

Relation between Red cell distribution width and Early Atherosclerosis in patients with Beta Thalassemia

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ABSTRACT

Repeated blood transfusions and chronic hemolysis in patients with thalassemia leads to iron overload and one of its complications is atherosclerosis. Hematological markers like red cell distribution width (RDW) may correlate with the early atherosclerosis. our study aimed to Relation between Red cell distribution width and Early Atherosclerosis in patients with Beta Thalassemia. The study included 60 patients with transfusion dependent β -thalassemia major at Fayoum University Hospital and 30 age and sex matched healthy persons as a control group. This study revealed that RDW was not correlated with carotid intima media thickness.

KEY WORDS: Red cell distribution width, Early Atherosclerosis , patients with Beta Thalassemia.

INTRODUCTION

Red cell distribution width (RDW) is a standard parameter of the complete blood count (CBC) and indicates variability in red blood cell (RBC) size; RDW is

calculated as the proportional variation in mean corpuscular volume (MCV) (RBC) (normal range: 11.5% to 14.5%) [1].

Thalassemia is considered the most common genetic disorder worldwide. It results from a defect in the synthesis of one or more of the subunits of hemoglobin. In β -thalassemia, the β -chains of hemoglobin have a normal structure but are produced in reduced or undetectable amounts, resulting in excess of α -chains, which are unstable and precipitate to form intracellular inclusion bodies. This excessive intracellular deposition of α -chain material is responsible for peripheral hemolysis of the erythrocytes [2].

Conventional treatment of the patients with β -thalassemia major is repeated blood transfusions. Repeated blood transfusions and peripheral hemolysis leads to iron overload

initially in reticulo-endothelial system and secondary to all parenchymal organs, mainly heart, pancreas, pituitary gland, and gonads, with cytotoxic effects. Iron overload accelerates the onset of atherosclerosis in patients with β -thalassemia by damaging the endothelium and increasing intima media thickness of blood vessels [3].

Increased RDW is a predictor of carotid atherosclerosis such as in cardiovascular diseases, cerebrovascular stroke, type 2 diabetes, hypertension. However, the mechanism underlying this relationship between RDW and carotid atherosclerosis remains unclear [4].

Subjects and Methods

This study was conducted on thirty patients with β -thalassemia major

(adolescents and young adults less than 40 years old) and thirty healthy controls. They were recruited from Internal Medicine Department, Fayoum University Hospitals. The study was approved by the Faculty of Medicine Research Ethical Committee and written informed consent was obtained from all study participants. . Full history taking , complete physical examination , Carotid Doppler, Laboratory investigations as cbc, serum ferritin

Results

The mean age of study group was (23.7 ± 7.6) years old among thalassemia and (25.4 ± 8.2) years among healthy control group. Males were representing 46.7 %, and females were representing 53.3 % of the total number 30 patients with thalassemia, males were 13 healthy persons representing 43.3 % and females were 17 healthy persons representing 56.7% (table 1).

Thirty-eight of patients (**63.3%**) had splenectomy.

Table (2) show that Sensitivity and specificity test for RDW level in diagnosis of carotid

atherosclerosis illustrates sensitivity of (80%) and specificity (56%) at cutoff level (19.5), but it shows lower sensitivity and specificity in thalassemia patients.

Table (1): Comparisons of demographic characters between patients and control

Variables	Control (n=30)		Thalassemia (n=60)		
	Age Mean /SD (years)	25.4	8.2	23.7	7.6
Sex	Male	13	43.3%	28	46.7%
	Female	17	56.7%	32	53.3%

Table(2):Sensitivity and specificity of RDW in diagnosis of carotid atherosclerosis.

Variable	Sensitivity	Specificity	AUC	Cut off point
RDW in general	80%	56%	71.6%	19.5
RDW among thalassemia	60%	44.4%	52.6%	21.5

Discussion

Our study shows that the prevalence of carotid atherosclerosis is 25% among cases of thalassemia, versus no atherosclerosis among age and sex matched controls. **Adly et al** in 2014 reported that CIMT measurements were slightly higher in the β -TM group (children and young patients) than that in the controls (0.57 ± 0.07 vs. 0.54 ± 0.04). This finding suggested that subclinical atherosclerosis started at an early age in β -TM children. They suggested early assessment of CIMT in patients with β -thalassemia major [5].

AS red blood cell distribution width (RDW) obtained from a standard complete blood count (CBC). It is a measure of the variability in size of circulating erythrocytes and is indicated as the coefficient of variation of the erythrocyte size [6].Clinical

conditions in which RBCs routinely elevated or decreased are usually caused by ineffective RBC production as in thalassemia RDW is elevated and The normal reference range of RDW most laboratories used was 11–15% [7].

Bujak et al. in 2015 showed that as RDW reflect the oxidative stress and inflammatory state which are postulated for the atherosclerotic process and PVD[8]. **Jia et al. in 2015** showed that RDW was about 14.3 ± 0.3 and The RDW is a potential predictor of carotid artery atherosclerosis in patients with ischemic stroke[9].

The current study couldn't detect this correlation between RDW and CIMT as a parameter of early atherosclerosis in patients with thalassemia as they all have higher RDW.

Bujak et al in 2015 showed a negative correlation between

RDW with red blood cell count and blood hemoglobin levels, although no association was found between RDW and lipid levels. The important role of RDW in the atherosclerotic process might explain the strong association between this new biomarker and the increased risk of acute coronary syndrome, ischemic cerebrovascular disease and peripheral artery disease[8].

In our study, there was statistically significant **positive** correlation between RDW, and level of WBCs level among cases of thalassemia, on the other hand there is no statistically significant correlation with age, hemoglobin, PLT, ferritin, cholesterol, and triglyceride level. This could be explained as RDW is elevated in all cases of thalassemia.

Several studies studied RDW as an indicator for atherosclerosis. **Tunçez et al 2017** reported that an

RDW level over 13.9 can predict the development of stent thrombosis with a sensitivity of 57% and a specificity of 52% in patients with STEMI undergoing primary percutaneous coronary intervention[10]. The related mechanism of this association is not fully understood. However, RDW is an indicator of inflammation related to early inflammatory biomarkers, such as C-reactive protein (CRP), interleukin-6 (IL-6) and tumor necrosis factor- α (TNF- α) [11].

Conclusions

RDW could not be considered a suitable parameter of atherosclerosis in patients with thalassemia. The Sensitivity and specificity test for RDW level in diagnosis of carotid atherosclerosis illustrates both low sensitivity (60%) and low specificity (44.4%).

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