asymptomatic state will bring out a novel perspective in reducing potential risks and predicting long-term mortality rates.

As a consequence, our results reveal that RDW and MPV values can be used in prediction of the patients with asymptomatic gallstone disease.

Disclosures

Ethichs Committee Approval: All procedures performed in studies involving human participants were in accordance with the Ethical Standards of the University of Pamukkale Research Committee (Ethical Committee Application Number: 60116787-020/41142, date: 01/06/2020), and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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