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ÖZGÜN MAKALE/ORIGINAL ARTICLE

INVESTIGATION THE IMPACT OF HYPOTHYROIDISM ON HEMATOLOGICAL PARAMETERS

Hipotiroidinin Hematolojik Parametreler Üzerine Etkisinin İncelenmesi

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ABSTRACT

Aim: To investigate impact of the hypothyroidism on hematological parameters.

Material and Method: Twenty patients with hypothyroidism and twenty two healthy subjects were enrolled in this study between February 2015 and July 2015. We collected clinical and laboratory data of patients with hypothyroidism and randomized healthy subject's from the Adıyaman University Medical Faculty Hospital records retrospectively. The patients with anemia, rheumatic diseases, chronic kidney diseases, chronic liver diseases, chronic obstructive pulmonary disease, chronic heart diseases, inflammatory bowel diseases, malignancy and acute infections were excluded from the study. Patients were divided into two groups; hypothyroid group and healthy group. TSH values were increased in all of the hypothyroid patients. We compared hematological parameters consist of hemoglobin, platelet count, white blood cell (WBC), red cell distribution width (RDW) and mean platelet volume (MPV) between the two groups.

Results: 70% of patients with hypothyroidism were female and 30% of patients were male. Mean age of patients with hypothyroidism were 44,8±13,4. 72,7% of healthy subjects were female and 27,3% of healthy subjects were male. Mean age of healthy subjects was 31±14,6. In the result with Independent sample T test increased RDW-CV values was significantly associated with hypothyroidism (*P* value =0.01). The other hematological parameters weren't different between the groups (*P* value >0.05).

Conclusion: The present study demonstrated that increased RDW values was associated with hypothyroidism.

Key words: Hypothyroidism, RDW, MPV

ÖZ

Amaç: Hipotiroidinin hematolojik parametreler üzerine etkisini incelemek.

Gereç ve Yöntem: Bu çalışmaya Şubat 2015 ile Temmuz 2015 yılları arasında görülen yirmi hipotiroidi hastası ile yirmi iki sağlıklı birey alındı. Çalışmaya alınan hasta ve sağlıklı bireylerin klinik ve laboratuvar dataları Adıyaman Üniversitesi Tıp Fakültesi Hastanesi kayıtlarından retrospektif olarak incelendi. Anemi, romatolojik hastalık, kronik böbrek, kalp, akciğer ve karaciğer hastalıkları, inflamatuar barsak hastalıkları, malignite ve akut enfeksiyonu olan hastalar çalışma dışı bırakıldı. Hastalar sağlıklı ve hipotiroidi olmak üzere iki gruba ayrıldı. Hipotiroidi hastalarının tümünde TSH değeri yüksekti. Bu iki grup arasında hemoglobin, platelet sayısı, beyaz küre sayısı, kırmızı küre sayısı, kırmızı küre dağılım genişliği (RDW) ve ortalama platelet hacmi (MPV) karşılaştırıldı.

Bulgular: Hipotiroidi hastalarının %70'i bayan, %30'u erkekti. Kontrol grubundaki bireylerin %72,7'i bayan, %27,3'ü erkekti. Hipotiroidi hastalarının yaş ortalaması 44,8±13,4, kontrol grubundaki bireylerin yaş ortalaması 31±14,6. İndependent sample T test sonuçlarına göre yüksek RDW'nin hipotiroidi ile ilişkili olduğu saptandı (p değeri <0.05). İncelenen diğer hematolojik parametreler her iki grup arasında farklı değildi (p değeri >0.05).

Sonuç: Bu çalışmada yüksek RDW değerlerinin hipotiroidi ile ilişkili olduğu saptandı.

