

Red distribution width correlated inversely with muscles power in patients with stroke

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Abstract

Background: Red cell distribution width (RDW) was reported to be higher in patients with stroke. However, the correlation between the RDW and the stroke severity in terms of muscle power grading was not reported.

Methods: The retrospective study involves 37 patients with stroke. "The Medical Research Council Scale (MRC) for Muscle Strength" was used for the assessment of the muscle strength. RDW% was calculated by Coulter Counter device.

Results: The muscle power grading was significant and inversely ($P < 0.01$, $r = -0.604$) correlated with RDW% and significant and inversely ($P < 0.01$, $r = -0.72$) correlated with plasma triglycerides in patients with stroke.

Conclusion: These results show an inverse association between muscle power grading in stroke patients with RDW% and plasma triglycerides.

Key words: Red distribution width (RDW), stroke.

INTRODUCTION

RDW is usually expressed as RDW% which is the dispersion in percent of red blood corpuscle volumes around the average red cell size. It reflects the variability of mature erythrocytes size (i.e. anisocytosis) with the presence of large proportion of small and large red blood corpuscles.⁽¹⁾ High RDW has been recorded in variety of medical conditions such as cardiovascular diseases, and stroke.⁽²⁾ Vijayashree et al suggested that RDW is a possible prognostic index of stroke's patient outcome.⁽³⁾

The associated link that correlates RDW with the high stroke occurrence and stroke mortality is not clear. One of the possibilities is the renin-angiotensin cascade reaction that stimulates bone marrow erythropoiesis and consequently increases RDW.⁽⁴⁾ Renin-angiotensin arrangement by itself may increase the factor of risk for intracerebral hemorrhage and stroke due to ischemia possibly by high blood pressure.⁽⁵⁾ Likewise, inflammatory reactions may also consider as

a risk factor for ischemic stroke and again was found to be related to RDW.^(6, 7) Previous authors suggest that there is a relationship between carotid intima-media thickness, cardiovascular risk factors, stroke and existence of the carotid plaque with RDW.^(8, 9)

The aim of the current research was to assess the correlation between baseline RDW level and the clinical severity of stroke represented by muscle power grading. Furthermore we investigate the impact of serum triglyceride and cholesterol as risk factors for stroke on RDW.

PATIENTS AND METHODS

A retrospective study was conducted at a Neuroscience hospital. It involves 37 patients who admitted in the neurological ward and confirmed as a case of stroke with or without one or more of co-morbid conditions such as diabetes and hypertension. All cases were under supervision of a consultant neurologist.

The severity of motor deficit of stroke patient was assessed clinically according MRC,⁽¹⁰⁾ as shown in table 1

Table1: The Medical Research Council Scale for Muscle Strength (Paternostro-Sluga et al, 2008)

MRC Scale	
Grade	Description
0	There is no muscle contraction
1	There is a flicker or trace of muscle contraction
2	There is an active muscle movement when the with gravity is eliminated
3	There is an active muscle movement against the gravity
4	There is an active muscle movement against gravity and the resistance
5	Normal muscular power

RDW was determined by Coulter Counter. The serum levels of triglycerides and total cholesterol were measured as a part of routine investigation for stroke patients. All measured were done at Neuroscience Hospital laboratory.

Statistical analysis: Values are reported as means $\pm$ SD. Differences between variables were calculated by Unpaired Student's t-test. Statistical significance was consider when $P < 0.05$. Normality test of the data for Gaussian distribution was done by using Graphpad Instat version 3.06 software. If the unpaired data did not pass the normality test, then Mann-Whitney is used. Correlation coefficient was calculated by Microsoft Excel program.

RESULTS

The measured values of the recruited patients are listed in the following table (table 2). A total 37 patients, 20 females (54%) and 17 males (46%). No significant differences were found in RDW, age, lipid profile(including total serum cholesterol and triglyceride). Therefore, the data of both genders were pooled together and considered as one group.

Table 2. Baseline characteristic of the patients.

