Red cell distribution width and mean platelet volume in patients with irritable bowel syndrome

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Abstract

Introduction: Possible pathophysiological mechanisms of irritable bowel syndrome (IBS) are interactions between microbial flora of the gut and the mucosal/systemic immune system, post-infectious status and inflammation. Mean platelet volume (MPV) and red cell distribution width (RDW) have been reported as inflammatory markers in patients with inflammatory bowel disease, but they have not been studied in functional gastrointestinal disorders.

Aim: To investigate whether there was an association between haemogram parameters (RDW and MPV) and IBS.

Material and methods: Forty patients with IBS and 44 healthy controls were included to this retrospective study. Patients diagnosed with IBS according to Rome III criteria were included as the IBS group. They were all screened for psychiatric or organic bowel diseases for the sake of precise diagnosis.

Results: Both RDW ($p < 0.001$) and MPV ($p = 0.046$) were increased in patients with IBS compared to controls. This increase in RDW and MPV was independent of the type of IBS.

Conclusions: The RDW and MPV should be laboratory indicators of IBS. More prospective studies with larger cohorts are needed to confirm our results.

Introduction

Irritable bowel syndrome (IBS) is a functional disorder of the gastrointestinal system, which is characterized by alteration in bowel habits, chronic abdominal pain, discomfort and bloating. The prevalence of IBS is estimated about 12–30%, worldwide [1–3]. Functional gastrointestinal disorders are associated with significant impairment of quality of life and considerable economic burden on healthcare systems [4, 5]. Possible underlying pathophysiological mechanisms of IBS are interactions between microbial flora of the gut and mucosal/systemic immune system, post-infectious status and inflammation [6–9]. We still do not know much about the systemic effects of the subclinical inflammation in IBS.

In addition to platelets' role in homeostasis and tissue repairing [10], it is now understood that platelets play an important role in diseases associated with inflammation. Activated platelets are involved in the inflammatory processes of various disorders [11–14]. A widely used marker of platelet function is mean platelet volume (MPV), which reflects the production rate in bone marrow and activation of platelets [15]. The MPV has been studied in inflammatory diseases of the bowel [16, 17], but, to our knowledge, it has not yet been studied in functional gastrointestinal disorders.

Red cell distribution width (RDW) reflects the dimension variability of red blood cells. As well as anaemia, an increase in RDW has been reported in literature in various other diseases [18–20]. Similar to MPV, RDW has also been reported as an inflammatory marker in patients with inflammatory bowel disease [21–25], but it has not been studied in functional gastrointestinal disorders.

Aim

To the best of our knowledge, there are no reports in the literature about the haemogram parameters of IBS

patients. Therefore, in this retrospective study, we aimed to investigate whether there was an association between haemogram parameters (RDW and MPV) and IBS.

Material and methods

Forty patients with IBS and 44 healthy controls were included in this retrospective study. Patients diagnosed with IBS according to Rome III criteria were included as the IBS group. They were all screened for psychiatric or organic bowel diseases for the sake of precise diagnosis. Control group was consisted of healthy subjects who have been evaluated in our outpatient clinics for a routine check up. None of the subjects in the study and control groups had a history of use of medications that might have affected platelet function (e.g. aspirin). Individuals with a history of major surgery in the previous 5 years, diabetes mellitus, infectious diseases and chronic inflammatory diseases were excluded. Patients diagnosed with IBS were classified as either constipation or diarrhoea and mixed type.

Venous blood samples were obtained and put into sterile standard tubes containing a constant amount of anticoagulant. Laboratory tests were carried out within several minutes after the blood samples were obtained. The complete blood count analyses were performed on an LH 780 automatic analyser from Beckman Coulter (Beckman Coulter In.; Bre CA). Original kits from the manufacturer were used in laboratory analyses.

White blood cell count (WBC), haemoglobin (Hgb), haematocrit (Htc), mean corpuscular volume (MCV), RDW, platelet count (PLT) and MPV values of the study population were obtained from the computerised medical database of our hospital.

Statistical analysis

Data was assessed using SPSS software. (SPSS 15.0; SPSS Inc., Chicago, IL, USA). Results are expressed as mean ± SD. Variables are conducted with independent samples *t* test and Mann- Whitney U test. A p value < 0.05 was considered as statistically significant. The study is approved by the local ethics committee of Abant Izzet Baysal University School of Medicine.

Results

The IBS group consisted of 13 male and 27 female patients, while the control group consisted of 18 male and 26 female subjects. The difference was not statistically significant ($p = 0.42$).

The mean ages of the IBS and control groups were 42.2 ±15.2 and 39.3 ±10.8 years, respectively. The difference was not statistically significant ($p = 0.32$). The WBC ($p = 0.53$), Hgb ($p = 0.33$), Htc ($p = 0.21$), MCV ($p = 0.84$) and platelet ($p = 0.97$) levels were not significantly different between IBS and control groups.

Mean RDW of the IBS and control groups were 16.53 ±0.37 and 16.06 ±0.61, respectively. The difference was statistically significant ($p < 0.001$). Similar to RDW, MPV was significantly increased in the study group (8.27 ±1.07) compared to controls (7.80 ±1.01) ($p = 0.046$). Table I shows the laboratory data of the groups.

