Dermatology Practical & Conceptual

Evaluation of MCV/RDW Ratio and Correlations With Ferritin in Telogen Effluvium Patients

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ABSTRACT

Introduction: Telogen effluvium is one of the chronic diseases that affect the quality of life (QoL) in women. Genetic factors, vitamin deficiencies, hormonal and environmental conditions take roles in the etiology of hair loss.

Objectives: The study aimed to evaluate the RDW(Red cell distribution witdh)/MCV(Mean corpuscular volume) ratio and its correlation with ferritin in Telogen Effluvium patients and to reveal their potential role in the etiopathogenesis of Telogen effluvium.

Methods: We retrospectively evaluated the medical data of 250 patients who were admitted to the dermatology outpatient clinic between September 2020 and December 2020 with a diagnosis of telogen effluvium. The control group was created retrospectively from the medical records of 250 healthy individuals. HB(Hemoglobin), HCT(Hematocrit), MPV(mean platelet volume), MCV, RDW, ferritin, and MCV/RDW ratio of both groups were compared and evaluated statistically.

Results: All telogen effluvium patients were women in terms of gender. The mean age of the patient group was 33.11 ± 9.66 years and the mean age of the control group was 34.98 ± 12.37 years. The ratio of MCV/RDW, MPV, MCV, and ferritin is lower in the group with telogen effluvium compared to the control group and a statistically significant difference was found ($P < 0.05$).

Conclusions: Iron deficiency anemia is thought of as a factor in female patients with telogen effluvium. Although the data shows the correction of iron deficiency is insufficient telogen effluvium, we proposed that laboratory tests should be routinely used in the diagnosis and treatment phase of patients who apply with the complaint of hair loss.

Introduction

The etiology of hair loss consists of unavoidable genetic factors as well as hormonal reasons, vitamin deficiencies, and environmental reasons. Hair loss is seen as an important cosmetic problem that is increasing day by day, and therefore, the number of patients who apply to clinics is increasing [1,2].

Studies have shown that the most common cause of hair loss in women is telogen effluvium, and it's listed that the most common factors causing hair loss as low ferritin, vitamin B12 deficiency, and thyroid dysfunctions [3,4]. Iron deficiency is the most common nutritional deficiency in the world [5]. One of the many problems caused by iron deficiency is hair loss [3]. It can even be considered as one of the most accused factors in the etiology of this disease [6,7]. It is thought that hair loss develops due to the lack of iron, which plays a role in oxygen transport to the tissues, and the inability to carry enough oxygen to the hair follicle [8]. Iron is stored by ferritin together with apoferritin, and serum ferritin level reflects iron stores in the body [9]. Kantor et al found low serum iron levels in patients with diffuse hair loss in their study, while Rushton et al found low ferritin levels in 72% of the patients [10,11]. Özden et al reported that women with diffuse hair loss had a low ferritin value of 36%, and in another study when 72 mg of iron was given daily to 22 women with chronic hair loss, they have shown that hair loss decreased [5,12].

The red cell distribution range (RDW) is a measure of the heterogeneity of circulating erythrocytes. High RDW can generally occur as a result of increased erythrocyte destruction (hemolysis), nutritional deficiency, or blood transfusion [13]. In addition, RDW elevation is observed as a result of ineffective erythropoiesis due to chronic inflammation and neurohumoral activation [14].

Objectives

As far as we know, the role of iron, RDW, and MCV(Mean corpuscular volume) in hair loss seems unresolved so far. Since the laboratory reference intervals were different in the studies, the results were also controversial. The spresent tudy aimed to evaluate the RDW/MCV ratio and its correlation with ferritin in patients with telogen effluvium and to reveal the roles of telogen effluvium in its etiopathogenesis.

Methods

We retrospectively evaluated the medical data of 250 patients who were admitted to the dermatology outpatient clinic between September 2020 and December 2020 with a diagnosis of telogen effluvium. The diagnosis of telogen effluvium was performed as clinical. The control group was created retrospectively from medical records of 250 healthy individuals who applied to family health centers, with no complaints of hair loss or any other inflammatory skin disease, and were similar to the patient group in terms of mean age and gender. Patients who were in the period of chronic disease, stress, thyroid disease, pregnancy, lactation, had a history of surgical operation in the last 3 months, and took vitamin supplements were excluded from the study.

Serum ferritin levels were evaluated by electrochemiluminescence (ECLIA, Roche) method, and hemogram parameters (HGB, HCT, MPV, and RDW) were performed with Mindray BC-6800 (Mindray Bio-Medical Electronics Co., Ltd) hematology analyzer which analyzes complete blood count based on laser light scattering (forward and light scatter) and side fluorescent light. This retrospective study was approved by the Non-Invasive Clinical Research Ethics Committee of Necmettin Erbakan University (Decision No: 2021/3515). The study has conducted by the principles of the Declaration of Helsinki.

Statistical Analysis

SPSS version 25.0 program was used for database creation and statistical analysis. Pearson correlation test was used to measure the relationship and degree of relationship between variables and $P < 0.05$ was accepted as significance limit.

Results

All patients consisted of females in the study. The mean age of the patient group was 33.11 ± 9.66 years and the mean age of the control group was 34.98 ± 12.37 years. There was no difference between the two groups in terms of age ($P > 0.05$).