	Male (n = 17)	Female (n=20)	P-value
Age (year)	63 $\pm$ 14	64 $\pm$ 15	NS
RDW (%)	11.7 $\pm$ 2.95	10.6 $\pm$ 1.45	NS
Total cholesterol (mg/dl)	191.3 $\pm$ 67.24	201 $\pm$ 68.65	NS
Serum triglyceride (mg/dl)	185.4 $\pm$ 65.33	188.5 $\pm$ 64.24	NS

The mean values of RDW correlated negatively with muscle power grading and reach a significant level ($P < 0.01$) despite the fact that RDW is still within its normal range (Fig.1). Furthermore, lipid profile including total serum cholesterol and serum triglyceride were tested in relation to the muscle power grading severity. Both of them were correlated negatively but it did not reach significant value with serum cholesterol. Interesting significant negative correlation was found between RDW and serum triglyceride with P value < 0.01 (Fig 2).

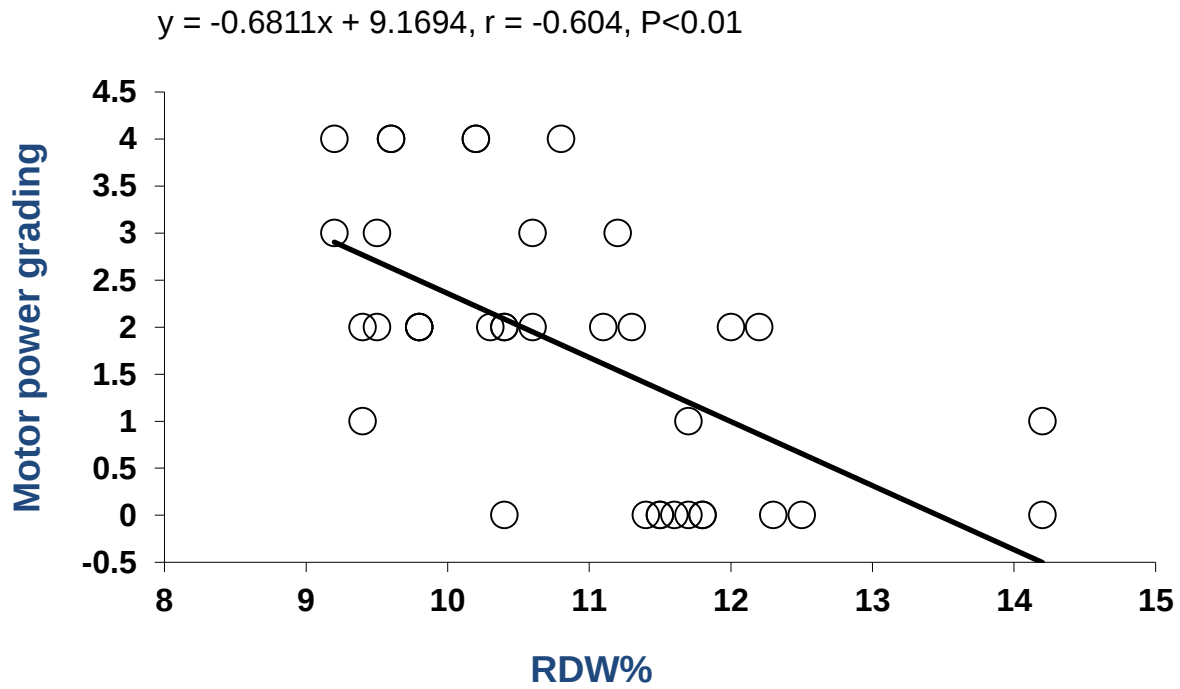


Figure 1: The correlation between RDW and motor power grading in patients with cerebrovascular accident (n=37)