Anahtar kelimeler: Hipotiroidi, RDW, MPV

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INTRODUCTION

Thyroid gland is an endocrine gland which is located on the anterior side of the neck. Thyroid gland secrets thyroid hormones including triiodothyronine and thyroxin. Hypothalamic-pituitary-thyroid axis is responsible for the regulation of metabolism, growth and development. Thyroid hormones use negative feedback control on the hypothalamus and pituitary gland. Hypothalamus product thyrothropin releasing hormone (TRH). Low levels of the thyroid hormones including triiodothyronine and thyroxin stimulate TRH production and TRH stimulates the pituitary gland to produce the TSH. Finally TSH stimulate the thyroid gland to secrete triiodothyronine and thyroxin (1-3).

Thyroid hormones regulate blood cells metabolism and proliferation as regulate metabolism of all cells in the human body. Therefore thyroid hormones have an important role on hematopoiesis.

Hypothyroidism and hyperthyroidism are the dysfunctions of the thyroid hormones. These dysfunctions have many negative affect on blood cells, including anemia, thrombocytopenia, red blood cell distribution width (RDW) and mean platelet volume (MPV) abnormalities (1-4). After treatment of thyroid disorders these dysfunctions usually return the normal status.

Hypothyroidism is a deficiency or inefficiency of the thyroid hormones. Primary hypothyroidism is the principal manifestation of the hypothyroidism which is marked by elevated thyroid stimulating hormone levels and reduced thyroid hormones including triiodothyronine and thyroxin. Anterior pituitary failure result in secondary hypothyroidism. Lacking stimulating of the TRH result in tertiary hypothyroidism. Hypothyroidism is one of the most common disease of endocrine system which affect all systems including hematopoietic system. Hematopoietic system is production of the all type of blood cells. Hematopoiesis prenatally occurs in the yolk sack and then in the liver and finally in the bone marrow which is the permanent area of the production.

All blood components are derived from the hematopoietic stem cells which have the potential to develop into all types of the blood cells. Hematopoietic stem cells are located in the bone marrow.

Hematopoiesis is divided into three lineages: Erythropoiesis, Lymphopoiesis and Myelopoiesis. Result of the Erythropoiesis erythrocytes are produced. Result of the Lymphopoiesis T and B cell lymphocytes are produced. Result of the Myelopoiesis granulocytes, megakaryocytes and macrophages are produced. These three phases are influenced by multiple factors. One of these factors is thyroid hormones. Thus thyroid hormones are the cornerstone of the homeostasis.

Thyroid dysfunctions are frequently accompanied with the different blood cell abnormalities. Thus we aimed to investigate impact of hypothyroidism on hemoglobin, platelet count, WBC, RDW and MPV.

MATERIALS AND METHODS

We collected clinical and laboratory data of twenty patients with hypothyroidism and randomized twenty two healthy subject's from the Adıyaman University Medical Faculty Hospital records retrospectively between February 2015 and July 2015.

Hypothyroidism defined as increased TSH values and decreased triiodothyronine and thyroxin levels. TSH values were in the normal ranges in the healthy subjects.

We collected patients' blood samples at the admission and then we analyzed laboratory parameters consist of TSH, RDW, MPV, hemoglobin, platelet count and WBC.

The patients with anemia, rheumatic diseases, chronic kidney diseases, chronic liver diseases, chronic obstructive pulmonary disease, chronic heart diseases, chronic inflammatory bowel diseases, malignancy and acute infections were excluded from the study.

The patients were divided into two groups; hypothyroid group and healthy group. The collected laboratory parameters including RDW, MPV, hemoglobin, platelet count and WBC were compared between these groups.

All analyses were performed using the SPSS for Windows (version 21.0; SPSS/IBM, Chicago, IL). Normality of the distribution was evaluated with the Kolmogrow-Smirnow Test. Data were shown as mean ± SD. The Descriptive statistics, Indepentent sample T test were used when suitable. Group means were compared by the Indepentent sample T test for parametric data. The statistical significance level was accepted as a P value of less than 0.05.

RESULTS

70% of patients with hypothyroidism were female and 30% of patients were male. Mean age of patients with hypothyroidism were 44,8±13,4 (Table 1). 72,7% of healthy subjects were female and 27,3% of healthy subjects were male. Mean age of healthy subjects was 31±14,6 (Table 1).