RDW value was elevated in telogen effluvium patients ($P = 0.02$), MPV and MCV values were decreased in telogen effluvium patients compared with the control group as $P = 0.00$ and $P = 0.04$, respectively. MCV/RDW ratio of the telogen effluvium patients was lower than the MCV/RDW ratio of the control group as 6.41 versus 7.41 ($P = 0.00$) (Table 1). The correlation between MCV/RDW ratio and ferritin was evaluated, and no significant correlation was found between the parameters ($P > 0.05$). When patients with telogen effluvium with positive and negative pull tests were compared, no statistically significant difference was found between the two groups in terms of HB, HCT, MPV, MCV, RDW, ferritin, and MCV/RDW ratios ($P > 0.05$) (Table 2).

Conclusions

Telogen effluvium is the most common cause of diffuse hair loss. Also, it's a non-cicatricial form of hair loss that develops approximately 3 months after a triggering factor and is characterized by widespread hair loss. Telogen effluvium

Table 1. Comparison of some parameters between patient and control group

	Patient group	Control group	P
Age, years, mean ± SD	33.11±9.66	34.98±12.37	> 0.05
HB, g/dL	13.60	13.47	> 0.05
HCT, %	42.13	40.18	> 0.05
MPV, μm^3	7.83	10.47	0.00
MCV, fL	84.22	86.65	0.04
RDW, %	14.30	11.68	0.02
Ferritin, µg/L	28.83	64.89	0.00
MCV/RDW, fL/%	6.41	7.41	0.00

HB = hemoglobin; HCT = hematocrit; MPV = mean platelet volume; MCV = mean corpuscular volume; MCV/RDW m= mean corpuscular volume/red cell distribution width ratio; RDW = red cell distribution width; SD = standard deviation.

Table 2. Comparison of telogen effluvium with positive and negative pull test

Pull test		N	Mean	P
HB	Positive	66	13.50	>0.05
	Negative	146	13.64	
HCT	Positive	66	40.30	>0.05
	Negative	146	42.95	
MPV	Positive	66	7.78	>0.05
	Negative	146	7.85	
MCV	Positive	66	85.47	>0.05
	Negative	146	85.10	
RDW	Positive	66	11.72	>0.05
	Negative	146	11.66	
Ferritin	Positive	66	30.71	>0.05
	Negative	146	27.97	
MCV/RDW	Positive	66	7.43	>0.05
	Negative	146	7.41	

HB = hemoglobin; HCT = hematocrit; MPV = mean platelet volume; MCV = mean corpuscular volume; MCV/RDW m= mean corpuscular volume/red cell distribution width ratio; RDW = red cell distribution width.

can be observed in both genders. On the other hand, women constitute the majority of patients who apply for treatment, because the frequency of the disease may be higher in women, or that the number of admissions in men is low and the cases remain subclinical [15,16].

Several studies were reported that fever, stress, major surgery, increase in androgen or estrogen hormone levels, hyperthyroidism, and many other causes have been associated with telogen effluvium [17]. To define the etiological diagnosis in telogen effluvium, a detailed history, and laboratory tests to exclude endocrine, nutritional, and autoimmune diseases should be performed [18].

While many studies have reported serum iron deficiency in telogen effluvium patients, some of them do not show a relationship between iron deficiency and the incidence of telogen effluvium [19]. Sinclair et al declared that low serum ferritin and hair loss were show not a relation between ferritin levels and hair loss [20]. A recent study reported that telogen effluvium patients had significantly lower serum ferritin concentrations compared to those in the control group (17.35 ± 18.54 ng/ml versus 39.27 ± 29.44 ng/ml, P = 0.001) [21]. As similar, patients with telogen effluvium had lower serum ferritin levels which compared to the control group in our study (28.83 µg/L versus 64.89 µg/L, P = 0.00) (Table 1).

MCV, is known as one of the red blood cell indices and defines the size of the red blood cells. MCV could determine the classification of anemia as microcytic anemia below the normal range, normocytic anemia within the normal range, macrocytic anemia above the normal range [22]. Ferritin is a measure of iron stores and the most sensitive biomarker to test for early stages of iron deficiency as well as iron deficiency anemia. Obaidat et al reported a significant association between low serum ferritin levels and chronic telogen effluvium [23].

As a routine parameter, RDW represents the variation in diameters of red blood cells in the complete blood count [24]. RDW has been investigated in several diseases, such as rheumatoid arthritis, psoriasis, heart failure, and cutaneous vasculitis, and has been considered as a marker of inflammation [25]. The MCV/RDW ratio is used to evaluate for many diseases such as acute pancreatitis, cardiovascular disease [26,27]. While RDW value was elevated in telogen effluvium patients (P = 0.02), MPV and MCV values were decreased in telogen effluvium patients compared with the control group as P = 0.00 and P = 0.04, respectively. MCV/RDW ratio of telogen effluvium patients was lower than the MCV/RDW ratio control group as 6.41 versus 7.41 (P = 0.00). Also, the correlation between MCV/RDW ratio and ferritin was evaluated in telogen effluvium patients, and no significant differences were found between the patient and control group (P > 0.05) (Table 2).

From the literature, controversial findings of related parameters were observed in Telogen effluvium. To clarify our study results, more comprehensive and further studies are needed.

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