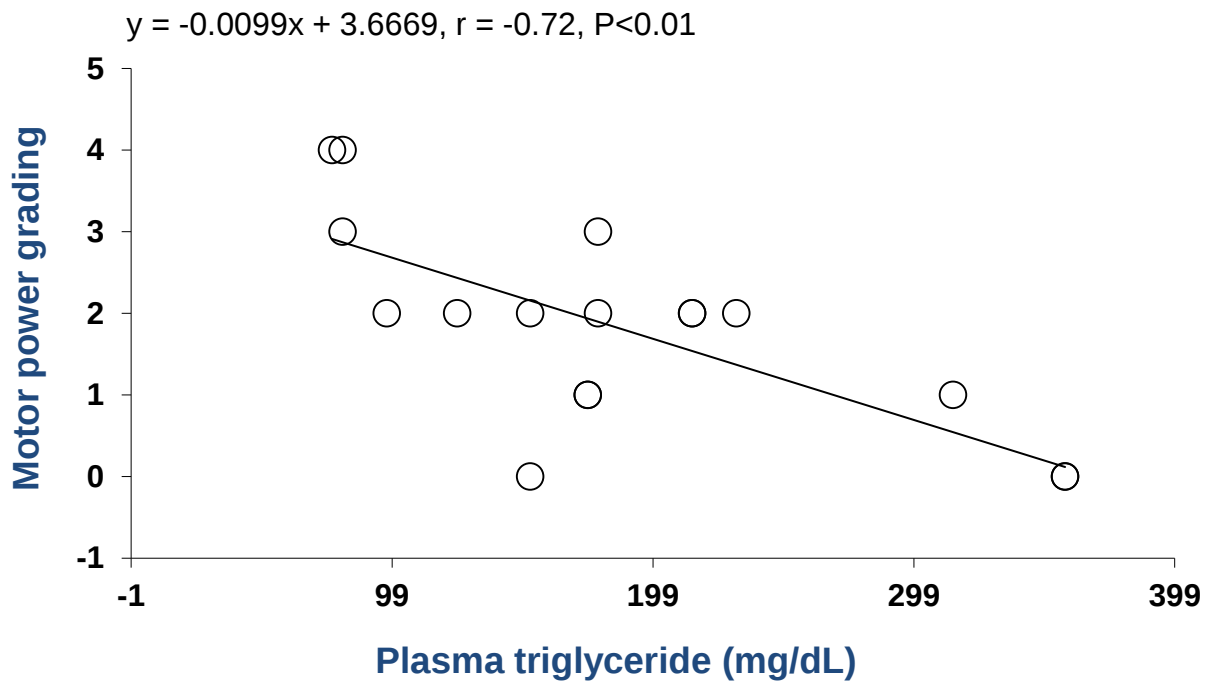


Figure 2: The relationship between plasma Triglyceride level and motor power grading in patients with cerebrovascular accident (n=17)

DISCUSSION

Stroke is an important cause of death and permanent disability.⁽¹¹⁾ The severity of disability and the probability of death after stroke depend on the condition severity.

In the present study, we chose the muscle power grading as simple indicator for the severity of stroke. Moreover, some of studies have concentrate on RDW, as it has a role in prognosis in different serious cardiovascular diseases,^(12, 13) idiopathic pulmonary fibrosis⁽¹⁴⁾ and diabetes.⁽¹⁵⁾ In addition, the most interesting feature regarding RDW, is that it is one of inexpensive routine used in clinical practice. We observed that although the RDW is still within normal rang, it tends to be significantly correlated with muscle power grading. This observation leads us to suggest that the change in erythropoietic activity associated with stroke leads to a higher RDW and consequently the presence of a higher proportion of larger red cells (anisocytosis) which have an adverse rheological effect in the brain microcirculation. These findings are in agreement with Ramirez-Moreno and co-workers⁽¹⁶⁾ who proposed to use RDW as good indicator for the severity and outcome of stroke.

Lipid profile variability are thought to be a factor of risk in the occurrence of stroke. In the current study, we identified a strong negative relation between the level of serum triglyceride with muscle power grading but not with serum cholesterol. This is in aligned with Philip-Ephraim et al,⁽¹⁷⁾ who proposed that there are no relationship between total cholesterol or HDL serum levels and cerebral infarction. The relationship between serum triglyceride concentrations, and the of stroke's risk is conflicting. Some studies had negative results while others reported positive correlation with high serum triglyceride concentrations.⁽¹⁸⁾ Furthermore, despite the facts that there are no direct correlation between RDW and serum triglyceride in the present study, both of them react similarly with muscle power grading in stroke patients, and the oxidative stress could be one of the explanation. Oxidative stress might contribute to anisocytosis as long as the erythrocytes are exposed to oxidative damage.⁽⁸⁾ likewise dyslipidemia including high level of triglyceride triggered oxidative stress with concomitant induction of inflammatory markers,⁽¹⁹⁾ that could lead to cardiovascular as well as cerebrovascular diseases.

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