We compare hematological parameters consist of RDW, MPV, hemoglobin, platelet count and WBC between hypothyroid patients and healthy subjects. Result with Independent sample T test RDW-CV was significantly associated with hypothyroidism (P=0.01) (Table 2). The other investigated hematological parameters weren't associated with hypothyroidism (P>0.05).

DISCUSSION

Herein we investigated the impact of hypothyroidism on hematological parameters. This study indicated that RDV-CV was significantly related to hypothyroidism.

RDW is part of a standard complete blood count (CBC) that measures the variation in either red blood cell (RBC) size or volume. RDW is used along with the mean corpuscular volume to determine the causes of anemia (5). Elevated RDW help health care providers in the diagnosis of early nutritional deficiency such as iron, vitamin B 12 or folat as it becomes elevated earlier than other RBC parameters (6).

Table 1: Baseline characteristics of the subjects.

	Hypothyroid subjects ***n=20***	*Healthy subjects* ***n=22***
Age(years) (mean±SD)	44,8±13,4	31±14,6
Gender (male/female)	*6/14*	*6/16*
TSH uIU/MI	*15,9±20,6*	*1,3±0,8*

Table 2: Comparison of hematological parameters between patients with hypothyroidism and healthy subjects.

	Groups	N	Mean	Std. Deviation	P value
RDW-CV (%)	***Healthy subjects***	*25*	*11,4*	*0,7*	*0.01*
	Hypothyroid subjects	*23*	*12,07*	*0,8*	
MPV (fL)	***Healthy subjects***	*25*	*8*	*1,44*	*0.48*
	Hypothyroid subjects	*23*	*8,4*	*1,44*	
WBC (K/mm^3)	***Healthy subjects***	*25*	*8,4*	*2,4*	*0,38*
	Hypothyroid subjects	*23*	*7,8*	*2*	
Hemoglobin (gr/dL)	***Healthy subjects***	*25*	*14*	*1,3*	*0,63*
	Hypothyroid subjects	*23*	*13,8*	*1,3*	
Platelet count (K/mm^3)	***Healthy subjects***	*25*	*234,5*	*46,1*	*0,92*
	Hypothyroid subjects	*23*	*236,3*	*70,6*	

In addition, RDW helps clinicians to differentiate between iron deficiency and heterozygous thalassemia, and also between megaloblastic anemia such as vitamin B 12 or folat deficiency anemia together with other causes of macrocytosis (7). Thus patients with anemia were excluded in our study.

Recently RDW has been investigated in many diseases. In a study conducted by Kim DS et al. mean RDW values were significantly higher in the psoriasis patients compared to the control (8). In a study conducted by Li W at al. elevated RDW was significantly associated with the Framingham risk score in the patients with coronary artery disease (CAD) (9). In a study conducted on colon cancer, RDW values of the patients with colon cancer were significantly higher than control (10). In another study conducted on sepsis, high values of RDW were significantly associated with severity of sepsis (11).

In this present study we indicated that increased RDW-CV was associated with hypothyroidism.

There are few studies conducted on relationship between RDW and thyroid dysfunctions. In a study conducted on patients with thyroid dysfunction, Yu HM at al. demonstrated that RDW was significantly associated with subclinical hypothyroidism compared to control (12). In a study conducted on thyroid stimulating hormone (TSH), RDW was significantly associated with serum levels of TSH (13). In another study Aktaş G at al. showed that RDW could be a marker in Hashimoto's thyroiditis (14).

According to the literature thyroid dysfunctions have diverse effects on blood cells. There are many studies demonstrated that MPV is associated with thyrotropin (15-17). However in the present study there wasn't any association between hypothyroidism and MPV.

We can say that health care providers might consider thyroid dysfunctions while they encounter to the hematological abnormalities.

Major limit of our study was the retrospective study that was considered. Single blood sampling was the other limitation. For these reasons, further investigations might be more useful to highlight the relationship between hypothyroidism and blood cell count and red cell indices.

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