We compared the general characteristics and laboratory data of the IBS group by the type of IBS, either constipation or diarrhoea and mixed types. Twenty-seven IBS patients were grouped as constipation type and 13 as diarrhoea and mixed type. There were 20 female and 7 male patients in the constipation group, and 7 female and 6 male patients in the diarrhoea and mixed type IBS groups. The difference was not statistically significant ($p = 0.20$). Furthermore, mean age ($p = 0.187$), WBC ($p = 0.367$), Hgb ($p = 0.622$), Htc ($p = 0.482$), MCV ($p = 0.083$), platelet ($p = 0.526$), RDW ($p = 0.155$) and MPV ($p = 0.143$) were not statistically significantly different between these groups. Table II shows the general characteristics and laboratory data of the constipation, and the diarrhoea and mixed type IBS groups.

Discussion

We found that RDW and MPV were increased in patients with IBS compared to controls. Moreover, this

Table I. Laboratory data of the groups

Data	IBS group	Control group	Value of p
WBC [× 10^9/ml]	6.54 ±1.51	6.76 ±1.7	0.53
Hgb [g/l]	139.5 ±11.1	141.8 ±10.3	0.33
Htc [%]	40.86 ±2.77	41.61 ±2.71	0.21
MCV [fl]	87.48 ±4.59	87.29 ±4.36	0.84
RDW	0.165 ±0.0037	0.160 ±0.006	< 0.001
PLT [× 10^9/ml]	260 ±65	260 ±59	0.97
MPV [fl]	8.27 ±1.07	7.80 ±1.01	0.046

WBC – white blood cell count, Hgb – haemoglobin, Htc – haematocrit, MCV – mean corpuscular volume, RDW – red cell distribution width, PLT – platelet count, MPV – mean platelet volume

Table II. General characteristics and laboratory data of constipation, and diarrhoea and mixed-type IBS groups

Parameter		Constipation type IBS group	Diarrhoea and mixed type IBS group	Value of *p*
Age [years]		40 ±16	46 ±11	0.187
Gender	Female	20	7	0.20
	Male	7	6	
WBC [× 10^9/ml]		6.39 ±1.48	6.85 ±1.6	0.367
Hgb [g/dl]		138.9 ±12	140.8 ±9.2	0.622
Htc [%]		40.64 ±2.93	41.31 ±2.47	0.482
MCV [fl]		86.42 ±3.5	89.67 ±5.84	0.083
RDW		0.166 ±0.0043	0.164 ±0.002	0.155
PLT [× 10^9/ml]		255 ±62	269 ±72	0.526
MPV [fl]		8.41 ±1.18	7.96 ±0.72	0.143

increase in RDW and MPV was independent of the type of IBS. There is no laboratory parameter defined in the diagnosis of IBS. Therefore, we think that the results of our study are important because of the strong association between RDW, MPV and IBS.

The difference in RDW and MPV between study and control groups was independent from the type of IBS. Because, MPV and RDW were not significantly different between constipation or diarrhoea types in IBS subgroup.

The RDW and MPV have been analysed in recent studies. Song *et al.* reported that RDW was associated with disease severity in patients with inflammatory bowel disease [24]. However, as well as increased RDW values, patients with moderate to severe active disease had significantly reduced Hgb and Htc values compared to patients on remission, in their report. Moreover, Cakal *et al.* found that elevation in RDW was more common in patients with active inflammatory bowel disease compared to healthy controls [21]. However, Hgb and Htc levels were statistically significantly reduced in patients with active inflammatory bowel disease compared to controls, in that study. It has been reported by Arhan *et al.* that RDW and MPV were increased in patients with inflammatory bowel diseases compared to healthy subjects [25]. As well as RDW and MPV, the study group had statistically significantly differences in WBC, Hgb, Htc and MCV values compared to the control group in that report. Anaemia, especially due to iron deficiency, may cause an increase in RDW in these studies. However, there was no statistically significant difference between study and control groups in terms of Hgb, Htc, MCV, PLT and WBC levels in our results.

In a recent study, elevated RDW levels in patients with IBS, Crohn's disease and ulcerative colitis were reported at 8.3%, 63.3% and 45.7%, respectively [23]. The authors considered normal values of RDW to be between 11% and 14%. They found RDW elevation was less common in patients with IBS compared to Crohn's disease and ulcerative colitis, but, there is no data in their report about concomitant diseases, laboratory parameters other than RDW (e.g. Hgb, Htc, WBC) or the use of medications that might affect blood count analyses. None of the individuals in our study had concomitant diseases or a recent history of use of medications that might have affected the results of blood count analyses.

Some authors speculate that subclinical inflammation may play a role in IBS pathogenesis [6–8, 26]. Thus, our results were not surprising, because RDW and MPV have been reported to increase in inflammatory diseases.

The limitations of the present study are its retrospective design and relatively small study population.

Conclusions

The RDW and MPV should be laboratory indicators of IBS in the absence of potential confounders, such as; anaemia, infection and inflammation. More prospective studies with larger cohorts are needed to confirm our results.

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